

TREATISE  
ON  
AMMUNITIO

1905.



# MILITARY BOOKS.

Published by



Authority.

LONDON:  
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE.

And to be purchased, either directly or through any Bookseller, from  
WYMAN AND SONS, LTD., FETTER LANE, E.C. 5; or  
OLIVER AND BOYD, EDINBURGH; or  
E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

## ARMY REGULATIONS:—

**PAY, APPOINTMENT, PROMOTION, AND NON-EFFECTIVE  
PAY OF THE ARMY.** Royal Warrant. 1900. Price 1s.

**ALLOWANCES OF THE ARMY.** Regns. 1903. Price 1s. *(Out of print.)*

**CLOTHING OF THE ARMY.** Regns. Part I. Regular Forces.  
1904. Price 1s. Part II. Militia. 1904. Price 6d.

**DRESS REGNS. FOR OFFICERS OF THE ARMY** (including  
the Militia). 1904. Price 3s. 6d.

**EQUIPMENT OF THE ARMY.** Regns. Part 1. 1902.  
Price 1s.

Part 2. Details:—Sections—I. Infantry. 1904. Price 4d. II. Cavalry.  
1905. Price 6d. III. Army Service Corps. 1904. Price 3d. IV. and  
IVa. Army Ordnance Corps. Army Pay Corps. 1904. Price 2d.  
V. Army Medical Corps. 1903. Price 2d. VI.–IX. Colleges and  
Prisons. 1898. Price 2d. VIIc. Training Schools Depot, R.A.M.C.  
1902. Price 2d. X. Engineers. 1902. Price 6d. XI. (a) Horse Artillery,  
with B.L. 12-pr. 6 cwt. 1904. Price 6d. (b) Field Artillery,  
with Q.F. 15-pr. 1904. Price 6d. (c) Field Artillery, with B.L.  
15-pr. 1904. Price 6d. (d) Field Artillery, with B.L. 5-inch  
Howitzer. 1904. Price 6d. (e) Horse and Field Artillery Staff and  
Depôts, with 12-pr. 6 cwt. and B.L. 15-pr. 1904. Price 6d. XIIa.  
Garrison Artillery. Price 2s. 6d. XIIc. Heavy Artillery Brigade.  
1905. Price 6d. XIII. Staff Units in Time of War. Price 2d. XIV.  
and XV. Remount Depot at Base. Mounted and Dismounted Com-  
pany of Signallers in Time of War. 1904. Price 2d. XVI. Militia.  
1905. Price 6d. XVII. Yeomanry. 1903. Price 6d. XVIII. Volunteers.  
1905. Price 6d.

**EQUIPMENT. INSTRUCTIONS FOR FITTING AND  
WEARING BANDOLIER.** Pattern 1903. Price 2d.

**KING'S REGNS. AND ORDERS FOR THE ARMY.** Provisional  
Edition 1904. Price 1s. 6d.

**MILITIA REGNS.** (Provisional.) 1904. Price 1s.

**ORDNANCE COLLEGE REGNS.** 1904. Price 1s. 6d.

**ORDNANCE SERVICES. ARMY.** Regns. (Provisional.) 1904.  
Price 1s.

**RECRUITING FOR THE REGULAR ARMY, MILITIA, AND  
IMPERIAL YEOMANRY.** Regns. for. 1903. Price 6d.

**VETERINARY SERVICES, ARMY.** Regns. 1900. Price 6d.

## ARMY SERVICE CORPS:—

**TRAINING.** (Provisional.) 1903. Price 1s.

**STANDING ORDERS.** 1895. Price 1s. 6d.

**SUPPLY, HANDBOOK FOR.** Price 1s. 6d.

**ARMY ORDERS.** General Orders, Regulations, and Instructions  
promulgated to the Army. Monthly. Price 3d. Covers for ditto. Price 9d.

**WAR OFFICE LIST.** 1903. Sold by Harrison & Sons, 59, Pall Mall, S.W.  
Price 5s. net.

CHIEF SUPPLIES  
13 SEP 1906  
OF ORDERS

**MILITARY BOOKS, published by Authority—continued.**

- ARMOURERS.** Instructions for. 1904. Price 1s. 6d.  
**CAVALRY TRAINING.** (Provisional.) 1904. Price 1s.  
**YEOMANRY. IMPERIAL TRAINING** 1905. Instructions. Price 1d.  
**Do. Do. REGULATIONS.** 1903. Price 1s.  
**BICYCLES.** Care and Preservation of. 1905. Price 2d.  
**CYCLIST TRAINING.** (Provisional.) 1902. Price 2d.  
**ARTILLERY TRAINING:—**  
**FIELD.** 1901. Price 1s.  
**GARRISON.** Vol. 1. 1902. Price 6d. Vol. 2. 1904. Price 6d.  
(Provisional). Vol. 3. 1905. Price 1s.  
**HEAVY.** (Provisional.) 1904. Price 6d.  
**SIEGE.** 1901. Price 9d.  
**ARTILLERY, FIELD, Tactics of.** 1897. Price 1s.  
**ARTILLERY. MUSEUM.** In the Rotunda, Woolwich. Catalogue of. 1899. Price 1s. 9d.  
**ARTILLERY KIT PLATES.** Nos. 1 to 10. Price 2d. each.  
**ARTILLERY AND RIFLE RANGES ACT, 1885.** Bylaws made by Her Majesty's Principal Secretary of State for the War Department, with the consent of the Board of Trade. 8vo. Price 12s. each:—  
Aldeburgh; Ash, Aldershot Camp; Hythe; Iuckeith Battery; Kinghorness; Landguard; Finborough; Lydd; Middlewick; Millbrook; Orchard Portman (1897); Paull Point Battery, Salisbury Plain (Price 4d.); Scarborough (1898); Scarborough Artillery (1902); Scraps Gate; Shoeburyness; Southwold, Strensall; Warden Point Battery and Hurst Castle; Wash; Whitehaven Battery, Cumberland.  
**ARTILLERY. ROYAL REGIMENT OF.** Standing Orders of the. November, 1893. Price 2s.  
**ARTILLERY STORE ACCOUNTS.** Notes on. Price 6d.  
**ELECTRICITY.** Notes on. For the use of the Garrison Artillery. By Lieut.-Colonel J. R. J. Jocelyn, R.A. Price 1s. 6d.  
**ENGINEER SERVICES.** Regns. for. 1900. Price 1s. 6d.  
**ENGINEERING MILITARY.** Instruction in. Compiled at the School of Military Engineering, Chatham. 8vo. Cloth.  
Part I.—Field Defences. Seventh Edition. 1902. Price 1s. 6d.  
Part II.—Attack of Fortresses. Fifth Edition. 1896. Price 1s. 3d.  
Part III.—Military Bridging and use of spars. Fourth Edition. Corrected to January, 1902. Price 1s. 6d.  
Part IV.—Mining and Demolition. Fifth Edition. 1901. Price 1s. 6d.  
Part V.—Miscellaneous. Fifth Edition. Price 1s. 6d.  
Part VI.—Military Railways. Price 4s.  
**ENGINEERING. MILITARY. Manual.** (Provisional.) 1903. Price 1s.  
**ENGINEERS. FIELD. Drill.** 1899. Price 2s.  
**ESTABLISHMENTS. WAR.** Secs. 1 to 4, 6, and 7. 1905. Price 1d. each.  
**EXPLOSIVES. Service. Treatise on.** 1900. Price 1s. 6d.  
**FIELD SERVICE REGULATIONS:—**  
Part I.—COMBINED TRAINING. 1905. Price 1s.  
Part II.—WAR ADMINISTRATION. 1905. (*In preparation.*)  
**FIELD SKETCHING AND RECONNAISSANCE.** Manual of. Price 1s. 6d.  
**FORTIFICATION AND MILITARY ENGINEERING.** Text Book. Part II. (1894.) Price 6s.  
**HORSE AND STABLE MANAGEMENT.** Manual. 1904. Price 4d.  
**HYDRAULICS FOR GARRISON ARTILLERY.** Manual. 1895. Price 4s. 6d.  
**INFANTRY. DRUM AND FLUTE DUTY.** 1887. Price 2s.  
**INFANTRY TRAINING.** 1905. Price 1s.  
**INFANTRY. MOUNTED. TRAINING.** 1904. (Provisional.) Price 6d.  
**INTELLIGENCE DUTIES IN THE FIELD.** Regns. for. 1904. Price 2d.  
**RIFLE RANGES.** Miniature and Safety. Instructions for. Price 3d.  
**Do. Do. Care and Construction of.** Do. Price 3d.  
**ANTI-TYPHOID INOCULATION COMMITTEE.** Report. Price 1s. 6d.  
**BARRACKS.** Manual of Instructions in Care of. 1901. Price 9d.  
**COMMISSIONS IN H.M. REGULAR FORCES.** Short Guide to. Price 4d.  
**COMMANDS AND STAFF IN THE UNITED KINGDOM.** A.O., Jan. 6, 1905. Price 6d.  
**COOKING. MILITARY.** Manual of. 1901. Price 6d.

*MILITARY BOOKS, published by Authority—continued.*

- MILITIA.** Regns. for. 1904. (Provisional.) Price 1s.  
**MUSKETRY REGNS.** 1905. Price 1s.  
**MUSKETRY EXERCISES.** (Provisional.) 1904. Price 3d.  
**ORDNANCE CORPS. ARMY.** Standing Orders 1903. Price 6d.  
**ORDNANCE SERVICES. ARMY.** Regns. for. 1902. Price 1s.  
**ORDNANCE. SERVICE.** Treatise on. 6th Edition. 1904. Price 10s.  
**PROJECTION.** Linear Perspective. Text Book for R.M. Academy.  
In two parts. Price 6s.  
**RAILWAYS DURING THE WAR IN SOUTH AFRICA, 1899-1902.**  
Price 4s.  
**VOLUNTEER CORPS.** Purchase of Land by. 1893. Price 2d.  
**VOLUNTEER FORCE.** Regns. for. 1901. Amended to July, 1904.  
Price 1s.  
**VOLUNTEERS** in Brigade and Regimental Camps, or when encamped  
with the Regular Forces. Orders and Instructions for. Revised May,  
1902. Price 1d.  
**STEAM ENGINES AND BOILERS.** Notes on the Management  
of. 1899. Price 1d.  
**DEBRICKS, SHEERS, and HOLDFASTS.** 1898. Price 9d.  
**TRUMPET AND BUGLE SOUNDS for the Army.** 1903. Price 1s.  
**GUNNERY:** Text Book of. 1902. Price 3s.  
**GUNNERY TABLES.** Collected and compiled by Major G. MACKINLAY, R.A.  
for the Text Book of Gunnery, 1887. 48 pp. Price 2s. 6d.  
**GUNS:** Handbooks for, viz. :—  
64-PR. R.M.L. of 64 cwt. (Marks I., II., III.) Land Service.  
1900. Price 1s. 3d.  
64-PR. " Converted of 58 and 71 cwt. 1902. Price 9d.  
40-PR. " of 32 & 35 cwt. 1899. Price 6d.  
20-PR. R.B.L., of 16 cwt., on Travelling Carriage. (Movable  
Armament and Volunteer Batteries of Position.) 1898. Price 1s.  
16-PR. R.M.L. of 12 cwt. 1903. Price 1s.  
15-PR. B.L. (Mark I.) (Field Batteries.) 1904. Price 1s.  
15-PR. " (Marks II.—IV.) and Carriage Wagon and Limber.  
Mark IV. (Field Batteries). 1904. Price 1s. 6d.  
13-PR. R.M.L. of 8 cwt. (Movable Armament.) 1900. Price 1s.  
12-PR. Q.F. (Movable Armament.) 1903. Price 9d.  
12-PR. of 12 cwt. A.Q.F. (Land Service.) 1903. Price 1s. 6d.  
12-PR. B.L. (Marks I.—IV.) of 6 cwt., and Carriages (Marks I.\*  
and II.). Horse Artillery. 1905. Price 1s.  
10-PR. Jointed B.L. (Mule Equipment.) 1904. Price 1s.  
8-PR. HOTCHKISS Q.F. (Land Service.) 1903. Price 6d.  
3-PR. " " " " " " 1903. Price 6d.  
6-PR. NORDENFELT Q.F. (Land Service.) Price 1s.  
3-PR. " " " " " " 1903. Price 9d.  
12-5-inch R.M.L." 38 ton. " (Marks I. and II.) Land Service.  
1904. Price 1s. 6d.  
12-inch B.L. (Land Service.) 1904. Price 2s.  
10-inch R.M.L. 1903. Price 1s. 6d.  
10-inch B.L. Land Service. 1904. Price 2s  
9-2-inch (Land Service.) 1902. Price 2s. 6d.  
8-inch R.M.L. Howitzer of 70 cwt. For Movable Armaments  
and Armaments of Works. Land Service. 1901. Price 2s.  
6-inch Q.F. Land Service. 1903. Price 1s.  
6-inch B.L. and B.L.C. Land Service. 1904. Price 1s. 6d.  
6-inch B.L. Howitzer of 30 cwt. (Mark I.). 1904. Price 1s.  
6-inch " Howitzer of 25 cwt. (Mark I.). Price 3s.  
5-4-inch " Howitzer (Mark I.). 1902. Price 1s. 6d.  
5-inch " Howitzer. 1903. Price 1s.  
5-inch " (Marks I. to V.) Land Service. 1904. Price 9d.  
4-7-inch Q.F. (Fixed Armaments.) Land Service. 1904. Price 1s.  
4-7-inch Q.F.B. (Mark IV.) on Travelling Carriage. Land  
Service. 1904. Price 1s.  
4-inch B.L. Marks V. and VI. Land Service. 1904. Price 1s.  
2-95-inch Q.F. Mountain Gun. (Mark I.). Mule Equipment.  
1901. Price 3s.  
0-303-inch and 308-inch Converted Maxim Machine Gun. (Maga-  
zine Rifle Chamber.) 1903. Price 1s.



[All rights reserved.]

TREATISE  
ON  
AMMUNITION.

---

WAR OFFICE—1905.

---



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

And to be purchased, either directly or through any Bookseller, from  
WYMAN AND SONS, LTD., FETTER LANE, E.C.; or  
OLIVER AND BOYD, EDINBURGH; or  
E. PONSONBY, 116, GRAFTON STREET, DUBLIN.

---

1905.

*Price Three Shillings.*

Size.	Length in inches.	Number of sticks.		
		Dram.	oz.	lb.

### WEIGHTS OF CORDITE.

3 $\frac{3}{4}$	12	6	94	—
5	11	3	50	—
7 $\frac{1}{2}$	11	2	32	—
10	11	1	16	—
15	13 $\frac{1}{2}$	—	5	—
20	16 $\frac{1}{2}$ (cut to 14 $\frac{1}{3}$ " for 4.7-inch).	—	3	46
30	23 $\frac{1}{2}$	—	1	15
40	25	—	—	7 $\frac{1}{2}$
50	16	—	—	6 $\frac{1}{4}$

### WEIGHTS OF CORDITE M.D.

4 $\frac{1}{4}$	11	7	100	—
8	10 $\frac{3}{4}$	2 $\frac{1}{3}$	33	—
11	14 $\frac{1}{2}$	1	14.5	—
16	24 $\frac{1}{2}$	—	3 $\frac{1}{4}$	48
26	26 $\frac{1}{2}$	—	1 $\frac{1}{2}$	20 $\frac{1}{4}$
37	32	—	—	9
45	18.5	—	—	9

N.B.—The above table of approximate weights is drawn up for use on the Battery when required, but is not to be used in the Laboratory when making up or altering charges.



# AMENDMENTS

TO

# TREATISE ON AMMUNITION.

*1905*  
NO. 3.



---

Corrected to 31 | 3 | 08.

---

## PREFACE TO EIGHTH EDITION.

---

DETAILED information with regard to Ammunition for R.M.L. and R.B.L. guns is not included in this edition, but will be found in that issued in 1902.

AMMUNITION BRANCH,  
ORDNANCE COLLEGE,  
WOOLWICH,  
1st September, 1905.



# CONTENTS.

	PAGE
Preface to the EIGHTH Edition .. .. .	iii
List of Abbreviations .. .. .	vi
Chapter I.—Gunpowder .. .. .	1-4
"  II.—Guncotton .. .. .	5-12
"  III.—Cordite .. .. .	13-16
"  IV.—Miscellaneous Explosives .. .. .	17
"  V.—Cartridges .. .. .	18-32
"  VI.—Barrels, Cases, Cylinders, etc. . . . .	33-43
"  VII.—Detonators and Electric Fuzes .. .. .	44-54
"  VIII.—Tubes and Stores connected with them .. .. .	55-70
"  IX.—Fuzes .. .. .	71-86
"  X.—Projectiles and Driving Bands .. .. .	87-110
"  XI.—Quick-firing Guns, Ammunition for .. .. .	111-133
"  XII.—Implements, Fuze, Shell and Cartridge .. .. .	139-151
"  XIII.—Aiming Rifle, Machine Gun, and Small-Arm Amunition	152-167
"  XIV.—Rockets, Lights, etc. .. .. .	168-178
"  XV.—Notes on the Ammunition of Earlier Armaments .. .. .	179-181
Tables .. .. .	182-230
Appendix .. .. .	178A

## LIST OF TABLES.

	PAGE
1. Dry guncotton, charges and primers .. .. .	182
2. Wet guncotton, slabs .. .. .	183
2A. " " torpedo charges .. .. .	185
3. Cordite, various sizes used .. .. .	186
4. Cordite cartridges .. .. .	188
5. Powder " .. .. .	194A
6. " " for use in gunnery ships, &c. .. .. .	195
7. Saluting " .. .. .	196
8. Cylinders, zinc, for cartridges .. .. .	197
9. Cases, cartridge .. .. .	200
10. " powder, rectangular .. .. .	201
11. " " cylindrical .. .. .	203
13. Exploders, lyddite shell .. .. .	204
14. Tin cylinders .. .. .	205
15. Bursting charges of common, common pointed, and A.P. shell .. .. .	208
16. Shell, B.L., B.L.C., Q.F. or Q.F.C., common and common pointed. . . . .	210
17. " " " " " armour-piercing .. .. .	214
18. " " " " " common, lyddite .. .. .	215
19. " " " " " shrapnel .. .. .	217
20. Shot, B.L., Q.F., or Q.F.C., armour-piercing .. .. .	221
21. " " " " solid .. .. .	222
22. " " or Q.F., case .. .. .	223
23. Ammunition, Q.F. 6-pr. .. .. .	224
24. " " Q.F. 3-pr. .. .. .	225
25. Packages of cartridges, aiming rifle, S.A. and M.G. (ball) .. .. .	226
26. " " " " (blank).. .. .	227
27. Combustible compositions .. .. .	228
28. Paint and non-combustible compositions .. .. .	230

## LIST OF PLATES.

	TO FACE PAGE
Plate I.—Cartridge, B.L., 10-pr., 3-oz. 9-drs. Cordite, Size 3 $\frac{1}{2}$ , Mark I .. .. .	23
„ II.—Cartridge, B.L., 12-inch, 63 $\frac{1}{2}$ -lb. Cordite, M.D., Size 45 ( $\frac{1}{4}$ charge) (Type) .. .. .	25
„ III.—Cartridge, B.L., 12-inch, 87-lb. Cordite, Sizes 58 and 3 $\frac{1}{2}$ , Mark I   N   .. .. .	27
„ IV.—Cartridge, B.L., 6-inch Gun, 10-lb. Cordite, Size 20, Mark I   C   .. .. .	28
„ V.—Cartridge, B.L., 6-inch, 30-cwt. Howitzer, 1-lb. 15 $\frac{1}{2}$ -oz. Cordite, Size 5, Mark I   L   .. .. .	29
„ VI.—Detonator, Electric, No. 12, Mark V .. .. .	47
„ VII.—Tubes, Vent, Sealing, Percussion .. .. .	55
„ VIII.—Tube, Vent, Sealing, Electric, P., Mark VII   C   .. .. .	57
„ IX.— „ „ „ Wireless, P., Mark IV   C   .. .. .	58
„ X.— „ Friction, T., Mark II   L   .. .. .	59
„ XI.—Fuze, Percussion, Direct Action with Plug, No. 3, Mark IV .. .. .	72
„ XII.— „ „ Small, No. 8, Mark IV   L   .. .. .	76
„ XIII.— „ „ Base, Large, No. 11, Mark II   C   .. .. .	78
„ XIV.— „ T. and P., No. 60, Mark II   C   .. .. .	80
„ XV.— „ T. and P., No. 63, Mark I   C   .. .. .	82
„ XVI.— „ T. and P., No. 56, Mark IV   C   .. .. .	82
„ XVII.— Time, Sensitive, Middle, No. 24, Mark I .. .. .	84
„ *XIX.— „ T. and P., No. 80,   L   .. .. .	85
„ XX.— „ Time, 15 Seconds, No. 25   L   .. .. .	86
„ XXI.—Types of Driving Bonds .. .. .	87
„ XXII.—Shell, B.L., Common Pointed, 9.2-inch, Cast Steel .. .. .	94
„ XXIII.— „ B.L., Q.F. or Q.F.C., Common Lyddite, 6-inch Gun, Mark IV   C   .. .. .	96
„ XXIV.—Shell, B.L., Armour Piercing, 9.2-inch, Mark III   C   .. .. .	98
„ XXV.— „ B.L., Shrapnel, 9.2-inch, Cast Steel, Mark VI   C   .. .. .	99
„ XXVI.— „ B.L. or Q.F., Shrapnel, 12-pr., 12, 8, and 6-cwt., Mark V   C   .. .. .	100
„ XXVII.—Shell, B.L., Star, 10-pr., Mark II   L   .. .. .	102
„ XXVIII.—Cartridge, Q.F., 1-pr., Common Shell .. .. .	111
„ XXIX.— „ Q.F., 6-pr., Cordite, Steel Shell, Mark VIII   C   .. .. .	113
„ XXX.—Fuze, Percussion, Base, Hotchkiss, Mark IV   C   .. .. .	114
„ XXXI.—Cartridge, Q.F., 13-pr. Shrapnel Shell, Mark I   L   Fuzed .. .. .	122
„ XXXII.— „ Q.F., 4.7-inch, 5-lb. 7-oz. Cordite, Size 20, Mark V   C   .. .. .	123
„ XXXIII.—Cartridge, Q.F. or Q.F.C., Primer, Electric, Large, Mark V   C   .. .. .	126
„ XXXIV.—Cartridge, Q.F. or Q.F.C. Drill .. .. .	129
„ XXXV.—Machine, Extracting, Shell, 3 and 6-prs., Mark I   C   .. .. .	138
„ XXXVI.—Cartridge, Aiming, Rifle, 1-inch, Electric, Mark V, M   C   .. .. .	152
„ XXXVII.—Cartridge, Aiming, Rifle, 1-inch, Percussion, Mark I   L   .. .. .	153
„ XXXVIII.—Distinguishing Marks for S.A. Ammunition Boxes .. .. .	165

\* Plate XVIII struck out.



## LIST OF ABBREVIATIONS.

---

A.C.	Army Circular.
A.O.	Army Order.
A.O.S.	Regulations for Army Ordnance Services.
A.P.	Armour-Piercing.
B.L.	Breech Loading.
B.L.C.	Breech Loading Converted.
C.	Common, to both Land and Naval Service.
C.S.	Cast Steel.
C.I.	Cast Iron.
F.S.	Field Service or Forged Steel.
F.G.	Fine Grain.
G.G.	Gardner-Gatling.
G.S.	General Service.
L.S. or  L.	Land Service.
L.G.	Large Grain.
M.G.	Machine Gun.
M.H.	Martini-Henry.
N.S. or  N.	Naval Service.
Q.F.	Quick Firing.
Q.F.C.	Quick Firing Converted.
R.F.G.	Rifled Fine Grain.
R.L.	Royal Laboratory.
R.W.M.	Regulations for care and preservation of War Matériel and Magazines.
V.S.	Vent Sealing.
§	Paragraph List of Changes.

[N.B.—This edition is corrected up to 1st September, 1905. As some typographical errors may have occurred in publication, it is requested that, should any be discovered, they may be at once pointed out, in writing, to the Under Secretary of State for War.]

# TREATISE ON AMMUNITION.

## CHAPTER I.—GUNPOWDER.

EXPLOSIVES are used for the propulsion of projectiles, or as disruptive agents, or for the purpose of igniting other explosives. The explosives commonly met with in the service are gunpowder, cordite, gun-cotton, lyddite, and fulminate of mercury.

Gunpowder is an intimate mechanical mixture of saltpetre, charcoal, and sulphur.

In England, black powder is, and for a long time has been, made of the ingredients mentioned above in the following proportions: saltpetre 75 parts, charcoal 15 parts, sulphur 10 parts.

The proportions of Prism<sup>1</sup> brown and S.B.C. powders are—saltpetre 79 parts, charcoal 18 parts, sulphur 3 parts; and of E.X.E. powder, saltpetre  $77\frac{4}{6}$  parts, charcoal  $17\frac{1}{6}$  parts, and sulphur 5 parts.

In addition from 0·8 to 2·4 per cent. of water is a recognised ingredient in powders. See A.O.S. Regulations, 1904, paragraph 548e.

The explosiveness of powder of a given composition can be modified by varying the charcoal, the amount of moisture, and its physical condition: *i.e.*, its density, hardness, and size and shape of grain. The effect of the above variations on fired powder is discussed in "Treatise on Service Explosives."

Speaking generally, a large grained powder, highly glazed, made from highly-burnt charcoal, and of high density, other things being equal, will burn more slowly, and therefore be less violent in its action, than a powder of opposite characteristics. If, however, the grain be very small as in mealed powder, the interstices between the grains are not sufficiently large to allow a free passage of flame, and so a charge of mealed powder would ignite in one place only and would burn comparatively slowly.

A charge of slow-burning powder gives rise to a lower maximum pressure than a charge of quick-burning powder, and the pressure is better sustained throughout the bore, and so for equal velocities with a projectile of a given weight the slow-burning powder strains the breech of the gun less.

To obtain a slow-burning powder, the density and size of grain were increased.

To ensure regularity of burning in guns 6 inch and upwards, moulded or prism powders were introduced. These powders are moulded into regular hexagonal prisms, having a hole running through the centre of each. Thus not only is the powder of uniform size, but the pressure of the gas is better sustained, since as each



prism burns, the decrease in surface on the outside is to some extent counterbalanced by the increase of the inside surface of the perforation. It is also probable that after a certain time the prism breaks up, thus forming additional surfaces for combustion, and consequently for the evolution of gas.

The brown powders have been very satisfactory in that the pressures they give are moderate, while the velocities are higher than with black powder. They are more difficult to ignite, and require a primer of a few prisms of the latter.

Gunpowder ignites at a temperature between 550° F. and 600° F., various conditions tending to modify the exact temperature. For instance, gunpowder made with slack burnt charcoal ignites at a lower temperature than gunpowder similar in other respects made with a highly-burnt charcoal. Mealed powder, again, will ignite more readily than the same meal pressed into a prism. Powder will deteriorate at lower temperatures than that which causes its ignition; sulphur begins to vaporise at about 239° F., and water is given up by powder at a still lower temperature.

Liability of  
gunpowder to  
explode by a  
blow or by  
friction.

Gunpowder can be exploded by a blow or friction, especially when a thin film of powder-dust is nipped between hard surfaces, or, if it receives a glancing blow, even between wooden surfaces. This fact forms a clue to most of the precautions laid down to be taken when dealing with gunpowder. When they are carefully observed the risk of an explosion is small. No departure should be made from the letter or spirit of the regulations laid down for dealing with explosives.

§ 2431.

Gunpowder stands climate well. Pure saltpetre is not deliquescent to any great extent; the glaze and density of powder aid in preserving it from damp; still, in damp climates, or in a damp magazine, it is necessary to keep powder in air-tight metal cases. Also moulded powders, especially brown powders, contain a comparatively high percentage of water, and if this moisture be allowed to decrease to any extent, high pressures will result on firing; hence these powders must be kept in air-tight metal cases to prevent this loss of moisture, which would otherwise occur in hot and dry magazines.

Keeping gunpowder in a damp atmosphere will tend to separate the ingredients by wetting a portion of the saltpetre, which on a change of atmospheric conditions may effloresce, *i.e.*, be carried to the surface of the grains.

The dryness and proper ventilation of powder magazines are therefore points of great importance.

Gunpowder should not be allowed to remain in direct contact with metal, as if there is the least damp present the powder will corrode the metal, thus damaging both. Again, paper, if of any thickness, is found to cause powder to deteriorate, as it is given to absorb and retain damp. This causes part of the saltpetre to be absorbed into the paper, which becomes more or less impregnated with it at the expense of the powder. This difficulty can be overcome by varnishing the paper.

There are various descriptions of powder in the Service. A specification guides the manufacture of each description, and governs its receipt into the Service.

The powders in the Service are enumerated in the list given in R.W.M.

Information as to its manufacture is given in the "Treatise on Service Explosives."

## BLANK POWDERS.

Blank powders are used for saluting and exercise and may either be powders reduced in class from "Service," or specially manufactured as "Blank," or "converted," that is, remade entirely from various black powders or from a mixture of black (2 parts) and brown (1 part). § 12449.

Blank L.G. is used for all natures of blank cannon cartridges, also 2 and 4 oz. puffs.

*Blank L.G., new, or converted,* for filling A.P. shell when lasting cloth burster bags are used. R.L.G.<sup>4</sup> is also used. § 12806.

Blank F.G. may be used with P. for shell filling, and when new for shrapnel shell and Webly pistol blank. § 9720.

Blank F.G. new is used as an alternative to R.F.G.<sup>2</sup> for the igniters of cordite cartridges. § 10498.

R.L.G.<sup>4</sup>, P., Q.F.<sup>1</sup>, P.<sup>2</sup>, and moulded powders are not to be placed in Class II., i.e., Blank.

Service gunpowders are not to be used for blank or saluting cartridges when any gunpowder classed under the head of blank is available.

## SHELL POWDERS.

Shell powders are manufactured as such, converted, or reduced, being not suitable for "Blank" or "Service." § 7714.

P. mixture consists of shell P. and shell F.G. It is used for filling common, common pointed, double, and \* armour piercing shell except those noted below.

*Shell F.G.* includes pistol, F.G., R.F.G., and R.F.G.<sup>2</sup>, reduced to Class III., and is used with P. for shell filling. Shell F.G. New may be used for shrapnel shell.

*Shell L.G.* is a powder reduced in class.

*Q.F. shell F.G.* is used for the bursting charge of 6 and 3-pr. Q.F. shell. It is a specially manufactured powder. § 6686.

Shell P. is now being manufactured from black and brown prism powders that are no longer required for other purposes, in the proportions of  $\frac{2}{3}$  black to  $\frac{1}{3}$  brown.

*Shell Q.F. is Q.F.<sup>1</sup>* either not fit for, or not required, as "Service." It is mixed with F.G. and used for filling 12-pr. Q.F. common pointed shell, Mark I. Should P. not be available it may be used with F.G. for filling common, common pointed, and \* armour piercing shell up to and including 6-inch, except 1, 3, and 6-pr. Q.F. §§ 7714, 7715, 10837.

Powders classed as shell powders are generally those found dusty or broken in grain, and not according to specification, and so unfit for Service powders, but suitable for shell filling.

Failing shell powders the higher classes of powder may be used, the only reason for using the inferior powder being to prevent waste.

Gunpowder of Class VI will at once be thoroughly wetted, and placed in old barrels. When such wetted powder unduly accumulates it is destroyed by being sunk in deep water.

All grained and cubical powders not made up in cartridges are packed in barrels, as laid down in paragraphs 180 and 181, R.W.M. Packing.

Prism powders are packed in special zinc-lined waterproof cases which always contain 100 lb.

For description of these packages, see Chapter VI.

\* See Blank L.G. new.

Service gunpowder, for convenience for store and issuing purposes, is divided and marked into lots or blends. These lots consist generally of from 40 to 300 packages, the contents of which are of uniform quality. A blend consists of two or more lots blended together so that the whole blend is of uniform quality.

§ 12046.

"P" gunpowder repaired lots having reached the last letter of the alphabet, in future the letter will be followed by a number: *i.e.*, A.<sup>1</sup>, A.<sup>2</sup> etc.

*Mealed Powder* is largely used in the manufacture of ammunition. It is ordinary powder reduced to an impalpable dust by drumming it in a revolving barrel with gun-metal balls, until it will pass through an 120-mesh sieve. The meal from Prism<sup>1</sup> brown, used in fuze compositions, is prepared by breaking the prisms into small pieces with a wooden mallet, and then crushing them by hand on a metal slab with a metal roller. The meal so obtained is passed through an 120-mesh sieve. It ignites readily and burns rapidly, and is used in fuze composition, quick match, friction tubes, &c. It causes compositions to burn readily and quickly, and the rate of burning may to some extent be regulated by the quantity of mealed powder employed. It is also mixed with gun-cotton dust to form priming composition for electric tubes, detonators, etc.

---



## CHAPTER II.—GUN-COTTON.

Gun-cotton is manufactured at Waltham Abbey, and a considerable amount is obtained from the trade. Details of manufacture, &c. will be found in "Treatise on Service Explosives, 1900."

The best white cotton waste which has been cleaned from grease by boiling with alkalies, and which should contain not more than 1.1 per cent. oily matters, is employed. It is picked over to remove foreign substances, passed through a teasing machine, and dried. It is then steeped for a short time in the strongest nitric acid not under 1.50 sp. gr., to which three parts by weight of strong sulphuric acid, 1.842 sp. gr., have been added. The cotton, now converted into gun-cotton, is very thoroughly washed, wrung out, boiled and pulped, to rid it of the free acid, which, if left in, even in minute quantities, would not only be fatal to the keeping qualities of the gun-cotton, but would make it dangerous to store, owing to its liability to decomposition and spontaneous combustion. After the washing process alkaline matter is added, except when required for the manufacture of cordite, and in this state it is moulded and pressed into any required form, the pressure employed being 6 tons to the square inch. When finished it should contain from 1 to 2 per cent. of alkaline matter. In this state it is ordinary wet gun-cotton as found in the Service in slabs, &c.

The cylinders of gun-cotton for making primers are subsequently dried till they contain only 2 per cent. of water.

The cylinders of gun-cotton for making cordite, are moulded under a pressure of 34 lbs. to the square inch and then dried.

Gun-cotton when dry *may* ignite at 277° F., it *must* ignite at 400° F.; its mean igniting point may be taken at about 340° F. Gunpowder ignites at about 560° F. The low igniting point of gun-cotton is taken advantage of in using loosely twisted strands of it as an igniter in some cordite cartridges. Gun-cotton is also used in the form of dust, mixed with mealed powder, as priming for electric tubes, &c. Bloxam.

Gun-cotton varies considerably in its rate of burning, according to its physical condition and mode of firing. If it be merely washed without being pulped, it retains its original colour and appearance, and can only be distinguished from ordinary cotton by the peculiar harsh nature of its fibres. In this state it can be twisted into strands or woven into fabrics.

When dry gun-cotton, perfectly unconfined, is ignited by a flame, or by a heated body, it burns very rapidly with a bright yellow flame; if, however, the cotton is confined in a strong case, even of wood, the action is very different; it explodes with great violence, and the strength of the explosion will depend upon the thickness of the case; to develop it fully a strong iron case is required. Dry gun-cotton.

Compressed dry gun-cotton may be detonated, even when unconfined, by the action of various explosives, of which fulminate of mercury is found the most suitable. It is not very easy to dis-

tinguish between ordinary explosion and detonation, but for practical purposes detonation may be considered as an instantaneous form of explosion, this latter term being used generally to include the above and also such comparatively slow action as the burning of a cordite charge in a heavy B.L. gun.

About 5 grains of fulminate of mercury enclosed in a tube and ignited in close contact with compressed dry gun-cotton produces detonation, but to guard against any chance of failure, Service detonators contain from 32 to 43 grains. A description of Service detonators will be found in Chapter VII.

When the detonation is required to spread from one primer to others, it is not necessary to have them absolutely in contact; rows of primers from 30 to 40 feet in length, with intervals of from  $\frac{1}{2}$  an inch to 1 inch, have been detonated by a primer at one end, set in action by a fulminate detonator.

To produce detonation, the gun-cotton must be in a compressed form; loose flocculent gun-cotton cannot be detonated, it is merely scattered by the detonator.

Ordinary dry gun-cotton contains about 2 per cent. of moisture. If the moisture amounts to 5 per cent. the gun-cotton can be easily ignited by a flame, but probably will not detonate with a service detonator. Dry gun-cotton may be exploded with comparative ease by percussion, but the explosion is usually very local and confined to the part struck.

The chemical constitution of gun-cotton is quite unaltered by immersion in or storage under water, and when dried again the gun-cotton will possess all its original qualities of easy ignition and susceptibility to detonation, so long as its mechanical cohesion is not destroyed.

On this account, gun-cotton in its Service forms cannot be kept for an indefinite time in a large volume of water, as it becomes disintegrated, and the loss of its compressed form deprives it of its susceptibility to detonation. If re-pressed, however, it would regain its former properties.

Wet gun-cotton in the Service, therefore, contains only about 25 parts of water to 100 parts of dry gun-cotton, which is sufficient to prevent its ignition, but not enough to cause it to suffer from disintegration.

Wet gun-cotton may itself be detonated by fulminate if a considerable quantity of the latter be used; or, as is the safest and most convenient plan in practice, by detonating a small quantity of dry gun-cotton in contact, with the wet mass, by means of an ordinary detonator. One or two half-pound dry primers of gun-cotton, when thus detonated, will communicate their action to a large mass of wet gun-cotton.

Wet gun-cotton is rather more powerful in its effects when detonated than dry.

It is impossible to ignite wet guncotton by a flame. If a slab of wet gun-cotton containing about 15 per cent. of water be put on a fire it will gradually smoulder away as the outer portions in contact with the fire become dried, but it will not explode.

These properties are most important. They allow the gun-cotton to be stored wet, in which condition it is safe from any danger of explosion by fire, and it can be re-dried, with care, for use in small quantities, or left wet for use in large charges, subject to the use of a dry primer as above mentioned. This property renders it the best agent of its class for military purposes.

When gun-cotton is detonated its action is practically instantaneous and therefore no confinement is required, thus there ceases to be any necessity for using a strong case for torpedoes, or for tamping mines, and it can be used to cut down stockades, &c., by simply attaching slabs loosely to the obstacle.

The chief products of the explosion of gun-cotton are aqueous vapour, carbon monoxide, carbonic acid and nitrogen; the carbon monoxide is highly dangerous in confined spaces, such as mines, &c., as it is an active poison and very inflammable.

For this reason gun-cotton is unsuitable for mining purposes in the L.S., except under special conditions, when the miners are not required to enter the ground again for some time after the charge is fired.

The chief properties of gun-cotton, as compared with those of gunpowder, may be summed up as follows:—

- (1) Dry gun-cotton can be inflamed at a much lower temperature than gunpowder.
- (2) Dry gun-cotton is very much more easy to explode by percussion or friction than gunpowder.
- (3) The explosion of gun-cotton is unattended by smoke.
- (4) The action of gun-cotton is much more rapid than that of gunpowder.
- (5) Gun-cotton is uninjured by moisture.

Gun-cotton is used in the service for torpedo and mine charges, Use. and for demolitions.

The forms of gun-cotton employed in the service are given in Table I. Priming charges, primers and slabs are designated by letters. §§ 9617, 9670.

Primers are cylindrical in shape, and the perforations mentioned in the table are intended to receive the detonators. All 1-oz. and 2-oz. primers issued dry are coated with paraffin (except torpedo primers) to preserve them from damp.

#### WET GUN-COTTON.

Wet gun-cotton is issued in the forms of slabs or primers packed in metal cases or metal-lined boxes, intended equally for transport and store, or made up in charges for torpedoes, and mines, all hermetically sealed. Issue, transport, and packing of wet gun-cotton.

The closing plates of the cases or metal linings are fitted with a screw plug, for removal, to allow the escape of gas that may have formed, or the re-wetting of the gun-cotton.

The packages are the 50-lb. box, a similar 15-lb. box, and the half-sized metal-lined case, specially prepared to take gun-cotton for G.S. Packages.

The above boxes are for store and transport.

There are also the 16½-lb. case for N.S., and a tinned copper box, to contain eight ½-slabs, for siege train, both of which are issued two in a packing case, and also a tinned copper box, to contain one ½-slab, for cavalry pioneers, which is issued in a special packing case to take 16. § 7068.

Box, gun-cotton, wet, 50 lb., Marks II\* and III, wood, with copper tinned inner case, is made of deal with elm ends, to each of which are attached rope handles by means of cleats. The whole of the box is painted red. The lid is secured by brass screws, and has two recesses for labels, and in the centre a G.S. plug, which can §§ 4660, 7192, 9615, 10169.

be removed to allow gas to escape. Inside the box is an inner case of tinned copper, which projects slightly over the edge of the box, and has a handle at each end to facilitate its removal. This inner case has a hole in the top, the edges of which are strengthened by a wire soldered to the outside of the flange, and this hole is closed by a rectangular plate of the same material, soldered on when the box is full. In the centre of the closing plate is a small metal screw plug with leather washer, which comes immediately under the G.S. plug of the lid, and can be removed when desired. To prevent danger in soldering on the plate, the top of the inner case is filled with strips of wood, painted with black paint, and the spare spaces not occupied by the gun-cotton are filled up with pieces of wood similarly prepared. The interior of the copper case is coated with the same material. On the exterior of the box are two labels, one white, giving directions for examination, and opening the box, and date of packing; the other red, giving the nature of slabs or primers packed in the box, the weight of gun-cotton, and the gross weight. On the inner case is another label with the weight of the copper case, and its contents, and the limit of increase or decrease in weight, which must not exceed 2 per cent. of the gun-cotton; directions for examination and re-wetting, and the date of packing.

Mark II boxes had an extra securing screw in the centre of each side of the lid and the hole in the inner case was smaller. Mark II boxes which are converted as above are known as Mark II\*, while new boxes are Mark III.

§ 9615.

To facilitate the removal of gun-cotton slabs from existing Mark II boxes, a tinned copper band is placed round one of the slabs on the top tier in packing, the words "and lifting band" being added to the detail nomenclature.

It is to be noted that, in all cases where the weight of gun-cotton is given independently of the package, the weight of that material in a dry state is intended.

§§ 4291, 4306,  
4659, 7448,  
10169.

*Box, gun-cotton, wet, 15 lb., Mark II,* is similar in all respects except size to the 50-lb. box described above. It contains 13½ lb. when packed with 1½-lb. slabs, 14 lb. when packed with 2-lb. slabs, and 15 lb. when packed with 2½-lb. slabs.

§ 4680.

Some *Cases, powder, metal lined, half,* have been specially prepared to take gun-cotton, by making the bottom removable, so that the metal lining may be taken out and weighed when necessary, and by inserting in the bung a screw plug which can be taken out to allow of the escape of gas or to admit of re-wetting. In the wood lid is a small hole to allow of access to this plug without opening the lid. An arrow on the bung and another on the exterior of the case denote when the bung is in the correct position, with the plug under this hole. The interior of the lining is also coated with black paint. These altered cases are still available for packing gunpowder if specially required for that purpose, but care must of course be taken to see that they are thoroughly dry before inserting the powder.

*Box, gun-cotton, eight ½-slabs,* for siege train is a rectangular box made of tinned copper to contain eight 1-lb. slabs, R. It is painted black; the lid is sealed by a tape band shellaced on, and has a loop at the top but no plug for re-wetting. This box has not appeared in List of Changes. It is issued two in a packing case, painted red.

§§ 7068, 8313.

*Box, gun-cotton, one ½-slab, Mark II,* for cavalry pioneers, is made of tinned copper to contain one 14-oz. slab of gun-cotton, V.



It is closed with a soldered strip similarly to fuze cylinders, and it has a loop on top for lifting, and a screw plug for re-wetting.

Mark I differs from the above in having no screw plug, and it is closed with a tape band.

It is packed in the *Case, packing, gun-cotton, wet, cavalry* § 7068. *pioneers*, which is made of deal with elm ends, dovetailed together, and the bottom secured with brass screws. To each end are attached rope handles secured by means of cleats. The interior of the case is divided into 16 partitions, each to hold one box. The top is secured by brass screws. The case is painted red outside.

*Case, gun-cotton, wet, charges, Naval*, 16½ lb., is the package in which gun-cotton is issued to the Royal Navy. It is used for out-rigger torpedoes, and for general demolition purposes.

The present pattern, Mark IV, consists of a tin cylinder about 10½ inches high, and the same diameter, strengthened by three tinned iron hoops and painted red. Construction. § 4360.

Two holes pass completely through the cylinder, one in the axis, the other parallel to it; the former is for attaching the case to a spar, and the other to contain the dry priming charge. The case is painted black inside, and contains 30 9-oz. primers, of which 20 are whole and 10 cut so as to fit closely against the cylinder intended to contain the dry priming charge. To ensure complete contact the whole are tightly packed with wooden wedges of suitable shape.

To prevent all chance of the heat from the soldering iron reaching the gun-cotton, the case is provided with a false tin bottom having a flange 0.2 inch deep, which is inserted over the cotton before the bottom is soldered on. In the other end is a small gun-metal plug, which can be unscrewed to allow the escape of gas or to re-wet the explosive.

On the exterior is a label giving the nett and gross weight, with instructions for periodical examination and re-wetting the gun-cotton, and instructions for weighing.

These cases are sometimes packed with slabs of wet gun-cotton.

*Mark III* had an asbestos wad instead of a false tin bottom. This § 3941. occasionally led to the accumulation of gas.

Two in a deal box. This box is made of deal with elm ends. It has the lid and bottom secured with brass screws. It is painted red outside. Issue. § 7192.

*Mine, boat, gun-cotton, wet charge*, 16¼ lb., Mark I., is generally § 10120. similar to the above. The case is of brass; a packing piece is used.

#### DRY GUN-COTTON.

*Dry gun-cotton* is employed in the form of primers for detonating wet gun-cotton charges, as yarn or canvas for igniters of cordite cartridges, as dust for priming electric tubes, fuzes, &c., and in the manufacture of cordite, also as 2-oz. primers for the sound rocket.

*Dry gun-cotton* is issued in brass, copper or tin cylinders, a number of cylinders being placed in a packing case for convenience in transport and storage.

These cylinders are placed in a numbered series.

*Charges priming, primers, and primers torpedo*, are in a lettered series, and care must be taken to distinguish between them.

The 1-oz. and 2-oz. *primers*, except for torpedoes, are coated with paraffin wax to exclude moisture. The gun-cotton yarn used for

priming cordite cartridges is waterproofed by dipping in indiarubber solution. The primers have a central perforation for the detonator, those for the "charges priming," have two holes.

§§ 9617, 4C65, 4744, 7<sup>d</sup>51, 9617. *Cylinder, gun-cotton, primer*, No. 61, 2 $\frac{1}{4}$  lb., empty, is used to contain the 2 $\frac{1}{4}$ -lb. charge, and when issued filled, it is sealed as *Gun-cotton, dry, charge, priming, C*, 2 $\frac{1}{4}$  lb., mentioned in table No. 1, for the Navy only. It is issued empty to R.E. for submarine mining. It is a tin cylinder, painted red and made to contain four 9-oz. primers, banded together with white paper to prevent them adhering to the lacquer of the cylinder, and prevented from shaking about by a thick felt wad. It is used in the Navy as a priming charge for the 16 $\frac{1}{4}$ -lb. case.

Description. The two uppermost 9-oz. primers have a wooden pin fitted into one of the holes to ensure the other holes being in line for the insertion of the detonator. On the exterior of the case, besides the list of the contents and instructions for re-closing the case, are directions for use when used as a priming charge for outriggers, &c.

The lid is sealed by a tape band shellaced on.

§§ 3789, 9617, 9618. *Cylinder, gun-cotton, primer*, No. 60, is a tin cylinder painted black, and similar to the above, but shorter. It also contains four 9-oz. primers, forming the 2 $\frac{1}{4}$ -lb. charge for submarine mining and sealed as *Gun-cotton, dry, charge, priming, B*. The primers are banded together with white paper and prevented from shaking about by a felt wad. A doubled tape round the primers facilitates their extraction. It is issued for submarine mining only.

§§ 4744, 9617. *Cylinder, gun-cotton, primer*, No. 59, is a tin cylinder painted black, and made to contain three 1-lb.-8-oz. primers, forming the 4-lb.-8-oz. charge for submarine mining, sealed as *Gun-cotton, dry, charge, priming, A*. These primers are also banded together, steadied by a felt wad, and have the doubled tape band for extraction. The lid is sealed by a tape band as above, and it is issued for submarine mining only.

§§ 6018, 9617. *Cylinder, gun-cotton, primer*, No. 50, is the one issued to cavalry pioneers. It is made of tin, painted black, and the lid is fastened by a bayonet joint and attached to the body by a piece of whipcord to prevent its being lost. The cylinder is lined with brown paper and contains nine 2-oz. primers, F. A doubled tape with the bight passed below the primers and attached underneath to a wooden disc enables them to be withdrawn.

§ 9617. *Cylinder, gun-cotton, primer*, No. 58, which is issued for the equipment disabling ordnance is similar to the cylinder for cavalry pioneers, except in dimensions, and contains eight 1-oz. primers, H.

§§ 4291, 9617. *Cylinder, gun-cotton, primer*, No. 51, is a tin cylinder, painted black, and contains five 2-oz. primers, F, for issue to R.E. It is lined with stout brown paper and the primers can be extracted by the usual doubled tape, the bight underneath being attached to a pasteboard disc. The lid is sealed by a tape band.

§§ 4291, 9617. *Cylinder, gun-cotton, primer*, No. 52, is similar to cylinder, 51, but smaller, and contains five 1-oz. primers, H. It is issued to the Royal Navy and R.E.

Torpedo primers. § 9617. The cases containing the *Gun-cotton, dry, primer, torpedo, D*, 6-oz., have in one end a cylindrical recess to take the detonator, and the other is closed by an indiarubber diaphragm between two metal plates, which can be pressed together by means of a screw. To prevent the indiarubber disc adhering to the sides of the copper cylinder the edges are covered with paper. These are converted to E.

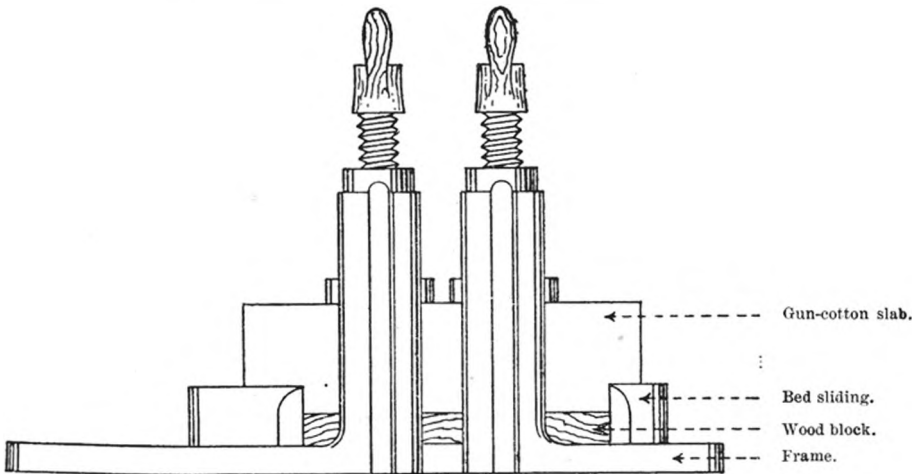
*Gun-cotton dry primer torpedo E* differs from D in being threaded § 12468. on the exterior at the detonator end, and a featherway is cut across the screw threaded inside, the recess for detonator is deeper.

The cylinders containing the *Gun-cotton, dry, primers, torpedo, A, B, and C*, of 12¾ oz. and 1 lb. 1 oz., are made of tinned brass, and one end is threaded on the exterior to fit the pistol, and threaded internally to receive a plate for closing it. This plate has a recess in the centre to receive the detonator, closed by a screwed washer; after the gun-cotton is inserted a felt washer is placed on top and the closing plate screwed in, an indiarubber disc is placed above the recess for detonator and secured by the screwed washer.

The cylinder containing the Brennan torpedo primer is made of brass, one end being closed by a brass cap. The top edge of the cylinder is coated with waterproof (Pettman) cement and the cap forced on, thus hermetically sealing the cylinder.

*Wood blocks* made locally are used for instructional purposes to § 11225. represent slabs and primers, so as to obviate issuing service slabs and primers for this purpose.

#### APPARATUS FOR CUTTING WET GUN-COTTON SLABS.



*Wet gun-cotton slabs, &c.*, may be cut into such portions as may be required by an *Apparatus, cutting, wet gun-cotton slabs*, issued for the purpose. It consists of a cast-iron frame which has two uprights, in each of which is fitted a gun-metal clamping plate, suspended on the end of a set screw, for holding the gun-cotton slab when in position for being cut. The saw used in cutting the slab passes between the uprights. § 3939, 3443.

There is a sliding bed of cast iron fitted to hold the gun-cotton slab, which rests on a wooden block, so as to allow of its being cut in any part, either parallel to a side, or diagonally. This apparatus is for submarine mining purposes.

For L.S. purposes a simpler and smaller apparatus is issued to the § 3940. R.E. It consists of a rectangular block of wood, with two movable wooden clamping pieces, which work on four iron screws fitted with gun-metal fly-nuts and washers. To use it, the wet slab is placed

on the lower block in the required position, and held in place by the lamping pieces being firmly screwed down on it. The saw works between the clamping pieces.

§ 4200.

*Apparatus, cutting, wet gun-cotton quadrants*, is supplied for Submarine Mining Services. The guillotine cutter is removable, and a plain knife or circular gouge, of which there are two sizes, may be used.

Drying  
gun-cotton.

Wet gun-cotton may be dried by simple exposure to the air of a dry room till it ceases to lose weight. Of course the actual time taken to dry any given specimen will depend on climate, state of atmosphere, &c.

The use of artificial heat in evaporating moisture from wet gun-cotton is strictly prohibited.

Damaged  
gun-cotton.

Pieces of gun-cotton sometimes become detached from discs and slabs in handling, packing, and unpacking boxes, and unloading mines. Small fragments and dust also accumulate in cutting and shaping slabs in loading mines. All these should be carefully collected, and together with the solid pieces cut off the slabs in filling mines should be re-wetted, placed in half metal-lined cases prepared for gun-cotton, and kept wetted until disposed of.



## CHAPTER III.—CORDITE.

CORDITE is the smokeless explosive adopted in our Service for propulsive purposes. There are two varieties—Mark I and M.D. §§ 6632, 7279, 11975.

Mark I consists of nitro-glycerine 58 parts, gun-cotton 37 parts, and mineral jelly 5 parts, incorporated together and gelatinised by the aid of a solvent, acetone.

The process of manufacture is given in the "Treatise on Service Explosives." In M.D. cordite the proportions are—nitro-glycerine, 30 parts; gun-cotton, 65 parts; and mineral jelly, 5 parts. It is manufactured in a similar way to Mark I, but a larger proportion of acetone is used and longer stoving is required. In the finished state it is considerably harder than Mark I cordite, and a larger quantity is required to give the same ballistics; less heat is however developed.

All lots of cordite from each manufacturer have consecutive numbers, irrespective of size, and one or more initial letters to identify the manufacturer. Some early issues of Waltham Abbey cordite had only the lot number and no initial letter.

To identify cordite completely, it is only necessary to quote the initial letter and lot number.

Finished cordite resembles a cord of gutta percha, and its colour varies from light to dark brown. Appearance.

Cordite is poisonous. Properties.

Cordite is practically smokeless; on explosion a very thin vapour is produced which is dissipated rapidly. This smokelessness can be understood from the fact that the products of combustion are nearly all non-condensable gases and contain no solid products of combustion which would cause smoke.

For the same muzzle-velocity a smaller charge of cordite than of gunpowder is required, owing to the greater amount of gas produced by it. Cordite is very slow burning compared with gunpowder, and on this account the maximum pressures are low, and the pressure on the projectile in the bore is well sustained.

The rate of burning of a charge of cordite is affected by the diameter of the cords; with equal weights a larger size presents a superficial area less in proportion to the volume of the charge than a smaller size, and so, other things being equal, a charge of large sized cordite burns more slowly than one of small. Cordite ground small ignites at about 355° F.; but charges in a gun are difficult to ignite, and an "igniter" of gun-cotton yarn or fine grain powder is used to extend the flash from the tube; fired in the open it burns away without explosion, even when in large quantities. Cordite can be detonated by means of a gun-cotton primer and in its action is nearly as powerful as gun-cotton.

The nitro-glycerine contained in cordite freezes at a fairly high temperature (about 40°), and if frozen cordite is suddenly thawed by being brought into a warm room, a slight amount of exudation may be noticed, as a thin oily film of nitro-glycerine on the outside of the cords, which, however, is reabsorbed after a short time. "Extracts," 1895, p. 48; 1898, p. 119. Temperature of magazines for cordite.

It is laid down that the temperature of magazines in which cordite is stored should not habitually exceed 100° F. (although experiments have shown that it is capable of standing higher temperature for long periods without injury), nor fall below 45° F., and if artificial means of heating are resorted to, the temperature should not be allowed to exceed 60° F.

Cordite in made-up cartridges which may have sweated does not require any special treatment. When in bulk, if sweating is observed, it should not be handled until it has returned to its normal state, which it will do by being kept at a temperature not below 45° F.

Felt wads or other absorbent material should not be left in actual contact with cordite, as after a prolonged period nitro-glycerine may be absorbed. It is for this reason that all felt wads in Q.F. ammunition have glazed board discs on the side next the cordite.

It suffers if exposed to direct sunlight, but not when enclosed in either shalloon or silk cloth cartridges. It is therefore ordered that when being made up into cartridges it should not be so exposed.

Cordite is not affected in any way by damp or water. If wetted with fresh water a cordite charge, on emergency, can be fired at once, if the igniter will fire. Before returning a wetted charge to store, it should be thoroughly dried in a ventilated building. Cordite wetted with sea water should be well washed in fresh water and dried before re-packing. Cordite is influenced more by heat than powder, so that pressure and muzzle-velocity depend on the temperature of the charge before it is fired. The higher the temperature the greater the pressure and M.V.

On the other hand, the amount of moisture in powder greatly affects pressure and velocity—it does not do so with cordite.

In some cases, after firing cordite charges to windward, on opening the breech a flame has issued. This is caused by the burning up of the carbonic oxide and hydrogen formed by the explosion, which take fire at the muzzle on coming in contact with the air in their heated condition and burn down the bore. It is not considered sufficiently serious for special orders in the case of field guns or howitzers, but with heavy guns the numbers opening the breech are cautioned against standing immediately in rear of the gun, or exposing cordite either bare or in a cartridge to the flame.

Unsealed vents erode very quickly.

Back flash.  
"Extracts,"  
1896, p. 62;  
1898, p. 123.

Advantages.

The chief advantages of cordite over gunpowder are:—

- (1) Smokelessness.
- (2) Superior ballistic results.

M.D. cordite has recently been made in the form of tubes, the object being to obtain a more constant burning surface and therefore more constant evolution of gas while the charge is burning. This is called M.D.T. Cordite.

Cordite is distinguished as follows:

Size,  
7279, 8536,  
9110.

- (a) When made in specified lengths, by a fraction the numerator of which represents the diameter in hundredths of an inch of the hole in the die through which the cordite is pressed, and the denominator the nominal length of the sticks in inches.

With M.D.T. Cordite the numerator gives in hundredths of an inch the mean external and internal diameter of the finished cordite.

The nominal length is the nearest whole number of inches above the maximum length to which the cordite is cut.

(b) When made in indefinite lengths (to be cut as required) by a number representing the diameter of the die as before.

For example. Cordite Mark I  $\frac{11}{12}$  signifies cordite Mark I between 11 and 12 inches long, and of a nominal diameter of .05 inch.

Cordite M.D.T. size  $\frac{29-15}{15}$  signifies cordite 14.3 ± 0.3 inches long, the external diameter of the tubes being 0.29 inches and the internal diameter being 0.15 inches.

The sizes of cordite made and the charges for the various guns will be found in Table No. 3.

Cordite is pressed into hollow cylinders, about four inches long and one inch internal diameter, and .2 inch, .15 inch, .1 inch, or .05 inch thick. These cylinders are used to support the Mark III igniter in Q.F. or Q.F.C. cordite cartridges. Cylinders.  
§§ 8873,  
10095.

*Case, Cordite, 100 lb., Mark III*, has been adopted for the transport and storage of cordite. It is a strong deal box, the body being dove-tailed together, and the bottom secured by 2-inch brass screws, with a lid of deal clamped with hard wood, which is secured by gunmetal screws working in nuts let into the sides and ends of the case; at each end is a mahogany cleat for a rope or wire handle. Three grooves are cut in each side of the case in which partitions may be placed to suit different kinds of cordite. Two partitions are supplied with the box. A strip of fearnought is attached to those portions of the lid, which come in contact with the case, by copper tacks and shellac. It is painted stone colour outside and is lined with non-absorbent paper and unpainted inside. Dimensions 40.5" × 17" × 8.12", weight, 1 qr. 23 lbs. Boxes Marks I and II are generally similar, but differ in dimensions and are not provided with partitions. Packing.  
§12113.  
  
§§7394, 8497,  
8868, 8869,  
8910, 9030,  
9264, 10170,  
10460.

Some Mark I boxes are varnished red inside and some earlier issues were painted black inside.

Mark IV differ from III in the position of the wood partitions. §12590.

Mark III\* cases are Mark III altered by the addition of three grooves on each side.

*Case, Cordite, converted, Mark I | N |*.—A pattern of this case has been sealed to govern the conversion of such Marks III, IV, and V, 100-lb. powder cases as may be required for use in the storage and transport of cordite in bulk. §§ 7929, 8869,  
8368, 8910,  
9030, 9264,  
10170.

The lining is taken out of the powder case and the lid is prepared with fearnought, the case painted outside and lined with non-absorbent paper, the older cases being varnished inside in the same way as the 100-lb. case. This case is for use in the Navy only.

*Case, Cordite, Converted, Mark II | C |*.—This case differs from Mark I by having two sets of grooves cut in the sides, one set 14 inches and the other 17 inches from one end, and by having a movable deal partition added, for use in packing cordite of 14 and 17-inch lengths. Both these cases are lined with non-absorbent paper, whether varnished inside or not. It is intended for both Land and Naval Services. §§ 9030,  
10170.

§§ 10666,  
12680.

*Drum, cordite, transport, Mark I, and Case, cordite, drum, Mark I,* are used for packing and transport of sizes 5 and  $3\frac{3}{4}$  when not cut to length.

The drum is a tinned iron cylinder, 8 inches in diameter, and about  $22\frac{1}{4}$  inches long. To each end a tinned iron flanged ring is secured with copper rivets.

The case is a square deal box, strengthened by wood battens and provided with cleats and rope handles. On the inside of the top and bottom, four wood corner pieces are secured, which fit over the flanges of the drum and steady it.

The lid is attached by screws.

*Barrel, Special, transporting, Cordite,* is used for transporting cordite,  $3\frac{3}{4}$  and 3, on drums to India. It is a machine-made barrel of deal, length 26 inches, diameter of bilge 17 inches, diameter of head  $15\frac{3}{4}$  inches. The heads are in three, and sometimes four, pieces; the middle piece is of deal and the cants of oak, on the inside of the head is secured, with four iron screws, a conical disc of deal  $8\frac{1}{2}$  inches diameter; these discs fit in the end of the drums, and prevent shaking during transport. It is bound with 14 ash hoops, four on each chime, and three on each quarter. There are two dowels in bottom end to support the back head.

Cordite is stored in bulk at tropical stations in cases powder 100 lbs., painted khaki, or cases powder metal lined, non-absorbent paper being placed between the cordite and metal lining.

A zinc reel is used for small quantities of size  $3\frac{3}{4}$  cordite.

---

## CHAPTER IV.—MISCELLANEOUS EXPLOSIVES.

*Ballistite* is a mixture of about 50 % nitro-glycerine and 50 % soluble nitro-cellulose with or without the addition of a small percentage of camphor or aniline. It was originally gelatinised by passing the mixture between hot rollers; it is, however, sometimes incorporated with the aid of a solvent.

*Picric acid* is a yellow substance which can be melted at a temperature of 250°F. When confined or melted into a compact mass it can be detonated. It can be fired by percussion. With bases it forms picrates, most of which are more sensitive to percussion or friction than picric acid. Lead picrate is particularly sensitive. Picrates are capable of acting as detonators to any picric acid within reach of their explosive influence. On this account the greatest care must be taken to prevent picric acid coming in contact with metallic oxides, lime, rust, verdigris, etc., as picrates may be formed. It is packed in powder barrels with waterproof bags, or 100 lb. powder cases with calico bags substituted for the linings.

Powder barrels for packing picric acid are marked with a band of yellow ochre paint, 1-inch wide, round the bilge, and have stencilled, in yellow ochre paint, on the top end, "To be used for Picric Acid only." These barrels are not to be used afterwards for packing any other explosives.

*Lyddite* has been introduced as the Service high explosive for § 8456. filling shell. It is picric acid brought to a dense state by fusion and poured into the shell where it solidifies. A cavity is left for the exploder of picric powder. It has a density of 1.6 and consequently the same shell will contain a greater weight of lyddite than of P. mixture.

*Picric Powder.*—It is a mixture of 43 parts of ammonium picrate and 57 parts of saltpetre. The two ingredients are dried, reduced to a very fine state of division and thoroughly mixed together in the dry state. It is of a bright yellow colour and when strongly confined is a powerful explosive.

It is used as an exploder for lyddite shells, and in bulk is packed in powder barrels with waterproof bags, the barrels being marked with a blue band round the bilge and having stencilled on the top end, "To be used for picric powder only."

Information about other explosives which may be met with in the Service will be found in the "Treatise on Service Explosives."



## CHAPTER V.—CARTRIDGES.

## FOR B.L. OR B.L.C. GUNS AND HOWITZERS.

A good cartridge for service should possess the following qualifications:—

Requisite properties of material used.

1. The material should be strong enough to bear reasonable knocking about when filled, and to stand the wear and tear of travelling.
2. It should be so close in texture that the explosive, even if slightly dusty, will not readily work its way through, and yet be permeable to the flash from the tube, &c., intended to fire it.
3. Lastly—and this is of the greatest importance—the material should consume entirely in the gun when fired, and should leave no smouldering fragments, or sparks, in the bore.

If much residue is left in the gun the vent is apt to be choked. If sparks remain, and the gun is re-loaded almost immediately, a serious accident will probably occur. Several accidents have thus occurred, especially when using blank cartridges.

These conditions are very well fulfilled by the materials in use in the Service, *i.e.*, shalloon, and silk cloth.

Materials used.

Chemical test.

Samples of all materials received for the manufacture of cartridges are tested by the W.D. chemist with a magnifying glass for closeness of texture, and chemically for purity of the material. Any admixture of cotton would be most objectionable, as that material has a tendency to hold fire.

Shalloon is made entirely of "long" wool and is woven twilled. It is red, there are two Marks, I and II, Mark II being less glazed than Mark I, and 36 inches wide.

Silk cloth.  
§§ 1780, 1822,  
1829, 1868,  
2047, 2116,  
2633.  
§§ 4460, 6317.

*Silk Cloth* is made of the refuse silk from the outside of the cocoons. It was originally introduced on the score of safety for blank charges, as in firing these there is not so much heat and pressure as when shotted rounds are fired, and therefore less chance of the cartridge being entirely consumed.

The silk cloth is steeped in a cold solution of boracic acid, 5 oz. boracic acid to one gallon of water, and dried at a temperature not exceeding 120° F. This is to prevent a fungoid growth forming on the cartridge and consequent rotting, but it does not preserve the cloth from rotting from any other cause.

Classes of silk cloth.  
§ 5817.

Silk cloth is divided into three classes, No. 1, 47 inches wide; No. 2, 54 inches wide; and No. 3, 40 or 52 inches wide.

Silk cloth may be tested by cutting a test piece, free from holes for braids, from the cartridge in the direction of either warp or weft, 10 inches long, and 1 inch wide (when lengths of 10 inches cannot be obtained, shorter lengths must be used).

The test piece will be passed through the ring of a weight made up to the necessary amount, which it must support when lifted by the two ends.

The following are the minimum weights the three classes of silk cloth should lift (1) when new and (2) to be considered serviceable for use —

Class No. 1,	minimum when new	65 lb.;	minimum for use	56 lb.
„ No. 2,	„ „ „	80 lb.;	„ „ „	70 lb.
„ No. 3,	„ „ „	100 lb.;	„ „ „	84 lb.

Silk braid for hooping is made in two widths, 0.35 inch wide and 0.65 inch wide. These braids should support a weight of 28 and 85 lb. respectively. For beackets the silk braid is also made in two widths, 1.5 inches and 1 inch, which should support a weight of 250 and 160 lb. respectively. Silk braid. § 6586.

Silk sewing No. 1 and No. 2 are used for sewing cartridges, and No. 1 is also used for choking. § 11974.

No. 1 should support a weight of 13 lb. and No. 2 a weight of 5½ lb.

The various charges for guns are classified as follows:—

Charges used with projectiles are termed "Proof" and "Service charges."

Names of various charges.

A proof charge is larger than a service charge, and is designed to give higher pressures than the working pressures of the gun. Proof is intended to find out defects and cover pressures to which guns may accidentally be subjected on service.

When a gun has two service charges they are termed "Full" and "Reduced" respectively; if it has only one this is called the "Full" charge.

Charges specially supplied for saluting are called "Saluting," and those for exercise without projectiles "Blank" charges.

Saluting or blank charges are made of powder, Blank L.G. being used.

"Reduced" charges are used with B.L. guns for firing projectiles principally for practice.

Blank or saluting cartridges are issued for B.L. guns up to 6-inch, Marks IV to VI; blank firing from B.L. guns or howitzers above the 15-pr. and 5-inch respectively is not to be carried out unless a shotted round has been fired within 30 days. Blank and saluting cartridges. § 9811.

Gun charges, both powder and cordite, in the larger natures are divided into fractions for convenience in handling, and also to allow reduced charges to be used.

54  
Artillery  
6957

## POWDER CARTRIDGES FOR B.L. ORDNANCE.

Powder cartridges are made of silk cloth.

Class 1 silk cloth is used for all powder charges up to 14 lb. inclusive. § 5817.

Class 2 silk cloth is used for powder charges from 14 lb. to 85 lb., and as strengthening linings for the B.L. 12-inch, Mark III, cartridge and 16.25-inch cartridge both for Naval Service, and all 13.5-inch cartridges.

Class 3 silk cloth is used for powder charges above 85 lb., and for all prism powder cartridges. This is on account of the sharp edges and the hardness of the prisms.

All silk cloth powder cartridges are hooped with silk braid.

The hoops are of .35-inch silk braid for cartridges of cut or granulated powders under 40 lb. weight, and of .65-inch for those of 40 lb. and above, and all prism cartridges. Choking and hooping. § 7567.

As before stated the heavier charges are divided into fractions for convenience in handling and economy. They are divided as follows:—

- B.L. 5-inch ½ charges and whole charges.
- " 6-inch ½, ⅓, and ¼ charges.
- " 8-inch to 13.5-inch ¼ charges.
- " 16.25-inch ⅓ charges.

B.L. cartridges.

Some of the earlier charges for 8-inch and 9.2-inch will be found made up in two cartridges.

Cartridges of Prism Powder.

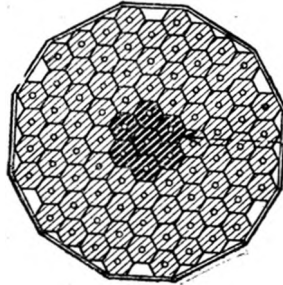
Cartridges of prism powder are made for B.L. guns, 6-inch, and upwards. In these cartridges the prisms are arranged in regular layers of the same number in each layer, except the top, which is sometimes incomplete to adjust the weight. When these cartridges are made of Prism<sup>1</sup> brown or S.B.C. powder, the centre prisms in the top and bottom layers are of black powder, which acts as a primer and prevents hang fires.

Cartridges of E.X.E. powder also have this primer, except in the case of the 12-lb. cartridge for the 6-inch B.L. gun.

§§ 4755, 4771.

The 12-inch B.L. 73 $\frac{3}{4}$ -lb. cartridge, owing to its shape, has a primer of 9 instead of 7 black prisms.

The shape of the filled cartridge is a more or less regular prism, and there is no choke, the ends of the cartridge being sewn to the body. Both ends have a central hole covered with silk netting to allow the passage of the flame from the tube; and to prevent the escape of powder dust, &c., from these holes, they are covered with shalloon discs, which should be removed before loading.



7 Black Prisms at each end.

Section.

### *Saluting Cartridges.*

Blank or saluting charges are invariably enclosed in silk cloth cartridges, which are filled with Blank L.G. powder.

The saluting cartridges of the B.L. 15-pr. and 12-pr. of 6-cwt. Mark I have a loop of silk braid sewn across the bottom for withdrawing them from the gun if necessary. The cartridge for the B.L. 15-pr., Mark I, is pear shaped to prevent it from passing the vent which projects slightly into the bore.

§ 10427.

The blank cartridge for 15-pr. or 12-pr. B.L. except Mark I 15-pr. guns is cylindrical.

### MANUFACTURE OF POWDER CARTRIDGES.

Empty cartridges are issued ready for filling. Should they have to be made locally, a sample will be obtained from the Royal Arsenal, Woolwich, which will be strictly adhered to.

All cartridges hooped with braid will be issued with the braids cut to proper length, tied with a loop at one end, and run into the empty cartridge.

### FILLING POWDER CARTRIDGES.

In filling cartridges particular care is to be taken that a record of the powder, with maker's name, lot and date of filling is kept in a book for reference.

The following limits of weight for the charge will be allowed above or below the weight laid down for each nature of cartridge:—

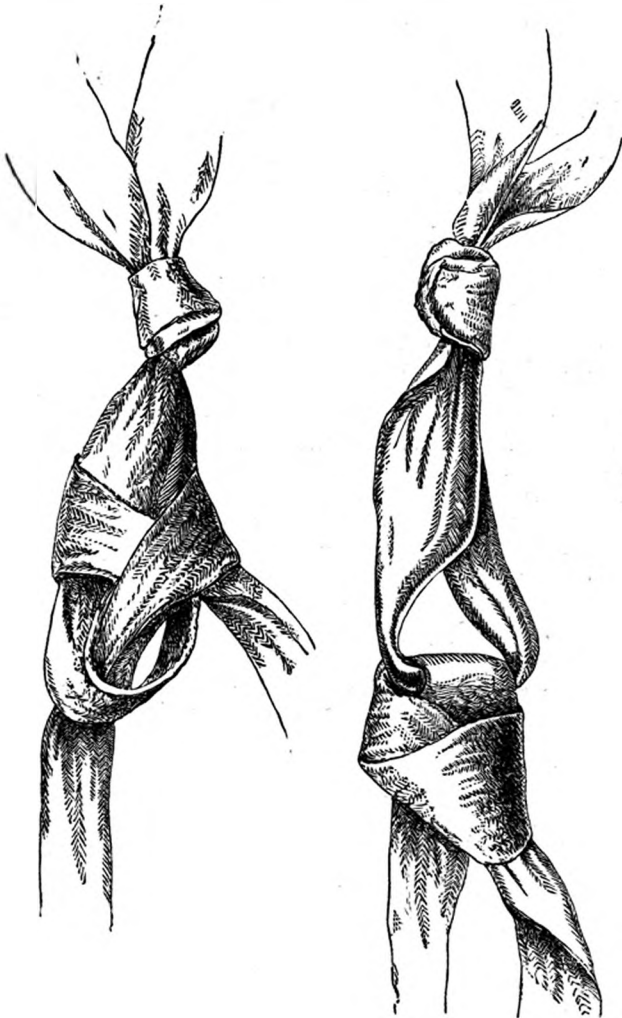
Prism powder	..	..	..	..	1 oz.
P. <sup>2</sup>	..	..	..	..	2 „
P. and smaller grain	..	..	..	..	$\frac{1}{2}$ „

If it is desired to check the weight of the charge in a filled cartridge, an allowance must be made for the weight of the empty cartridge, which is slightly less than a new one, as some of the material is cut off after choking.

The methods employed for filling cartridges are given in R.W.M., para. 233, et seq.

#### Hooping—

With braid hoops.—Draw the braid through the silk cloth



THE RIGHT WAY.

THE WRONG WAY.

until the knot of the loop comes home to the silk cloth, the single end being already passed through the loop from underneath,

pass the single end to one side of and under the loop, then draw the hoop tight, and keep it so by placing the forefinger of the left hand firmly on the loop; bring the running end between itself and the loop, and draw tight the single bend thus formed, *taking care that the bend bites on the loop and not on the single end*, otherwise the knot will slip. This is a most important point and men are very apt to make the bend on the wrong place, unless experienced, or closely watched by experienced men. The sketch makes the difference plain.

The maintenance of the proper form of the cartridge depends on the hooping being thus secured.

§ 12795.

Powder cartridges will be marked with the nature of powder they contain. If filled with a different nature or weight of powder from that already marked on the cartridge, the marking will be altered to agree with the contents. The calibre of the gun or howitzer is marked on the cartridge, and when a gun and howitzer of the same calibre exist, followed by the word "GUN" or "HOWT." as the case may be. The monogram of station (or initials of Contractor) and date of filling.

### CORDITE CARTRIDGES.

Cordite cartridges all require an igniter, which is made of R.F.G.<sup>2</sup>, or of gun-cotton yarn.

The materials used are shalloon and silk cloth.

Materials.

*Shalloon* is used for the smallest cartridges, the B.L. 10-pr., 12-pr. of 6 cwt. and the 15-pr. guns, and for all B.L. howitzer cartridges. It is also used in the igniters of the other cartridges.

*Silk cloth* is used for all B.L. gun cartridges above the 15-pr. No. I class is used for cartridges up to 14 lb., and No. II class for 14 to 85 lb., No. III class for the B.L. 12-inch, Marks VIII and IX, and 13.5-inch half-charges.

The heavier cordite cartridges are divided into fractions for convenience in handling, etc., as in the case of powder cartridges.

The fractions are as follows:—

B.L. guns. 6-inch Marks VII and VIII, also XI,  $\frac{1}{3}$  and  $\frac{2}{3}$  charges.  
6-inch Marks VII and VIII, and B.L.C. half charges.

7.5	"	} half and quarter charges.
8	"	
9.2	"	
10	"	
12	"	
13.5	"	

Cordite cartridges are issued filled. In case they should have to be made up locally, a sample cartridge or drawing, and detailed description of the method of manufacture, must be procured from the Royal Arsenal, Woolwich.

§ 10083.

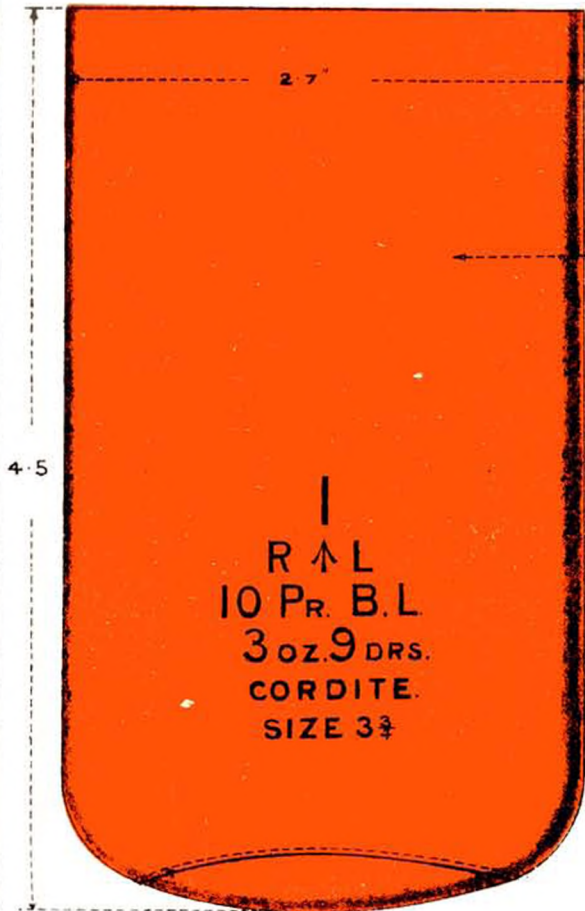
Apparatus, cutting cordite, is for use in making up cordite cartridges. It consists of an oblong mahogany board, about  $9\frac{1}{2}$  inches wide and  $40\frac{1}{2}$  inches long, having a metal knife working in a fixed pivot near one end. It is provided with a graduated scale, and is fitted with an adjustable end, which can be fixed, by means of a winged nut, at any required distance from the knife, enabling cordite sticks to be cut to any desired length.

The larger cartridges have to be built up carefully and tied of various places with silk sewing No. 1, and although a detailed descrip-

# CARTRIDGE, B.L. 10 PR. 3oz. 9DRS. CORDITE, SIZE 3 $\frac{3}{4}$ . (MARK I) (L)

SHALLOON FOR STAR SHELL.

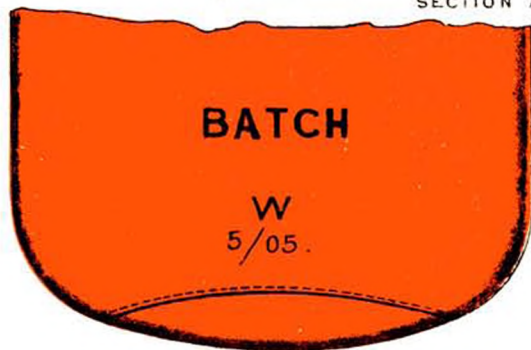
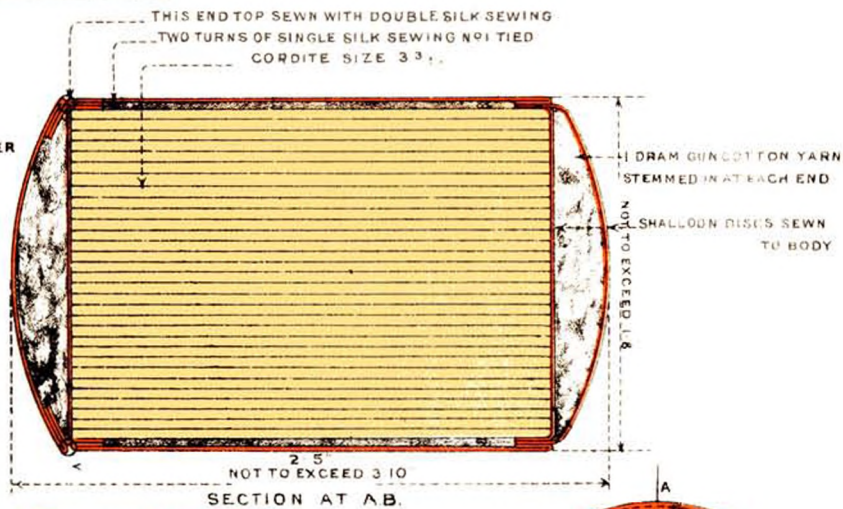
*Full Size*



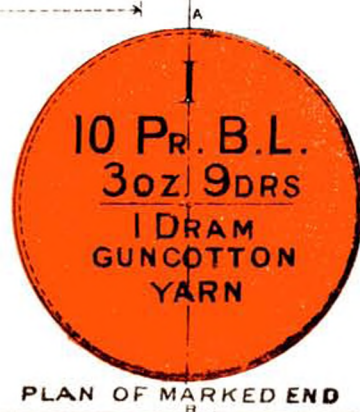
EMPTY BAG

SHALLOON DISCS SEWN TOGETHER

SHALLOON



PART BACK VIEW OF BAG



PLAN OF MARKED END



tion in each cartridge to be made up should be obtained as above, a few notes on the general method of making them up, with a short description of each cartridge, will be given here. There is no apparatus sealed for the purpose of assisting in filling these cartridges, but certain articles are used in the Royal Arsenal, and a description of these is given with the cartridges they concern. They are all more or less rough articles which could be made up locally as required. A record of the cordite used in all cartridges, with maker's name, lot, or batch, and date of filling, will be kept in a book for reference.

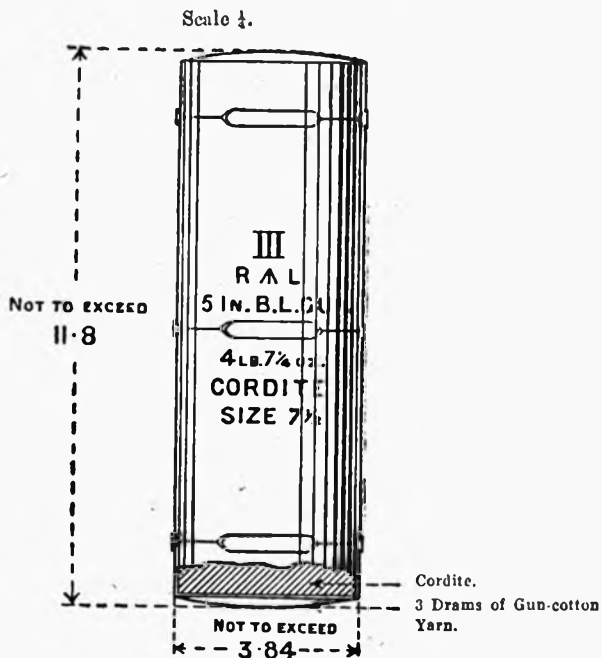
*Cordite cartridges for B.L. guns and howitzers.*

Details of these are given in Table No. 4.

The 10-pr. and 12-pr. cartridges consist of a bundle of cordite tied together in places with silk sewing and inserted in a cylindrical shalloon cartridge, each end of which is closed by double thickness of shalloon, containing the igniter of gun-cotton yarn waterproofed, Plate I. §§ 8317, 11021, 11022, 10580.

The 15-pr. cartridge consists of a bundle of cordite, secured in five places by silk sewing, and having an igniter at each end, consisting of two drams of gun-cotton yarn, prepared with indiarubber solution to waterproof it, wound round the bundle, commencing §§ 7507 8314, 8199.

*Cartridge, B.L., 5-inch, 4 lb. 7½ oz. cordite, size 7½, Mark III | L | silk cloth.*



½ inch from the end. The whole is inserted in a shalloon cartridge, choked at one end with silk sewing.

The 4-inch and 30-pr. cartridges consist of a bundle of cordite secured in three places by silk sewing and inserted in a cylindrical silk cloth § 7596.

cartridge, each end of which is closed by a double thickness of shalloon to contain the priming. Earlier marks with powder igniters had the shalloon cross-stitched to form four compartments.

The 5-inch B.L. gun cartridge, Mark III, is of silk cloth, similar in shape to the 4-inch: it is hooped in three places with silk braid. Weight, 4 lb.  $7\frac{1}{2}$  oz.; size  $7\frac{1}{2}$ .

Mark I. cartridge is larger at one end, short sticks being bundled round to give it the increased diameter; it is primed at this end only.

The cartridge for the 60-pr. is 9 lb. 7 oz. cordite M.D., size 16. It is similar to the ordinary 5-inch. The igniter is two discs of shalloon cross-stitched into four compartments filled with F.G. powder; the igniters fit into recesses at each end of the cordite sticks; the discs of shalloon are stitched to two rings of silk cloth which are sewn to the cartridge. The cartridge has four hoops.

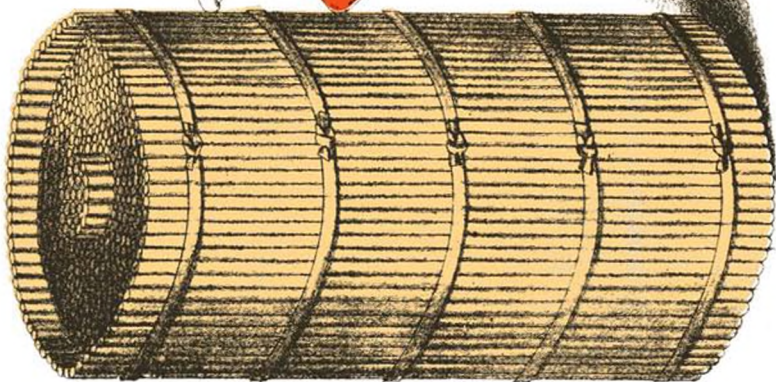
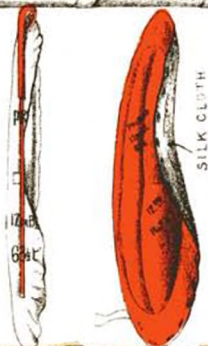
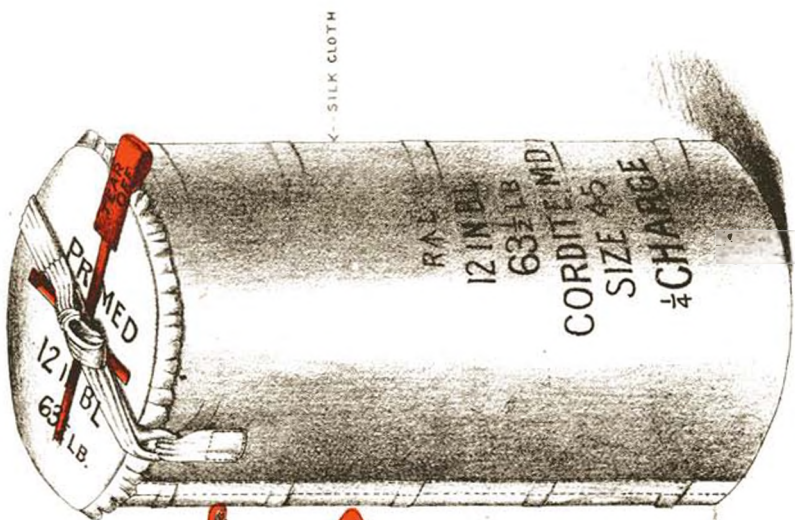
*Cartridge, B.L.C., 5-inch gun, 5 lb. 4 oz., cordite, size 10, Mark I* | *N* |, is fitted at each end with an igniter similar to the latest 6-inch cartridges. The 2 lb. 4 oz. is a reduced charge for the same gun; it is not fitted with felt studs. Both have powder igniters.

Cartridges for  
heavy B.L.  
guns.

Cordite cartridges for B.L. guns, 7.5-inch to 13.5-inch, inclusive, with a few exceptions to be detailed later, are made up on one model, the only difference being in external shape, some being cylindrical, others slightly coned.

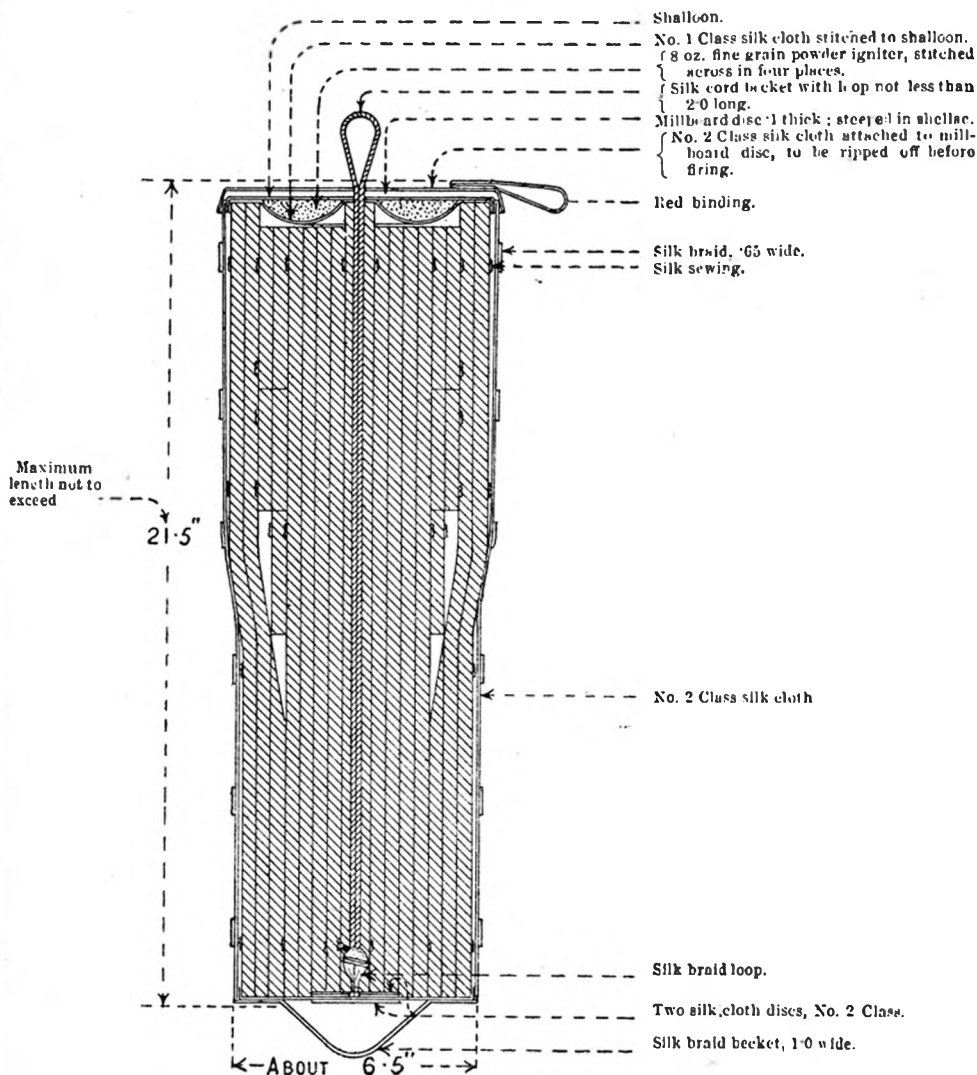
The cordite is built up and enclosed in a silk cloth cartridge, open at the top, hooped in the ordinary way with silk braid, and having a silk braid becket across the bottom.

In addition the heaviest charges have a becket round the cartridge, near the centre in the half charges and near the top for quarter charges, and 9.2-inch half charges. These cartridges have a becket of silk cord running up through the centre of the charge and forming a loop at the top; the end of this cord is attached to a silk braid loop which is secured to the inside of the base of the cartridge, being stitched to two discs of silk cloth, sewn on, one inside and the other outside the cartridge. This becket is useful for pulling the cartridge out of the cylinder or case in which it is packed. They also have a becket at the bottom. The top of the cartridge is closed by an igniter of fine grain powder, enclosed in a bag, the inside of which is made of a disc of silk cloth, and the outside of a larger disc of shalloon. These discs are sewn together by two concentric rows of stitching, one near the centre and the other near the outer edge. The whole is then cross-stitched so as to form four compartments, which are filled with the fine grain powder. This ensures a portion of the powder being always opposite the vent of the gun, while there is no powder actually in the centre of the igniter. A hole is made through the centre for the cord becket to pass through, and the outside edge of the shalloon disc is provided with a draw-string of silk sewing. The cartridge is sewn to this igniter and the powder lies in an annular groove formed at the top of the cordite, as shown in plate. A mill-board protecting disc, to the outer side of which a disc of silk cloth is attached by glue and sewing, is placed over the igniter and very lightly attached to the cartridge by four stitches. The disc is painted with a red cross and the word "primed," and is provided with a loop of red braid on which the words "Tear off" are printed. This disc has a hole in the centre, through which the cord becket is passed, and the disc is to be torn off before loading. The 6-inch 14 lb. 12oz. Mark II, cartridge was made on similar lines to the above, the later issues were without the beckets.



Cartridge, B.L., 9.2-inch, 31 lb. 8 oz. cordite, Mark I, size 40,  
Mark II | N | silk cloth, half charge for Mark VIII gun.

Scale =  $\frac{1}{2}$ .



A number of these cartridges were made with a disc of silk § 9765. netting, sewn to the cartridge, over the igniter, to strengthen it. This netting is now dispensed with, but no change of Mark is entailed by this alteration.

In certain cartridges of recent manufacture the central, side and end §§ 12838, beackets are discontinued, and the hoops for quarter charges discontin- 12853. continued; a small loop is sewn at each side of the cartridge near the primed end, a length of silk braid is passed through these loops and secured on top by a slip knot; this is for removing the cartridge

from the package, and is removed before loading. These alterations also apply to composite cartridges (see Plate 2).

These cartridges are built up as follows:—

Making up  
cordite  
cartridges.

The cordite is cut to the correct length and weighed. A portion is bundled round the silk cord becket, which is doubled so that the bight forms a loop at the top. This bundle is tied in several places with silk sewing. Round the central bundle, or core, layers of cordite sticks are placed, and also tied with silk sewing. These layers are made of sticks slightly shorter than the central ones. Outside this, again, comes another layer of full-length sticks, tied as before, thus forming an annular recess for the igniter, at one end. Elastic bands, which may be made up locally, are used to keep the different layers in position while they are being tied. In some cartridges the cordite sticks are too short to reach from end to end; in these cases the central core is made of two bundles, butting against each other, and the outer layers are put on so as to break joint and so form a rigid cartridge. In the coned cartridges, the primed end is made larger than the other by inserting layers of short sticks at that end and then putting on the outside layer as before. The charge is now reweighed, allowance being made for the sewing silk and silk cord becket used in building up.

A wooden ring is now placed in the recess at the top of the charge to prevent displacement of the sticks, and the charge is laid on its side. The empty cartridge, previously well dried, is taken and a few vertical slits about two inches deep made round the mouth. The cartridge is then turned inside out, and the ends of the cord becket are tied to the braid-loop on the base of the cartridge by a single bend. The becket is pulled up so as to bring the base of the cartridge tight against the cordite, opening out the sticks slightly with a pricker or piece of wood, so that the knot may go up between them. The charge is now placed base upwards upon a pedestal, the top of which is not greater in diameter than the built-up charge. Two men pull the cartridge down over the charge, and it is then hooped in the ordinary way, commencing at the top hoop. The cartridge is next placed base down upon a table, the wood ring is taken out, and the surplus silk cloth is cut off to within about one inch of the cordite. The cartridge is pushed down so as to expose the end of the charge, and the igniter is placed in position, the loop of the becket being pulled through the hole in the centre. The shalloon projecting beyond the cordite is turned down, and the running string drawn tight and tied. The mouth of the cartridge is then pulled up, turned in all round flush with the edge of the igniter, and sewn all round to the shalloon of the igniter, using two strands of silk sewing and the  $1\frac{3}{4}$ -inch nickel-silver needle. The cartridge is then completed by placing the mill-board and silk cloth disc on the top, the becket passing through a hole in the centre of it, and attaching it to the cartridge by four single stitches, at equal distances round the edge.

Some of the earlier patterns had no central cord becket, but the chief difference lay in the igniter, which fitted into a recess at the top of the charge, but did not extend over the edge of the cordite. A disc of silk netting was placed over the igniter and was sewn all round to the edge of the cartridge. There were thus bare ends of cordite exposed round the edge of the cartridge, which was considered a possible source of danger from the back flash, which is sometimes met with in guns firing cordite charges. This danger would of course be greater after the protecting disc had been torn off.

**Page 26.**—§ 13501. *Cartridges, B.L. 9·2-inch.*

44 lb. 12 oz. Cor- } Consisting of 29 lb. and 15 lb. 12 oz.  
dite M.D. Size 16. } charges laced together.

16 lb. 1 oz. Cor- } Consisting of 12 lb. 6 oz. and 3 lb.  
dite M.D. Size 8. } 11 oz. charges laced together.

Each charge consists of a bundle of cordite sticks, in the centre of which is secured a perforated paper cylinder. The central and outer layer of cordite sticks are slightly longer than the remainder of the sticks, thus forming an annular recess at one end for the igniter. The charge is inserted into a silk cloth bag, hooped with silk braid; a circular hole being left in the bottom of the bag for the stick.

The igniter consists of two discs of shalloon sewn together and sub-divided into eight compartments containing F.G. powder. A disc of silk cloth is also sewn to the underside of the igniter. The igniter is secured to the charge by a draw-string, and by being sewn to the mouth of the cartridge bag, and is protected by a "Tear Off" disc, having a central hole for the stick.

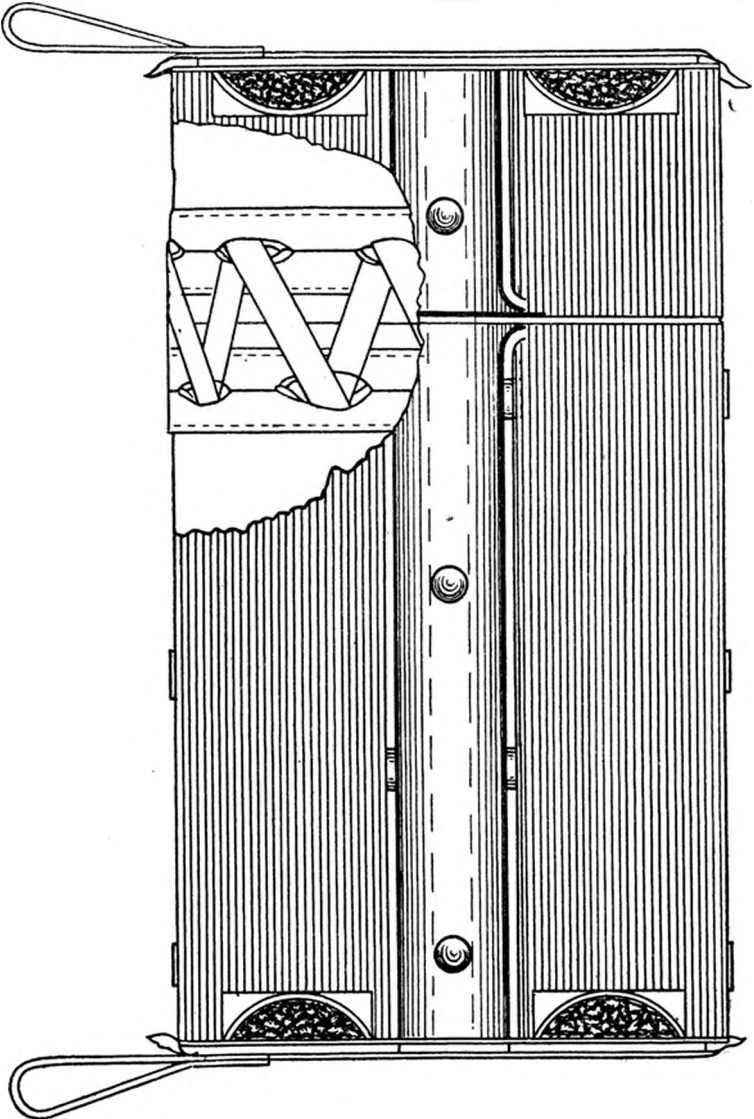
The two fractions of the cartridge are placed base to base, and laced together in a similar way to the cartridges for the B.L. 6-inch Mk. VII and VIII guns.

Page 26—  
continued.

The heavier fraction is provided with a removable silk braid lifting becket tied on top of cartridge with a slip knot.

With the above cartridges a special stick is provided, which passes through the perforated paper cylinder in

Approximate scale =  $\frac{1}{25}$ .



CARTRIDGE, B.L. 9.2-INCH 16 LB. 1 OZ. CORDITE M.D., SIZE 8, CONSISTING OF 12 LB. 6 OZ. AND 3 LB. 11 OZ. CHARGES, FOR GUNS ON H.A. MOUNTINGS.

the centre of the cartridge; one end of the stick bears against the base of the shell when rammed home, while the face of the breech-block, when the breech is closed, bears against the other end, and so prevents the shell



Page 26—  
*continued.*

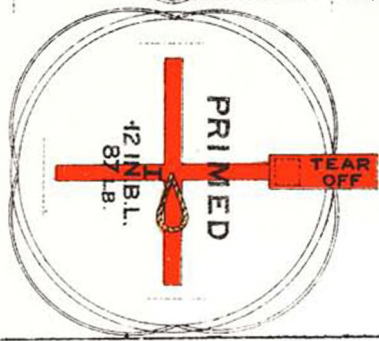
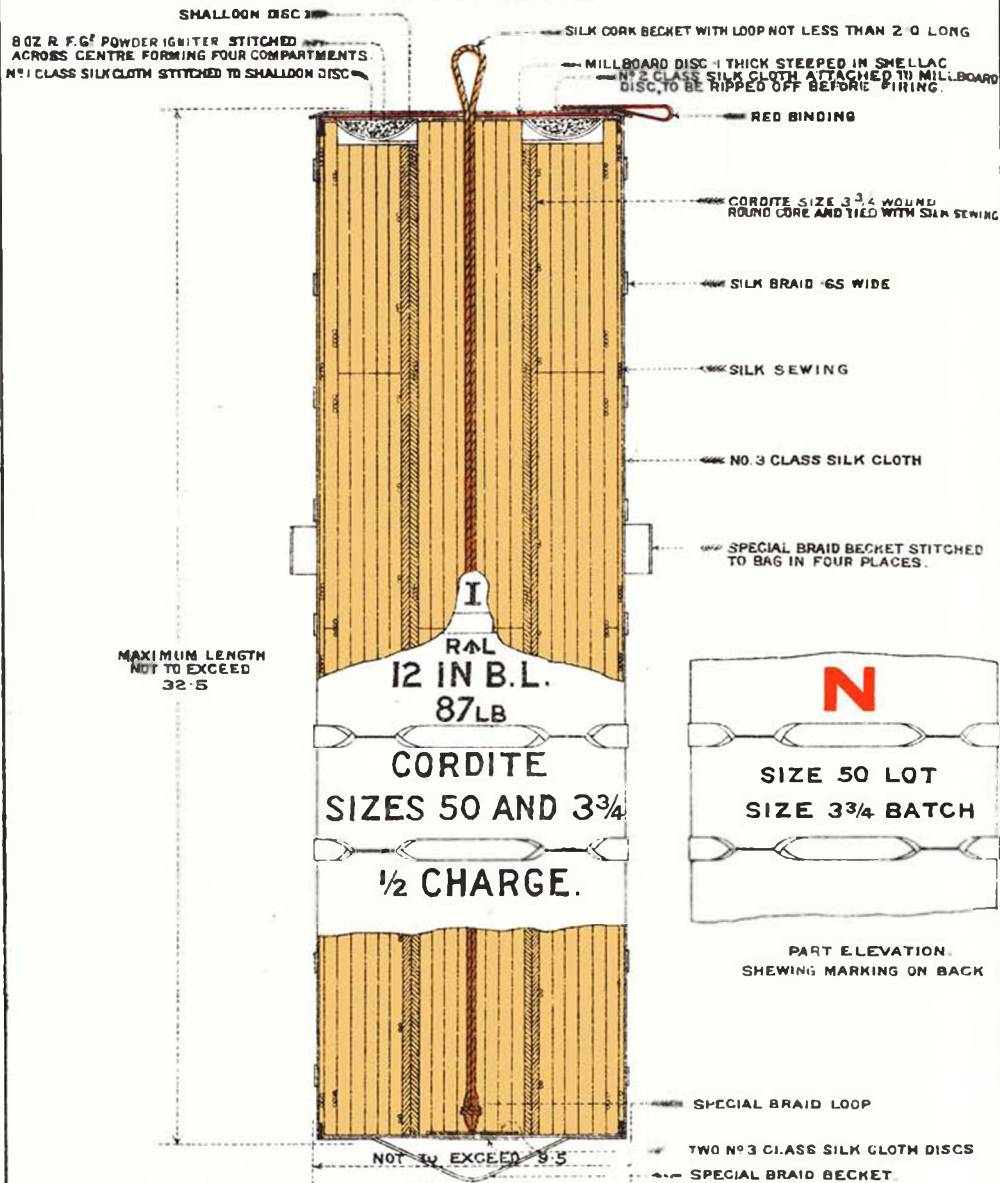
from slipping back when the gun is elevated. The stick is of beech, 1.25 inches in diameter, in two parts, one part 3 inches in length (exclusive of screwed part) having a male screw; the other part 39.4 inches in length, having a female screw, the end being strengthened by a brass ferrule.

The stick is made up in two parts so that it can be easily lengthened by partly unscrewing the two portions, so as to arrange for over-ramming in worn guns.

# CARTRIDGE B.L. 12 INCH 87LB CORDITE SIZES 50 AND 3<sup>3</sup>/<sub>4</sub> MARK I [N]

SILK CLOTH . 83 LB. 4 OZ. SIZE 50. AND 3 LB. 12 OZ. SIZE 3<sup>3</sup>/<sub>4</sub>, 1/2 CHARGE MARK VIII GUN.

SCALE 1/6.



In cartridges without the central becket, the empty cartridge is not turned inside out, in order to draw it over the sticks.

The Mark I cartridge, 14 lb. 12 oz., for the 6-inch B.L. gun, § 7594. Marks IV to VI, is made up in the same manner as the Mark I for the 5-inch B.L. gun, described before.

A different system of making up cartridges of cordite, Mark I, for the heaviest guns has been adopted. In these cartridges two sizes of cordite are used, a large size and a small, and the cartridges are known as "composite" cartridges. They have been introduced for the latest Marks of 9.2-inch and 12-inch B.L. guns, and for the 13.5-inch B.L. In external appearance they do not differ from those described. After tying the central bundle of large-sized cordite round the silk cord becket, a bundle or rope of cordite, size  $3\frac{3}{4}$ , is wound round this core from one end to the other; the outer layers of large-sized cordite are then built up as before described. The heavier cartridges have a braid becket round the outside, stitched to it in four places. See Plate 3. Composite cartridges. §§ 10233, 10367, 10388, 10393.

This method of making up enables a larger charge to be fired, increasing the muzzle velocity, but without any increase in the chamber-pressure. It has also been found that with this design of cartridge ballistics vary less with change of temperature, and are better maintained in worn guns.

As an instance, the original cartridge for the 12-inch B.L., Mark VIII, weighed 83 lb. 12 oz., size 50 cordite, for the half charge, and 41 lb. 14 oz. for the quarter charge. These cartridges have been replaced by composite cartridges, the half charge now weighing 87 lb., made up of 83 lb. 4 oz., size 50, and 3 lb. 12 oz., size  $3\frac{3}{4}$ . § 9927.

The quarter charge weighs 43 lb. 8 oz.; 41 lb. 10 oz., size 50, and 1 lb. 14 oz., size  $3\frac{3}{4}$ .

Cartridge, B.L., 6-inch, 14 lb. 8 oz., cordite M.D., size 26, Mark I	half charge.
" " " 11 lb. 8 oz., " " size 16, Mark I	half charge.
" " " 10 lb., cordite, size 20, Mark I	half charge.
" " " 9 lb. $10\frac{2}{3}$ oz., cordite M.D., size 26, Mark I—	one-third charge.
" " " 10 lb. $5\frac{1}{3}$ oz., " " size 26, Mark I—	two-thirds charge.

The above cartridges are for use with the Marks VII to VIII guns. They are similar in construction, differing only in the size of the cordite, weight and dimensions. Two half charges are laced together to form a full charge. Each half-charge consists of a bundle of cordite sticks tied together with silk sewing. The sticks in the centre of the charge are slightly shorter, thus forming a circular recess at one end for a igniter. The cordite sticks are enclosed in a silk cloth cartridge, hooped with silk braid. The mouth of the cartridge is closed by the igniter. This consists of two circular discs of shalloon sewn together round the edge, and sub-divided into two compartments, filled with fine-grained powder. The discs of shalloon are sewn to a ring of silk cloth, which has attached to it a draw string, and has fitted on its exterior four perforated felt studs, intended to prevent the heated axial vent pressing against the igniter. The igniter is placed over the end of the charge, the two compartments of F.G. powder fitting into the recess formed by the short lengths of cordite, being held in position by the draw string, and by being sewn to the silk cloth cartridge.

The bottom of the cartridge is strengthened by a band of silk cloth, which is intended to prevent the cartridge from tearing when the two half charges are laced together. See Plate 4.

The 14 lb. 8 oz. charge is for projectiles] with cupro-nickel driving bands.

*Cartridge, B.L.C., 6-inch, 10 lb. 7½ oz., cordite M.D., size 16, Mark I | half charge, is similar in construction, differing in dimensions, etc.*

*Cartridge, B.L., 6-inch, 10 lb. 14 oz., cordite M.D., size 26, Mark I | one-third charge.*

*Cartridge, B.L., 6-inch, 21 lb. 12 oz., cordite M.D., size 26, Mark I | two-thirds charge, for Mark XI guns are similar to the above.*

*Cartridge, B.L., 6-inch, 20 lb., cordite, size 30, Mark I | Marks IX and X guns; Cartridge, B.L., 6-inch, 16 lb. 12 oz., cordite M.D., size 16, Mark I | IV and VI guns, are made up in full charges as described for the half charge for Marks VII to VIII guns, but have no strengthening band.*

The 14 lb. 12 oz. Mark II for Marks IV to VI guns is similar to the heavier natures, but no beackets are employed.

#### *Cordite cartridges for B.L. howitzers.*

The cartridges for B.L. howitzers are all alike (except 9·45-inch), and consist of a mushroom-shaped core of cordite, upon the stalk of which three or more rings of cordite are placed. The igniter is contained in the head of the core, and the rings are attached to the core by pieces of silk braid, which are stitched to the core and tied round the rings. The cordite used is small: size 3¾ for the 5-inch, 5·4-inch, and 6-inch of 25 cwt.; size 5 for the 6-inch of 30 cwt., and 4¼ M.D. This method of constructing the cartridge affords a simple and ready means of varying the charge, which is a necessity for the charges of howitzers. See Plate 5.

The cartridge is made up as follows:—The core is made of a bundle of cordite, weighed out and tied in two places with silk sewing. This is inserted into a funnel-shaped shalloon bag, and projects slightly from the end. Round this end is placed a ring of cordite which forms the mushroom head. This ring is made up in a wooden block, which has a ring-shaped recess in it and also a hole in the centre.

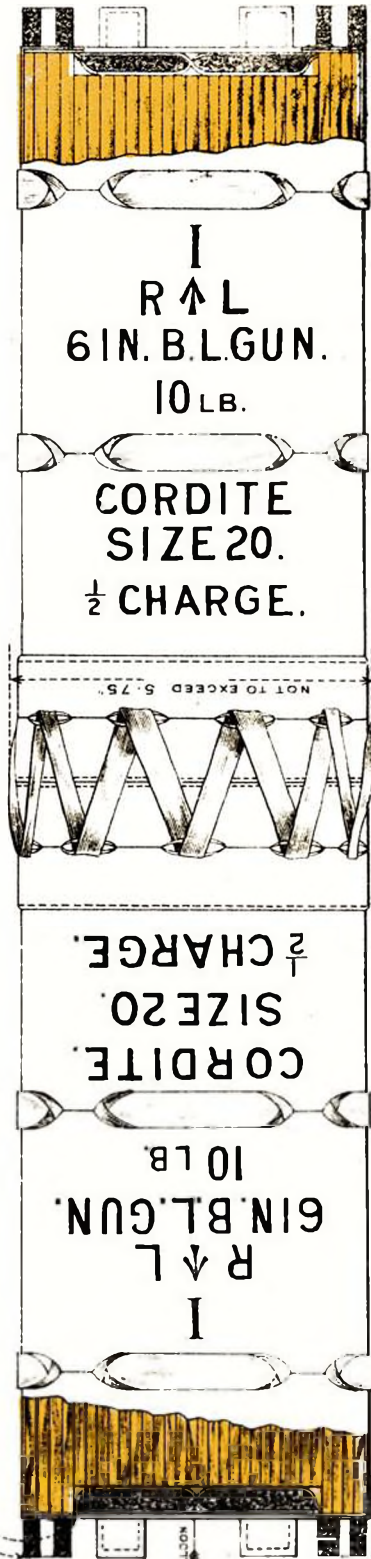
Four slots are cut through the rim and projecting centre. Strands of silk sewing are laid in these slots, and are cut in the centre so as to form eight pieces. The cordite is then neatly coiled in the ring on top of these pieces of silk-twist, which are then tied round it. The ring thus formed is placed on the exposed end of the cordite bundle, and lies in the funnel-shaped part of the bag. This part of the bag is just large enough to extend over the edge of the ring, and has a draw-string in its edge, which is pulled tight and tied. Then the igniter, consisting of two discs of shalloon, sewn together, and the pocket, thus formed, being stemmed with gun-cotton priming (F.G. powder with earlier Marks), is placed over the head of the core. The outer disc is large enough to completely cover the head, and has a draw-string round its edge, which is pulled in and tied tightly round the stalk of the mushroom-shaped core.

CARTRIDGE, B. L. 6 INCH GUN, 10 LB., CORDITE, SIZE 20, MARK I. C.  
SILK CLOTH, 1/2 CHARGE.

*This drawing represents two  
1/2 charges laced together.*

Scale 1/3

4 FELT PADS PERFORATED.  
SILK CLOTH RING.



CORDITE  
SIZE 20  
1/2 CHARGE.

I  
R ↕ L  
6 IN. B.L. GUN.  
10 LB.

NOT TO EXCEED 5.75"

MAXIMUM LENGTH NOT TO EXCEED 11.75"

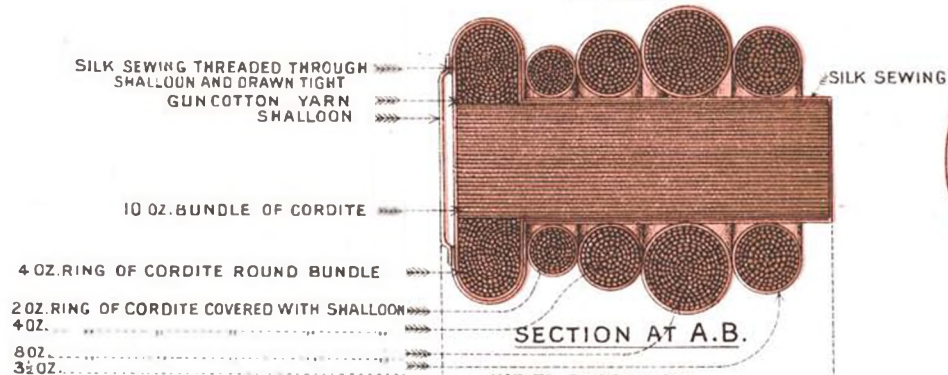
MAXIMUM LENGTH NOT TO EXCEED 11.75"

MAXIMUM LENGTH, OVER ALL NOT TO EXCEED 23.6"



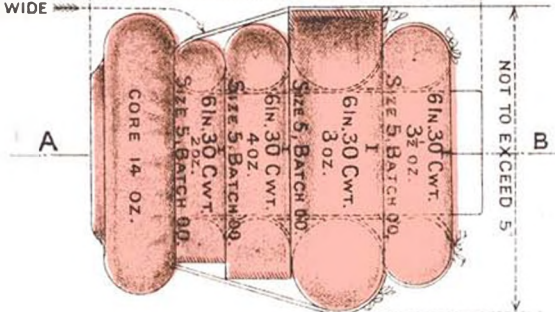
CARTRIDGE, B. L. 6 INCH, 30 CWT. HOWITZER, 1 LB. 15½ OZ. CORDITE SIZE 5, MARK I, | L |.  
SHALLOON; CORE AND FOUR RINGS.

SCALE 1/3.



NOT TO EXCEED 6.5

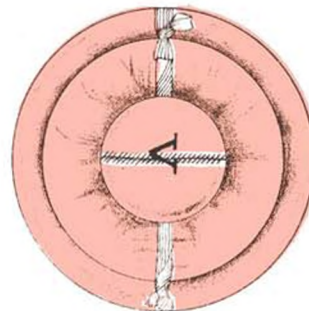
SILK BRAID .35 INCH WIDE STITCHED TO BAG



PLAN.



PLAN OF BASE.



PLAN OF TOP.

Each ring is formed of a bundle of cordite, weighed, and inserted into a shalloon cylinder, open at both ends. The ends of the cylinder are brought together, turned in and stitched together. The rings for the 5-inch and 5.4-inch howitzer cartridges are all of equal weight, but the 6-inch of 30 cwt. has rings of 2 oz., 4 oz., and 8 oz., and the 6-inch of 25 cwt. rings of 2 oz., 5 oz., and 11 oz. With rings of different weights, the smallest is placed on the core first, and in all cases the rings are secured by two pieces of silk braid, the centre of each piece sewn to the igniter. One end of each braid is brought up inside the rings and tied to the other end, which is outside, by a reef knot, thus holding the whole cartridge together.

*Cartridge, B.L., 6-inch, 30-cwt. howitzer, 1 lb. 15½ oz. cordite, size 5, Mark I*, differs from the 1 lb. 12 oz. cartridge described above in having an additional 3½ oz. ring secured on top of the 8 oz. ring by two pieces of silk braid threaded through the securing braids of the cartridge. It is for use with the heavy shell in the Mark I\* howitzer. The M.D. charge is for use with the light shell in the same howitzer. The latest 5-inch howitzer cartridges have the stem of the core and the rings secured by silk sewing, no shalloon covering being used; a loop of silk sewing on the base is used to remove it from the cover. The latest cartridges for 5.4-inch and 6 inch 25 cwt. howitzers have the core made to shape, and then inserted in the funnel-shaped shalloon bag, the opening being afterwards sewn up; this does away with drawn string and a certain amount of shalloon. The M.D. charge is primed with 12 drams of F.G. powder.†

*Cartridge, B.L., 9.45-inch howitzer*, consists of seven silk cloth bags § 12355. filled with ballistite, and secured by two silk braid bands to a shallow millboard cup. Two flat sector-shaped bags, each containing 4 oz. 7 drams of ballistite, are placed at the bottom of the cup. Over these are two semi-circular bags, each containing 8 oz. 14½ drams. These bags fill up the cup; over these are placed three flat circular bags, each filled with 1 lb. 2 oz. 4 drams, and primed with 6 drams of F.G. powder. The silk braids pass through holes in the cup, and are tied on top.

#### MARKING CORDITE CARTRIDGES.

Cordite cartridges are marked in the same way as powder cartridges, with nature of cordite, and weight. If filled with a different nature or weight from that already marked on the cartridge, the marking should be altered to agree with the contents. The lot number, which includes the initials of the manufacturer, will be also stencilled on the back of the cartridge later issues, also the date of filling (*see Plates*). The igniter is marked with the weight of the explosive.

Howitzer cartridges have the above information stamped on the base of the core, and in addition the weight of the core is stamped on its edge, and each ring is marked with its weight, and the size and batch number of the cordite in it. § 12795.

All cordite cartridges have the initial or monogram of the station where they are filled, marked on the back near the bottom for gun cartridges, and on the top of the core for howitzer cartridges. This monogram is not stamped on by the Royal Artillery when they fill cartridges for their own use. The initials and monograms of stations are given in R.W.M. All cordite cartridges are carefully examined, and gauged for length and diameter previous to packing.

† § 12972. The core and 3½ oz. ring of the 2 lb. 8½ oz. charge is for star shell in Mark I\* howitzer.



## GAUGES, ETC.

## GAUGES, CARTRIDGE.

§ 9804. The gauges used with filled cartridges are the "*gauge, cartridge, length, universal, Mark II,*" and "*gauges, cartridge, ring.*"

The universal gauge tests the length and may also be used to test the diameter.

The ring gauges test the diameter and are all "high" gauges, that is to say, the greatest diameter of the cartridges must pass through them.

Mark II.  
§§ 3307, 4946,  
9904.

For gauging  
lengths.

The universal gauge has a slip of paper, on which is a printed table giving the lengths and diameters of the cartridges. The edge of the gauge is graduated in inches and tenths.

The arrangement for giving the variation in length is not now used, and the gauge is used as a high gauge, being set at the greatest length of the cartridge.

The upper sliding arm should be fixed firmly against the zero block by clamping the sliding-stop against it. The lower arm is then placed with its inner edge at a distance from the zero-block equal to the length of the cartridge, given on the slip, and clamped. It should be possible to pass the cartridge between the arms.

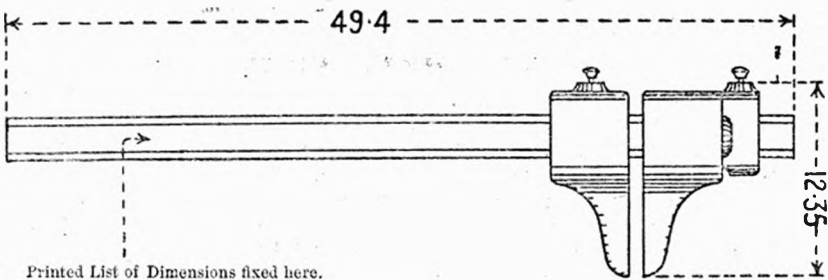
For gauging  
diameters.

The gauge can be used in the same manner for testing the diameters of cartridges, but the ring gauges provided will be found more convenient for this purpose.

*Gauge, Cartridge, Length, Universal, Mark II | C | .*

Wood; for filled cartridges.

Scale  $\frac{1}{16}$ .



Mark I.  
§§ 2074, 3307.

Gauges, car-  
tridge, ring.

§§ 12032,  
12796.

Mark I differs from Mark II in having the lengths of various cartridges marked on its side, instead of the paper slip, the edge of the gauge is not graduated in inches and tenths.

Are rings of gun-metal, with straight handles; they are marked on and near the handle with the internal diameter of the gauge.

Covers, cartridge paper, are brown paper bags on which are marked the contents and numeral of the cartridge which they cover.

They are for the blank charges for the 10-pr., 12-pr., and 15-pr. B L. guns.

In packing cartridges covered with the above covers in a barrel or box, the interior of the latter is also lined with brown paper.

*Covers, cartridge, canvas.*—The covers for the 2 lb. 6 oz. for 30-pr., §§ 7657, 8136, 15½ oz. for 15-pr., 12 oz. 7 drs. for 12-pr. of 6-cwt. B.L. cordite 8223, 8312, charges, are made of canvas, with a draw string in the mouth for 8498, 9157. bringing it together.

In field batteries the covers to some extent preserve the cartridge from wearing out; they are also stated to preserve the cartridge from damp.

Covers, cartridge, dowlas, are issued for protecting 5-inch B.L. howitzer cartridges, Marks I to III.

*Covers, cartridge, silk cloth, B.L., 5-inch howitzer, 11¼-oz. cordite* § 12452. | L | is used with Mark IV cartridge; it is provided with a silk braid draw string at the mouth and a bucket at the base.

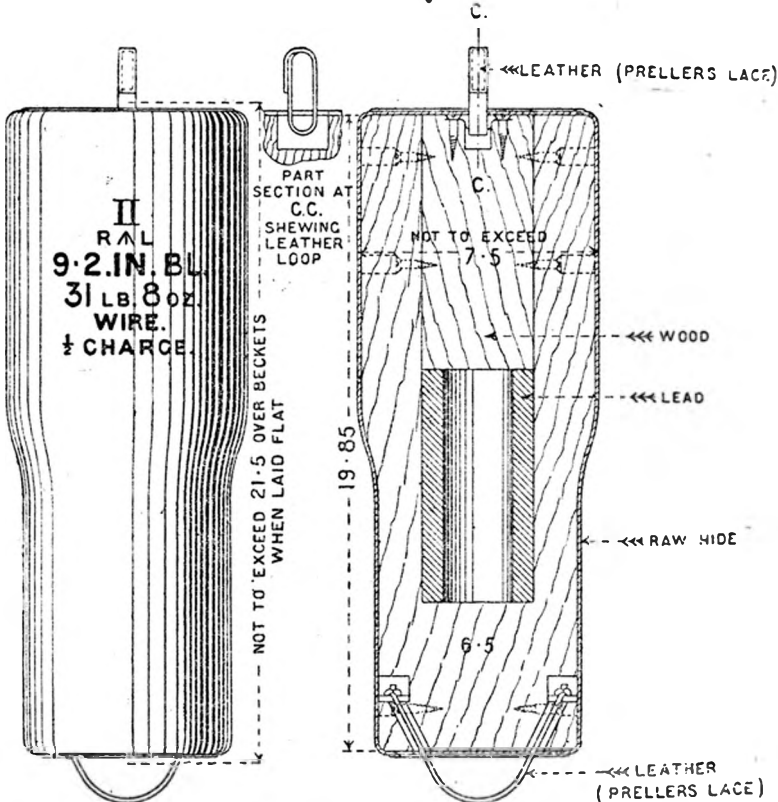
DRILL CARTRIDGES.

*Cartridges, drill,* are made to the same shape, weight, and dimensions as the Service cartridges they represent. They consist of wooden cylinders built up in segments, usually containing a cast-iron

*Cartridge, B.L., drill, 9.2-inch, 31 lb. 8 oz., Mark II | N |*

Raw hide; ½ charge, for wire guns.

Scale = ½.



cylinder to give the necessary weight, and covered with raw hide. Cartridges, drill, B.L., representing prismatic cartridges, 8-inch to 16.25-inch, are weighted with lead and are made with polygonal sides, and have rope handles at each end so fitted that they do not project.

Cartridge, drill, 6-inch, 29 lb., is of rope and lead covered with leather.

Drill representatives of cordite cartridges are issued for B.L. guns and howitzers except the 10-pr., 12-pr. of 6 cwt. and 15-pr. B.L. guns and the 5-inch B.L. howitzer. They are made of wood covered with raw hide, and conform to the general shape, weight, and dimensions of the service cartridges. The representatives of cartridges, 6-inch and upwards, however, have no disc to be torn off, and the primed end of the cartridge is represented by being painted white with a red cross. It has also a small becket projecting from its centre. These cartridges are stamped with the usual marking to be found on service cartridges.

§§ 8413, 9416,  
9052.

Cartridges, B.L., for instruction, are issued for the B.L. howitzers. They consist of a core of wood and three or more rings of twine covered with leather. The rings are secured to the core by two leather strips, and the cartridge is marked in a similar manner to the service one. They are used for instruction and not for drill.

---

## CHAPTER VI.—POWDER BARRELS—VARIOUS CASES, USED TO CONTAIN GUNPOWDER AND FILLED CARTRIDGES, GUNPOWDER AND CORDITE, ETC.

In this chapter will be described powder barrels and the various other cases, in which gunpowder and filled cartridges for ordnance are transported and stored. A description of the boxes specially used with small-arm and Q.F. ammunition will be given hereafter in the chapters devoted to those subjects.

*Barrels, powder.*—The present pattern is Mark III. There are three sizes, *whole, half, and quarter*. They are machine made; the timber is of the best Quebec oak, thoroughly seasoned; but teak would be used when the barrels are required for issue to stations where they would be exposed to the attacks of white ants; and Memel oak staves if a supply of Quebec oak was not available. §§ 1884, 2553, 3320, 6127. § 1324. § 2119.

Powder barrels consist of three-parts, viz. :—

1. Staves.
2. Heads.
3. Hoops.

The most protuberant part of the barrel is known as the “bilge,” and the centre of the bilge is distinguished as the “pitch.” Staves.

Between the bilge and the end of the barrel is the “quarter.”

The extreme end is known as the “chime.”

To distinguish one end of the barrel from the other, that which is opened (when required) is known as the “top end,” the other as the “back end.” The top end may be known by having the staves bevelled off close to the chime to facilitate heading.

All powder barrels have four copper hoops, the remaining hoops are of ash or hazel. At stations where rattan cane is available, and the stock of spare ash or hazel hoops is exhausted, the cane may be used locally, for making spare hoops. Hoops. § 6444.

12 ash hoops to the whole, 10 to the half, and 8 to the quarter barrel.

All powder barrels before issue, and such as are repaired at out stations, are to be hooped as above. § 3739.

The ash hoops generally strengthen the barrel, and, moreover, protect it by keeping the bilge off the ground when stacked on their sides, and it is stated that they keep the copper hoops from slipping. Use of the ash hoops.

Powder barrels are used to transport and store cubical and granulated powders when not made up into cartridges; they are also occasionally used to hold cannon cartridges, and then would have brown paper lining. Use.

Powder barrels are also used for packing picric acid, and when so used, they will have a band of yellow ochre, 1 inch wide, painted round the bilge, and be stencilled on top with the words, “To be used for picric acid only,” also in yellow ochre. Powder barrels § 8838.

which have been used for picric acid are never to be used for any other explosive. Barrels for picric powder are marked in a similar manner, but in blue.

Barrels not  
to be rolled.  
Contents.

Barrels of gunpowder are not to be rolled, but will always be carried by hand or on trucks or barrows.

The whole barrel contains 125 lb. P. or P.<sup>2</sup> powder, 110 lb. Q.F.<sup>1</sup>, R.L.G.<sup>1</sup>, or R.L.G.<sup>2</sup>, if with a waterproof bag, or 120 lb. R.L.G.<sup>2</sup> if without a waterproof bag. Of every other description of grained powder it holds 100 lb. The half barrel contains 50 lb., and the quarter 25 lb.

Requisites of  
a powder  
barrel.

A powder barrel suitable for military purposes should possess the following properties:—

1. Sufficient strength to stand moderately rough usage without leakage.
2. It should be perfectly watertight.

§§ 4752, 6208.

To make up for the deficiencies of the above barrel in the second requirement, a *Bag, powder barrel*, has been introduced to enclose the powder inside the barrel.

Mark II bag differs from Mark I in being made of one piece of stronger material.

Waterproof bags are invariably used in powder barrels which are to contain picric acid or picric powder.

*Case, transport, explosives, Marks I\* and II | C |* are similar in construction to the "case, transport detonators, Mark III," described at p. 52, but differs in dimensions; the lid is provided with 12 square-headed screws, it is painted khaki colour. Dimensions 33·15" × 18·25" × 10·8". Mark I is similar, but has galvanized-iron wire handles.

§ 3240.

*Cylinders, ammunition, half and quarter barrel.*—When powder is sent by rail, it is put in a flannel bag and placed in a half or quarter barrel. The barrel is covered by a canvas bag, and placed in an iron case or cylinder. There are two sizes, half and quarter; any other combustible stores are sent in the same manner, except high explosives. Small arm cartridges may be sent without being placed in iron cases, as they are very difficult to ignite in any way, and will not explode in mass.

§§ 8263,  
8285, 8497,  
11015, 11187.

*Case, powder, 100 lb., Mark V, wood, zinc lined, prismatic,* is designed for the transport and storage of prism and other moulded powders. It is a stout deal box, with lid of teak clamped with hard wood, which is secured by brass screws working in gun-metal nuts screwed into the sides and ends of the box. It stands on two ledges attached to the bottom, and at each end is a cleat of hard wood for a handle. The exterior dimensions are 2 feet 5½ inches long, 1 foot 3½ inches wide, 9¼ inches deep over all, and there is a circular recess in the lid and side, which was intended for the safety label.

The zinc lining is removable, and has a flanged recess at top for luting, the zinc lid is also flanged to fit in recess of zinc lining, and is fitted with two folding wire handles for lifting.

§§ 9087,  
12073.

The inside of the lining and lid are coated with black paint, the outside of the lining is varnished with copal varnish which is stained with vegetable black, and the exterior of the box is painted red.

§§ 4390, 4915,  
5075, 5615,  
6272, 8263,  
8385.

Marks II\*, III, and IV will be converted by having a similar lining and lid to Mark V inserted, and will then be distinguished by the addition of an asterisk after the roman numeral, thus: II\*\*, III\*, IV\*.

To close the above cases, fill the recess or groove on top of zinc lining with luting, then press in flanged edges of zinc lid, and with the thumb smooth off the luting level with the top of the rim of the groove, wipe clean round the edges with a piece of cotton waste or rag, then place on the wooden lid in correct position and secure by screws. The lids are numbered to correspond with the case. Closing the case.

100 lb. powder cases, when used to contain picric acid, have their linings removed and calico bags substituted. Used for picric acid. § 4913.

Each of these cases is to be packed with 100 lb. powder, and no more; the empty space, if any, being filled with suitable pieces of varnished wood, which will be made of the necessary size, and provided locally as required; and, when filled, will be marked on the lid and sides, as laid down in R.W.M. § 6272.

*Brace, magazine, Mark II*, and a *bit* for the same, both of phosphor-bronze, are supplied for use with these cases, for which the ordinary "driver, screw, magazine," is not strong enough. §§ 4386, 9245.

Beside the above, prism powder is sometimes transported in zinc-lined cases supplied by contractors, which are altered to hold 100 lb.

All these cases, whether Service or contractor's, when issued to foreign stations, are to be rendered air-tight previous to issue, by the application of a tape band about 2 inches wide at the junction between the lid and the case. This band is then to be securely fastened to the wood by means of shellac cement, and painted the same colour as the case. Such cases should not be opened, if it can possibly be avoided, until the contents are required for making up cartridges. Issue to foreign stations.

Besides the packages described above, gunpowder, in the form of made-up cartridges or bags of spare powder, is transported and stored in the following cases:—

*For Land Service.*

*For Naval Service.*

Cases, metal lined—

Mark I, special.

Mark II, field.

Cases, powder, metal lined.

Cylinders, cartridge, zinc.

Case, cartridge.

Case, powder, metal lined.

    "    "    pentagon.

    "    "    rectangular, plain.

Cases, powder, rectangular, corrugated.

Cases, powder, cylindrical, brass.

Cylinders, cartridge, zinc.

Case, cartridge.

All packages will be carefully examined in the interior to ensure their being free from moisture before being used for packing explosives. Packages to be examined.

*Case, metal lined, field, Mark II*, is of wood, provided with a sliding lid with pin, and with a cleat and rope handle at each end. §§ 9109, 10272.

The interior is fitted with a removable tinned copper lining, with a groove for luting at the top, and the lid of the lining is flanged to fit into the groove. The case is for field service B.L. reserve cartridges, and is only used for the carriage of cordite cartridges, which are packed without their covers on, in ammunition and store wagons, in ammunition columns and parks. These cases are stencilled to show the exact nature and number of cartridges they contain.

Mark I case, which is known as *Special*, differs in dimensions. § 8946.  
No more will be made, and existing cases will be used for such services, other than mobilization, as may be ordered.

§§ 5406, 6033, 10665, 11097, 11328. *Cases, powder, metal lined*, Mark IV, are of three sizes—whole, half, and quarter; they are rectangular cases of deal, strengthened by oak corners, and the cleats of ash, the sides and ends are secured by dovetailing, and the top and bottom by brass screws. They are lined with tinned copper. Their dimensions are:—Whole, 17" × 17" × 20½". Half, 13½" × 13½" × 16½". Quarter, 10½" × 10½" × 14".

The cases are *Land* and *Naval*, differing from each other only in the handles, which are of rope for the former and wire covered with leather on the inner portion, for the latter.

A square lid opens on hinges on top of the case; it is screwed down by two gun-metal bolts by means of a gun-metal key; this lid covers a circular opening in the lining, which is closed by a lid or bung of tinned copper.

Metal lined powder cases are used for the storage and transport of the smaller cartridges, powder and cordite, and for small combustible stores generally, also for packing small quantities of cordite in bulk for tropical stations. The half size also for wet gun-cotton, when specially fitted as described on p. 8.

Painting and marking.

The cases are painted stone colour. Marking and labels are given in R.W.M.

§§ 6646, 9570.

The whole size will take cartridges, B.L., up to 6-inch inclusive.

To close the case.

The case is closed by covering the side of the bung all round flush to the top and bottom rim with luting, pressing it well home, and filling up the recess round the bung with luting, and smoothing it down with the thumb, wipe clean with a piece of cotton waste or rag. The wooden lid is then closed, and the two gun-metal bolts screwed down alternately, giving not more than one turn at a time to each, so as not to strain the bolts or hinges.

Mark III luting. § 8756.

The luting to be used for securing the lids of powder cases and metal lined cases is Mark III, which consists of 80 parts, by weight, of whiting, 20 parts of mineral jelly (vaseline), and one part of castor-oil. It will be issued from Woolwich ready mixed in tin cylinders each containing 1 lb.

The luting, before use, will be beaten up with an ordinary wood mallet on a wooden tray until it is of the required consistency.

Marks I and II, luting. §§ 9016, 10146.

Mark I luting, consisting of equal parts of beeswax and tallow, is reverted to for Naval mining and torpedo services. With this exception Marks I and II luting is not to be used in future.

§ 5780.

*Bag, powder, 10 lb., Mark I, serge.*—Whenever loose powder is stored in metal-lined or pentagon cases, it will be packed in serge bags, which are not to contain more than 10 lb. powder. The mouth of this bag will be tied with twine.

§§ 2483, 7506.

*Case, powder, pentagon*, of two sizes, whole and half. The lid hinges on a curved bolt; there are slots in the projecting rim of the lid, and corresponding projections on the neck of the case; the lid will only open when the slots and projections are in a corresponding position. The dimensions of the whole size case are, 19.3" × 15.5" × 11".

There is a second socket furnished for the bolt, in case the other should get broken. The body of the case is made of sheet brass, the top and fittings of cast brass.

The whole size takes cartridges B.L. up to 6-inch 21-lb. When packed with B.L. 6-inch 12-lb., E.X.E., quarter-charges for Naval Service, wood packing pieces will be used.

There are five pieces to a set, viz. :—

Two tapering pieces, each not to exceed	14 $\frac{1}{2}$ "	×	3 $\frac{1}{2}$ "	×	$\frac{3}{4}$ "
Two rectangular ,, ,, ,,	6"	×	3 $\frac{1}{2}$ "	×	$\frac{3}{4}$ "
One securing piece, not to exceed	8"	×	7 $\frac{1}{2}$ "	×	$\frac{3}{4}$ "

These packing pieces will be made locally as required.

There is a lever and spanner issued for opening this case, the § 1322.  
spanner works the jam screw, and the lever turns the lid.

The groove round the neck of the case is filled up with Mark III luting, the bung is then inserted, and tapped gently down with a wooden mallet, the recess round the bung is then filled in with luting, and well smoothed down with the thumb; wipe clean round the edge with a piece of cotton waste or rag, and clean the lid. The projection on the point of the lever is then inserted in the ring on the curved bolt, and the lever turned from left to right. The spanner is then used to turn the screw and jam the curved bolt. To close the case.

To open the case, unscrew the set screw free from the curved bolt with the spanner, turn the lid from right to left with the brass lever until the inclines are clear, then raise the lid and lift out the bung.

*Cases, powder, rectangular, A to O.*—Made of corrugated sheet brass, with cast gun-metal top and fittings. The corrugations strengthen the case. These cases are used for N.S. only.

There are fifteen sizes of these cases, lettered from A to O. § 10219.

The present patterns are A and L, Mark IV; B to G, Mark III; H to J, Mark II; M, Mark II; and N and O, Mark I. They are double riveted, and have the brass strips on the vertical joints at the sides 3 $\frac{3}{8}$  inches wide, instead of 1 $\frac{3}{8}$  inches, as in the earlier patterns.

The lid, except of the M case, is circular, and provided with a flange which fits into a circular groove in the raised lip round the opening in the case, and is secured by a cross bar working on a pivot at one end, and fitting under a projection at the other. A central screw bolt bears upon the lid; when this is tightened all is fixed in its place; when loose the bar can be turned on one side and the lid lifted out. All these circular lids, of new and repaired cases, have a hole in them, closed by a gun-metal screw-plug, this hole is used for making air connections for testing purposes. This caused an advance of numeral in the pattern, or the addition of the symbol \* to the existing numeral. § 9317.

The plugs used, both for rectangular and cylindrical cases, are the same as are used for closing the hole in B.L. shells, 7.5-inch to 13.5-inch, for the Mark II small lifting eye-bolt.

All these cases have handles of copper wire covered with leather, for lifting.

D, E, F, G, H, I, and J cases have a wood lining at the top to prevent the cartridge being cut by the lower ends of the top fittings.

To turn the central screw in the cross bar a key is required.

The Mark II key is made of gun-metal, with a cross handle bevelled off at one end, for the purpose of extracting the ring handles of the lid of the case, if they should become fixed in the recess. § 2538.

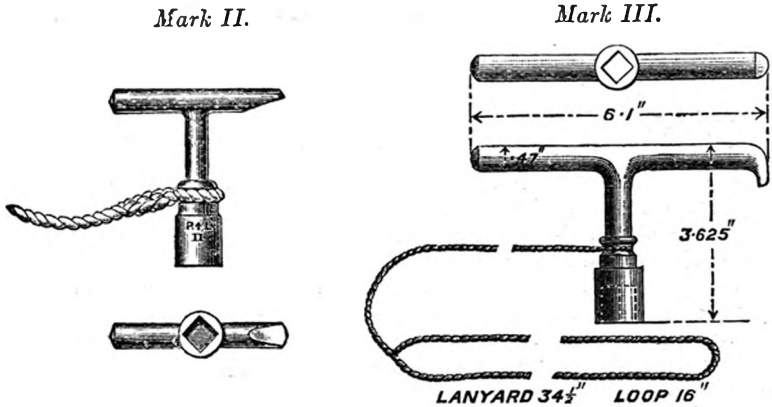
The Mark III key differs from the above in having one end of the cross handle formed into a toe for raising the lid of the "M" case. It will, however, be used for other rectangular cases, when the existing store of previous patterns is used up. §§ 5917, 7076, 9616.

The Mark IV key is similar to Mark III, but is made of aluminium bronze, and is consequently stronger. § 8073.

It is also used for Q.F. naval cartridge boxes, 12-pr. to 6-inch.



To open a case, unscrew the tightening screw, unfasten the cross-bar, and lift out the lid.



Securing lids.

The lids of these cases are secured as follows:—

Twist loose jute, or hemp (untwisted white spun yarn is best, if available) round to a compact and uniform thickness of about one quarter of an inch, and of sufficient length to form a complete ring to fit into the circular groove on the top of the case.

Thoroughly coat the twisted jute or hemp with Mark III luting, by holding some luting in one hand and drawing the jute or hemp through it; place it in the groove, and press it down so as to present an even and uniform surface to receive the edge of the lid, then fill up the whole of the groove with luting. Cover the side of the lid all round with luting flush with the rim; put on the lid in such a position that the handles will be under the cross-bar, and tap it gently down with a wooden mallet until it is well home in the groove; put the cross-bar in its place, and screw down the tightening screw with the metal key, cleaning off the superfluous luting with a piece of waste.

Testing powder cases. A.O.R.

At depôts at home and abroad, such naval powder cases as are fitted with testing plugs will be tested for air-tightness by means of the "pump, air, testing powder cases."—

1. On receipt into store.
2. After packing.

The test will only be considered satisfactory when the indicator on the gauge of the pump remains stationary (under compression or exhaust) for a period of not less than  $1\frac{1}{2}$  minutes at a pressure of  $1\frac{1}{2}$ -lb. per square inch. Any cases which fail at this test should be emptied and returned to Woolwich as soon as they can be spared, if the defects are such as cannot be satisfactorily remedied locally.

§ 8806.

*Pump, air, testing powder cases, Mark I,* is issued for the above test. It is a single acting pump and can be used for either compressing or exhausting the air in the cases. It is fitted with a gauge for indicating "compression" or "exhaust," which will read to 3 lb. either way.

Connection with the powder case is made by means of an india-rubber pipe having a nozzle which screws into the hole in the lid of the case.

The pump fits into a wooden box, provided with a leather handle.

The actual number of cartridges contained in each size will be found in the tables, Nos. 4, 5, and 10.

Some of the large cartridges are stored in *cases, powder, cylindrical*, of which each size only takes one nature of cartridge. These cases are also known by letters: O, P, Q, R, S, T, U, V, W and X.

They are all for Naval Service. They are all, except case S, fitted with the hole and plug for the air-test as described for the rectangular cases.

Existing cases which come through Ordnance Factories will be § 9317. fitted with this plug and a \* added to their numeral.

*Cases, powder, cylindrical*, O, P, Q, and R. The cases are made of stout sheet brass butt jointed; on the exterior two gun-metal bands are attached to the body with solder; between these bands over the joint is secured, with rivets and solder, a bar with two loops fitted with copper wire, covered with leather, to form a lifting handle. Earlier Marks had a lifting bar. At each end of the case there is an end ring also of gun-metal secured to the body with rivets and solder, having four bearing surfaces on each, which give stability to the case in stowage; the top ring forms the mouth of the case, inside of which a groove is formed, and in this groove the locking cams on the lid work. Two joint strips of sheet brass are riveted and soldered over the joint between the bands and stiffening rings.

The bottom fits over the end of the case and is secured by rivets.

The lid is made of gun-metal, having a flange on the upper surface; locking cams, worked by a key, are fitted in it at right angles and secured from the underside of the lid by means of a nut held by a set screw; these cams engage in a short groove inside the top of the case thus securing it. A recess is formed on the underside of the lid and tinned to receive a dermatine washer, which is secured in the recess with india-rubber solution, and painted with whiting to prevent its adhering to the mouth of the case. A wood packing piece painted stone colour is secured to the underside of the lid by four metal screws. On the upper surface a circular recess is formed, across which is a handle for the purpose of lifting the lid.

It is fitted with the usual plug for the air-test.

Radial lines are cut on both body and lid, and must be made to coincide when the case is closed. A small pin then engages in a slot in the rim of lid and prevents the lid from turning. These cases are not moved from the bays; they hold cordite charges, and open only at one end.

For working the locking cams a key is required. This is the *Key, O to R, Mark II*. It is made of gun-metal, about 5 inches long with a cross handle. It has a square projection which fits into the recesses in the cams, and is fitted with a lanyard of white line. It is also used with all cylindrical and rectangular cases to remove the air-testing plug.

Place the lid in the mouth of the case so that the radial lines cut on both coincide. Then secure the lid by turning the locking cams, till they engage in the recesses in the case.

*Cases, powder, cylindrical*, S, T, U, V, and W. are generally similar in construction to the above, differing principally in the method of closing. Each end of the case is closed by an embossed brass lid strengthened at the rim with a gun-metal ring having four gun-metal handles pivoted in positions corresponding to the lugs on the body; the upper end of the handles are formed into cams which bear on the top of the lugs to start opening the lids, at the other end of the handle is fitted a dermatine ring to prevent injury to the case. The lower part of each handle is a tube, threaded

Key.  
§§ 9831, 9584,  
8644, 10218.

Securing lids,  
O, P, Q, and  
R cases.

internally, and having a hexagon on the exterior at the top, thus forming a nut by which the lid is secured.

§§ 6511, 7513, 9979. Two stops on the ends of the body engage in corresponding slots in the flange of the lid to prevent the latter turning in locking and unlocking the handles, underneath the lid is a packing ring of wood secured by four gun-metal screws working in sockets soldered on to the lid. In a recess formed inside the lid, which is tinned to prevent deterioration, fits a dermatine washer, which makes an air-tight joint with the end of the body, which is also tinned.

In each long space between the handles on the lid are placed two flat bearing pieces to give greater stability in stowage.

§ 7565. One handle on lid, and lug on each end of the body are painted *blue* and *red* respectively, and the body and lids are numbered; this is to ensure the cylinder always being closed with its own lid, it is also stencilled with the monogram of the station with letters  $1\frac{1}{4}$  inches long. This system of marking applies to all cylindrical cases for Naval service.

For screwing up and unscrewing the handles a metal spanner is provided.

§§ 4681, 5174. Spanners are provided for use in screwing up the handles of the above cylindrical cases, S, T, U, V, and W.

§ 5174. Spare rings, in the proportion of 50 per cent., will be issued with the cases to replace any that may deteriorate or may become injured in removing the lids. These rings are issued 20 in a tin cylinder.

India-rubber solution will also be issued for securing them on the cases. The solution will be applied in the recess for the ring with a brush; if too thick, a little naphtha should be added.

In the latest pattern, S, T, and V cases, the handles work sideways.

In the earlier patterns of S, T, U, V, and W cases the lugs opened outwards; V case will eventually supersede U and W cases. These cases are moved in action, and open at both ends, so that a rammer may go right through the case.

To close the cases when filled, place the lid in position with the red or blue handles opposite the similarly painted lugs, and screw up the nuts of the handles sufficiently to just allow the nuts to enter under the points of the lugs, so that the handles require slightly tapping home by means of a light wood mallet, those opposite each other being tapped home consecutively. When the cases are empty, the nuts only require to be screwed up to give sufficient pressure to keep the handles in the lugs, and to prevent them working loose during transit a piece of tarred spun yarn is attached to one handle and passed round the case, a half hitch being made on each handle over which it is passed. Should any difficulty be found when cases are being opened in withdrawing the handles by hand, they should be prised out by means of the handle of the spanner. To adapt the spanner for this purpose, its handle is, for a length of one inch from the end, filed to the form of a screwdriver.

Painting and marking naval cases. Pentagon, rectangular and cylindrical Naval powder cases are painted stone colour, inside and out.

§§ 4869, 4944, 6646, 10085.

#### *Cylinders, cartridge.*

*Cylinders, cartridge*, made of zinc, are used in the L.S. to transport store, and bring up to the gun the cartridges for B.L. guns 6-inch to 13.5-inch inclusive.

Zinc cylinders are also used for the temporary storage of the reserve of filled B.L. 16·25-inch to 6-inch cartridges for the R.N. until required for issue to vessels, when they will be transferred to the proper cases, &c., suitable to each particular magazine.

There are two Service patterns, viz. :—

Those with screw tops, known as B pattern.

§ 4195.

Those with screw tops and side handles, known as C pattern.

§§ 4709, 9233.

Cylinders are known by numbers from 1 up.

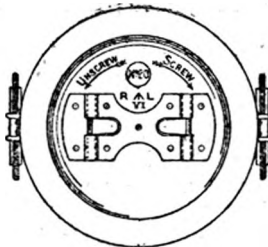
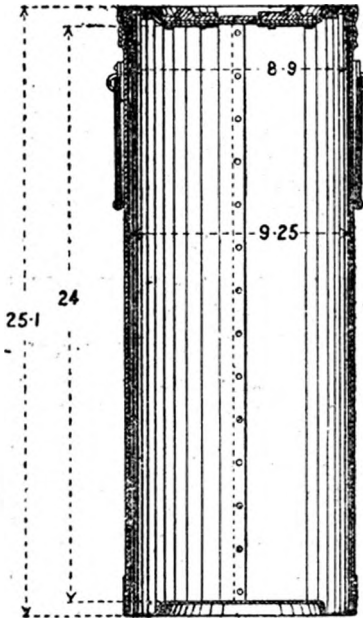
These numbers are stamped on all new cylinders.

Older cylinders have the numbers stencilled on them.

*Cylinder, Cartridge, No. 20, Mark VI | C | .*

Zinc; 8·9 × 24 inches.

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



A list of these numbered cylinders, giving dimensions and also the cartridges which can be packed in them, will be found in the tables, Nos. 4, 5, and 8.

- § 4195. "B" pattern cylinders have the lid attached by means of a screw of about  $\frac{1}{2}$ -inch pitch, forming corrugations in the lid and top of the cylinder. The handles, of iron, are attached to the lid and are used for screwing it on or off.
- §§ 4709, 7078. It is found that cylinders having their handles on the top of the lid are liable to be distorted if at all roughly handled, so that they are fastened and opened with difficulty. To remedy this, pattern C was introduced, the only difference between it and B pattern being that it has its handles attached to the sides of the body, and lugs on the lid for opening and closing.
- The cylinder is made of zinc, with a strengthened bottom and lid attached in the same manner as the B pattern.
- The lid has a recess in which is fitted a dermatine washer which makes an air-tight joint with the top of the cylinder. To form fulcrum for a lever to turn the lid, and at the same time allow the cylinders to be stacked on end, two hinged metal lugs are attached to the top of the lid, by a plate on the outside riveted through to two strengthening plates on the interior. Attached to each side of the body, near the top, by short galvanised-iron brackets, are the handles which are of galvanised-iron wire run through a short tube of galvanised-iron.
- § 9233. The latest C pattern cylinders have a strip of zinc soldered round the inside of the mouth, to give a greater bearing surface for the dermatine washer. Existing cylinders will be altered when sent in for repair and a \* will be added to the mark when so altered.
- To open or close the cylinder, the lugs on the lid are turned upright, the "Bearer, cartridge, cylinder" laid between them and a smart wrench given.
- Discs. It has been found that there is a liability of injury to cartridges, when in zinc cylinders, from moisture collecting on the bottom of the cylinder and the silk cloth adhering to the latter.
- §§ 7902, 8055, 8113, 8179, 8728, 9265, 9513.
- § 11480. To remedy this defect, a circular disc of painted wood is now placed at the bottom of each cylinder, so as to prevent the cartridge coming in contact with the bottom of the cylinder.
- Packing pieces. Certain cylinders, at present Nos. 18, 20, 22 and 28, have packing pieces to prevent the cartridges from shaking about. These packing pieces consist of a painted wood disc, to the back of which two wooden cross pieces are screwed. When one of these packing pieces is used, it would take the place of the disc.
- §§ 9647.
- Testing. For securing lids, etc., see R.W.M.
- After closing the lid of any case or cylinder except metal-lined cases, the joint may be tested by immersion in warm water (90°—100° F.). If air bubbles escape at the joint the case or cylinder must be re-closed and re-tested; if elsewhere the case should be put aside for repair.
- Painting. New zinc cylinders are not painted.
- Repaired cylinders are painted stone colour inside and out.
- Marking. The stencilling and labelling of zinc cartridge cylinders, and the information to be given is laid down in R.W.M.
- Care against damage to cylinders. Great care will be taken in transporting zinc cartridge cylinders, whether filled or empty, between laboratories, magazines, &c., in order to prevent their being damaged by accidental blows or from any shaking loose of the lids which might affect their air-tightness.
- Wooden cases for protecting cylinders. When zinc cylinders are issued containing filled cartridges, they will be protected by wooden skeleton cases which will be made up locally as required, brass screws being used. Serviceable zinc cylinders, when issued empty, will be similarly protected. Heavy

natures of cartridges will require a case for each, but those under 50 lb. may be packed two or more together.

*Bearer, cartridge, cylinder, Mark III.*—This is an ash stave 4 feet long, 1 inch thick,  $2\frac{1}{2}$  inches broad in the centre, and tapered off to each end to  $1\frac{1}{2}$  inches. § 3959.

Mark II is 6 inches shorter.

§ 2944.

*Cases, cartridge* are made of leather, or Clarkson's material (strips of cork cemented together between two layers of canvas and strengthened on the outside by cork bands); they are used to convey cartridges from the magazine to the gun.

The latest cases, cartridge, are of canvas strengthened by rope strapping, the top and lid being of leather stiffened with ash. The handle is formed by prolongation of the rope strapping; it is fitted with a leather grip. § 12699.

*Box, exploders, lyddite, Mark I.*—The box is of deal with elm ends, painted yellow, the lid is secured by brass screws working in nuts let into the top of the box. It is fitted with a copper tinned lining which has a luten groove formed round the top, into this the flange of a copper tinned lid is pressed so as to make an air-tight joint, cleats with handles are attached to each end of the box. The box is provided with packing pieces of varnished wood for use with different sized exploders. §§ 9907, 10,026.

*Mark II* differs in dimensions and the nuts for screws securing lid, a felt-wad over the exploders is also used.

## CHAPTER VII.—ELECTRIC FUZES AND DETONATORS.

**Definitions.** *Electric fuzes* are used for firing the powder charges of L.S. mines, and in connection with submarine mining.

*Detonators*, as their name implies, are used for detonating charges of gun-cotton, etc. They may be fired by electricity or otherwise.

**Low tension fuzes.** *Low tension fuzes* and detonators are constructed on the following principle. When a continuous current of electricity of sufficient strength passes through a thin wire of high resistance, the temperature of the wire is raised until it becomes incandescent and capable of igniting any easily inflammable substance in contact with it.

This principle applies to all electrical stores such as vent scaling tubes, &c., in the Service.

**Bridges.** The fine wire which is raised to incandescence by the passage of the current is called a "*bridge*," and the three resistances are:—

Bridge.	Calculated mean resistance.	Manufacturing limits.
Naval. . . . .	1·65 $w$	1·5 $w$ to 1·8 $w$
Field and siege . . . . .	1·05 $w$	·95 $w$ to 1·1 $w$
Submarine . . . . .	·325 $w$	·3 $w$ to ·35 $w$

The above are the resistances of the bridges at ordinary temperatures, but when the bridges are on the point of fuzing the resistances rise to about 2·9 $w$ , 2·6 $w$ , and ·74 $w$ .

**Firing currents.** Detonators with Naval bridges should fire without appreciable delay with a current of 1 ampere, but should not fire when a current of ·32 ampere is applied for 4 seconds; those with L.S. bridges with a current of ·8 ampere, but should not fire with a current of ·32 ampere for 4 seconds; while the S.M. detonators are tested, all for over-sensitiveness with a current of ·8 ampere for 4 seconds, and two per cent. for under-sensitiveness with a current of 1 ampere which will fire the detonator within ·05 second.

**Colours.** The colours with which they are painted have a special significance in the case of electric fuzes and detonators, thus:—

*Red* denotes presence of fulminate of mercury.

*Yellow* denotes that the fuze, &c., is for Naval service.

\**Blue* denotes that the fuze, &c., is for submarine mines.

*White* denotes that the fuze, &c., is for L.S.

§ 3498. The cylinders containing the fuzes, &c., are now coloured and numbered to correspond with their contents.

*Detonator No. 8, Mark IV.*—This detonator is non-electric. It consists of a solid drawn brass tube, the lower portion containing 24 grains of fulminate composition (80 parts fulminate of mercury, 20 parts chlorate of potash) covered by a wooden plug, through

\* No. 8 Mark IV has the top painted blue.

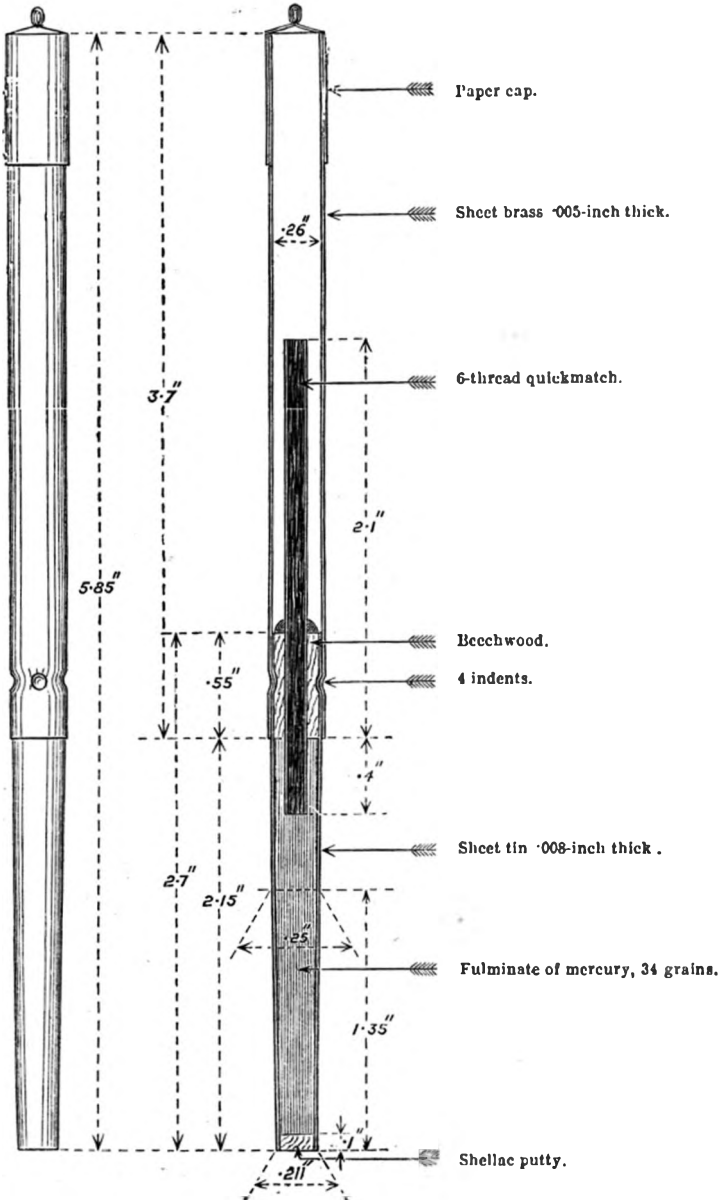


which passes quickmatch. The top part of the tube is enlarged to allow of the easy insertion of a piece of safety or instantaneous fuze. The top is covered with a twisted paper cap, which is torn

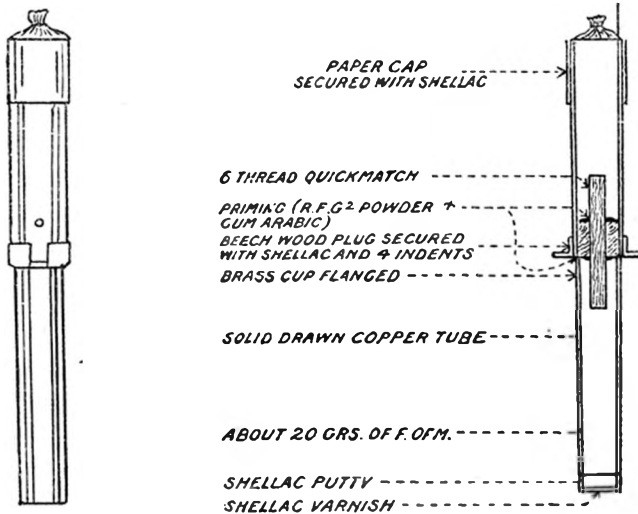
*Detonator No. 8, Mark III.*

*For Instantaneous and Safety Fuze, Land Service.*

Full size.



The Mk. V detonator differs from the Mk. IV in the body being made of solid-drawn copper instead of brass, and in the quick-match in the top part of the tube being erect instead of flattened over the top of the beech wood plug.



*Tube, friction, "T" push, Mk. I | L. |*

The above-mentioned tube is used with the 15-pr. B.L.C. guns.

It consists of the following parts, viz., body, screw, plug,

Page 45—  
continued.

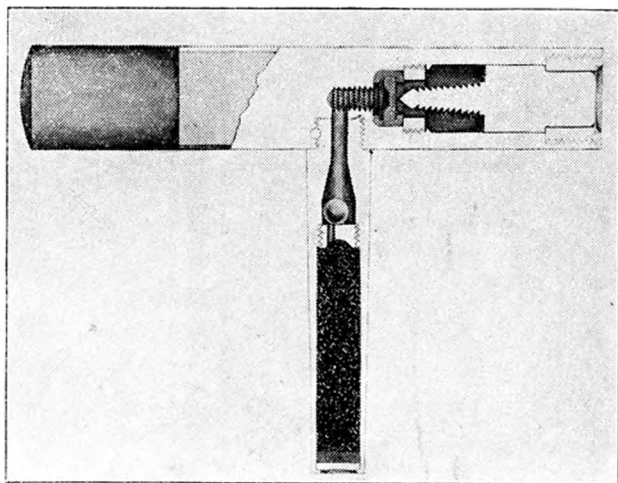
copper ball, head, screw collar with detonator, push bar, with shearing wire and screw collar, cork plug, and paper disc.

The body is similar in all respects to that of the tube, friction, "T," Mk. IV. The head is made of gunmetal, square in section, with the exception of about  $\frac{3}{4}$  inch at the solid end, which is cylindrical, intended to be used as a handle for turning and withdrawing the tube after firing. The square end is bored out to take the detonator and push bar with their retaining screw collars.

The push bar is cylindrical, its outer end is reduced in diameter to form a shoulder against which a screw collar bears and retains it in the head. A shearing wire of lead and antimony passes through the collar and push bar.

A disc of paper, coated with Pettman cement, is shellaced to the outer end of the push bar to prevent the ingress of damp.

*Tube, friction, "T" push, Mk. I. | L. |*



*Action.*—The firing plunger of the breech mechanism pushes the "push bar" inwards: the shearing wire breaks, and the roughened point of the push bar pierces the detonator and fires it.

The rest of the action is the same as in the case of the tube, friction, "T," Mk. IV.

off before inserting the fuze. Great care should be taken to pinch the tube well down on the fuze, as otherwise it may fail to fire. It may be pinched with the fingers or any stronger appliance. A ring of brass with two projecting strips prevent the detonator being inserted too far in the primer. The lower portion of the tube containing the composition is painted red, and the top blue. A small paper label is fixed on the body showing the number and mark of the detonator.

§ 6548.

*Detonator, No. 8, Mark III* consists of a tin tube containing fulminate of mercury, about 34 grains; to the tube is attached a thin brass socket. On the top of the fulminate of mercury is a small plug of wood secured by four indents, and through which passes a strand of quickmatch into the fulminate of mercury. Damped mealed powder is put round the quickmatch at each end of the wooden plug to prevent the fulminate of mercury working through. The other end of this strand extends about a couple of inches up the brass socket, and is intended to convey the flash from the safety fuze to the fulminate of mercury. The top is covered similarly to Mark IV. The detonator is painted red all over.

This detonator is intended for hasty demolitions in the Land Service in conjunction with safety or instantaneous fuze, and is issued in different ways: (1) in a tin cylinder containing 25 detonators without a rectifier to R.E. as ordinary equipment of field companies; (2) with 2 feet of safety fuze attached as follows:—

For siege train, eight No. 8 detonators, with 2 feet of safety fuze attached, are packed in a long tin cylinder lined with wood, both ends of which form lids attached by bayonet joints. One end of the cylinder contains the detonators and fuze, the other the rectifier.

To cavalry pioneers, eight No. 8 detonators, with 2 feet of safety fuze attached, are issued in a cylinder which is similar to the above, but shorter, having no rectifier, and only one lid.

All cylinders containing No. 8 detonators are painted red all over the exterior.

No. 9 detonator.  
§ 5242.

*Detonator, Electric, No. 9, Mark IV.*—The head is of ebonite, with a hemispherical top. The lower part of the head receives a brass socket attached to a tin tube. The conducting wires are of three strands of tinned copper, which are easier to manipulate than a thicker single wire. To the ends of these, which fit into the head of the detonator, are soldered two short tinned copper poles, flattened to prevent them from turning round after they are fixed and so breaking the bridge.

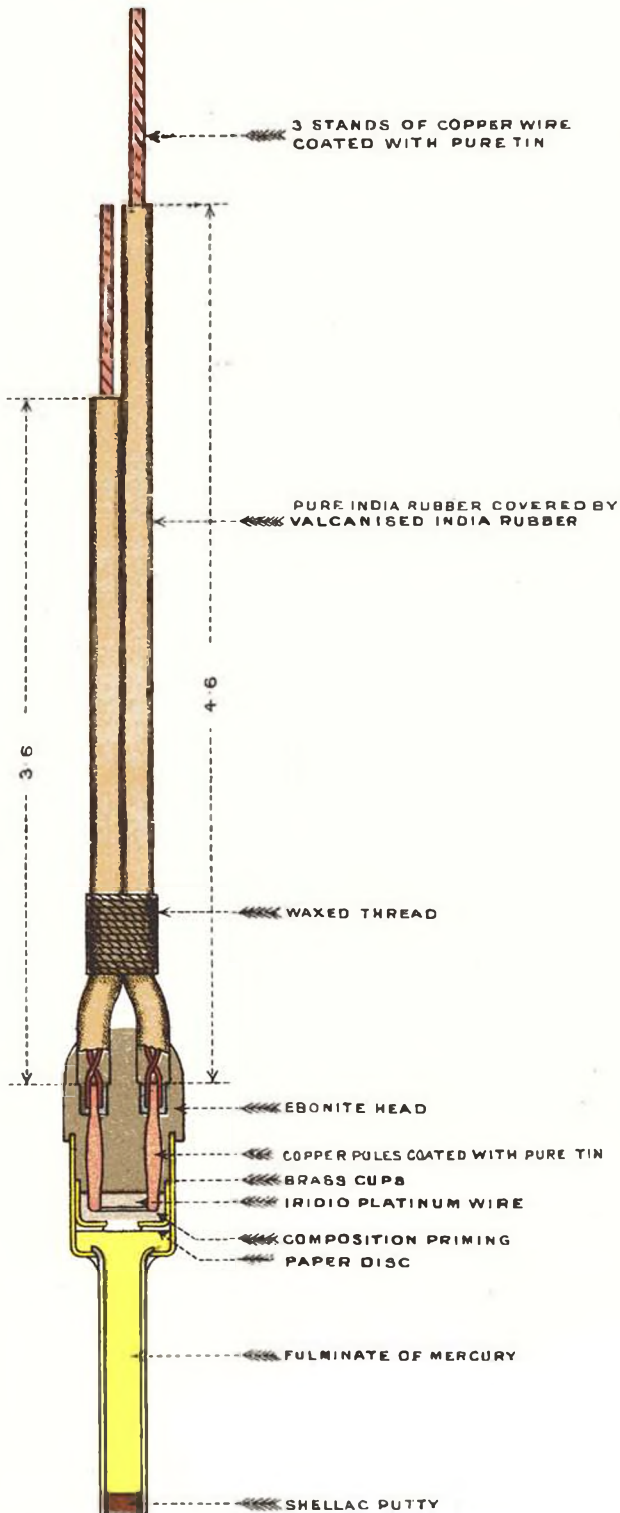
The two solid poles thus treated are dipped into hot gutta-perch cement, and forced down into the holes prepared for their reception in the ebonite head. When cool the conducting wires are twisted together above the head, and whipped near the head with black thread. The two poles above-mentioned, project about 1 inch beyond the bottom of the head, and are 25 inch apart at the ends. They are connected by a bridge of fine platinum-silver wire (21 grains to the yard), the ends of the bridge, which has the usual Naval resistance being carefully soldered with pure tin on to the flat ends of each pole. Round the bridge is priming composition.

This composition is separated from the fulminate by a thin brass cup having a small hole in the base covered with paper attached by shellac.

The tube contains about 32 grains fulminate of mercury.

# DETONATOR, ELECTRIC, N° 12. (MARK V.) (L.)

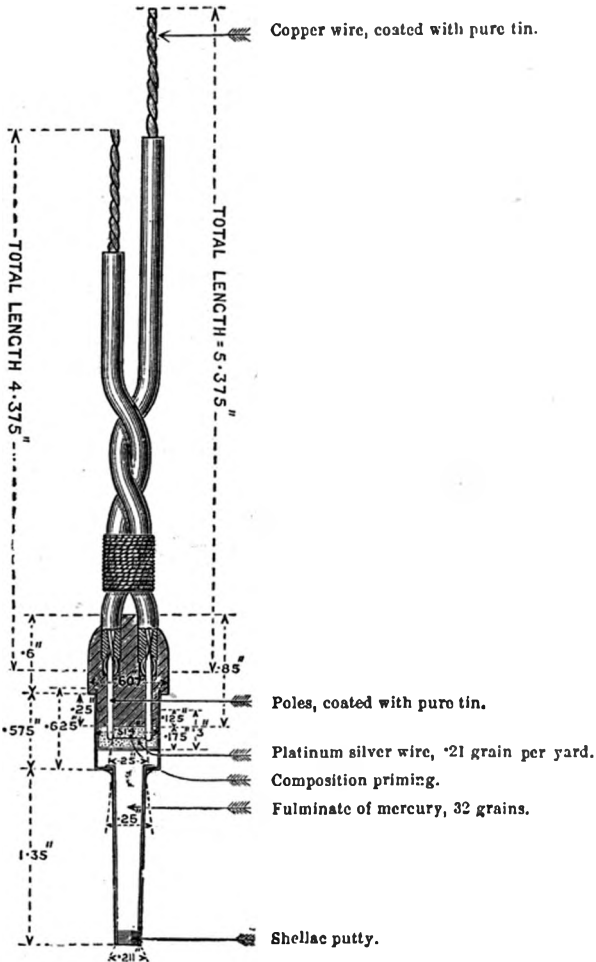
SUBMARINE.



The head and socket are painted yellow, the tube red; a small slip of paper bearing the numeral and number of the detonator is fixed on the socket.

*Detonator, Electric, No. 9, Mark IV.—Naval.*

Scale,  $\frac{3}{8}$ .



Mark III differs from the above in having the wires and poles not coated with tin, and in having the bridge attached with ordinary solder, which was found liable to set up chemical action, causing the bridge to become disconnected electrically from the poles. §§ 3644, 4086.

Detonator, electric, No. 12, Mark V, resembles No. 9 Mark IV in construction. The wires are straight, being whipped above the head with waxed thread; it contains 32 grains of fulminate of mercury. The bridge is of iridio-platinum wire and has the usual submarine resistance (0.325 ohms.). (See Plate VI.) § 11313.

The wires are insulated by pure indiarubber covered by vulcanized indiarubber.

The head is painted white, socket blue, and tube red. It has the usual slip of paper with number and mark.

Mark VI differs from Mark V in having one of the wires about 3 inches longer than the other.

The Mark IV had the wires, above the head, twisted and contained 35 grains of fulminate of mercury. In Mark III the fulminate of mercury and priming composition were separated by a muslin diaphragm.

No. 13 detonator.  
§12517.

*Detonator, Electric, No. 13, Mark III.*—This detonator is used in field and siege operations in conjunction with F.S. exploder, for exploding charges of gun-cotton.

It is generally similar to No. 12, Mark V, being without the brass cup and priming composition.

The bridge is of thin iridio-platinum wire, which has the mean resistance of 1.05 $\omega$  laid down for Field Service. A small piece of loose gun-cotton yarn is tied on the bridge. The tube is filled with 43 grains of fulminate of mercury, which also extends into the socket and completely surrounds the bridge. The bottom of the tube is closed by shellac putty. The head and socket are painted white, and the tube red.

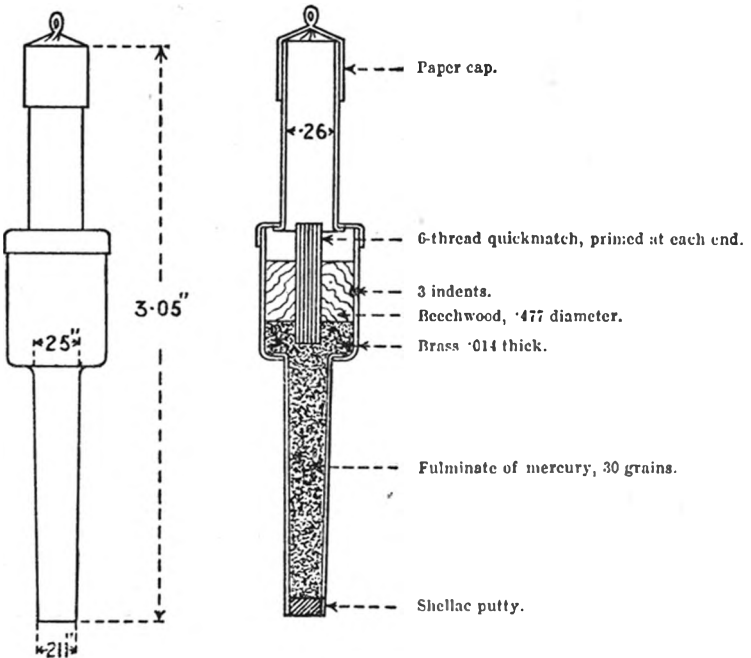
§ 5242.

Mark II had twisted wires, and was without the thread frapping; it is filled with 37 grains of F. of M.

§ 3446.

Mark I, the wires not tinned and the bridge was attached to the poles with ordinary solder.

*Detonator No. 15, Mark III.*



§§ 11977,  
12501.

*Fuze, Electric, No. 14, Mark III.*—The body is of ebonite, cylindrical with a hemispherical top, the poles, wires, and bridge, with guncotton tuft, are similar to those of No. 13 detonator, Mark III. The part of the body reduced in diameter is fitted with a lengthening piece secured by cement. The interior is charged with pellet powder, then closed with a glazed board disc, coated with Pettman

cement; a brass cup is fitted to the lower part of the body, a paper cap giving the number and numeral of fuze fixed on the cap. The fuze is painted white; Mark II is described in the 1902 Edition of this book. § 5242.

*Detonator, No. 15, Mark III, for Safety Fuze*, is intended for use in the Royal Navy, with safety fuze. It consists of a tube, body, and neck, as shown in the sketch. The tube and body are of the same diameters as in No. 9. The former is filled with about 30 grains fulminate, which extends into the body, the central part of which is filled with a wooden plug through which passes a strand of quick-match connecting the fulminate with the space in the neck above the body. No. 15 detonator. § 11711.

The neck is intended to receive the end of the safety fuze. It has four indentations, so that when the fuze is inserted, and the neck compressed round it, the points of the indentations will grip the fuze. The neck is covered with a paper cap which is torn off before inserting the safety fuze.

Painted red all over.

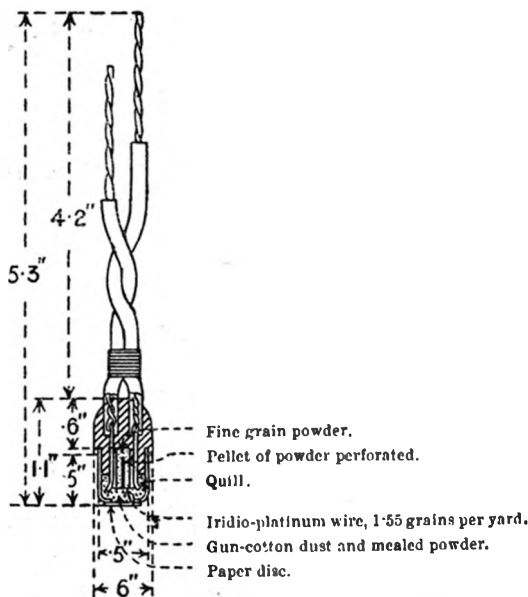
The usual paper slip is pasted on the body. Mark II differs from the above in having the neck closed by a wooden plug with a milled head covered with paper. It is to be used up. § 4557.

*Fuze, Electric, No. 16, Mark II.*—This fuze consists of an ebonite body, and the general arrangements are shown in the cut. No. 16 fuze. § 5242.

The bridge is of iridio-platinum wire, and has the same resistance

*Fuze, Electric, No. 16, Mark II. Disconnecting (Submarine).*

Scale,  $\frac{1}{4}$ .



as those of other submarine electric stores. The centre of the lower part of the body is recessed out, between the wires, to form a cavity of .2 inch diameter. This hole contains a small quill driven



with mealed powder and pierced in the ordinary way. Above the quill is a small quantity of fine grained powder. Immediately below the quill is the bridge, the object of this arrangement being to ensure the breaking of the bridge and consequent interruption of the current when the fuze is fired.

The head fits into a short brass socket whose base is closed with a disc of paper, secured with shellac. The socket is lined with paper to prevent contact with the poles. The use of this fuze is to disconnect each one of a series of electro-contact mines when fired, without interfering with the current to the other mines yet unfired. The details do not come within the scope of this work.

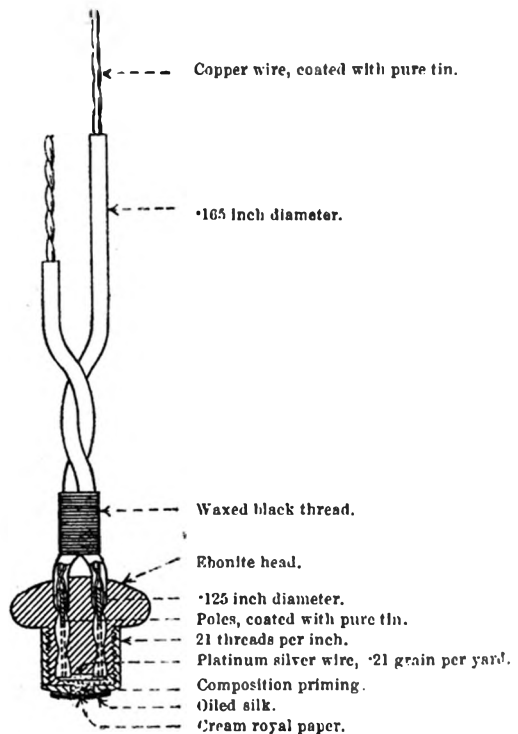
The head of the fuze is painted white and the body blue. It is fitted with the usual slip of paper bearing the number and numeral of the fuze.

No. 18 De-  
tonator.  
§§ 11313,  
12501.

*Detonator, Electric, No. 18, Drill, Mark V*, is the representative for drill purposes of No. 12, which it resembles in dimensions. The tube is empty and is not closed at the bottom. A small disc of beech, having a  $\cdot 2$ -inch hole in the centre, fits in the bottom of the brass socket. An ebonite washer and two white fine paper discs are placed over, and an oiled silk disc under this wood disc. The usual priming composition,  $2\frac{1}{2}$  grains, is placed in a recess in the body between the poles, and surrounds the bridge, which is identical with that of No. 12. The body fits into the brass socket, and is secured

*Fuze, Electric, No. 19, Mark III, Disconnecting, Naval.*

Scale,  $\frac{3}{4}$ .



by a brass pin, passing through it and the socket, which can thus be removed when necessary for rebridging and repriming. These drill detonators are to be packed and treated as explosives.

The head is painted white, the socket blue, and the tube white; the object of the latter being to distinguish it from the Service Paint. detonator, which has a red tube.

Mark VI differs from Mark V in having one wire about three inches longer than the other.

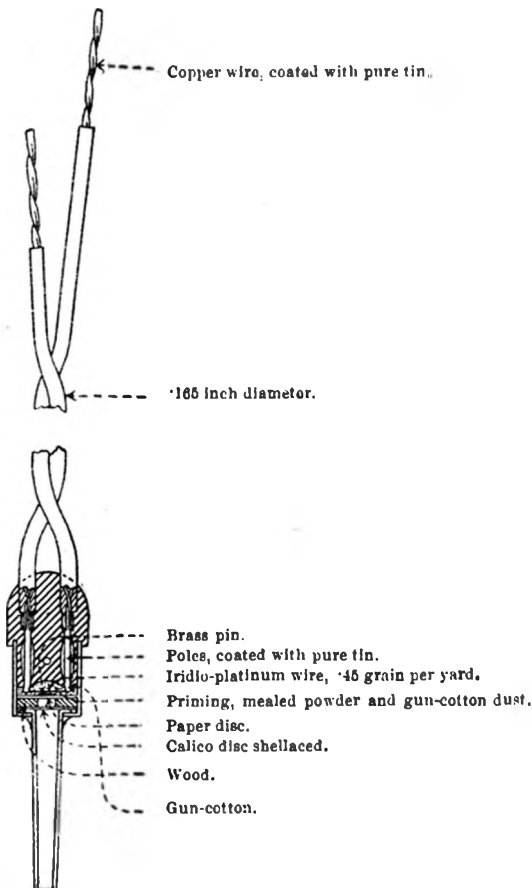
Mark IV differs from Mark V in having the insulated wires twisted above the head.

*Fuze, Electric, No. 19, Mark III.*—This fuze performs the same service for the naval mines as No. 16 does for the submarine ones. § 9449.

The mushroom-headed body is of ebonite, and through it pass the conducting wires, which are three-stranded; to reduce the liability of the bridge being broken, the poles have a double flange to prevent their turning in the ebonite. See cut.

*Detonator, Electric, No. 20, Mark I, Drill, Land Service.*

Scale,  $\frac{3}{4}$ .



The bridge is surrounded by  $2\frac{1}{2}$  grains of the priming composition, retained by a brass socket, which screws on to the body of the fuze and is milled on the outside for convenience of handling.

In the bottom of the brass cap is a central hole .175 inch diameter, covered on the outside by a piece of oiled silk shellaced on, and covered by a disc of paper.

§ 5407.

*Detonator, Electric, No. 20, Mark I, Drill*, is the representative for drill purposes of No. 13, which it resembles in dimensions. The tube is empty, and in other respects it is very similar to No. 18, Mark III, except resistance. The insulated wires are twisted.

Paint.

White all over.

§12547.

Mark II has straight wires insulated by pure indiarubber covered by vulcanized indiarubber, and guncotton round the bridge.

#### GENERAL NOTES ON THE ABOVE DETONATORS.

It is especially important to remember that detonators contain a large proportion of fulminate of mercury, and that it is most dangerous to treat them roughly, or to entrust them to unskilled persons. They should be handled with care, and only by persons well conversant with their properties. In testing detonators for continuity they should always be either removed to some distance, or strongly confined, in case of one being accidentally fired.

Packing.

§§ 2975, 9954.

All the detonators except No. 8 are packed in tin cylinders containing 25, round the rectifier. The latest cylinders have a central tube for the rectifier, so that it is easily got at without disturbing the detonators. These cylinders are closed by a tin band soldered on, and have their bodies and lids lined with sheet asbestos, which extends down the bodies as far as the tin diaphragm, which supports the detonators. This lining is to prevent heat from the soldering iron reaching the contents of the cylinder.

Electrical fuzes are also packed in tin cylinders containing 25, except No. 19, which are packed 15 in a cylinder. The packing of No. 8 detonator is given with the description. All these detonators and fuzes are carefully arranged in the cylinders by perforations in the diaphragms and cotton wool, or other soft packing, so as to obviate any risk from rough usage in transit, &c., as far as possible. The cylinders are numbered to correspond with their contents.

§ 12026.

*Case, Transport, Detonators, Mark III*, is made of sheet steel with angle pieces of gun-metal, and a gun-metal framework riveted to the top. The lid of steel is secured to the framework by 10 screws and the joint is made by asbestos attached to the lid. A folding metal handle is attached to each end of the case. It is painted red; it holds 100 detonators. On the lid is painted in black letters "Not to be hoisted by one handle only." Dimensions, 26.48" × 9.48" × 12.262". Weight, 63 lbs.; filled, 82 lbs. 2 ozs. Marks I\* and II differ in dimensions, 26.6" × 20.6" × 15.5". Mark I case had galvanized wire handles.

Rectifier, gun-cotton primers.  
§§ 9572, 10090.

*Rectifier, Gun-cotton, Primers Mark IV*, consists of a piece of lignum-vitæ, with a flat handle, the lower part being of the same form and dimensions as the body and tube of the detonator. This portion is inserted in the perforation made in the primer to receive the detonator, and "rectifies" the hole. It is to be used in all cases before inserting a detonator, and can be used for every detonator in the Service.

§ 10090.

Previous patterns differed in dimensions and are obsolete.

*Rimer, Rectifying Gun-cotton, Primers Mark I | L |* is made of § 10708. hard wood, and is for use in enlarging the perforations of the "charges priming  $2\frac{1}{4}$  lb. and  $4\frac{1}{2}$  lb." Care must be taken to use the rimer carefully and slowly, and to see that it is not applied too vigorously for too long a period, as otherwise there may be a danger from heating. Mark IV rectifier will still be required to press the rough edges into shape.

Cylinders containing detonators have a brownish-red label on the top giving the contents of the cylinder, and those containing electric fuzes or tubes a white label. Labels.

Each cylinder of detonators, except No. 8, has the following label:—

"CAUTION.

"These detonators must *on no account* be forced into gun-cotton slabs or primers by screwing or twisting.

"Before inserting a detonator, force the rectifier into the hole for the detonator, up to the full extent to which the detonator should enter, and then withdraw it by twisting.

"On no account is any detonator to be taken to pieces for examination or any other purpose.

"Any detonator that may have missed fire, or that may be found distorted or injured in any way that would appear to render it unfit for use, should at once be destroyed.

"This cylinder of detonators contains a rectifier (Mark IV.)."

The cylinders (except the special ones for No. 8 detonators) are closed with a tin band soldered on in the ordinary manner, and printed directions for opening and closing are attached to each cylinder.

The top label has printed on it the number and nature of the fuzes, &c., contained in it, their distinguishing numeral, and in MS. the date of packing. Cylinders containing detonators have the words "With Care" printed in large letters on the labels. The cylinders are not to be opened until required for use or for special inspection; also the group and division.

The cylinders containing detonators are "*Not to be placed in the magazine on any pretence whatever.*"

There is a special label on the cylinders containing No. 12 detonators, as follows:—

"DETONATORS, ELECTRIC, NO. 12, MARK IV. Bridge—Nature of—Iridio Platinum, Resistance between 0.3 and 0.35 ohms when traversed by a measuring current not exceeding  $\frac{1}{6}$  ampere.

"These detonators, before use for Submarine Mining, are to be tested as directed in the Manual for Submarine Mining, Part III. If used for any other purposes, and it is not possible to test them in accordance with the above directions, the maximum safe current that may be passed through any one of them is to be taken as  $\frac{3}{10}$  of an ampere.

"A detonator must never have a testing current passed through it when any one is so placed as to be liable to injury from its ignition."

There is a somewhat similar caution issued with cylinders containing No. 13 detonators, and No. 14 fuzes. It runs thus—

"These detonators (or fuzes) are only to be tested with the test cell specially made for the purpose, unless it is known for certain that a current not exceeding one-twentieth of an ampere is used."

§ 12468. *Detonator, Torpedo, Small Flange, Mark III. | C |*; 77 grains for all pistols (S.F. and A.W.) in all torpedoes, 18-inch and 14-inch, also for Brennan.

The above detonator is a solid drawn copper tube, about 1.4 inches in length and .3 inch in diameter, the end of the detonator is rounded and solid, and the mouth is formed into a flange about  $\frac{1}{8}$  inch in diameter. The detonator is filled with 77 grains of Fulminate of mercury pressed in and covered by a brass disc, retained in position by the metal at the mouth being spun over it. On the flange is the contractor's initials, month and year of manufacture, and mark. Packing 5 in a tin cylinder.

§ 11482. *Detonator, Torpedo, Large Flange, Mark II. | N |*, 77 grains for ordinary pistols in all torpedoes, 18 inch, also 14 inch R.G.F., Marks X and up, and Weymouth, Mark I, is now superseded by the above. It differed from it, in having a larger flange with two slots.

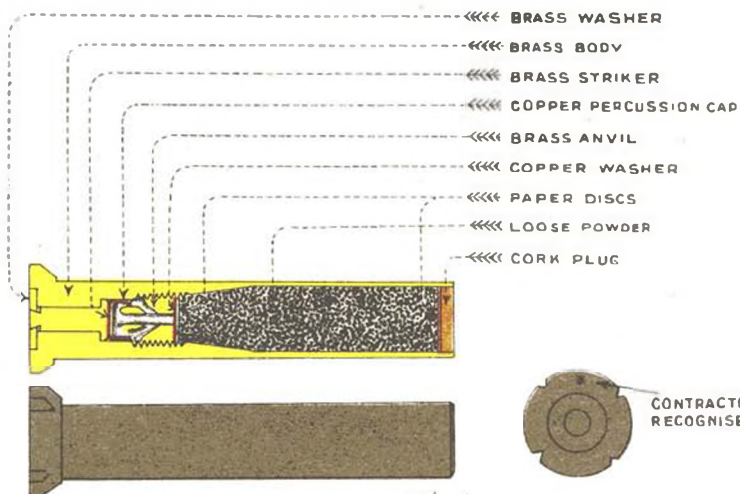
---

NOTE.—It must be remembered that no amount of immersion in water will destroy fulminate of mercury; when wet it is harmless, but when dried again it is as active and dangerous as ever. Hence a detonator should be thrown into deep water.

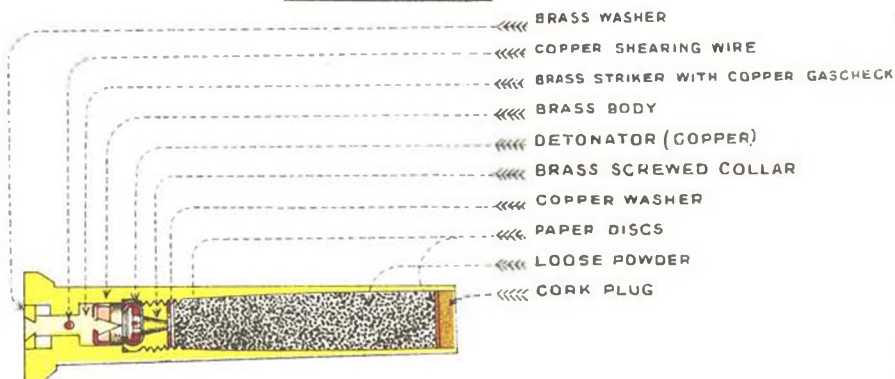
# TUBES VENT SEALING PERCUSSION.

BRASS.  
FULL SIZE.

## MARK IV | C |



## MARK VI | C |



## CHAPTER VIII.—TUBES AND STORES CONNECTED WITH THEM.

For igniting charges in B.L. guns tubes are employed which fit a seating in the vent accurately and are held in the vent by the lock or other means attached to the outer end of the vent or breech-screw. The heads of these tubes are closed in such a manner as to prevent the passage of gas through them, while the tube itself is expanded against the walls of the seating and so prevents escape of gas past it.

These tubes are known as Vent Sealing Tubes, and there are two distinct patterns, P and T.

There are three different "P" tubes; the percussion; electric "P," and wireless electric "P."

The percussion and electric "P" tubes are used with guns having percussion locks.

The wireless electric "P" tube is used with guns having wireless locks.

Q.F. guns, when using adapters, employ either the percussion or wireless tube.

The "T" friction tube is used with guns and howitzers having "T" vents; these are B.L. 10-pr., 12-pr. of 6-cwt., 15-pr., 30-pr. and 60-pr. guns, and 5-inch, 5·4-inch, 6-inch of 30-cwt. howitzers. The "T" tube seals the vent and also avoids lock complications, being held in by a bayonet joint at the end of the vent itself.

In all the electrical tubes the bridge is 0·25 inch long, except for the "T" electric tube which has a bridge only 0·2 inch long; resistance from 1 to 1·3 ohms.

Bridges.

*Tube, Vent-sealing, Percussion, Mark IV, C.*, for guns with percussion locks is made from solid drawn brass by a series of punchings and annealings, the head being stamped up into shape, and enlarged to prevent it being forced too far into the vent. The head underneath is chamfered to facilitate extraction. It is 2·19 inches in length over all, and 1 inch in diameter across the widest part of the tube. It tapers slightly towards the front end, and is made to fit the vent with great accuracy. Through the centre of the head a hole is bored to receive a brass striker, through which the blow is given to the detonator. (See Plate VII.)

§ 10406,  
10500.

This striker has an enlarged head, which fits against a shoulder in the interior; and its outer end is riveted in a brass disc let into a recess in the exterior surface of the head. The tube is lacquered inside and blackened outside, and four notches cut in the rim for identification. (See Plate VII.)

Underneath the head is screwed a brass anvil carrying a percussion cap of special manufacture, and retained in position by a copper washer at its base. There are three fire-holes in the anvil to allow of the flash passing from the cap to the powder in the body. A disc of fine white paper is placed outside the copper washer. The body is filled with pellet powder. The end is closed by a varnished cork and paper disc, the metal being burred over on to the disc.



Action.

The striker in the head of the tube is forced by the action of the percussion lock in upon the cap, firing it, the pellet powder and the charge. The explosion of the pellet powder expands the tube against the sides of the vent, in which it is retained by the percussion lock, while the head of the striker and copper cap prevents any escape of gas through the interior.

This is the tube at present being manufactured.

In earlier issues the metal at the end of tube was not burred over.

Mark VI differs from the above, as follows:—

Striker.

The front end of the striker is enlarged and fits against a shoulder in the interior of the body; on this end is formed a needle point, round the base of which a groove is cut and a copper cup is snapped on to act as a gas-check. The outer end is reduced in diameter to receive a brass disc, which is riveted to it. This disc fits into a recess formed for it in the head of the tube, and is flush with the exterior surface; the recess is deepened and a space is left below the disc into which it is forced by the striker of the percussion lock.

The shearing wire is a fine copper wire, which prevents the tube being fired by a jar or light blow.

In the interior of the body is screwed a brass plug or "collar" which supports a small detonator immediately under the point of the striker. The detonator is similar, except in dimensions, to the R.L. cap and is spun into a recess in the end of the screw plug.

The screw plug has a conical fire-hole through the centre, the largest part of the cone being next the detonator; the plug is prevented from unscrewing by a copper washer, which is inserted in a cup-shaped form and expanded into the screw threads. Next to the copper washer is placed a disc of paper to prevent the powder working up into the plug, and the body of the tube is filled with pellet powder,† the end being closed by a paper disc and cork plug secured with shellac.

The manufacture of this tube is discontinued.

§ 10091.

Mark V tube differed from the above in having no copper cup round the needle point, but a groove formed in the striker head instead. Very few were made.

§ 6102.

Mark III in general construction resembles Mark IV, except that the end is closed with a sulphur pellet in which is embedded a brass ball. *This tube must not be used unless the range is clear.*

§ 5802.

Mark III\* | N | is III fitted with a cork plug, instead of the sulphur pellet, it is for gunnery schools and practice for sea-going ships.

Mark II in general construction resembles the above, except that the body of the tube is completely filled with powder, and closed with a varnished cork and paper disc, secured with shellac. There is only a single central fire-hole in the anvil.

§ 12115.

In future manufacture the percussion tubes will be blackened, and have four notches cut in the rim to distinguish them from the wireless electric tube by sight or touch.

No advance is made in the numeral.

Existing tubes are so treated when passing through the Ordnance Factories. Previous to this the tubes were lacquered externally.

§§ 8655, 9768,  
10500.

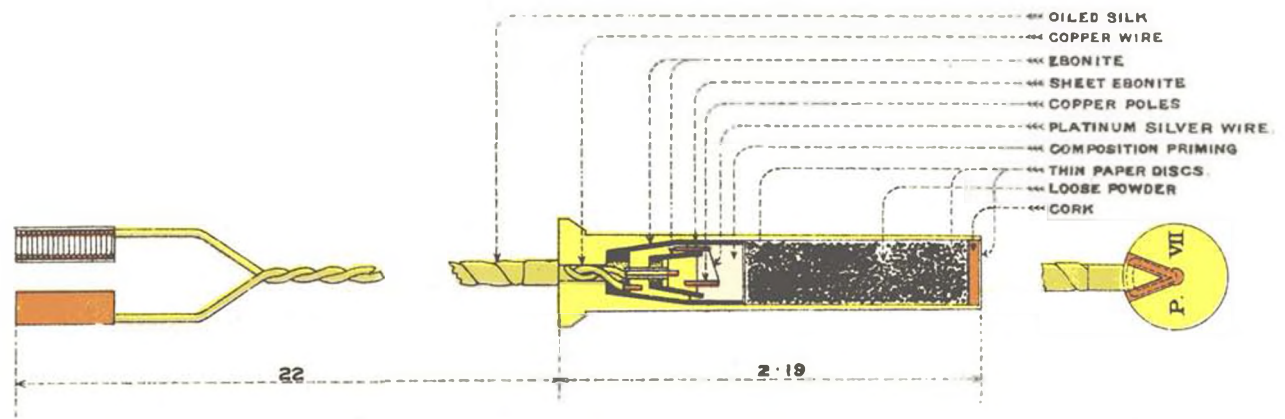
*Tube, Vent-sealing, Electric, P, Mark VII*, resembles the last in exterior form, dimensions and material. The interior of the body

† Pellet powder is composed of siftings of R.F.G.<sup>2</sup> powder (24-32 mesh); it was originally used for the powder charge of .303-inch cartridges, which was pressed into a pellet.

# TUBE VENT SEALING ELECTRIC P MARK VII |C|

BRASS.

FULL SIZE.



near the head is conical, and a small hole is drilled through the head, through which pass two tinned copper wires twisted together and insulated by varnished silk, on the exterior the wires are parted and led through a V-shaped groove across the head, the metal between the grooves on the head being routed out; they are then twisted together again and wrapped with oiled silk for a distance of 5 inches commencing at the head, and terminate in spirals 22 inches from the tube, the spirals are covered with sarcenet. In the interior near the head are two cones, the larger one fitting in the conical recess in the body, the small cone fitting into a conical recess in the large cone, the cones are insulated from each other and from the body by ebonite; the front end of one of the wires is attached to the rear end of the large cone, and the front end of the other wire passes through the large cone, is insulated from it, and is attached to the rear end of the small cone. One pole of copper is attached to the front end of the large cone, and the other pole to the front end of the small cone, these poles are connected by a platinum silver wire bridge, resistance 1.5 to 1.8 ohms, which is embedded in a priming composition of gun-cotton dust and meal powder, contained in an ebonite cylinder closed at the end by a paper disc. The remainder of the tube is filled with pellet powder, and the end is closed by a paper disc and varnished cork disc, secured by shellac. On the outside of the cork disc is a second paper disc, to prevent the shellac on the outside of the cork sticking to the packing pieces of the box in which the tubes are issued. The metal of the tube is buried over on to the disc. The tube is lacquered inside and out. (See Plate VIII.)

The wires from the battery are connected to the wires of the tube, and on a current of electricity being passed through the wires the bridge becomes incandescent and fires the tube. The cones are jammed into each other and the coned part of the body, and so prevent any escape of gas through the head. Action.

Mark VI in construction is identical with Mark VII, but the wires are led through a groove across the head, instead of the V-shaped groove, and it is without the extra 5 inches of oiled silk wrapping. § 8655.

Mark V in construction is identical with Mark VI, but the end is closed with a sulphur pellet in which is embedded a brass ball. *This tube must not be used unless the range is clear.* §§ 7204, 7487.

In Mark IV the wires, which were laid in two slots in the head, passed through it by separate holes. The wires then passed through an asbestos plug and a small air space, and were soldered to two brass poles embedded in a conical ebonite plug. *This tube must not be used unless the range is clear.* § 6071.

In Mark III the cylindrical portion of the body was entirely filled with powder, the end being closed by a cork and paper disc shellaced in; the wires were also 1 inch shorter than in the Mark IV. § 6071.

Mark II was in construction similar to Mark III, but the wires were only 18 inches long. § 5352.

Mark I was like Mark II, but the wires were not tinned over, and the bridge was attached to the poles with ordinary solder. §§ 4622, 8182.

Marks I to IV will be used up for drill purposes only. § 11350.

*Tube, Vent-sealing, Electric, Wireless, P, Mark IV, C.*—This tube in exterior form and dimensions is identical with the other P tubes. The interior cavity terminates in a cone into which fits a conical brass plug at about .25-inch from the head; this is insulated from the body by an ebonite cone, the front end of the cone is cupped out § 11695.

to form a gas-check, and a hole is bored in the centre, into which screws an ebonite plug. Into the centre of this plug fits a tinned copper pole which extends the full length of the tube. This pole is bent, and attached to the body of the tube at the mouth with pure tin. The pole and edge of the brass cone are connected by an iridio platinum bridge of .95 to 1.1 ohms resistance attached with pure tin. At the rear end of the cone a small hole is drilled, a little out of centre, to receive the bared end of an insulated copper wire. A turn is taken in this short wire and it is passed through a hole in the head, also drilled a little out of centre and communicating with a recess, into which screws an ebonite plug. This plug is recessed in the centre and undercut and the end of the wire passes into the recess. It is bared and coiled down upon a cup of pure tin .025-inch thick at the bottom of the recess, the remainder of which is then filled in with molten tin. This is kept in by the undercut and forms the contact piece; its surface is slightly below that of the head of the tube. The tube is primed with the usual priming composition of gun-cotton dust and mealed powder, over which is placed a perforated glazed board disc with a paper disc attached, the remainder of the tube being filled with pellet powder. The end is closed by a cork and paper disc shellaced in, and on the outside of the cork is a second paper disc to prevent the shellac sticking to the box in which the tubes are packed; the cork and paper discs are secured in position by the mouth of the tube being burred over. The tube is lacquered inside only. (See Plate IX.) On the head is the contractor's initials, Mark of tube, and letter "P."

Action.

On contact being made the current passes from the battery through the striker which is in contact with the tin, through the short wire, cone, the wire bridge, the long copper pole, the body of the tube, and the metal of the gun back to the battery again. The wire bridge becomes incandescent, fires the priming and the powder, the gas expands the cupped-out portion of the cone, and prevents any escape of gas through the head, the body expanding prevents any escape between it and the vent.

§ 11220.

Mark III differs from the above as follows:—There is only a paper disc between the priming composition and powder; the bridge is of platinum silver having a resistance of 1.5 to 1.8 ohms.

§10234,10352,  
10500.

†Mark II differs from III in having a smaller contact disc which in some of the earlier issues was made of solder instead of pure tin.

§§ 8182, 9676,  
9768.

\*Mark I tube differs from Mark II in having two bridges, giving a resistance of from .6 to .9 ohm. In the majority of Mark I tubes also the ebonite insulating plug is not screwed into the head, and the paper disc on the outside of the cork closing plug is absent.

§§ 6384, 8550.

P tubes are packed in tin boxes, painted black on the outside, and secured by a tin band soldered over the joint.

Percussion tubes are packed, 10 in a flat box, heads and tails, steadied by a tin rack and pieces of paper placed over them.

Electric, wireless P tubes are packed similarly to the percussion; additional tin fittings, to which pieces of glazed paper are attached, steady the tubes and keep contact disc clean. Calf skin was first used.

Electric P tubes are packed, 5 in a box, which is almost square. The tubes are separated by tin partitions, and movement is prevented by two end and one top packing pieces of cork. The wires

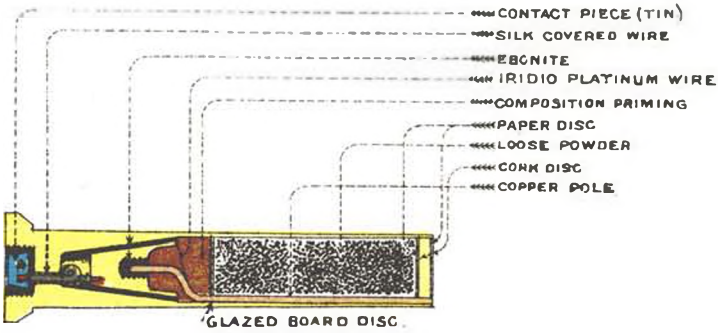
\* Retained for instructional purposes only.

† Mark II tubes not to be used in adapters for Service practice in Q.F. guns.

# TUBE VENT SEALING ELECTRIC WIRELESS P MARK IV | C |

BRASS.

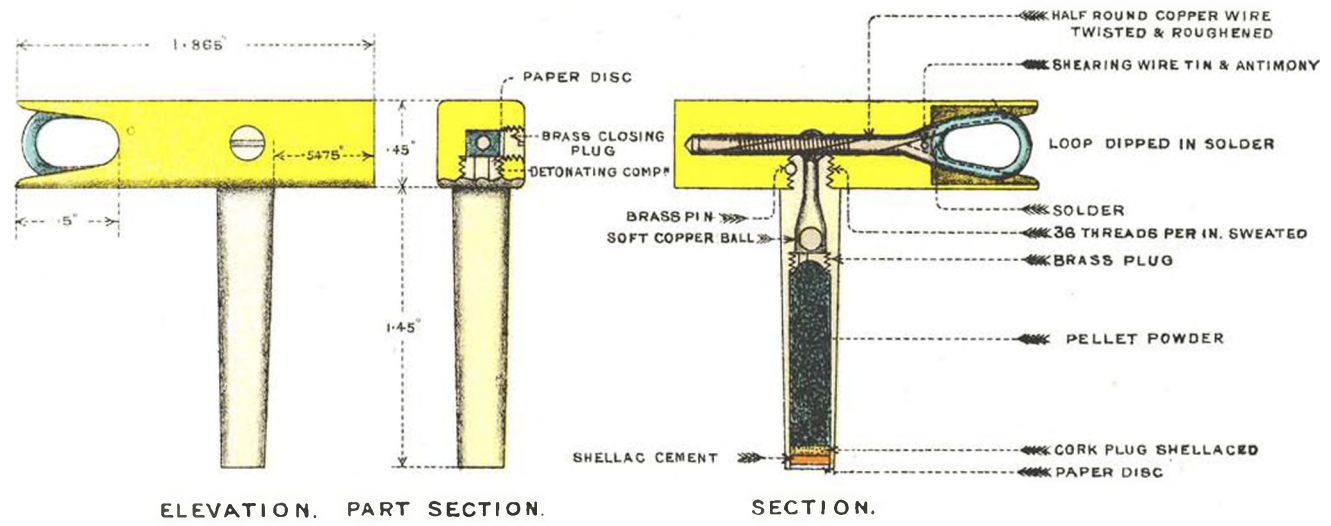
FULL SIZE.



# TUBE, FRICTION, T (MARK IV.) (L.)

BRASS, FOR USE WITH CORDITE.

*Full Size.*



ELEVATION. PART SECTION.

SECTION.

of the tubes are coiled up tightly close to the head. A piece of tape is placed under one of the tubes to facilitate extraction from the box. This pattern of box is Mark III. Marks I and II were longer and wider, had tin racks for the tubes and no cork packing pieces, and the wires were not coiled so tightly. Mark I box was sealed by a tape instead of a tin band.

On the exterior of each box is a label giving the contents and directions for opening and reclosing the box, with instructions that it is not to be opened until required for use or special inspection. These labels are printed in red for the percussion and friction tubes, in black for the electric tubes.

In the interior of the lid is a label giving the following "Instructions for use":—

Instructions  
for use.  
§ 4436.

"If there is any appearance of fouling, the vent must be carefully cleaned with the rimer supplied for the purpose.

"The vent-sealing action of the tube depends upon an accurate mechanical fit, and consequently a very slight amount of fouling in the vent will derange it.

"Vent-sealing tubes are sometimes considered to be too high to gauge, when, in fact, the only defect is that the vent has not been properly cleaned."

These instructions, which are given with all the Service tubes, are most important. To them is added, in the case of the electric tubes—

"The weight of the bodies of these tubes being so great in proportion to the strength of the conducting wires, great care should be taken in handling them, so that no undue strain may be given to the wires, and thus affect and perhaps break the fine wire bridge.

"As much as possible these tubes should be handled by their bodies, and not by their conducting wires."

*Tube, friction, T, Mark IV*, brass for guns with T vents. (See Plate X). The body is made of solid drawn brass, slightly coned to fit the vent, and bored out to receive 8 grains of pellet powder, above which it is screwed to receive a screw plug having three fire-holes on top of which rests a small copper ball, and the upper part of the interior of body above the ball terminates in a cone, a small hole is bored through the upper part from the end of the cone to admit the flash from the detonating composition, and the exterior is screwed to fit into the head. The head is made of gun-metal, rectangular in form, and screws on to the body, and is secured by a brass pin, a hole is drilled into the head at right angles to body to receive the friction wire, and one end is countersunk, as shown in the plate. The friction wire is made of half round copper wire twisted and roughened. A large loop is formed at one end by two turns of the wire, which are fixed together by dipping the loop in solder. The wire does not extend through the head, and is retained in place by a shearing wire of tin and antimony, passing through the head and friction wire, near the loop. A hole is bored into the side of the head at right angles to it, so as to come over the fire-hole of the body, and is screw-threaded at the end. Detonating composition is pressed into this hole, surrounding the roughened part of the friction wire, and the hole is closed by a screwed brass plug.

§§ 5904, 9768,  
10025, 11694,  
12211.

The bottom of the body is closed by a cork plug, shellaced in, and filled up flush with shellac. A disc of paper is placed on the outside of this to prevent the shellac sticking to the box in which the tubes are packed. The mouth of the tube is burred over to hold the discs in position. The tube is lacquered inside and out.

Action.

The tube being held in the T vent, when the friction wire is withdrawn the flash from the detonating composition passes down the small hole in top of the body over the copper ball and through the fire-holes in screw plug, and ignites the powder, the gas from which forces the ball into the cone seating and so prevents any escape of gas through the head, it also expands the body, and so prevents any escape of gas between it and the vent, the flash ignites the charge.

§§ 9054, 9768.

Mark III differs from Mark IV in the loop of the friction wire, which is smaller, and in having the hole in the side of the head closed by a gut-skin disc, a cork plug shellaced and shellac cement outside it. Some of the earlier issues of Mark IV also had the hole closed in this way.

§ 8560.

Mark II differs from Mark III in having the hole for the friction wire bored completely through the head; the end of the hole enlarged and the ends of the friction wire splayed out in the enlarged part. The hole is then closed by a cork plug.

§§ 9520, 9768,  
10269.

These tubes are being converted to Mark II\*, by being made as nearly as possible like Mark III. The end of the hole is closed by a screw-plug and a shearing wire is inserted through the friction wire, which has the large loop, the head being further slotted out to receive it. A paper disc is also placed outside the plug closing the body.

Mark I differs from Mark II in having the friction wire made of ordinary twisted wire, and in the detonating composition being pressed into a hole in the head in prolongation with the body instead of at the side. The hole for the friction wire was not closed by a cork plug.

§§ 9573, 9768,  
10269, 12408.

It also is being converted to Mark I\* in the same way as Mark II, having the half round friction wire, hole closed by a screw plug, shearing wire and paper disc over closing plug of body.

In future, the serviceable bodies of all fired "Tubes, friction, T," will be repaired, when passing through the Ordnance Factories, as required for use with Service charges only, by having new shanks fitted, and filled, and the heads refitted with new friction wires.

Marks I and II will, previous to being repaired as above, be altered to conform to Marks I\* and II\* in accordance with § 9573 and § 9520 respectively.

Marks I\*, II\*, III and IV tubes will, when fitted with new shanks and friction wires, be known as Marks I\*\*, II\*\*, III\* and IV\* respectively, as shown above.

The existing stock of filled T tubes will be used up as follows:—

Marks III and IV with Service ammunition.

Marks I, I\*, II and II\* with blank ammunition.

Certain T tubes, which have been fired and refilled, were stamped on the head, thus ⊙; if emptied and refilled R.

§ 12409.

*Tube, friction, T, for blank. Adapter, Mark I. Tube, copper, Mark I.*—The above-mentioned adapter and copper tube have been scaled to govern manufacture for Land Service, for use with B.L. guns and howitzers having T vents, when firing blank ammunition.

These adapters and tubes will not be issued for blank firing until the existing stock of Service filled T tubes of Mark I, I\*, II and II\* have been used up for this purpose in accordance with § 12408.

The adapter is made of brass in two parts, viz., head and screwed stem. The head is generally similar in shape to the head of the Service T friction tube, and is recessed to receive the head of the copper tube.



The tube is similar to the "Tube, friction, copper, solid drawn Mark I," except that it has a slightly larger loop and solid drawn nib piece. The length of the tube is 1.89 inches (maximum).

The tube is retained in position in the adapter by the screwed stem being placed over the body of the tube and screwed into the head of the adapter.

Consequent upon the adapter and tube described above being used with B.L. 15-pr. Mark I radially-vented guns, and the extended use of the tube mentioned, no more "Tubes, friction, copper, solid drawn, special, Mark I" (§ 8316), will be provided, and so soon as the existing stock of the latter is used up they will be regarded as obsolete.

In future, "Tubes, friction, copper, solid drawn, without ball, Mark I" (§ 5371), will be used for firing powder puffs by R.H.A. and R.F.A. (§ 6429), instead of "Tubes, friction, copper, solid drawn, special, Mark I."

*Tube, friction, copper, solid drawn, Mark I.*—The body of this § 5371. tube is made from solid drawn copper, brought up to shape by a succession of punchings and annealings. The head is solid; it is about 2 inches long and .2 inch in diameter, and is lacquered both inside and out. About a quarter of an inch below the head a small hole is bored through one side for the friction wire, the nib piece is of sheet copper, secured by a wooldin of wire and solder.

The nib piece contains a copper friction bar roughened on both sides and smeared with a detonating composition composed of chlorate of potash, sulphur, and sulphide of antimony. This composition is damped with shellac varnish, while it is being smeared on. The nib piece is pressed down on to the sides of the friction bar. The projecting part of the friction bar has a vertical eye, into which the hook of the lanyard fits; the junction of the nib piece and friction bar is sealed by shellac varnish. The body of the tube contains about 9 grains of pistol powder, and the bottom is closed by a cork and paper disc secured with shellac.

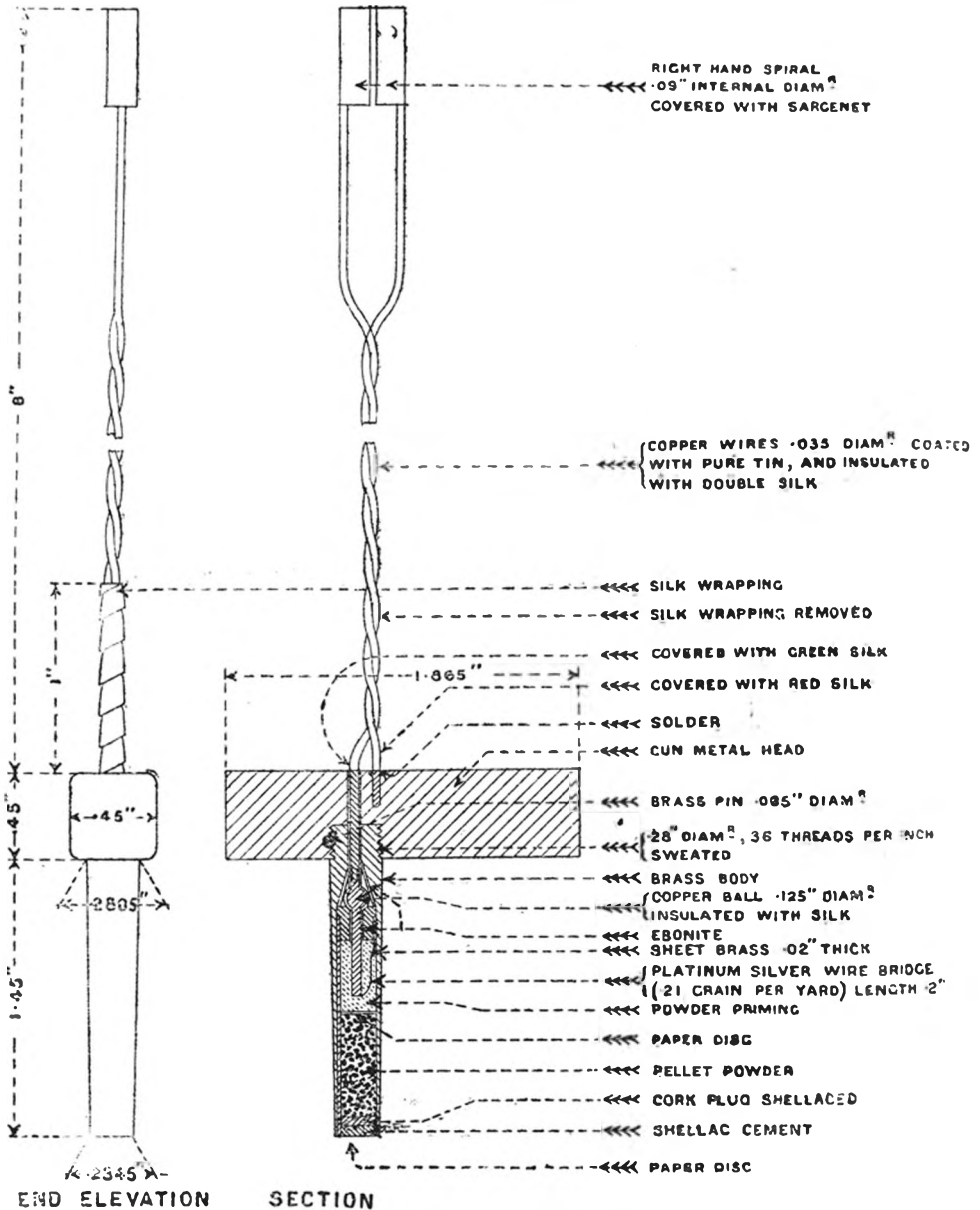
On pulling the lanyard (which should be stretched and then sharply pulled) the friction bar is drawn out, igniting the composition and firing the tube.

*Tube, vent-sealing, electric T, double wired, Mark I,* resembles the §§ 8839, 9786. "T" friction tube in exterior form, dimensions, and materials.

It is furnished with two tinned copper wire terminals, insulated with silk, one coloured green and one red. The red terminal is called the "ground" wire and is merely attached to the head of the tube. The green terminal passes through a hole in the head and is secured with tin to a copper pole. This copper pole has a ball formed on it, immediately below which it passes through an ebonite plug. The ball and upper part of the pole are insulated from the body by silk and an ebonite cone. A strip of brass with two projections, one long and one short, is bent round the lower part of the ebonite plug. The short projection forms the second pole, while the long one is attached to the end of the body by tin. The two poles are joined by a platinum-silver bridge, .2-inch long, resistance 1.0 to 1.3 ohms. The bridge is surrounded by a priming of 1 grain of mealed powder, separated by a disc of paper from about 5 grains of pellet powder. The tube is closed by a cork plug and shellac cement, to which is attached a paper disc to prevent sticking to the box. If this tube is used with an "earth return," it is necessary to connect the green terminal to the battery. The terminals are twisted together above the head, wrapped with oiled silk for about 1 inch, and terminate in spirals covered with sarcenet the same colour as their insulation.

*Tube, U.S., Electric, T, Double Wired, Mark I | L | Brass.*

Full size.



Action.

The current passes through the terminals, head and body, the poles and bridges, raises the latter to incandescence and so fires the priming and powder. The gas forces the ebonite plug and copper ball into the coned seating, thus sealing escape of gas.

3-pr. Q.F. Hotchkiss and Nordenfelt guns connected with position finder for instructional purposes. U.S. § 11483.

T friction tubes are packed 10 in a square tin box, painted black, and having both top and bottom removable; secured by tin bands soldered over the joint. Inside the box at each end there is a partition, with a corrugated strip for holding five tubes. Movement of the tubes is prevented by a cork packing piece and a felt wad on top. There is a tape band under one of the tubes to facilitate removal. This makes a neat package, and if only one or two tubes are required, five out of ten remain hermetically sealed. T electric tubes are packed ten in a similar, but larger box. The tubes are kept apart by tin partitions and are steadied by cork packing pieces. These boxes have the usual labels as to opening, reclosing, &c. § 7867. § 8839.

T-friction tubes will as soon as possible, and not later than 24 hours after firing, be immersed in ordinary mineral oil for 24 hours, and, after removal, be allowed to drain. A.O. 52, March, 1896.

*Primer, percussion, B.L., 9.45-inch Howitzer, Mark I*, is a short metal plug with a flange; it is hollowed out from the front, and fitted with a small screwed anvil and brass cap, similarly to the Mark IV percussion tube; the hollow part of the body in front of the anvil contains a pressed powder pellet kept in position by a brass washer spun in. The metal over the cap is thinned, so as to allow for exploding the cap. § 12355.

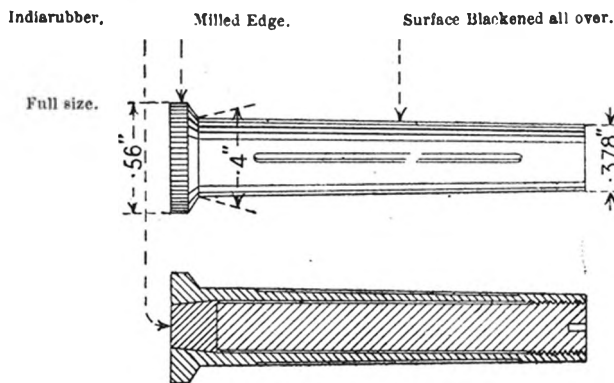
The primer screws into the obturating cup; three key-hole slots are formed in the head.

*Primer, Vent, Cordite, Mark I*, is for use with vent-sealing tubes without ball, in B.L. guns, 8-inch and upwards, with powder charges only, and is put in the vent after the breech is closed and before the tube is inserted. § 8103. § 8227.

It consists of a stick of cordite, size 20, cut 4.75 inches long.

The primers are packed 10 in a box, which is lined with felt, and closed with a tape band shellaced on.

For each pattern of Service vent-sealing tube there is a corresponding drill tube. Drill tubes.



*Tube, Vent-sealing, Percussion, Drill, Mark II*, is used for drill with guns having percussion locks, is of gun-metal and hollow. Into the head is fitted a coned india-rubber plug, as shown in the woodcut, and the lower part is closed by a gun-metal plug. The head is milled, the body fluted; the tube is blackened. § 12594.

Mark I was shorter, and without the milled head or fluted body; it was not blackened. § 4780.

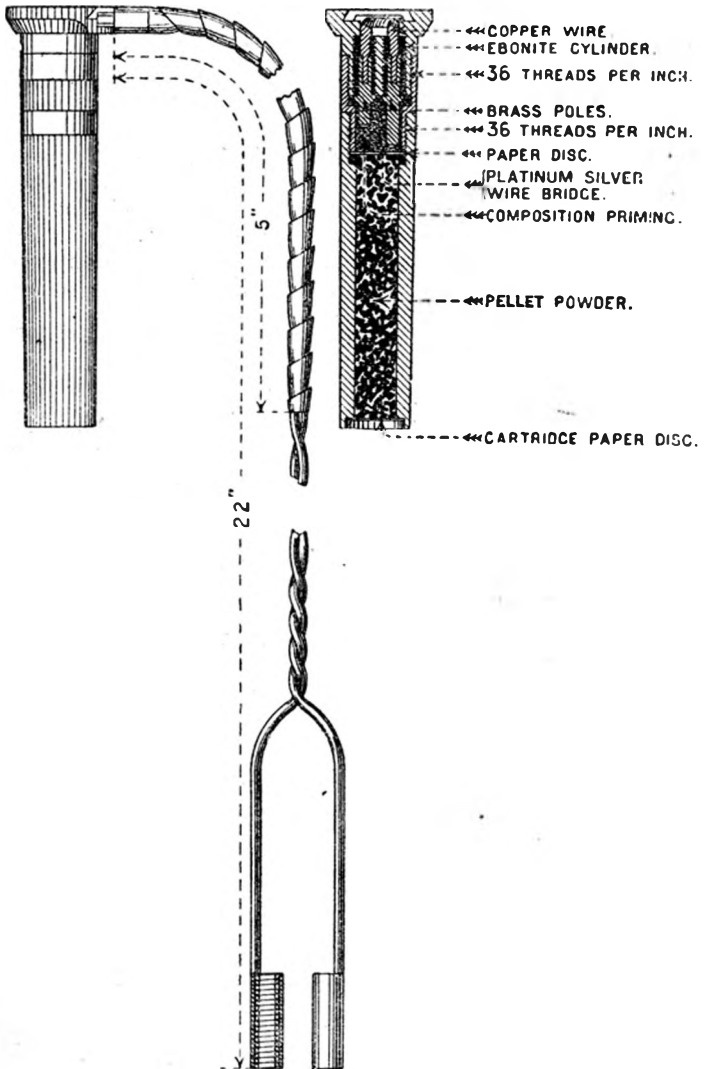
§§ 10234,  
10312.

*Tube, Vent-sealing, Electric, P, Drill, N, Mark VI, is of gun-metal, and for use with guns having percussion locks. It is in three parts, screwed together and milled outside. The insulated copper wire terminals pass through a slot in the head, and are continued*

*Tube, Vent-sealing, Electric, P, Drill, Naval, Mark VI, N.*

Metal.

Full size.



at right angles into the interior, the holes bored for their reception in the head being lined with ebonite. The slot in the side of the head is covered with a small brass plate let in; this affords the wires more protection from friction against the percussion lock. The

wires are whipped together near the head with black thread, and terminate in spirals 22 inches distant from the tube. The ends of the wires which project into the interior are connected by the usual bridge. In this tube there is an extra wrapping of oiled silk, 5 inches long, on the leads, commencing at the head.

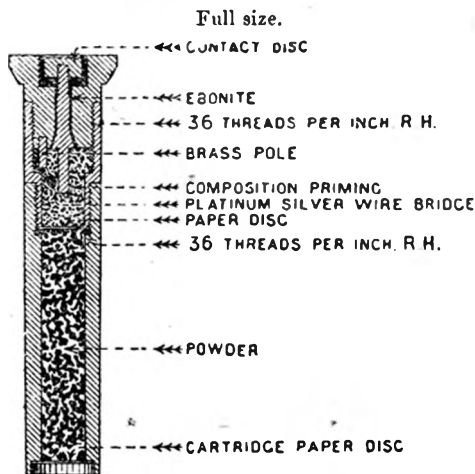
The central portion of the tube is filled with the usual priming composition of gun-cotton dust and mealed powder, and the end closed by a paper disc. The body of the tube is strong, and contains a charge of pellet powder; the end is closed by a paper disc.

Mark V tube only differed in having a double bridge, resistance § 8112. '6 to '9 ohm, and has a tuft of gun-cotton laid on the bridges.

Mark IV differs from Mark V in not having the extra wrapping of § 7601. oiled silk on the leads.

*Tube, Vent-sealing, Wireless, Electric, P, Drill, Mark II, N.*— §§ 10256, 10312.  
In external appearance this resembles the service tube, but it is milled on the exterior. The body is in three portions—head, middle piece, and bottom—which screw together. A hole is bored through the head, coned at the bottom, into which fits a brass pole insulated by ebonite. This central pole is joined to a brass

*Tube, Vent-sealing, Electric, Wireless, P, Drill, Mark II, N, Brass.*



pole let into the head by a single bridge of platinum silver wire (resistance 1·5 to 1·8 ohms). The outside end of the central pole is screwed into a tin disc, and insulated from the head by ebonite. The middle piece is filled with priming composition, and the bottom part with pellet powder. A paper disc separates the priming composition and the powder, and a paper disc secured by shellac closes the end of the tube. In some of these tubes the contact disc is of lead and tin. Those with pure tin discs have the letter T stamped on the head.

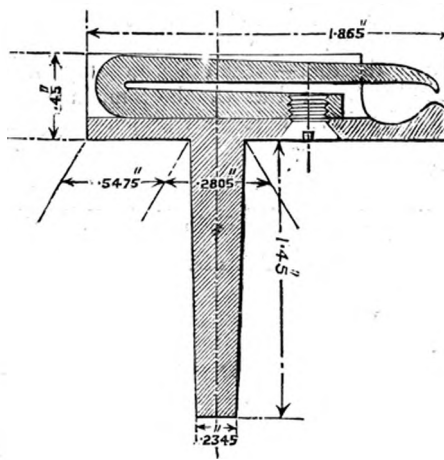
Mark I differed in having a double bridge, resistance '7 to '9 ohm. § 10256.

*Tube, Friction, T, Drill, Mark I,* as its name implies, is for drill purposes, with guns fitted with T vents. It is made of hardened steel, and resembles in form the Service tube; the head is slotted §§ 7867, 10539, 10667, 12743.

out and a lip formed on lower part, a curved spring is fitted into the slot in the head, which offers about the same resistance to the pull of lanyard as the friction wire in Service tube. Fired tubes are now fitted with a spring and bronzed over. The body is closed with a wooden plug. These are intended to replace the steel ones and are known as Mark I converted.

*Tube, Friction, T, Drill, Mark I.*

Full size.



Issue.  
Storage.

Instructions  
for refixing  
bridges.

Vent-sealing drill tubes are all issued in tin boxes containing 10. When filled, electric drill tubes are treated as explosives of Group II, Division I.

To refix bridges and reprime drill vent-sealing tubes:—

1. Unscrew the centre and bottom portions from the head.
2. Clean the tube with a hog's hair brush, dipped in methylated spirit.
3. Clean the ends of the poles with a smooth file, taking care not to remove more of the metal than necessary.
4. Tip the poles with a small quantity of pure tin; using resin as a flux.
5. Solder one end of the wire (platinum silver .21 grain per yard) to one pole with pure tin, and stretch the wire across a piece of wood as a support, and solder it to the other pole, then cut off the loose end with a pair of scissors.
6. Test the bridge.
7. Stop the holes in the head of the P tube (except Marks IV and V and wireless electric P) with luting.
8. Screw on the middle portion of the tube, and fill it with priming composition, tapping the tube to ensure the priming being in contact with the bridge.
9. Screw on the bottom end of the tube.
10. Pack in tin boxes, close with a tape band and shellac, and mark the labels "Refilled," with station and date.

To keep the vent properly clean and free from fouling, *Rimer, vent, axial, short, Mark IV*, made of bronze, is supplied. It forms the frustum of a cone accurately fitting the vent on one side, while the removal of three faces from the opposite side leaves it in the form of a frustum of a hexagonal pyramid, the angles of which remove the fouling or dirt without injuring the steel vent.

The rimer has a cross handle with a long shank, so that it may be used in the guns fitted with tube-holders as well as others fitted for vent-sealing tubes. It is suitable for all axially vented guns, except those having T-axial vents; also for adapter, cartridge, Q.F. or Q.F.C. When used with 6-inch, Marks VII and VII' guns in L.S. a lanyard is attached to the cross handle.

Mark III rimer only differs from Mark IV in length, being shorter. The handle of Mark III fouls certain fittings in the B.L. 6-inch, Mark VII, and so it is only suitable for other axially vented guns; it is also suitable for adapter cartridge Q.F. or Q.F.C.

Mark II differs from Mark III in a shoulder on the handle, where the bronze coned portion is attached. This shoulder fouls the chamber for striker in the D-pattern lock. Mark II is consequently suitable for axially vented guns (except those having T axial vents, or percussion locks D, 12-inch Mark VIII and IX, and 9.2-inch Mark VIII, IX, and X), also for adapter, cartridge Q.F. or Q.F.C.

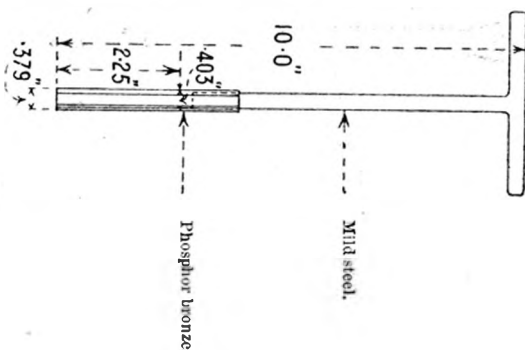
Stores used in connection with vent-sealers.

Rimer. §§ 9761 12675.

*Rimer, Vent, Axial, Short, Mark IV | C. |*

Bronze, for Axially-vented Guns, excepting those with T axial-vents, also for Adapter Cartridge Q.F. or Q.F.C.

Scale, 4.



*Rimer, Vent, Axial, long, Mark I*, for use with guns using cordite primers, resembles the Mark III, but the bronze portion is 6 inches longer, which is reduced in diameter to .21 inches, and for a length of 4.4 inches is grooved spirally for removing the fouling of the primer vent cordite.

*Rimer, Vent, T, Mark I*, is identical in construction to rimer, vent, axial, Mark III above, but smaller to suit the diameter of the T vent.

*Extractor, Tube, Special, box slide, "A," Mark I | C |*, is for use with B.L. 12-inch Mark IX; 9.2-inch Marks X and IX; 7.5-inch, 6-inch Marks VII and VIII; and B.L.C. 5-inch, when the vent-sealing tube is so tightly jammed in the vent that the extractor in the slide

§ 8096.

§§ 10887.

11572, 12734.

§§ 7860.

10456.

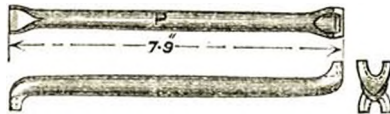
box fails to remove it. It is generally similar to the "Extractor, tube P special," described below, from which it differs principally in the sheath at the front end, which is arranged to suit the recess in the slide box when the electric and percussion lock is withdrawn as far as the jammed vent-sealing tube will admit.

§ 4872.

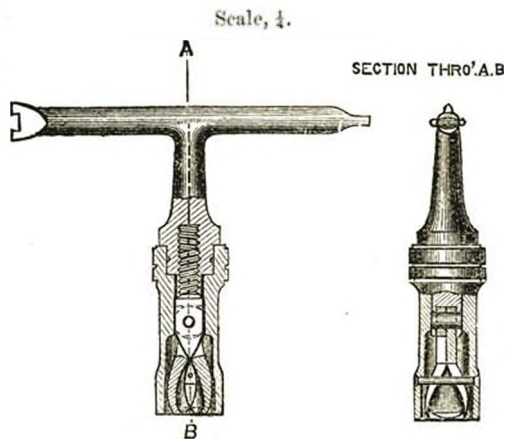
*Extractor, Tube, P, Mark I*, is of the form shown in the woodcut, and is intended for extracting vent-sealing tubes from the vents of guns fitted with percussion locks other than those fitted with D locks.

§§ 4873, 7228.

When the tube is so tightly jammed that it cannot be extracted by means of this instrument the extractor, tube, P, special, must be employed. In all cases the lock must be first removed before this extractor can be applied.



It consists of a sheath containing a bolt with a screw thread on the inner end, and two small levers hinged to the outer end. A revolving cross-handle actuates the threaded portion of the bolt, a small bar between the levers causes them to diverge on passing out of the sheath; and their outer ends, which are semi-circular in form, are lipped so as to clip the head of the tube.



The cross-handle is then turned till the ends of the levers protrude sufficiently to admit of their being placed over the head of the tube. On turning the handle in the opposite direction the tube is gripped and forcibly extracted.

§§ 7080, 7228,  
8008.

*Ordnance, B.I., Lever Extractor*, consists of a steel rod about 9 inches in length, having toe pieces at either end, which may be inserted in the loop of the extractor to which the lanyard is attached, the sides of the lock frame affording a fulcrum. It is intended for use in the extraction of vent-sealing tubes, in the event of the latter being found to be jammed in guns fitted with electric B, and percussion D locks, and also with the 12-inch Marks VIII and IX, 9.2-inch Marks VIII and IX, and 13.5-inch guns.



*Box, Tubes, Vent-sealing, Garrison, Mark I*, is fitted with a wood block bored to carry 36 V.S. tubes. They are painted red, and are intended to be suspended against the mounting in the most convenient position. §§ 4514, 5402, 12797.

For Naval Service the vent-sealing tubes are carried in a leather pocket, strapped round the waist of one of the gun's crew. The rimer is carried in a leather case and the extractor in a frog similarly attached. § 4724.

Lanyards are used with friction tubes, with percussion locks, and with Q.F. guns. Those for the L.S. are made of white line tarred; the Naval lanyards are made of white line untarred, and have a loop to allow of half cocking. The rocket machine lanyard, although for Naval Service, is tarred, as also are the 6-inch and 3-pr. Q.F. lanyards. Lanyards.

*Lanyard, Cocking, Mark I*, is made of white line, tarred, with toggle and hook, and is intended for use with B.L. guns with percussion locks, except lock D, to prevent injury to the man re-cocking the lock after a miss-fire, by the gun recoiling, should it be accidentally fired during the operation. In future this lanyard is to have a spherical toggle, stamped with the letter "C." Cocking. §§ 6910, 10145, 11875.

*Plug, Vent, T, Mark I*, is made of gun-metal with a cross-head. The head has a loop screwed in, and a steel spring; the body is covered with leather. It is used up with B.L. 15-pr. Mark I guns with Mark I radial T vent. § 8403.

Mark II differs from Mark I in having no leather washer covering on stem. A leather washer is provided at the upper end of the stem under the head, to close the tube chamber when the plug is in the vent.

*H.M. Ships Swiftsure and Triumph* employ a special percussion tube, also electric wireless tube, which differ in construction and dimensions from other service tubes. §§ 12822, 12823.

*Cartridge, Impulse, Torpedo, 7½-oz., Mark II*, consists of a solid drawn brass case, slightly tapered, flanged at the base for extraction, and to prevent it being pushed too far in. It is lacquered with transparent lacquer inside and out. A hole in the centre of the base is screwed to receive a central pipe, the rear part of the hole being enlarged to receive the head of the tube, and provided with two slots to allow of the extractor being used. The central pipe is screwed into and lightly soldered to the base, the interior at the end is slightly coned. The upper end of the central pipe is closed with a brass disc over which the metal is barred. A number of holes are bored at the front end of the pipe. A wood block is placed at the bottom of the case, and on this is placed the charge in tiers of pebble powder, the space between each tier being filled with R.L.G.<sup>2</sup> powder in a muslin bag. § 7218, 8717.

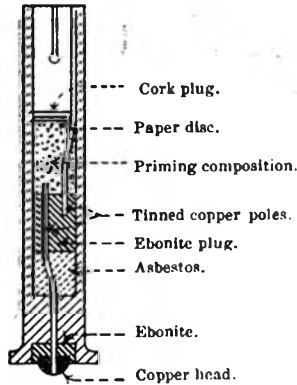
The top of the case is closed by a millboard disc fitting into a recess in the mouth, the metal being burred over.

The 5½-oz. cartridge differs from the above in having a deeper wood block and the charge in four rows.

The 4-oz. and 4½-oz. are shorter and have no wood block. The 6-oz. is similar to the above 7½-oz.

*Tube, Electric, Wireless Impulse Torpedo, Mark III*, is used in conjunction with the above. The body is of solid drawn brass, with an enlarged head; it is about 1⅞ inches long and 0.3 inch diameter; the front end has slots cut across it parallel to the axis, and slightly enlarged to make it act as a spring and retain it in the central pipe of the cartridge. The tube is bored out to take the electrical arrangements, and a recess formed in the head for a copper contact piece,

which is fitted into an ebonite plug; a copper pole is riveted to it and passes into the interior through asbestos and ebonite plugs, the lower end being connected with a second pole by means of a platinum silver wire bridge resistance, 1.5 to 1.8 ohms. The second pole is connected



with the the bottom of the tube with pure tin. Priming composition surrounds the bridge, and is kept in position by a cork and paper

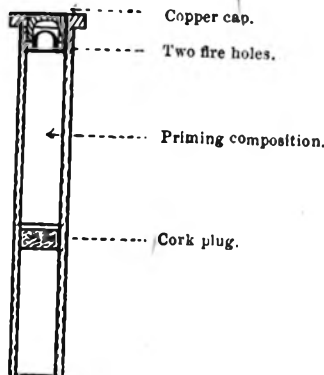
**Page 70.**—§ 13967. *Tubes, Percussion, impulse torpedo, Mk. I and II for above-water tubes of single revolving type.*

The Mark II tube consists of a body, copper cap, cork-plug, paper discs and priming composition.

The body is made of brass, recessed at the head to receive a percussion cap, and the bottom of this recess is formed into an anvil perforated with two fire holes. The tube is partly filled with priming composition, retained in position by a cork plug and paper disc. Two slots are cut in the mouth of the tube.

The Mk. I tubes, the existing stock of which are to be used up in torpedo schools, differ from the Mk. II in that the solid head of the percussion cap is held in position by a screw plug which forms an anvil, and has a cone-seating containing a copper ball, the ball being retained in position by a perforated screw plug.

**Page 70—**  
*continued.*



TUBE, PERCUSSION, IMPULSE, TORPEDO, MK. II.

## CHAPTER IX.—FUZES.

The bursting charge of a shell is ignited by means of a fuze, which is constructed so as to act under certain conditions.

Fuzes may be divided into four classes: percussion, delay action, time, and time and percussion or combined, which are commonly known as T. and P. fuzes.

Percussion fuzes are intended to act as soon as the shell strikes, and may be either "direct action," which require a very heavy blow to make them act, or "graze," which are much more sensitive to shock.

Percussion fuzes are designed, either to screw into the nose or into the base of a shell; all other fuzes screw into the nose.

Delay action fuzes are designed to ignite the bursting charge of the shell a short time after impact, thus giving the shell time to penetrate.

Time fuzes are constructed so as to act at the expiration of an interval of time, this interval being regulated by the setting of the fuze, previous to the shell being placed in the gun.

A T. and P. fuze can be set as a time fuze, but if the shell strikes before the time portion acts the fuze will act as a percussion fuze.

Fuzes must always be carefully protected from damp, or they will quickly deteriorate.

They are manufactured in lots of 2,000 T. and P. since 1899, 1,000 percussion, 1,000 T. and P. previous to 1899, and are stamped with their numeral or lot number and contractor's mark; they are usually packed in tin cylinders, which have a label on the lid showing the nature and mark of fuze, number of lot, date of packing, and contractor's mark; time and T. and P. fuzes have also marked on the label the time of burning at rest when the fuze is set full.

Decrease in atmospheric pressure increases the time of burning of time or T. and P. fuzes, the rough rule being that one inch fall of the barometer will give an increase of  $\frac{1}{30}$  to the time of burning. In fuze T. and P, No. 80, however, the increase is  $\frac{1}{34}$ .

## PERCUSSION FUZES.

*Fuze, Percussion, Direct Action, with Plug, No. 3, Mark IV.*—This § 11396. fuze is employed in the L.S. with B.L. guns, 5-inch to 13.5-inch; in the N.S. for B.L. guns, 4-inch and upwards; 4-inch to 6-inch Q.F.

This fuze is to be used in both N.S. and L.S. when hydraulic Use. machinery is used for loading. In the L.S. it is used on sea fronts.

The direct action is an impact fuze, but it will act on graze provided the angle of incidence is somewhat over  $10^{\circ}$ .

**Description.** The fuze consists of the following parts, viz. :—Body, safety plug, screw collar, needle disc with steel needle, screw plug for needle disc, and bottom plug; all of which are made of an alloy resembling gun-metal, with the exception of the steel needle, and the needle disc which is of copper. Plate XI.

**Body.** The body is threaded throughout on the exterior to the G.S. taper and pitch. The lower part is hollowed out and takes a blowing charge of about 63 grains of F.G. gunpowder, and the bottom is closed by a bottom plug screwed in, having a central fire-hole closed on the upper side by a disc of fine white paper, and one of red shallon. There are two key-hole slots in it.

**Bottom plug.** The top edge of the body has two slots cut in it to take the projecting arms of the "Key, fuze, universal," by which it is screwed into the shell. The upper portion is bored out and screwed left-handed to take the screw plug for needle disc, screw collar, and safety plug. Below this the centre of the body is recessed for the detonator, and immediately under this recess is a fire-hole communicating with the blowing charge in the lower part. A paper disc prevents the powder working up the fire-hole.

The detonator is known as the R.L. cap. (See p. 76.)

**Screw plug for needle disc and needle.** The *screw plug for needle disc* is threaded so as to screw into the body, and is recessed. It is slightly coned at the bottom, and has a hole through the centre. Two holes are drilled in the top so as to screw the plug into the fuze. The needle disc is of copper, with a single-pointed steel needle snapped on to the centre of it, and soldered. The needle disc rests on a small shoulder made in the top of the screw plug for needle disc.

**Screw collar.** The screw collar retains the needle disc in position. It screws into the body over the screw plug, having two slots cut in its upper edge to take a key.

**Safety plug.** The safety plug screws into the top over the screw collar and prevents accidents in transport and storage. It must be removed at the moment of loading; for this purpose a slot is cut across the upper surface of it. The top is marked with an arrow and the word "unscrew," showing the direction to turn. The flat arm of the "Key, fuze, universal" will fit the slot in the safety plug.

**Waterproofing.** The exterior of the fuze is lacquered, and the fuze is carefully waterproofed, by putting a little Pettman's cement on the threads of the plug for needle disc, edge of needle disc, screw collar and bottom plug before screwing them in, and finally painting the top of the fuze below the safety plug with the same cement, so as to completely cover the needle disc; and also painting the bottom of the fuze completely over. The needle is soldered to the needle disc to improve the water-tightness of the fuze.

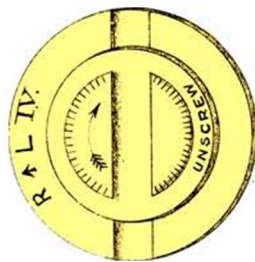
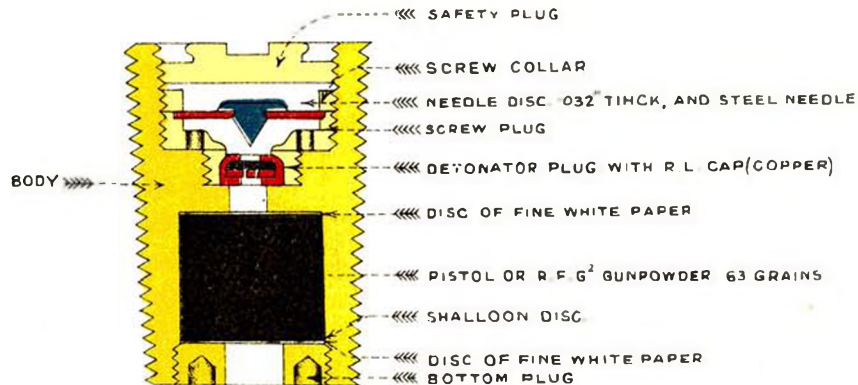
The weight of the fuze, without safety plug, is about 5 oz., weight of plug, about 6 drs.

The fuze, being prepared by simply removing the safety plug, is quiescent in all its parts till direct impact takes place, or graze at such an angle that the nose of the shell enters the ground. Earth or water entering the head crushes in the needle disc, the needle pierces the detonator, fires it, the flash passing through the fire-hole to the magazine fires it. The flash passes down into the shell through the bottom plug.

The head of the needle being some distance below the head of the fuze makes the fuze safe in loading.

# FUZE, PERCUSSION, DIRECT ACTION WITH PLUG, N°3, MARK IV.

METAL

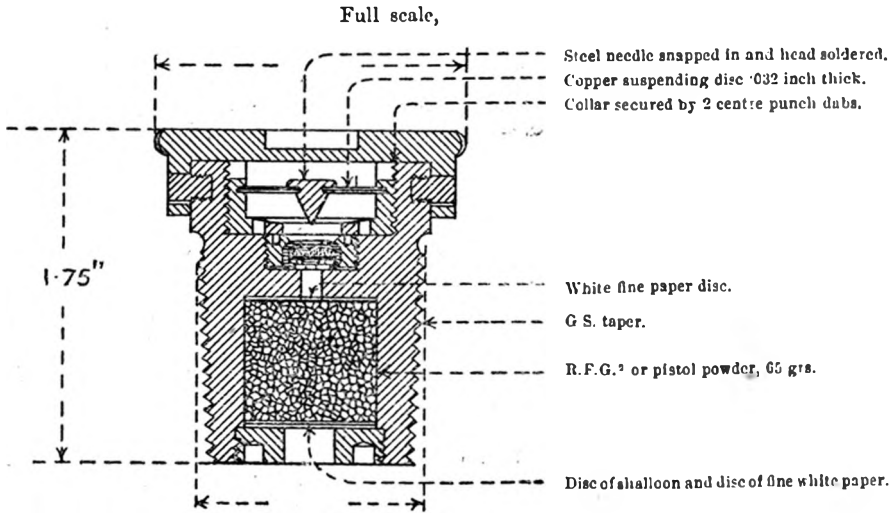


No. 3, Mark III, differs from Mark IV. chiefly in the detonator and fire channel.

There are nine conical fire holes filled with mealed powder; on the upper side the metal is recessed and fitted with a tinfoil disc, the  $3\frac{1}{2}$  grains of detonating composition covered by a thin brass disc, held in position by a copper washer, over which the metal is spun.

It also has a jagged needle, and the magazine contains about 75 grains of powder.

*Fuze, Percussion, D.A., with Cap, No. 1, Mark III, L, in general construction is similar to Mark IV with plug. The body,*



however, is not screwed throughout its entire length, the upper portion being turned to receive a cap. The latter fits over the top and has a milled edge. On each side a T-shaped slot is cut in it to fit over two brass pins which screw into the body, and by which the cap is secured to the fuze. A square keyhole is cut in the upper surface to take the flat arm of the fuze key for screwing it into the shell. This fuze requires no preparation beyond removing the cap at the moment of loading.

No. 1 Marks I\*, I\*\* and II are identical in construction, and differ from Mark III in the same way as No. 3 Mark III differs from Mark IV. § 10173, 10297.

These fuzes are wrapped singly in brown paper, and issued five in a tin cylinder; for 5-inch Howitzer equipments one in a tin cylinder. Issue. § 11018.

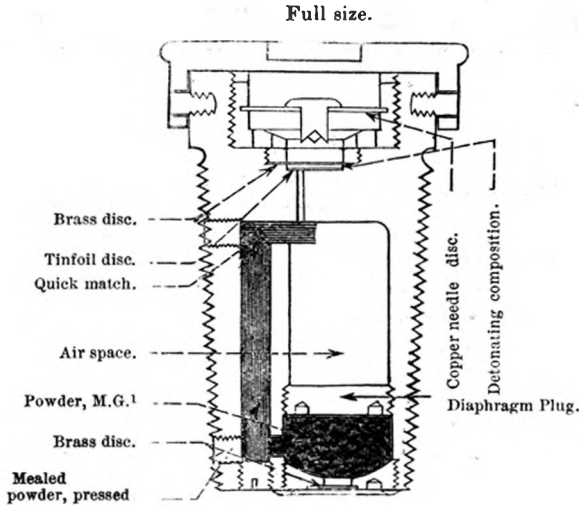
These fuzes are used with the same guns as the No. 3 already described, but are for L.S. on land fronts. They are also used for lyddite shells in the Land Service when ordered. Use. § 10707.

Fuzes manufactured or repaired before 27th June, 1894, are without the tinfoil disc under the detonating composition and will, as soon as they are replaced, be withdrawn. § 9906.

§ 8871.

*Fuze, Percussion, Direct Action, Delay, No. 10, Mark III.*—The construction of the percussion portion of this fuze is very nearly identical with that of the "Fuze, percussion, D.A., with cap, Mark II." There are a few minor differences, the brass disc covering the detonating

*Fuze, Percussion, Direct Action, Delay, Mark III, L, Metal.*



composition is retained in position by a small gun-metal plug which screws in over it. There are five cylindrical fire-holes under the detonator which are not filled with powder. The detonator only contains 1 grain of detonating composition.

The body of the fuze is longer than the D.A. with cap, Mark II, and generally resembles it in shape. The cap is also similar.

Two holes are bored in the lower part of the body, parallel to its axis, the smaller forming the delay chamber, and the larger being divided into two by a diaphragm plug. The upper part of this hole forms a chamber for the gas escaping from the burning composition, while the lower part forms the magazine of the fuze.

The delay chamber communicates with the air chamber by a fire-hole which is primed with quickmatch to carry the flash from the detonator to the pressed mealed powder with which the delay chamber is filled. A fire-hole at the bottom connects the delay chamber with the magazine of the fuze, and the bottom of the chamber is closed by a screw plug.

The lower part of the body is filled with 20 grains of M.G.<sup>1</sup> powder, and closed by a bottom plug screwed in, the latter having a central fire-hole closed on the lower side by a brass disc, spun in.

The lower edge of the body is spun over the bottom plug. The fuze is lacquered externally, and is waterproofed with Pettman cement in the same way as the Direct Action with cap.

Action.

The safety cap having been removed at the moment of loading, the percussion arrangement, on impact, ignites the quickmatch priming and the column of mealed powder; the latter burns for

more than half a second, thus allowing the shell time to penetrate well before bursting.

Issued one in a tin cylinder, wrapped in brown paper.

*Fuze, Percussion, Direct Action, Impact, No. 13, Mark IV*, is for use with lyddite shell.

§§ 8482, 8630,  
9620, 9673,  
9721, 9854,  
10172, 10321,  
10707, 11190.

Mark II is for Land Service only, as may be ordered. Externally the four marks are similar and resemble the Direct Action, Mark II. In the earlier fuzes the caps were made of steel, but they are now made of manganese bronze to prevent rust. The caps of the later fuzes are further secured by a safety pin, which passes horizontally through the cap and head of the fuze, and is fitted with a twine becket for use in withdrawing it. The numeral of the fuze is stamped upon the cap, as well as on the fuze body, so that the pattern may always be known without removing the cap. Mark I fuze is waterproofed by having a disc of foolscap paper attached to the head by an annulus of Pettman cement, the outside of the paper and bottom of the fuze being subsequently coated with the same cement.

Mark II fuze has the edge of the brass disc in the head coated with Pettman cement before being spun in, while the whole top of the fuze will be afterwards painted with the same cement. All openings made in the bodies of both fuzes are finally painted with Pettman cement. Mark III has also a brass disc spun in and waterproofed like Mark II. Mark I fuzes are converted to Mark I\* by waterproofing like Mark III.

Marks I\*, II and III, altered to conform with Mark IV, have a star added to their numeral.

The fuze weighs 10 oz. and the cap 3 oz.

It is issued one in a tin cylinder.

Weight.  
Issue.

#### FUZES WHICH ACT ON GRAZE.

We now come to the fuzes which act on graze. Next to safety from prematures, quickness of action is the most essential quality, as the effect is lost if a shell has time to rise to any height before bursting.

A short range and a heavy shell are the most trying conditions, as the velocity of the shell is but little checked by grazing, and for the same reason, soft ground increases the chance of failure.

The Small Percussion Fuze is found to act well in B.L. guns up to and including the 5-inch at small angles of elevation.

The Base Fuze, which is used with pointed common and armour-piercing shells, is made on much the same principle. It is, however, not so sensitive owing to a very strong spiral spring between the needle pellet and fuze body. The shells, in which it is used would hardly be required to act on graze, though the fuze will act provided the angle of incidence is  $5^\circ$  or over.

*Fuze, Percussion, Small, No. 8, Mark IV*, is used for B.L. guns, 30-pr. and 4-inch.

§§ 7230, 7635.  
Use 8807,  
10172.

The general construction is shown in Plate XII.

It consists of the following parts, viz., body, detonator pellet with cap, and two retaining bolts with spiral springs, phosphor-bronze spiral spring, needle plug with steel needle, safety pin, closing pellet with spiral spring, and magazine.



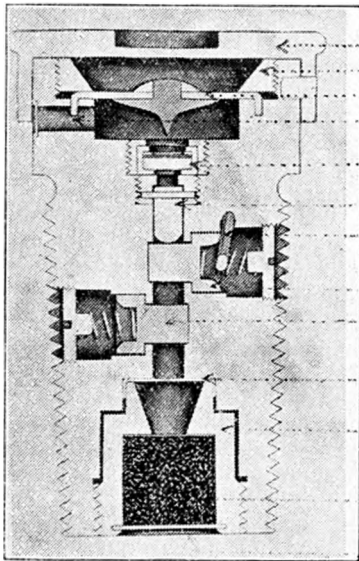
Page 75.—Fuze, percussion, D.A., with cap, No. 17, Mk. I. | L. | has lately been introduced for use with lyddite shell with field and siege guns and howitzers

The body of the fuze externally is similar to the fuze, percussion, D.A., with cap No. 1, but longer. The construction of the fuze is shown in the following diagram,

..... THE FOUR BOLTS are similar and resemble the Direct 10172, 10321,

Page 75—  
continued.

Fuze, percussion, D.A., with cap, No. 17, Mk. I. | L. |



Safety cap.  
Screw collar for needle disc.  
Needle disc with steel needle.  
Escape hole.  
Detonator plug with detonator.  
Brass pellet, with collar and shearing [wire].  
Safety pin.  
} Two centrifugal bolts with springs.  
Brass shield.  
Magazine plug.  
F.G. powder.  
Brass disc.

*Action.*—At the last moment of loading the safety pin and safety cap are removed. On shock of discharge nothing takes place, but on rotation the centrifugal motion of the shell causes the two bolts to spin outwards, compressing their spiral springs, and opening the fire channel in the fuze body. On graze or impact, the needle disc is crushed in, carrying its needle on to the detonator. The explosion of the detonator forces the brass pellet through the fire channel; it shears its suspending wire and pierces the brass shield, and thus allows the flash from the detonator to fire the magazine of the fuze, which in turn explodes the shell.

If the detonator is fired prematurely before the centrifugal bolts are spun out by the rotation of the shell, the brass pellet would be unable to pass the small ends of the bolts.

The flash in this case would blow out the brass disc in the small side hole in the upper part of the body, and so would escape to the exterior. The result would be a blind shell instead of a premature in the bore.

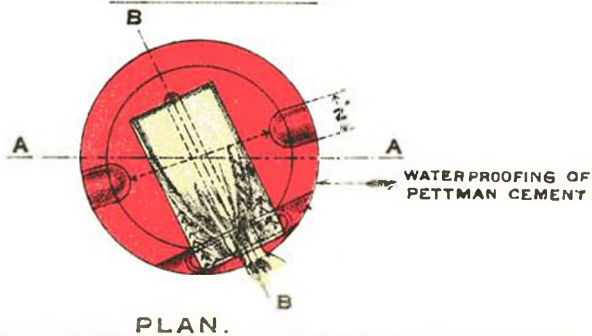
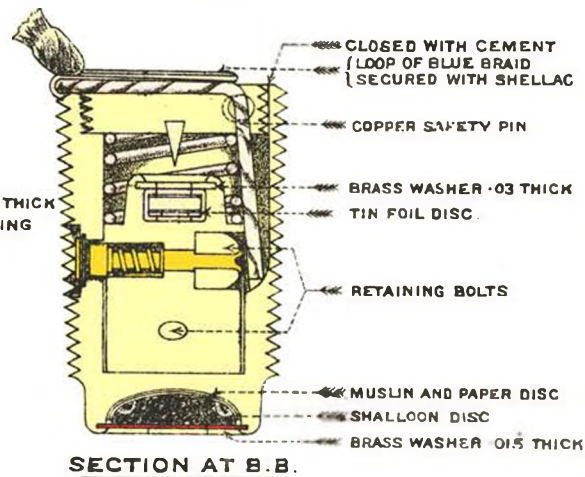
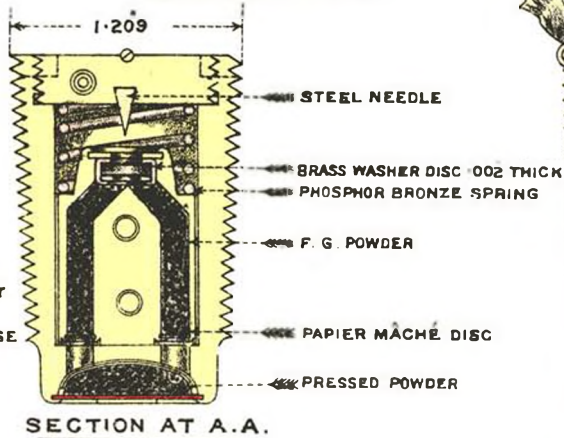
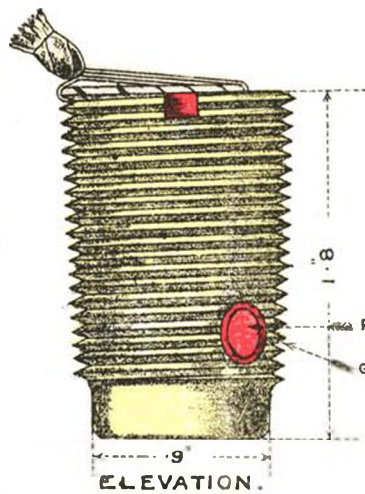
spiral spring, needle plug with steel needle, safety pin, closing pellet with spiral spring, and magazine.

- Material.** The body, detonator pellet, and needle plug are of gun-metal; the retaining bolts, closing pellet, and fine spiral springs are of brass, and the safety pin of copper.
- Body.** The body is threaded nearly throughout to the G.S. taper and pitch. The lower end for a length of  $\frac{3}{8}$  inch is reduced in diameter and left plain. In the top edge there are two key-hole slots to take the projecting arms of the "Key, fuze, universal," by which it is screwed into the shell. Two holes are bored through the side of the body for the smaller ends of the retaining bolts; these are closed on the outside by brass discs cemented over.
- The fuze is bored out from the top to take the detonator pellet, and two grooves are cut down the side of the body to allow for the retaining bolts being spun out of their recesses.
- Two fire-holes are bored through the bottom to communicate the flash from the pellet to the magazine in the lower part.
- Detonator pellet, &c.** The detonator pellet rests inside on the bottom. It is recessed at the top to take the R.L. percussion cap, the latter being retained in position by a brass washer having the metal of the detonator pellet spun over it. The pellet has two fire channels leading from the cap to the magazine. These are filled with F.G. powder, the bottom of each being closed by a papier-mâché disc.
- R.L. cap.** The R.L. cap is of copper, the top is cut out and the opening closed by a thin brass disc. It contains about  $3\frac{1}{2}$  grains of cap composition pressed and varnished, the bottom is closed by a disc of copper pierced with four fire-holes and secured in position by six lugs on the cap proper bent down on it; under the composition is a tinfoil disc.
- Two retaining bolts pass transversely through the pellet; their smaller ends project into holes in the body, where they are retained by fine spiral springs. The retaining bolts prevent the detonator pellet moving forward against the needle until they are spun out by the rotation of the shell. There is a small longitudinal groove in the side of the pellet, into which a screw projects from the side of the body. This prevents the pellet from turning round during flight.
- Spiral spring.** The top of the pellet is reduced in diameter, forming a shoulder, on which rests a spiral spring of phosphor-bronze, the object of which is to prevent the pellet working forward during flight, and so causing a premature or blind.
- Needle plug.** The needle plug has a steel needle projecting from its under surface. It screws into and closes the top end of the fuze. Before screwing in, its edges are coated with Pettman cement.
- Safety pin.** The safety pin, of twisted copper wire, passes through the needle plug, down one of the longitudinal grooves in the body, behind the head of one of the retaining bolts, and is bent over at the top into a groove in the needle plug. An eye is formed on the outside end of the pin, to which is attached a loop of blue braid for withdrawing it. This loop is fastened down upon the top by shellac or glue.
- Closing pellet.** A hole through the side of the fuze into the needle plug contains a brass pellet, with spiral spring behind it, for closing the safety pin-hole.
- Magazine.** The magazine consists of a pellet of pressed powder; on the upper surface an annular groove is formed to facilitate ignition, and it is secured in the lower end of the body by a brass washer, over which the metal is spun. Between the magazine and the bottom proper there are two discs, one of muslin and one of fine white paper, and between it and the brass washer is a disc of shalloon.

# FUZE PERCUSSION SMALL N<sup>o</sup> 8 MARK IV L

METAL.

SCALE 1/1.



The fuze is waterproofed by having the safety pin-hole and plug for the same closed by Pettman cement. The top and bottom of the fuze are painted with Pettman cement, and all openings made in the body of the fuze are finally painted with the same cement.

To open the fuze for examination, the safety pin and closing pellet must be withdrawn before the needle plug can be unscrewed.

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

Mark III differs from the above in having a screw plug instead of a brass washer over the detonator; this screw plug was found liable to work loose. There was no tinfoil disc in the R.L. cap, and the pellet of pressed powder had a hole through its centre, and no annular groove. § 6114.

This fuze is very quick in its action, and, being contained entirely within the fuze hole, it is not likely to be fired by an accidental blow unless strong enough to crush in the head of the shell. The fuze weighs 5·8 oz. Remarks.

Small percussion fuzes are wrapped in brown paper and packed one in a tin cylinder. Issue.

#### BASE FUZES.

*Fuze, Percussion, Base, Large No. 11, Mark IV,* is used with B.L., Q.F., or Q.F.C. guns, 6-inch and upwards, for all pointed common, cast steel and uncapped armour-piercing shells. § 12114.

The principal parts of the fuze are:—Body, needle pellet, centrifugal bolt, pressure plate with spindle and nut, and steel protecting disc, screwed cap with detonator and magazine, phosphor-bronze spring, brass spiral spring, and four screws. The body, centrifugal bolt, spindle and nut, screw cap for detonator are of metal class "B." the needle plug and four screws of metal class "C."

The general construction of the fuze is shown in the Plate XIII.

The body is screwed nine threads per inch left hand for a length of 1·65 inch, the remainder above the screwed part being left plain; it has a flange below the screwed part which is coated with Mark III luting to make a gas-tight joint with the shell. The interior is bored out to receive the needle pellet, and threaded at the top to receive the screwed cap, a hole is bored in the base through which passes the pressure plate spindle; and a recess is made in the base into which fits the pressure plate and steel protecting disc. A hole is bored through the side of the body, and is closed by a brass screw plug, the end of which is reduced in diameter, and on it fits a fine brass spiral spring, this keeps the bolt in position till acted upon by centrifugal force; a recess is also made in the opposite side of the body, which the small end of the centrifugal bolt engages, two elongated holes are made in the base for screwing it into the shell, it is also stamped with an arrow showing the direction to turn when screwing it into the shell, and with the number of thousand of fuze and contractor's initials and numeral of fuze and No. 11. Body.

**Needle pellet.** The needle pellet is cylindrical in form, and rests on the bottom, inside the body, it is reduced at the top end, forming a shoulder over which fits the phosphor-bronze spiral spring, the object of which is to prevent rebound and the pellet working forward during flight, and so causing a premature. A hole is bored at right angles to the axis, in which fits the centrifugal bolt, and another along the axis, from the top, in which works the nut of the pressure plate spindle; the upper part is threaded to receive the needle plug, after the needle plug is screwed home, the metal of the pellet is spun over it to prevent the possibility of its unscrewing; a small hole is bored in the bottom of the pellet through which passes the spindle. There is a small longitudinal groove in the side of the pellet, into which a screw projects from the side of the body, this prevents the pellet from turning round in flight.

**Centrifugal bolt.** The centrifugal bolt is also cylindrical in form, and fits in the hole in the needle pellet, one end is reduced in diameter to fit in the hole inside the body made to receive it. An elongated hole is bored through it from top to bottom, the upper surface on one side of this hole is recessed for the nut on the spindle to grip, this locks the bolt, and makes the fuze perfectly safe till set in action.

**Pressure plate.** The pressure plate has a boss on one side, into which screws the spindle; it fits in the undercut recess made near the base of fuze, and when in position the metal of the body is spun over it.

**Pressure plate, spindle, and nut.** The pressure plate spindle is threaded at both ends, one end screws into the boss on pressure plate, and the other receives the nut on top of centrifugal bolt, the end of the spindle is riveted over the nut when screwed home.

By this arrangement the centrifugal bolt is securely locked until the pressure plate is forced inwards, by the pressure of the gas on discharge, thus raising the nut. The safety of the fuze during transport, and, in fact until the gun is fired, is thus ensured.

**Steel protecting plate.** The protecting disc is a perforated disc of steel fitted into a slightly undercut recess in the base of the fuze, the metal of the body being spun over it. It is intended to protect the fuze from accidental blows.

**Screwed cap, with detonator and magazine.** The screwed cap is in two parts, screwed together and prevented from unscrewing by a locking screw, the two parts together forming a magazine holding a pressed pellet of R.F.G.<sup>2</sup> powder with a hole through the centre, a disc of muslin is shellaced between the powder and the upper part of cap to prevent the powder working through the four fire-holes, through which the flash passes into the shell. A recess is made in the under side to receive the R.L. cap and six fire-holes to convey the flash from it to the powder, the metal is spun over the R.L. cap to keep it in position. After the screw cap is home in the body, it is prevented from unscrewing by a locking screw from the side of the body.

Before issue the top and bottom of the fuze are painted red with Pettman cement.

Fuzes before being screwed into shells will be lubricated with thinned luting (half Mark III luting, half mineral jelly) on the screw threads, and unthinned luting under the flange. They should be screwed hard home.

Weight of fuze 2 lb. 8 oz.

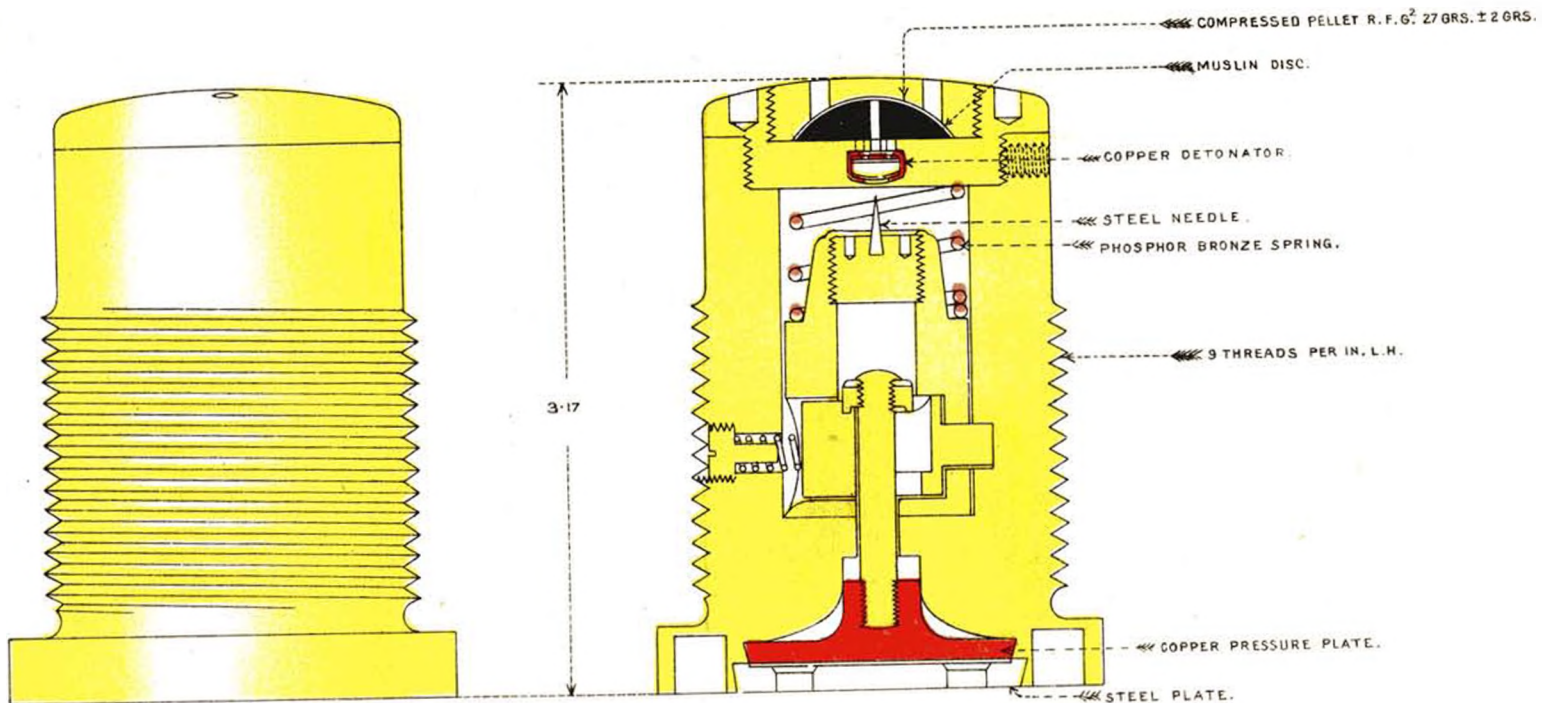
One in a tin cylinder, wrapped in brown paper.

**Action.** On discharge, the gas acting through the holes in the protecting plate, the pressure plate is crushed in, carrying forward the spindle and nut, thus releasing the centrifugal bolt. The rotation of the

FUZE, PERCUSSION. BASE. LARGE, N° II MARK IV C

METAL.

FULL SIZE.



ELEVATION

SECTION

to face page 78.

Plate XIII.

Page 79.—Fuze, percussion, base, large, No. 11, Mk. V. | C. |

This fuze is used with B.L., B.L.C., Q.F., and Q.F.C. guns, 6-inch and up, with common, pointed, and armour-piercing shell.

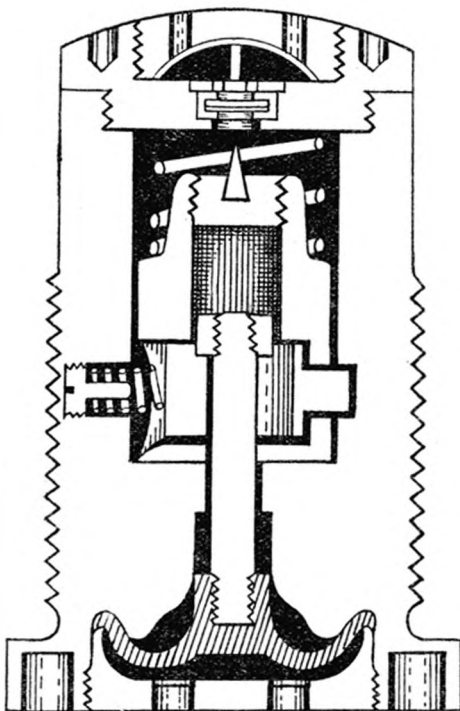
The principal parts of the fuze are:—Body, steel protecting plate, pressure plate and spindle, detonator pellet, centrifugal bolt, small retaining bolt, locking pellet with axial spring, detonator sleeve with detonator brass ball

Page 79.—Fuze, Percussion; base, large, bronze, No. 15, Mk. III.

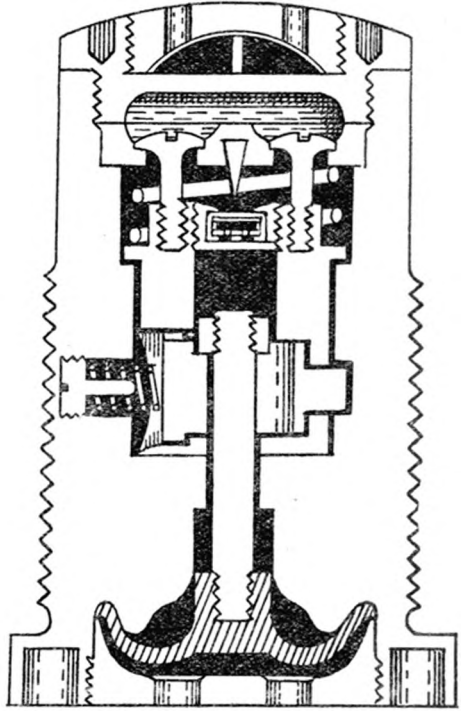
" " " base, medium, No. 12, Mk. VI.

The above fuzes differ from previous pattern in being fitted with a needle-plate with steel needle, and the detonator being carried in the percussion pellet. The action differs as follows:—

On graze, or impact, when the detonator pellet and the safety bolts move forward, the heads of the bolts



FUZE, PERCUSSION, BASE, LARGE, NO. 15, MK. II.



FUZE, PERCUSSION, BASE, LARGE, NO. 15, MK. III.

the pellet.

Passing through the percussion pellet, at right angles to its axis, is a centrifugal bolt, one end of which is enlarged, while the other end projects into a recess in the fuze body. The centrifugal bolt in this position masks the fire channel in the pellet, but when the bolt is spun out of its



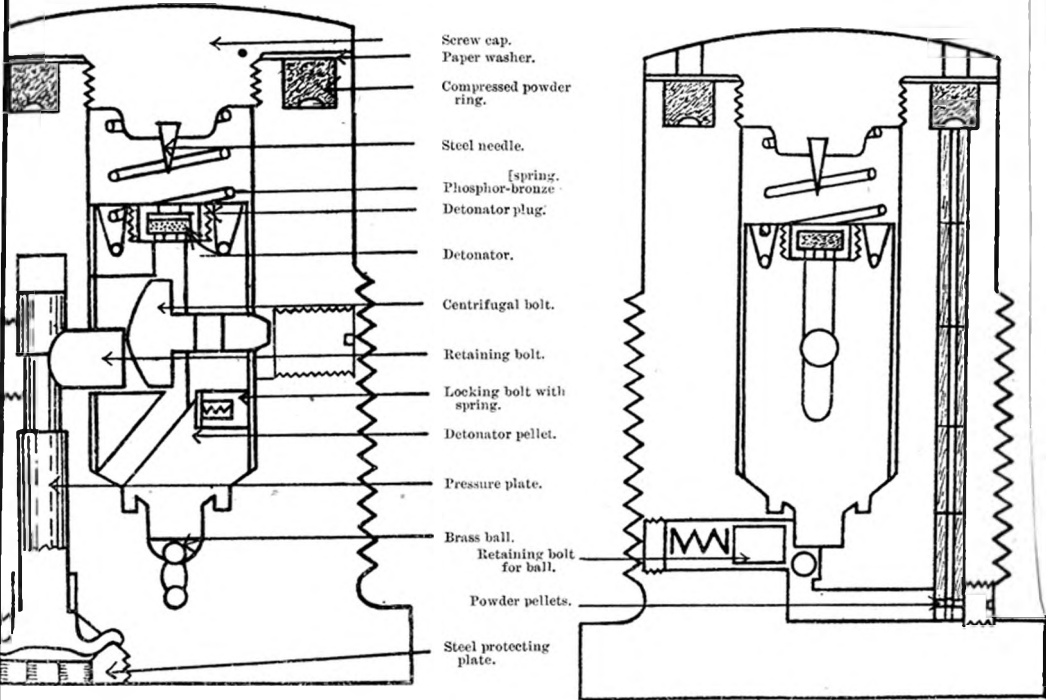
Page 79.—  
continued.

by a washer of paper secured to the underside of the flange.

To prevent the cap from unscrewing, a set screw passes vertically through it and into the body.

In the base of the fuze there are two elongated holes to take the key for screwing it home into the shell. The base is stamped with an arrow showing the direction to turn when screwing the fuze home, and with the lot number, contractor's initials, date of manufacture, No. 11, and Mark of fuze.

*Fuze, percussion, base, large, No. 11, Mk. V. | C. |*



This fuze is specially designed to avoid premature action. If the detonator is accidentally fired on the shock of discharge, the flash is masked by the centrifugal bolt, by the flange on the bottom of the pellet fitting into the groove in the body, and by the brass ball closing the fire channel in the base.

*Action.*—On discharge the gas acting through the holes in the protecting plate crushes in the pressure plate, carrying forward the spindle, thus bringing the reduced diameter of the spindle opposite the small retaining bolt. The rotation of the shell causes the bolts to move outwards, the grooved end of the small retaining bolt fitting round the reduced part of the spindle allows the centrifugal bolt to withdraw its projecting end from the recess in the body, and to bring its vertical flash hole in line with the fire channel in the pellet. At the same time



shell causes the centrifugal bolt to fly outwards, leaving the needle pellet free to move forward, which it does on impact or graze, compressing the spiral spring, the needle coming in contact with the cap fires it, the flash ignites the powder in the magazine and explodes the shell.

In Mark III the protrusion of the centrifugal bolt was less; only § 12114. a few issued.

Mark II differs from III in having no steel protecting plate. §§ 8652, 8788,

Mark I fuze differs from Mark II in the form of the recess for the pressure plate, the shoulder of which is not so much cut away. § 9674.  
The fuze is less sensitive since the pressure plate offers greater resistance. §§ 8099, 8315, 8788.  
This fuze is not suitable for use with reduced charges.

Marks I and II originally had a lead washer under the flange of the body to make a tight joint between the fuze and the shell. The washers did not prove satisfactory, and were ordered to be removed from all loose fuzes.

Cylinders of fuzes will not be specially opened to remove the lead washers, but whenever a cylinder is opened for any reason the lead washer will be removed from the fuze. Similarly, fuzed shell will be altered by removing the washer from the fuze only when passing through laboratories for examination or repair.

Certain existing large base fuzes will be converted to the Mark IV pattern. When altered, the fuzes will have a (\*) added to their numeral.

*Fuze, Percussion, base, large, bronze, No. 15, Mark I*, is of aluminium § 12834. bronze, is identical with No. 11, Mark IV. It is for use with capped A.P. shell, and is stamped with No. 15 on base.

*Protectors, large, base, percussion fuze, Mark I | N |* are issued for use with the earlier marks (those without the steel protecting disc). They are discs of steel, about  $2\frac{3}{8}$  inches diameter, with spring studs to fit into the key holes of the fuze, the centre is raised so as to protect the pressure plate of the fuze during transport.

*Fuze, Percussion, base, medium, No. 12, Mark IV*, is for use in all § 8100, 8315, 12249. armour-piercing and common shell having pointed heads for B.L. and Q.F. guns, 12-pr. to 5-inch; and for Q.F. 2.95-inch with double shell.

In material, construction, and action it is similar to the fuze, percussion, base, large, but is smaller, and is screwed outside twelve threads per inch instead of nine. Also the retaining (or centrifugal) bolt is a different shape, having the heavy end enlarged, and the needle pellet recessed to receive it. §§ 11873, 12114.

Marks III and II correspond to the Marks IV and III large base fuze.

Mark I corresponds to Mark I large. § 8100, 8315.

Weight of fuze 1 lb.  $\frac{1}{4}$  oz.

One in a tin cylinder, wrapped in brown paper.

Issue.

Fuzes, drill, percussion, are either burnt out fuze bodies or solid gun-metal of the same external dimensions as the fuze they represent, § 10742, 11017, 11872. bronzed all over and stamped "Drill."

*Fuze, percussion, base, 9.45-inch Howitzer, Mark I | L |* is similar § 12355. in appearance to the Hotchkiss base fuze. The body is bored out and fitted with a loose needle plug with steel needle, fitting round the needle plug is a copper ring with three clips, which prevent it moving forward till impact. A four-armed stirrup spring rests on the front of the needle plug, and supports a thimble; a brass cylinder fits round the thimble, so as to keep the needle central. The front of the fuze is closed by a screwed plug with anvil and detonator. This plug carries a screw cap at its front end, which holds a

magazine of loose powder; a lead washer is placed under the flange of the head.

*Action on shock of discharge.* The brass thimble sets back straightening the four clips of the stirrup spring; on impact the needle plug and thimble fly forward and fire the detonator.

### FUZE, T. AND P., No. 60, MARK II.

THE FUZE CONSISTS OF THE FOLLOWING PARTS:—Body, percussion pellet with steel needle and retaining bolt, spiral spring, detonator plug, safety pellet, brass ball, bottom plug, two composition rings, dome, brass washer, cap, two safety pins, a calf skin washer below each time ring, and a leather washer. The body, composition rings, percussion pellet, detonator plug, bottom plug and cap, are made of gunmetal. The dome, washer, ball, safety pellet, and spring are made of brass. Plate XIV.

The time safety pin is made of phosphor bronze wire, and the percussion safety pin of split copper wire.

The bottom part of the body is screwed on the exterior to fit the G.S. fuze hole, and is bored out in the interior to take the percussion arrangement, and screwed to receive the bottom plug.

Above this the body is of larger diameter, and fits over the nose of the shell, a leather washer on the underside making the joint tight.

Above this again the body terminates in a stem, the top of which is threaded to receive the cap, and has two grooves cut in it to receive the feathers on the brass washer.

Two brass pins are secured into the stem, which engage with slots in the upper composition ring and prevent it turning.

In the enlarged diameter of the body will be found the safety pin of the percussion arrangement and a hole for the projection on the key, by which the fuze is screwed into the shell, and a blackened pointer marks the position of a fire-hole containing a perforated pellet of powder leading to a horizontal channel filled with F.G. powder, the latter communicating with the detonator plug.

A white calf skin washer, beneath which is one of white paper, is placed on the flat part of the body. These are attached to the body by shellac, a hole being pierced through them so as to leave the powder pellet in the fire-hole exposed.

The lower composition ring is barrel-shaped on the exterior, to give a better grip to the fingers in setting, and is graduated from 0 to 44.

It is also marked with an arrow. When this is opposite the setting mark the fuze is set at safety, as the fire-hole in the body is covered by solid metal and not by fuze composition.

The gas escape is external; for this a hole is bored into the ring at the commencement of the composition; this hole is covered by a thin brass patch covered with Pettman cement, which is blown out when the ring lights.

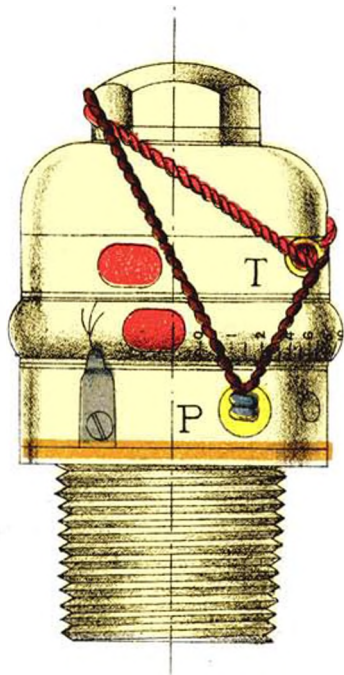
This ring is movable, for setting the fuze.

A channel lined with asbestos paper runs nearly all round its under surface, and contains fuze composition. Rings of vegetable paper are cemented to the lower surface of each ring, earlier issues were without this.

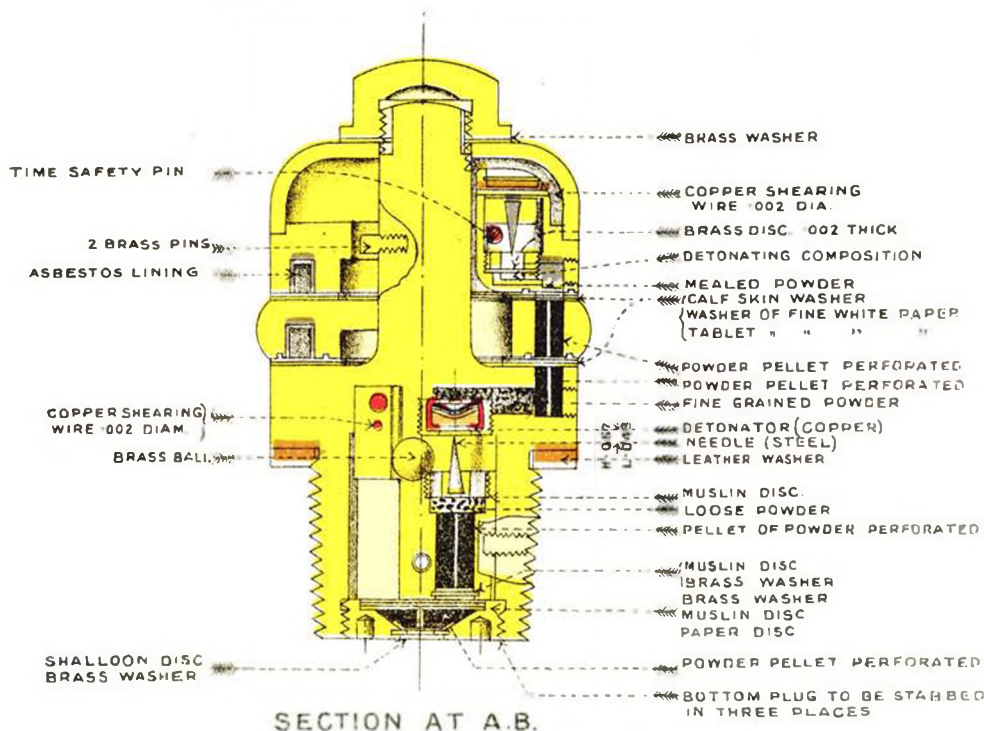
At the zero mark of the lower ring is a perforated pellet of powder placed in a vertical hole, to communicate with the upper ring.

# FUZE T. AND P. N° 60 MARK II. C

METAL



ELEVATION  
FUZE SET AT SAFETY



SECTION AT A.B.

The upper ring rests upon a calf-skin washer upon the top of the lower ring, and is pinned to stem so that it cannot turn, as before described. It is similar to the lower ring, but is cylindrical and has no graduations.

On the upper side of the ring there is a small chamber containing the lighting arrangement, which consists of a gun-metal hammer, having a steel needle, and suspended by a thin copper shearing wire over 0.2 grain of cap composition surrounded by mealed powder and covered by a thin brass disc, kept in position by a small screw collar or plug. The top of the chamber is also closed by a brass disc.

A strong safety pin of phosphor bronze wire passes through the ring from the outside and underneath the hammer, which it supports.

The letter "T" is stamped on the ring near the entrance of the safety pin.

When the safety pin is withdrawn, a small brass pellet having a spiral spring behind it closes the hole.

A fire-hole leads from the bottom of the chamber to the commencement of the composition.

The dome is stamped from sheet brass; it fits over the upper composition ring and covers the lighting arrangement.

The washer is made of sheet brass, and has two feathers which fit into grooves in the top part of the stem.

The cap (hexagonal) screws on to the end of the stem and holds the dome and composition rings in position.

The percussion arrangement consists of a percussion pellet with steel needle, and retaining bolt with spiral, safety pellet, detonator plug with detonator, spiral spring, brass ball, and bottom plug.

The percussion pellet contains on its upper surface the needle plug with a hardened steel needle in the centre, with 6 fire holes round it. Under the needle plug is a recess containing one grain F.G. powder and a perforated pellet of powder, closed at the bottom by a brass washer and muslin disc.

A small recess is made on the underside of the body, and a corresponding one on the top of the pellet, into which fits the spiral spring, to prevent the pellet moving forward in flight.

There is a slot down the side of the percussion pellet for the safety pellet and ball to fall into, and the percussion pellet is prevented from turning by a screw, in the body of the fuze, which projects into a groove down its side.

The retaining bolt is an additional precaution against prematures.

It passes transversely through the percussion pellet, and its end projects into a recess in the body, in which position it is kept by a spiral spring. The other end of the bolt is heavier, and flies outwards when the shell rotates.

A slot is formed in the body in which this end can move.

The ball prevents the percussion pellet moving forward as long as safety pellet is in its place.

The safety pellet is suspended in the body of the fuze by a thin copper shearing wire.

The safety pin passes through the body and through the safety pellet.

The letter "P" is stamped on the body near the entrance of this pin.

A small brass pellet, having a spiral spring behind it, closes the safety pin hole when the latter is withdrawn.

The detonator plug is a small cylinder of gun-metal screwed on the exterior to fit into the body at the end of the horizontal powder channel, and immediately above the needle of the percussion pellet. It is recessed to receive the R.L. cap and has a central fire-hole.

The bottom plug is a short cylinder of gun-metal threaded externally to screw into the body of the fuze. It has a cavity filled by a perforated pellet of powder covered on the top by a disc of paper, and a disc of muslin secured by a brass washer. The hole at the bottom is closed by a brass washer and shalloon disc, and is painted with Pettman cement.

The exterior of the fuze is lacquered all over.

The mark, lot number, and initial of contractor, and date of filling are stamped on the body.

Time of burning at rest is about 20 seconds.

Packing, one in tin cylinder in papier mâché packing pieces. Labels show nature and mark of fuze, lot number, date of manufacture, time of burning at rest, and instructions for opening the cylinder; instructions for closing the cylinder are given inside, also a packer's label inside.

§§ 11019, 11226, 11137. No. 60, Mark I, differs from Mark II, in having a blackened notch for setting instead of a pointer. In the first issues the graduations showed the odd numbers.

§ 11691. No. 60c, Marks I and II, are conversions from No. 56, 57, and 61. These fuzes have the old numeral, lot number and date of filling barred out, and new substituted.

*Fuze T and P, No. 63, Mark I,* differs from No. 60, Mark II, in the following particulars. Plate XV. :—

The scale is engraved on the upper time ring, the lower ring being milled round its edge, and fitted with the pointer. Cloth washers are used instead of calf skin. The cap securing the dome is fixed permanently in position by means of a steel set screw, which prevents it turning on the stem of the fuze.

The fuze is set by means of a spanner, which grips the milled edge of the lower ring and enables it to be turned in the required direction. Time of burning at rest 20·1 seconds. The number is stamped on the nut. The time detonator contains 35 grains of composition.

§§ 7716, 9088, 9194, 9251, 9809, 9856. *Fuze, Time and Percussion, No. 56, Mark IV.*—The fuze consists of the following parts :—Body, percussion pellet with steel needle and retaining bolt, spiral spring, detonator plug, safety pellet, brass ball, bottom plug, composition ring, dome, brass washer, cap, two safety pins, and two leather washers. Plate XVI.

This fuze differs from No. 60, Mark I, in having a single barrel-shaped composition ring, with lighting arrangement, graduated from 0 to 18 and sub-divided into quarters. A hole is bored into the composition ring at the side near its commencement, and another at the top. These holes allow the gas from the burning composition to escape into the dome.

A groove is cut in the top face of the body close to the stem and half-way round it; a hole is bored through the body into the groove at an angle the reverse to the spin of the rifling for the escape of the gas.

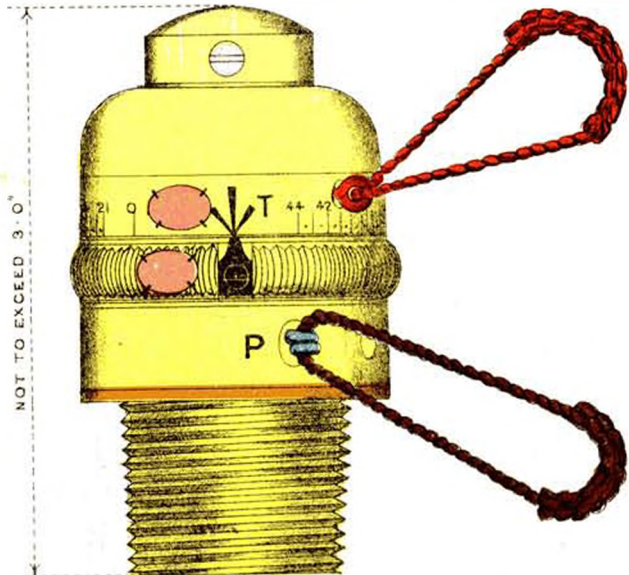
The percussion pellet is filled with F.G. powder instead of the powder pellet, and shalloon instead of muslin is used for the discs.

There are no earlier Marks of this fuze.

P. and P. middle, fuze. §§ 8912, 9809, 9856, 11874. *Fuze, Time and Percussion, Middle, No. 54, Mark III,* is for use with B.L. howitzers, 5-inch, 5·4-inch, and 6-inch, except for star shell. It is obsolete when used up.

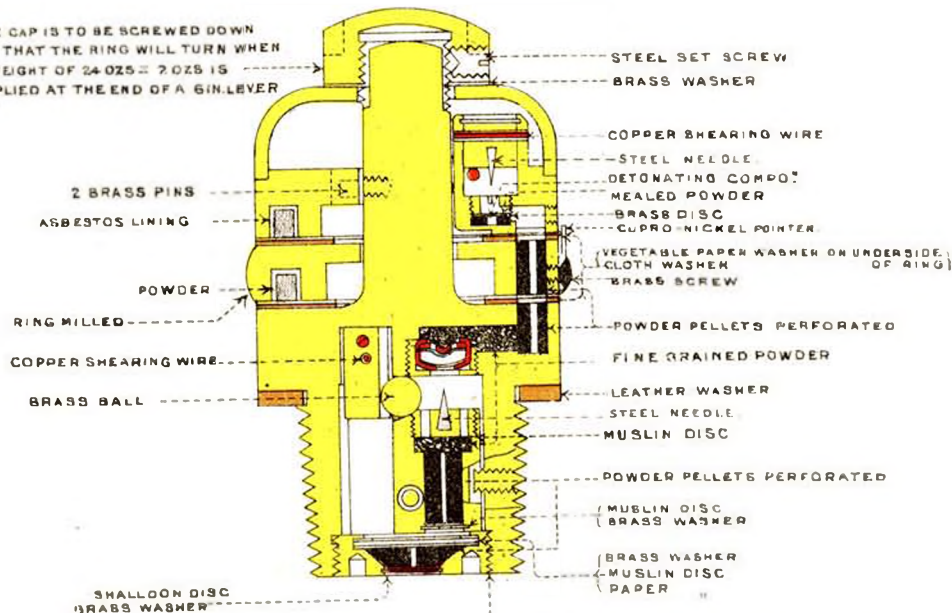
# FUZE, TIME & PERCUSSION, N<sup>o</sup> 63. MARK I | C | METAL.

FULL SIZE



ELEVATION  
SET AT SAFETY.

THE CAP IS TO BE SCREWED DOWN  
SO THAT THE RING WILL TURN WHEN  
A WEIGHT OF 24 OZS = 7 OZS IS  
APPLIED AT THE END OF A 6 IN. LEVER

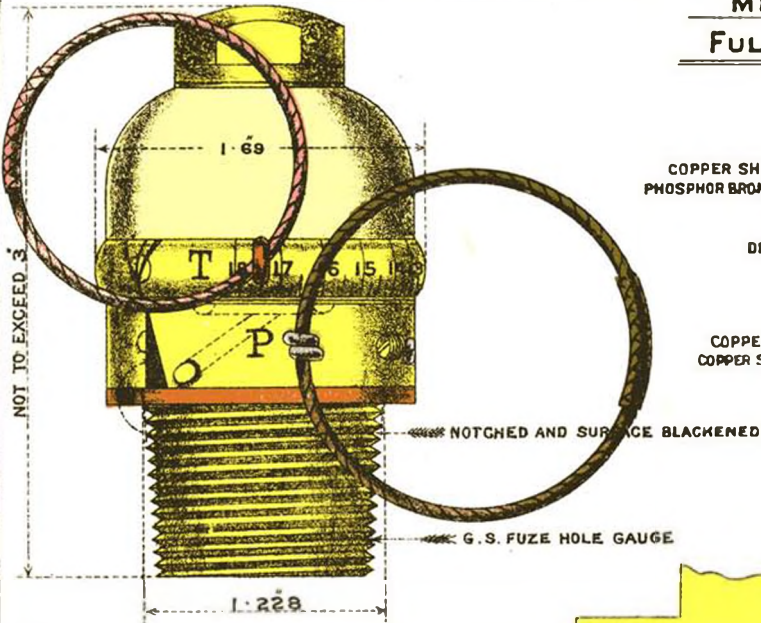


SECTION



# FUZE, TIME AND PERCUSSION NO. 56. MARK IV, |c|

METAL.  
FULL SIZE.



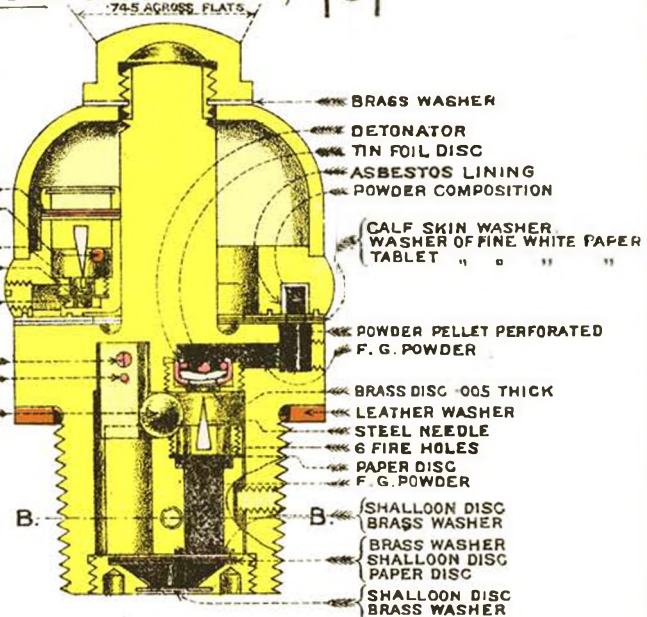
ELEVATION.

NOT TO EXCEED 3

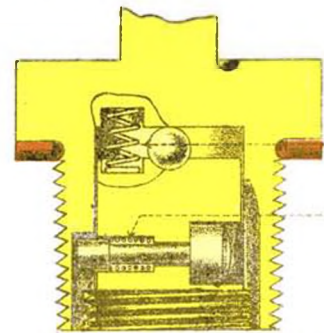
5907-3-06

Wells & Graham, Philadelphia, Pa.

- COPPER SHEARING WIRE .022 DIAM<sup>s</sup>
- PHOSPHOR BRONZE SAFETY PIN .065 DIAM<sup>s</sup>
- BRASS DISC .001 THICK
- DETONATING COMPOSITION
- MEALD POWDER
- COPPER SAFETY PIN .065 DIAM<sup>s</sup>
- COPPER SHEARING WIRE .022 "



SECTION.



PART SECTION.

- BRASS SPRING .015 DIAM<sup>s</sup> OF WIRE
- BRASS SPRING .008 DIAM<sup>s</sup> " "



SECTION AT B. B.

To face Page 82.

Plate 117.

Land Service.—B.L. or Q.F. 4·7-inch and upwards (guns).

Naval Service.—B.L. or Q.F. 4-inch and upwards (guns).

In construction the fuze is similar, in all respects, to the T. and P., No. 56, Mark IV, except as to dimensions, weight, marking, and length of composition. The stem is hollowed out for lightness only; the time ring contains 5·1 inches of fuze composition and is graduated up to 30 divisions. Construction.

The lines of the whole numbers do not extend across the ring as in the No. 56 fuze. Like the latter fuze, its setting mark was formerly an arrowhead but is now a blackened notch, and the time safety pin is made of a single phosphor-bronze wire, where formerly it was made of double copper wire. These changes took place with the 63rd and 58th thousands of the fuze respectively.

The loop of the time safety pin is of bright scarlet whipcord.

The fuze burns at rest about 16 seconds, and weighs about 1 lb. 4 oz.

One in a tin cylinder, the fuze wrapped in brown paper.

*Fuze, Time and Percussion, Short, No. 55, Mark III*, is for use in the Land Service with B.L. guns, 4-inch and 30-pr. and the 12-pr. Q.F. gun. Issue.  
T. and P.  
short, No. 55.  
§ 7176.

It was superseded by the T. and P., No. 56, Mark IV.

The fuze is generally similar in appearance to the T. and P., No. 56.

In the time portion, the stem of the fuze is hollow and communicates with the interior of the dome by three holes. The top cap has a small cylindrical projection on the top, through which four gas escape holes are bored.

This projection affords a ready means of distinguishing the fuze from No. 56.

The gas given off by the burning composition of the time ring escapes into the dome and thence into the hollow stem, from which it finds an exit by the holes in the top cap.

The marking of the time ring is not so distinct as in the later No. 56 fuzes. The setting mark is an arrowhead on the body of the fuze.

The safety pins are of the unstrengthened pattern and the loops are short.

The mean time of burning is about 12·5 seconds.

In the percussion portion the chief difference is in the relative positions of the detonator and steel needle. In this fuze the needle plug is screwed into the underside of the body, while the detonator is placed in a recess in the detonator pellet and retained in its place by a metal screw collar. The needle plug closes the end of the channel communicating with the time portion of the fuze and is provided with fire-holes.

The brass spring between the detonator pellet and underside of the fuze body is placed round the needle instead of to one side.

The action of the time portion is the same as that of the No. 56, except that the escape of gas is through the head of the fuze instead of through the side of the body. Action of  
time part.

In response to demands for a longer burning fuze for use with field guns, the *Fuze, Time and Percussion, 22 seconds, No. 57, Mark I*, was introduced for special service. This fuze differs from the T. and P., No. 56, Mark IV, only in the composition of the time ring, which is made to burn for 22 seconds at rest. No. 57 fuze.  
§ 10174.

In order to distinguish this fuze from the T. and P., No. 56, Mark IV, the dome and the cap are coloured blue, and the cylinder in which the fuze is issued is also coloured blue.



T. and P.  
No. 58.  
§ 12150.

*Fuze, Time and Percussion, 20 seconds, No. 58, is for use with the 15-pr. Q.F. gun with Mark I shell. It is a double-banked fuze.*

In this fuze there are two time rings fitting round a central stem. The lower ring is graduated from 0 to 18 and in halves and quarters, and it has a cross showing the position of safety. This ring can be turned round in order to set the fuze. Above it is the upper ring, which is clamped in a fixed position and cannot turn. This ring carries no graduations. The lighting detonator of the time part and the percussion portion of the fuze are carried in the central stem and body. A safety pin, with scarlet loop, supports the time detonator before loading. The lower time ring is always clamped tightly, and the fuze is set by dragging it round by means of a steel setting key, until the desired graduation is opposite the setting mark on the body of the fuze.

On the shock of discharge the composition of the upper ring lights and burns round until it reaches the zero of the lower ring, when it lights the composition of the latter, which burns in the opposite direction to that of the top ring, until the setting mark on the fuze is reached, when the magazine of the fuze is exploded.

This fuze is obsolete for future manufacture.

§§ 5638, 5982,  
7046, 7231,  
8417, 8788

*Fuze, Time, Sensitive, Middle, No. 24, Mark I.—This fuze will become obsolete when expended. Plate XVII.*

Weight of fuze, 1 lb. 4 oz.

Preparation  
and action.

The fuze is prepared in a similar manner to the T. and P. fuzes, except that both safety pins are removed at the moment of loading. Nothing occurs on the shock of discharge, but immediately the shell begins to rotate the retaining bolts acted upon by centrifugal force fly outwards, compressing the spiral springs and releasing the lighting pellet, which, acted upon by the same force, also flies outwards against the needle, firing the detonating composition, the flash passing through the body of the pellet to the axial magazine; thence it passes out through the fire-holes in the bottom of the stem and ignites the fuze composition. The latter burns round until it reaches the channel behind which the arrow is set, the flame is then communicated to the blowing charge in the bottom, and so to the bursting charge of the shell.

From the above it will be seen that it does not depend for its action on the shock of discharge. It will act equally well with a small or large charge, and is thus suitable for star shell, which are fired with small charges.

§§ 11099,  
11227.

*Fuze, Time and Percussion, No. 61, Mark I.—This fuze is a conversion from No. 56, Mark IV. The escape hole in the body of the fuze is closed by a plug sweated in, the two escape holes in the time ring are also closed. A hole is bored in the time ring at the commencement of the composition, this is closed by a brass disc and Pettman cement, the disc being blown out when the composition is ignited forms an external gas escape. The composition was made slower burning by increasing the proportion of brown powder. For identification, the dome and cap are painted red, also the cylinder in which it is packed. It is obsolete for future manufacture.*

§ 12800.

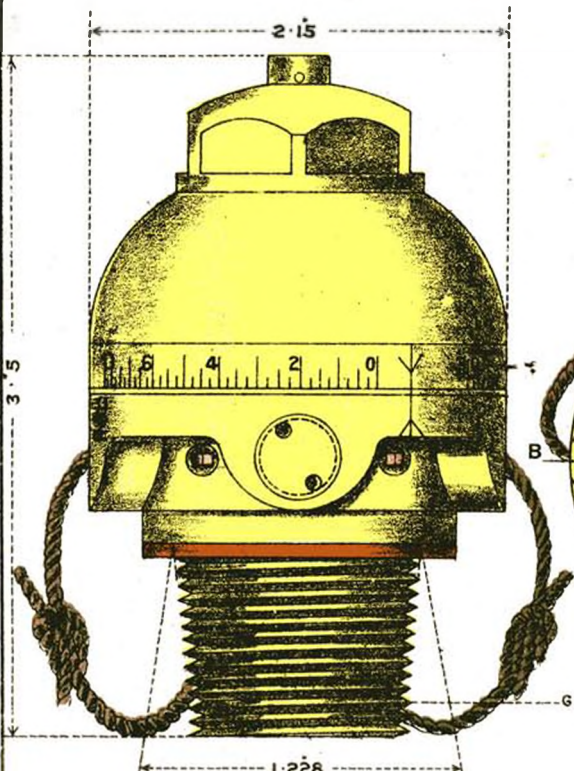
*Fuze T. and P., No. 80, Mark I, consists of a body, two time rings and a cap made of aluminium. The cap is screwed on to the body and fixed permanently by means of a set screw. The upper time ring is prevented from turning by two keys, which fit into recesses in the ring and the body. The lower ring can be turned round by means of a spanner. Into the middle of the body, from the underside is screwed a steel saddle which supports a double-pointed*

# FUZE TIME SENSITIVE MIDDLE N<sup>o</sup> 24 MARK I. (METAL)

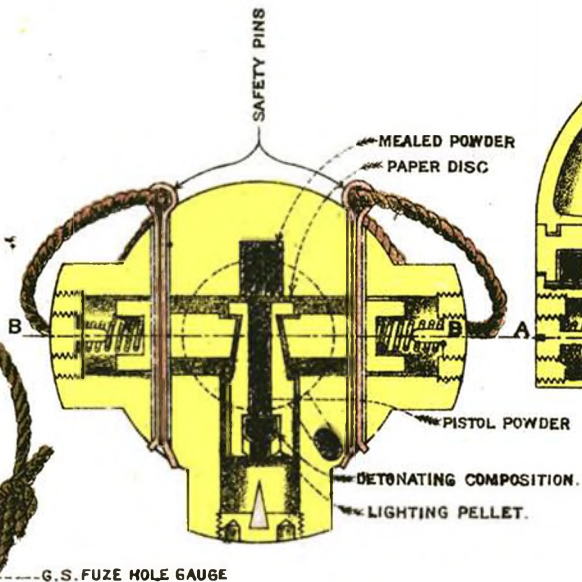
§ 7231

SCALE 1/1.

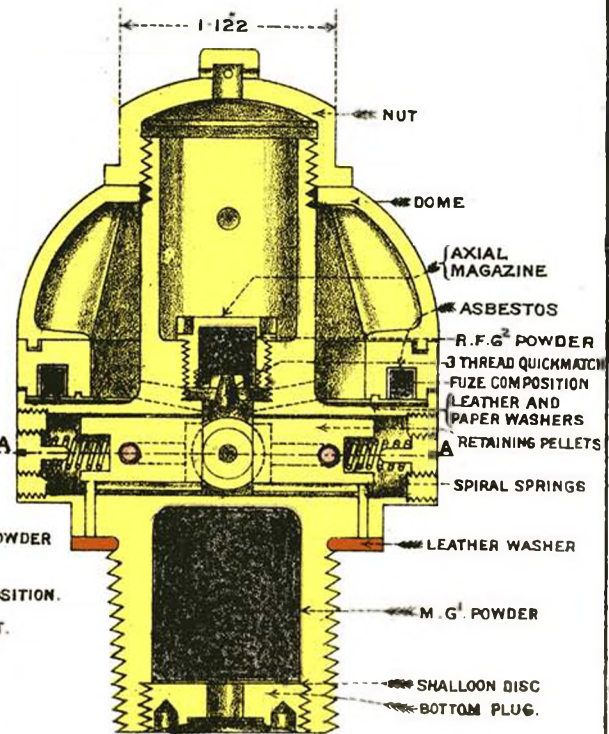
WEIGHT 1 LB. 4 OZ.



ELEVATION SET AT SAFETY.



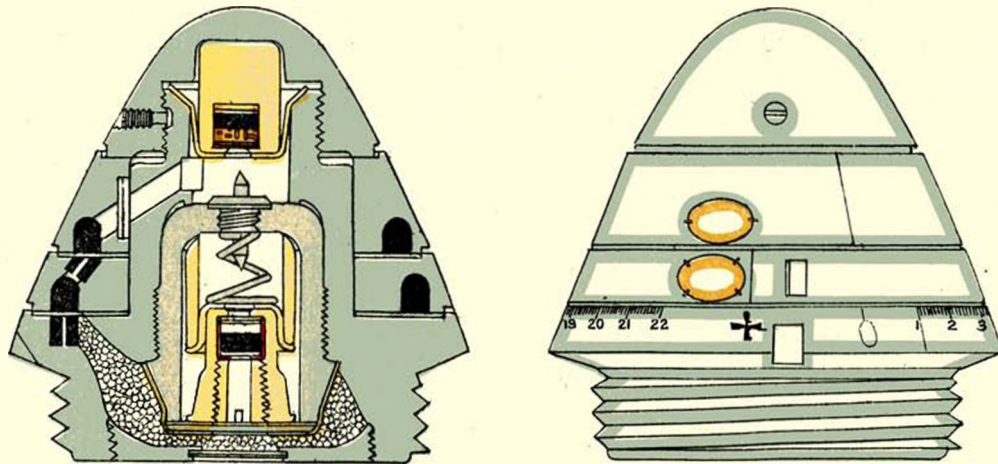
SECTION AT A. A.



SECTION AT B. B.

FUZE T AND P N° 80. L.

ALUMINIUM.



WEIGHT 10.229 OZS.

Page 85.—§ 14128. *Fuze, time and percussion, No. 80, Mk. II. | L. |*

Future manufacture of the above-mentioned fuze will have the time ring between 0 and 1 graduated in a similar manner to the other divisions of the ring; the dagger denoting the safety point will be coloured red.

centre.

This pellet is held in position by a brass collar supported on a two-armed stirrup spring, and also by a spiral spring between the upper end of the pellet and the lower point of the needle.

The base of the fuze is closed by a screw plug with a large flash-hole in the centre of it, which is closed by a thin brass disc water-proofed over with cement. Above this plug is an annular space which is filled with F.G. powder.

The setting mark is on the lower ring and the scale, numbered up to 22, and sub-divided into tenths, is engraved on the body.

The lower part of the body is screw threaded, 14 to the inch, but is considerably larger in diameter than G.S. gauge (known as the F.S. gauge). Weight  $10\frac{1}{4}$  oz. § 12802.

The fuze when set full will burn for about 22 seconds, and is designed for use in the 13-pr. and 18-pr. Q.F. guns.

On the shock of discharge, the upper pellet overcomes the resistance of its stirrup spring and sets back, bringing its detonator on to the upper point of the needle. The flash from the detonator passes through a diagonal hole and ignites the powder pellet at the commencement of the time composition in the upper ring. Action.

The composition in the time rings burns in the same manner as in fuze T. and P., No. 60.

With regard to the percussion arrangements, on the shock of discharge the brass collar overcomes the resistance of its stirrup spring and sets back, jamming itself over the coned portion of the percussion pellet.

On the shock of impact, the percussion pellet, together with the brass cylinder, overcomes the resistance of the spiral spring and flies forward, bringing its detonator on to the lower point of the needle.

The flash from the detonator passes down the flash-hole in the centre of the pellet and ignites the magazine in the base of the fuze.

Plate XVIII, XIX.

*Cover Fuze, T. and P., No. 80, Mark I | L |*. These fuzes when carried in the shell are protected against damp by brass caps. § 12798.

*Fuzes, drill, T. and P.*, are empty service fuze bodies bronzed all over, with the exception of the time rings, and a patch showing the index, which will be left bright. They are fitted with special safety pins and steel washers. §§ 9955, 11343, 10296, 11627, 11872.

*Fuze, Time, No. 25* is an aluminium fuze for use with the 10-pr. star shell; the lower part of the fuze is threaded to the G.S. gauges, and contains a magazine of 25 grains R.F.G.<sup>2</sup> powder, and is closed by a bottom plug with shalloon disc. A blackened notch on the body indicates the position of a fire channel leading to the magazine. The stem is threaded for the clamping nut, and hollowed out to take the lighting arrangement. A needle plug is screwed into the bottom of the stem, the detonator pellet is supported by a stirrup spring, which rests on the top of the stem, the pellet carries the R.L. cap on its underside. A phosphor bronze safety pin passes through the pellet and cap. The time ring is similar to the bottom ring of No. 80, but is graduated from 0 to 44, the safety position being shown by an arrow. The cloth ring and clamping nut are also similar. Plate XX. §12592.

A steel spring washer is placed between the nut and time ring  
Weight about  $5\frac{3}{4}$  oz.

*Action.*—The time ring is moved by a key; the safety pin is pulled out at the moment of loading; on firing, the detonator falls on the needle and fires, the flash passes by the holes in the stem to the powder pellet at the commencement of the time composition, which burns to the setting mark, the flash then passing to the magazine, and so into the shell.

Time of burning, 15 seconds.

**Page 86.**—§ 14066. *Fuze, time, 15 seconds, No. 25, Mk. II.*

The Mk. II fuze differs from Mk. I in the shape of the time ring, which has a lip and recess turned on the underside, fitting into a corresponding recess and lip on the body, the angle of the channel leading to the magazine has been altered, and the flash hole in the bottom plug enlarged. The external contour has also been slightly altered.

A certain number of fuzes have been issued which only differ from the abovementioned fuze in the external contour, and as this difference is slight, the fuzes will be known as Mk. II.

§ 13736 is hereby cancelled.

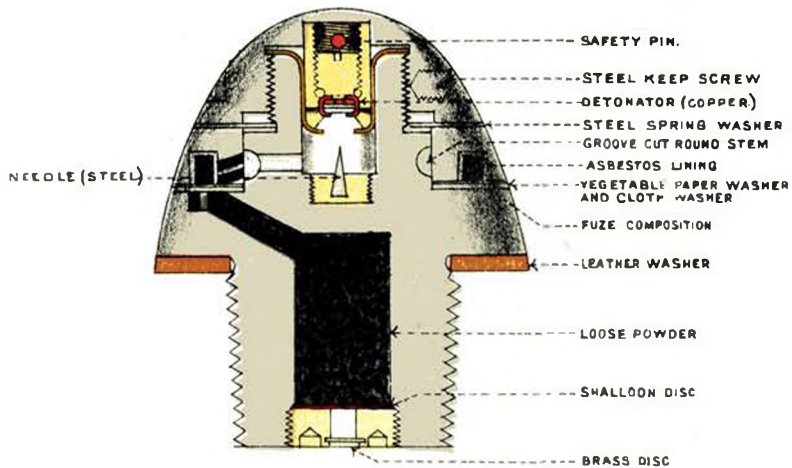
The above fuze is now used with all star shell.

---

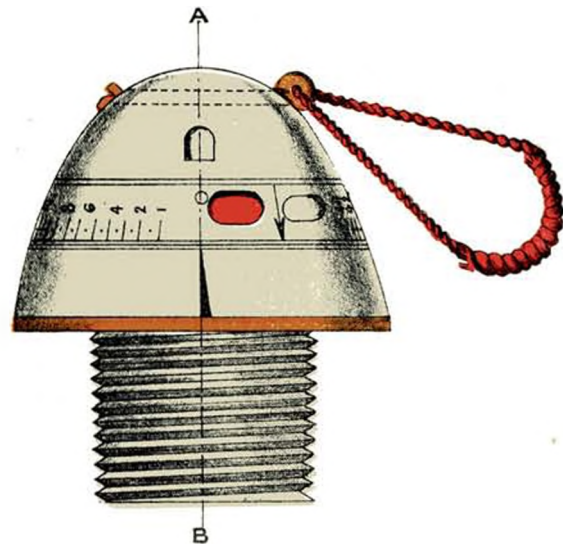


# FUZE TIME, 15 SECONDS. N<sup>o</sup> 25. L.

ALUMINIUM.



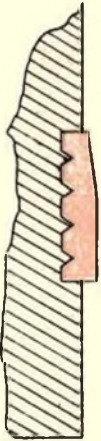
SECTION AT A.B.



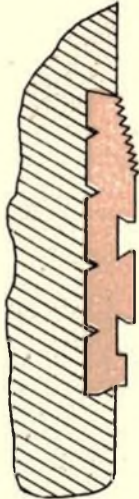
ELEVATION.

# TYPES OF DRIVING BANDS.

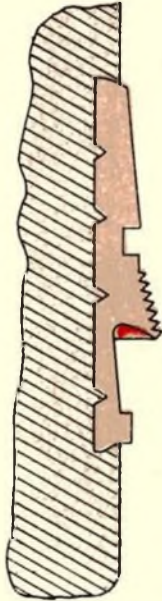
Nº 1.



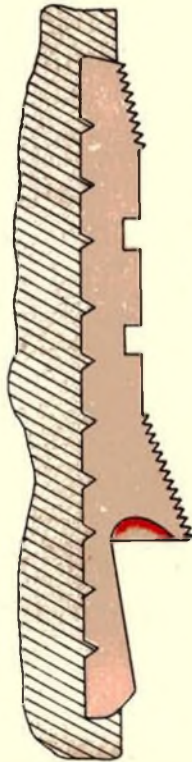
Nº 2.



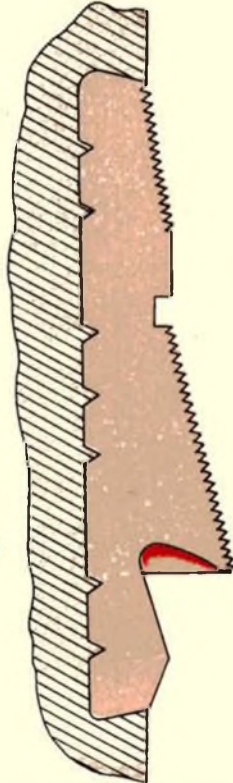
Nº 3.



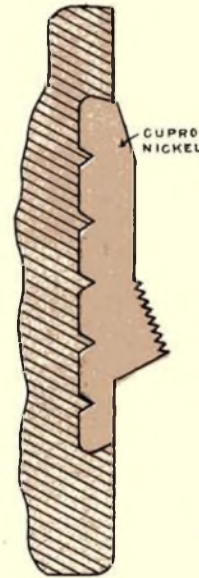
Nº 4.



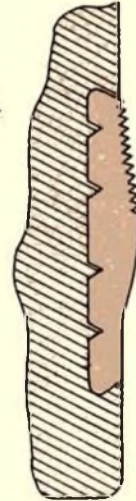
Nº 5.



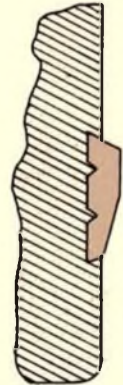
Nº 6.



Nº 7.



Nº 8.



## CHAPTER X.—PROJECTILES FOR B.L., B.L.C., Q.F. OR Q.F.C. GUNS.

### DRIVING BANDS.

In B.L., B.L.C., Q.F., or Q.F.C. guns rotation is imparted to the projectile by means of a somewhat narrow ring or band of copper attached to it not far from the base. This ring is larger in diameter than the bore of the gun, and consequently when the charge is fired the soft metal is compressed into the grooves and cut into by the lands, overflowing somewhat into cannelures or towards the base, at the same time receiving from the grooves a motion of rotation which it imparts to the projectile.

The driving band should be as near the base of the projectile as possible, it being generally found that the more rearward position of the band gives the most accurate shooting. In practice, however, this is limited by the thickness of metal behind the band which is necessary to support the great strain thrown upon the shell, when the band is forced through the grooves, tending to tear off the base.

This tendency to break off the base of the shell round the ring is intensified when any material harder than copper, is employed for the band, and consequently copper has been almost universally adopted for the purpose. But the hardness of two samples of the same copper differently prepared will vary, and it is found in practice that the best condition of the metal for this purpose is that in which it is cut from drawn tubing in the shape of rings which are afterwards annealed and then forced into a groove round the circumference of the shell by a powerful hydraulic or other press. Electro-deposited copper is also used.

Recently cupro-nickel, *i.e.*, copper containing about 5 per cent. of nickel, has been introduced as the material for driving bands for certain high velocity guns.

In our service the projectile is centred by confining the limits at the shoulder within the narrowest compass, so that the projectile may fit as accurately as possible between the lands; and by giving a considerable bearing surface to the driving band.

Plate XXI shows sections of the principal driving bands. These are not accurately drawn to scale. The numbers are for reference in connection with the tables.

The Vavasseur driving bands now employed are of three descriptions; the "narrow," the "broad," and the "broad with gas-check."

The Narrow Vavasseur (No. 1) band was employed with early issues of certain projectiles for 4-inch, 5-inch, 6-inch, 9.2-inch and 12-inch guns; the driving band for the 9.45-inch howitzer is practically the same.

It consists of a ring of copper cut from a tube and pressed into a shallow groove round the circumference of the shell near its base. The width of the ring varies with the calibre. The distance of the rear of the ring from the base of the shell also depends upon the

Position of driving band.

Material.

Centering.

Vavasseur.

Description.



calibre, but it is always reduced to a minimum consistent with the strength of the projectile. On the bottom are ribs parallel to the circumference, triangular in section, and  $\cdot 04$  inch high. These ribs are not continuous, being cut away at intervals. The object of dividing the ribs is to prevent the band slipping.

In recently manufactured projectiles the bottom of the groove for the driving band is formed with waved ribs, which are continuous, except for diagonal chisel cuts across them in three places, to allow the air in the channels between the ribs to escape when the band is being pressed in.

Into this groove the band is forced by a powerful press and afterwards turned to exterior dimensions, the front part being bevelled off at a slope of  $7^\circ$ , so as to fit into the cone between the bore of the gun and the powder chamber, and hold the projectile in its place.

Broad band.

One of the objections to this narrow band of large diameter is the "jamming out" of the metal; that is, the surplus copper is dragged back by the lands of the gun as the projectile passes down the bore and forms a sort of fringe behind the band. When the shell leaves the gun this fringe is no longer supported, and the pressure of the gas behind it turns it up at various angles to the axis of the projectile, thus forming variable resistances and causing irregularity of flight.

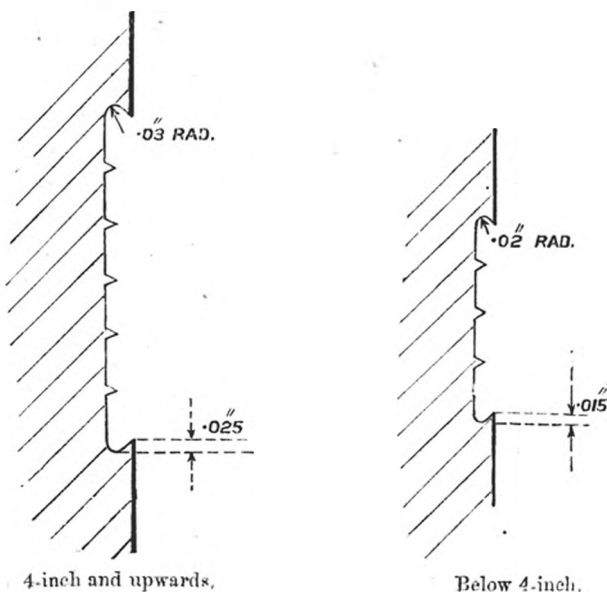
To meet this objection, the broad band (No. 2) was introduced. In it the exterior diameter is somewhat reduced and the width is considerably increased, while cannelures have been cut in the copper to receive the excess of metal.

The band is of pure copper cut from a tube, and pressed into the groove near the base of the projectile.

§§ 9957,  
10157.

Previous to April, 1899, the sides of this groove were straight, but since that date the groove has been undercut for all projectiles, in order to make a firmer attachment with the driving band. (See wood-cut.)

*Undercut grooves for driving bands, showing dimensions of undercut.*



The distance of the band from the base of the projectile is determined by the minimum amount of material necessary for its support, the position being the same in all natures of projectiles of the same calibre. The front slope of the band is  $7^\circ$  as before, and it is furnished with cannellures for all natures.

From 4-inch and upwards, except the 30-pr. 5-inch and 5.4-inch B.L. Howitzers, and the 4.7-inch Q.F., the bottom angles of the cannellures (except the rear bottom angle of the rear cannellure *see cut*) are undercut to take the augmenting strips. § 8919.

The cannellures of 12-pr. Q.F. projectiles, other than shrapnel shell, are also undercut to take augmenting strips. § 9723.

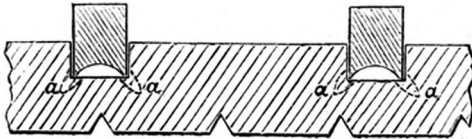
The front slope of all broad driving bands is now grooved or serrated to ensure the projectile gripping in the chamber and to prevent slipping back when loading with the gun elevated. This alteration was approved first for 9.2-inch and upwards, then in June, 1894, it was extended to 6-inch and upwards, and finally extended to all calibres. §§ 6119, 6225, 7569, 8693, 10304.

*Strips, augmenting, B.L., Mark I,* are for use with B.L., Q.F. or Q.F.C. projectiles, having broad Vavasseur driving bands, 4-inch and upwards, except for 5-inch and 5.4-inch B.L. howitzers, and 4.7-inch Q.F., in cases when the rifling of the gun has, owing to firing, become much worn. They are also issued for 12-pr. Q.F. projectiles, other than shrapnel shell. When the stock of these projectiles has been used up, augmenting strips will become obsolete. Augmenting strips. §§ 5891, 6140, 6228, 9091, 9399, 9723, 10302.

The function of the augmenting strip is chiefly to correct the ramming, and to hold the projectile until the charge is well ignited.

The strips consist of pure copper, of even section throughout, and grooved on one side (as shown in the sketch). The lengths of the strips vary with the calibre, and they are marked for the nature of the gun with which they are intended to be used. Description.

Projectiles with cannellures undercut will have the letter U stamped on the driving band between the first and second cannellures.



The augmenting strip is placed in the cannellure, grooved side downward, and hammered round the shell until the two ends meet. Mode of use. § 5687.

When the gun is further worn and one strip is found to be insufficient, two may be used, the second being secured in the lower cannellure, but the addition of a second or third strip appears to make little or no difference.

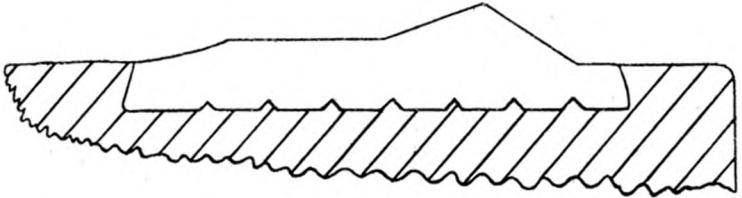
With projectiles for the 13.5-inch B.L. gun, having 5 cannellures and the front slope grooved, the augmenting strip will be placed in the second cannellure, as it cannot be efficiently used in the first which comes at the junction of the front slope with the cylindrical portion of the band. Later issues of these projectiles have four cannellures only, and in that case the augmenting strip may be used in the front cannellure. § 9453.

For those projectiles which were issued before the undercutting of the cannellures, a special steel chisel is provided. By means of this chisel and a hammer V-shaped grooves are cut in the bottom angles of the upper cannellure, as shown by the dotted lines *a, a*, in the sketch. § 5887.

Page 90.—§ 14032. With reference to § 13260, it should now read as follows:—

In future, projectiles not fitted with gas-check driving bands may be fired with cordite charges at practice, from B.L., B.L.C., Q.F. and Q.F.C. guns 6-inch and up, provided an augmenting strip is used with the existing broad vavasseur band, except when firing full charges from the B.L. 9·2-inch Marks IX, X and X<sup>v</sup>, guns, in which case projectiles with gas-check driving bands must be used.

Page 90.—New type of driving band for B.L. 9·2-inch and 7·5-inch projectiles. The band is made from solid drawn copper, and is shown below in sketch.



not undercut, since augmenting strips are not required in the rear of band.

Modifications have been made in this driving-band since it was first introduced, principally with regard to the extent and depth of the serrations on the gas-check lip. These are now made deep and sharply pointed in order to better ensure the projectile remaining fast in the chamber and not slipping back. The gas-check lip of these bands also tends to prevent over-ramming the projectile in worn guns.

§§ 10177, 10187, 10252, 10508, 10720. Bands (Nos. 4 and 5) of slightly different form have been introduced for the projectiles, both "Light" and "Heavy," of 12-inch B.L. guns, and also for B.L. 13·5-inch, 10-inch, 9·2-inch, and 8-inch. In these the "grave" behind the gas-check lip differs in shape.

The object of this is to prevent the metal of the lip "fringing" when it is jammed back by the passage of the driving band through the gun. This was found to occur and so affected the shooting of the gun. The size of the "grave" is so arranged that the metal of the lip just fills it and a tendency to fringe is eradicated. With the 10-inch and up the front slope is also serrated.

§ 8735. Projectiles having the driving band, with gas-check, will be fitted with rope grummets for the protection of the band when in store and transport. 6-inch to 8-inch, grummets of 1½-inch tarred rope, placed one on each side of the gas-check portion of the band. 9·2-inch and above, grummets of 1½-inch and 2-inch tarred rope, placed on the band, the former above and the latter below the gas-check portion.

In the L.S. the grummets will be removed whole by means of a "driver-grummet," of hard wood, and a mallet.

Cupro-nickel driving bands (No. 6) are used with projectiles for the 6-inch, Marks VII and VIII, guns (29 lb. charge), also the 7·5-inch.

These differ principally from the gas-check driving band in having the metal in rear of the gas-check portion sloping towards the base of the projectile instead of being undercut, to form a grave.

The driving bands for later projectiles, 6-inch howitzer (light), 5-inch and 4-inch, also for the 8-inch special for Marks VII and VIII guns (No. 7), are without cannellures, sloping from a short cylindrical portion to front and rear, the width of band and slopes varying considerably with the different calibres.

The slope in rear reduces any tendency to fringing. This band was also used with the 10-pr., 12-pr., and 15-pr., with certain issues of projectiles.

No. 8 shows the band at present used with the 10-pr., 12-pr., and 15-pr. It is a narrow band, having a short steep slope in front, and is also sloped off in rear.

Projectiles which are altered by being rebanded with the driving band with gas-check will have the symbol \* added to their numeral. Those rebanded with new gas-check driving band add \*\*, the 12-inch H. adds one \*, except the common pointed practice Mark I, which adds two \*\*; this is to distinguish them from shells which had their grooves cut to fit the new bands, § 10341.

Projectiles re-banded with cupro nickel bands for use with 6-inch Marks VII and VIII guns also add a star to their numeral.

10-inch projectiles which have the gas-check lip reduced to correspond with the latest band have the letter "T" stamped on the band between the cannellures.

The projectiles fired from B.L. and Q.F. guns and howitzers are:—

Common	} Shell.
Common pointed	
Lyddite	
Armour-piercing	
Shrapnel	
Star	} Shot.
Armour-piercing	
Palliser	
Case	
Solid	
Paper	
Proof	

The diameter of B.L. and Q.F. projectiles across the bands or the body of those which are cast without bands is less than that of the bore of the gun across the lands, varying from about .05-inch with heavier natures to .02-inch with the smallest. Windage, &c.

#### Common Shell.

Common shell are designed to hold as large bursting charges as possible, but must be strong enough to stand the shock of discharge without deformation and the shock of impact without breaking up. Common shell.

The nose of the shell is fitted with a gun metal bush threaded internally to take the fuze or plug.

The interior of the shell is lacquered or painted so as to give a smooth surface.

The bursting charge for 4-inch shell and upwards, which consists of P mixture, is enclosed in a bag made of *dowlas* as a precaution against the premature explosion of the charge from the shock of discharge and friction against the walls of the shell.

Common shell of cast-iron, cast-steel, and forged steel will be found to exist in the equipments of B.L. guns. From 6-inch upwards the latest patterns are of cast-steel; for other calibres the latest patterns are of forged steel.

The Roman numeral indicating the pattern refers to the mark of the projectile, and not to that of the gun. This applies to all natures of projectiles.

Cast steel.

Cast-steel common shell of the following calibres have been manufactured :—16·25-inch, 13·5-inch, 12-inch light and heavy, 10-inch, 9·2-inch, 8-inch, 8-inch special for Mark VII and VIIa guns, 6-inch B.L. or Q.F., and 30-pr. guns, and 6-inch 30-cwt., 5·4-inch howitzers.

§§ 10412,  
12388.

They have been declared obsolete for future manufacture, except the 12-inch heavy:

They are about 3·5 calibres long, with ogival heads struck with a radius of two diameters, the walls being about one-seventh the diameter in thickness. A flanged gun-metal bush is screwed into the nose, and is threaded to the G.S. gauge, with the usual 2-inch countersink to receive the naval wad, except the 30-pr., which is not countersunk.

Bands.

From the 8-inch upwards they have "bands" that is, the diameter of the shell over the greater part of the body is slightly reduced, leaving a zone of metal at the base and another at the shoulder of the full diameter of the shell.

Lifting eye-bolt.

From 8-inch upwards, except the special shell for the 8-inch Mark VII and VIIa guns, they have a hole bored in the side, opposite the centre of gravity, and threaded to take an eye-bolt for lifting purposes. (See page 145.)

The driving band is pressed into a groove near the base, which in the latest is undercut, and provided with waved ribs.

Closing bases.

In casting, the core spindle in the heavier natures passes entirely through the base. This necessarily causes a large hole to be left in the base of the shell.

This hole is threaded with a left-handed screw thread and in the earlier C.S. shell is closed by a solid gun-metal plug. There are two sizes of the plugs, the large in use with the 13·5-inch Mark I and 12-inch Mark IV, and the small with the 9·2-inch Mark IV shells. The joint between the plug and body of the shell is sealed by a lead ring, hammered into a recess round the plug.

For the 9·2-inch and upwards, these holes in the base are now closed by "adapters." The adapter is made of gun-metal, similar in size to the gun-metal plugs, mentioned above, but differing from them in being bored out and threaded with a left-handed screw thread to receive the large base plug. There are two sizes of these adapters, the large for use with the 16·25-inch Mark III, 13·5-inch Mark II and 12-inch light Mark V and the small with the 10-inch Mark I and 9·2-inch Mark V shells.

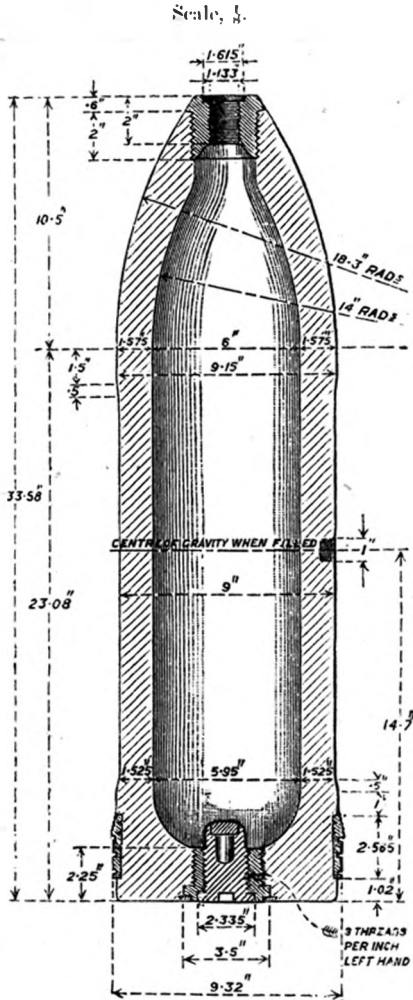
The joint between the adapter and body of the shell is sealed by the lead ring hammered into a recess round the adapter and the joint between base plug and adapter by luting. (See page 93.) Formerly a lead washer was used, under the flange of the base plug, but when the plug is removed for any purpose, the lead washer is to be taken off and luting used when replacing the plug, care being taken to screw the plug home.

The 8-inch Mark IV and 6-inch Mark VI take the large base plug only, without adapter; while the 6-inch Marks IV and V take a base plug similar to those used with cast-iron common shell, the joint in this case being sealed by a large lead disc, hammered into a recess over the plug. (See page 97). Some cast steel shells supplied by contract may not have the adapter, in which case they will be fitted with a large base plug similar to the 8-inch Mark IV or 6-inch Mark VI.

Black, with a white ring,  $\frac{1}{2}$ -inch wide, at a distance of 1 inch from the fuze hole, denoting steel. The driving band is not painted.

Rings, base plug, large and small, are used with B.L. cast-steel common shell, 9.2-inch and upwards and earlier issues of common pointed. They are made of lead,  $\frac{3}{8}$ -inch in thickness, and hollowed out on the under surface; they are intended to be hammered into the recess round the base plug or adapter to seal the joint. Rings, base, plug. § 5334.

9.2-inch, Mark I.



The large ring is for 12-inch shell and upwards, and 16.25-inch forged steel Mark II, the small for 9.2-inch and 10-inch.

Shell, B.L., Common, Pointed, Cast steel, are for B.L. guns 4-inch and upwards, and for Q.F. guns 12-pr., 4 inch, 4.7-inch, and 6-inch, also for the 9.45-inch howitzer.

Page 94.—§ 14178. *Shell, B.L., common, pointed, with cap*, are now being manufactured for Naval Service. These shells differ from previous patterns in being of a stronger design, in having a cap fixed over the point, and in being fitted with a brass or copper container to hold the bag and bursting charge of "P" mixture.

8-inch and upwards they have bands and the hole for lifting eye-bolt, and the earlier patterns have adapters in the base; the small adapter for 8-inch and large for 9·2-inch and upwards.

§ 9963.

The later patterns have a steel bush screwed into the base and the joint riveted up, instead of the adapter. This steel bush is screw-threaded inside to take the large base fuze or plug, and is not removable. (See plate XXII.)

The 6-inch has its base closed by the No. 1 base plug and below 6-inch by the No. 2.

Exceptions.

The 4·7-inch Q.F., Mark III, took the Armstrong base fuze. This fuze is obsolete for L.S., but a few of them may still be met with in the Navy. The 12-pr. Q.F., Mark I, took the Hotchkiss base fuze. Very few of these are likely to be met with.

Paint.

Black with a white ring,  $\frac{1}{2}$ -inch wide, one inch from the tip, denoting steel. The driving band is not painted.

Forged steel.

Forged steel shells of the following calibres have been issued:—16·25-inch, 12-inch, light, 9·2-inch, 8-inch, 5-inch, and 4-inch.

These shells, in external appearance, length, &c., closely resemble the cast-steel common, but being made of a stronger material, the walls are thinner, and their capacity for bursting charge increased in proportion. With one exception they are forged with solid bases, and consequently are filled through the nose. This exception is the 16·25-inch Mark II, which has the centre of the base bored out and screwed to receive the large adapter, as in the cast-steel shell. The 16·25-inch Mark I common shell has a solid base, and, for convenience of filling, the bush is removable. After filling, the bush is secured by means of red lead.

They are all fitted with flanged gun-metal bushes, countersunk to take the Naval wad. The 8-inch and upwards have the hole in the side to take the "bolt, eye, lifting."

These shells are for use with powder charges, and are obsolete for future manufacture.

They are painted in the same way as the cast-steel common.

§ 12355.

*Shell, B.L., Filled, Common Pointed, 9·45-inch Howitzer, Mark I*  
| L |.—This shell is made of steel with a removable base, screwed in the centre to take either a special plug, or the "Fuze, percussion base, B.L. 9·45-inch howitzer, Mark I."

The charge is composed of compressed ammonium powder, made up in two parts. Each part has a hole through the centre to take a burster of F.G. powder, enclosed in a muslin bag. Each part is wrapped round with thin paper, then covered with tin foil, and both enclosed in a calico bag, the mouth of which is drawn up.

*Shell, B.L., Common, cast-iron*, have been made for the following calibres:—

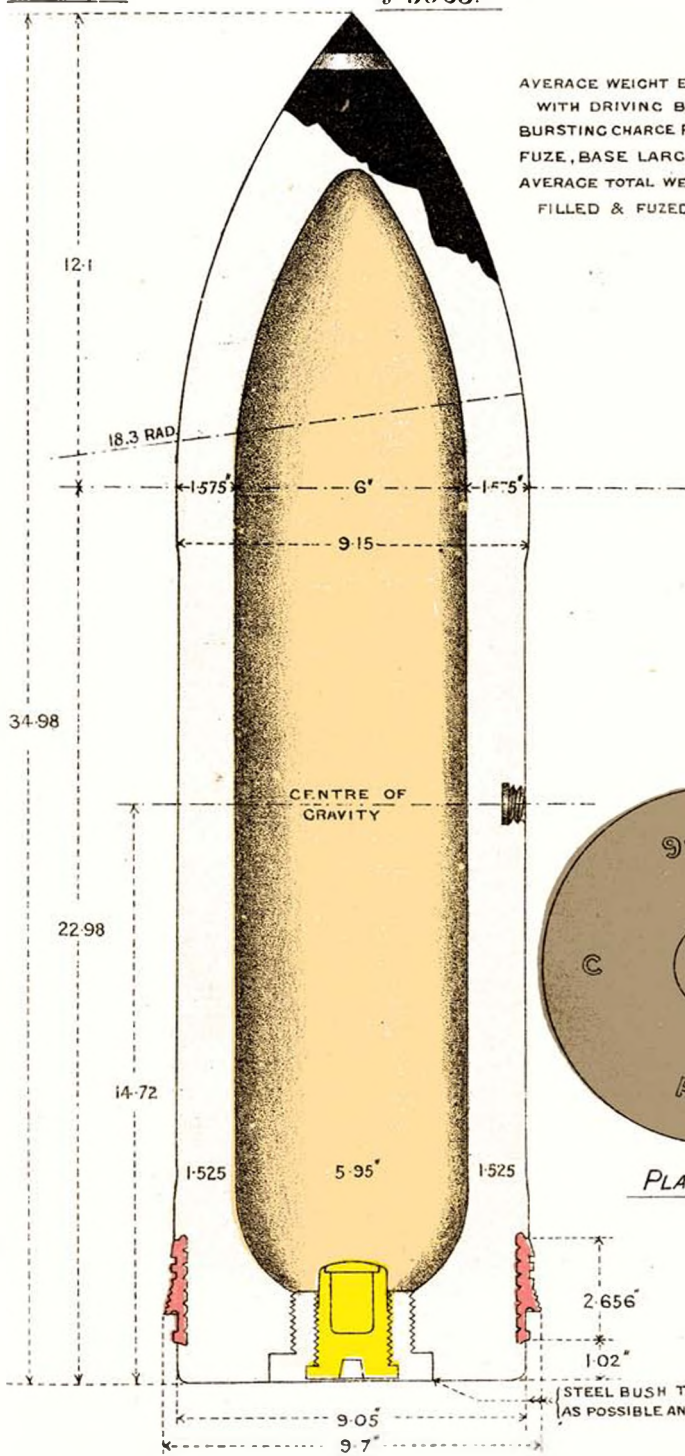
12-inch light, 9·2-inch, 8-inch, 6-inch, 5-inch, 4-inch, and are still manufactured for 6-inch, 5·4-inch, and 5-inch howitzers for practice—or service, if required; and for 4·7-inch Q.F. on travelling carriages for practice. These are filled with L.G. powder.

They are from 3 to 4 calibres in length, the walls and base being made of the necessary thickness to withstand the shock of discharge. Their heads are ogival, struck with a radius of two diameters, and the bases are nearly flat. From the 4-inch and upwards they are provided with a gun-metal bush, which has a flange extending over the nose

# SHELL B.L.COMMON POINTED 9.2 IN CAST STEEL.

MARK IV N.  
FOR LARGE BASE FUZE.  
\$ 9963.

SCALE  $\frac{1}{5}$



AVERAGE WEIGHT EMPTY	}	LB	OZ.
WITH DRIVING BAND		347	.8
BURSTING CHARGE P & F.C.		30	.0
FUZE, BASE LARGE		2	.8
AVERAGE TOTAL WEIGHT	}	360	.0
FILLED & FUZED			

PLAN OF BASE.

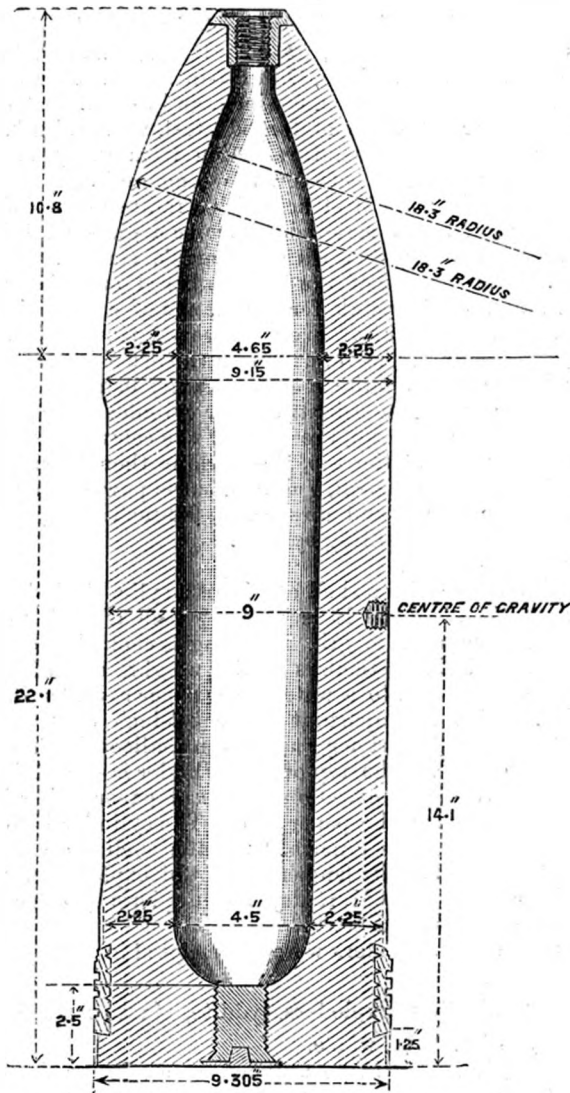
STEEL BUSH TO BE SCREWED IN AS TIGHTLY AS POSSIBLE AND THE JOINT RIVETED.



and rounded on the exterior to the same shape as the head of the shell. This bush is threaded to the G.S. taper and pitch, and has a .2-inch countersink to receive the Naval wad. The 8-inch and up have bands, and a hole is bored into the side in line with the centre of

*Shell, B.L., Common, 9.2-inch, Cast Iron, Mark VII.*

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



gravity, and threaded to take an eyebolt for lifting purposes. Rotation is imparted to them by means of a copper driving band secured to the body near the base.

They are lacquered or painted internally to take the bursting charge, which is contained in a burster bag. The 6-inch and

upwards have a hole in the base, through which they are filled; this hole is closed by a gun-metal screw plug, a recess left over the latter is sealed by a lead disc hammered in after filling.

Paint.  
5-inch, I  
and II.

Black all over, except the driving band.

The 5-inch Marks I and II gun shell have gun-metal screw plugs in the base, but they are not to be utilised for filling. They are issued with the lead disc permanently hammered in.

*Shell, B.L., Common, Lyddite, forged steel*, are made for the following calibres:—

B.L. guns, 10-inch, 9·2-inch (heavy and light), 8-inch, 8-inch (special for Marks VII and VIIA guns), 7·5-inch, B.L., Q.F., or Q.F.C. 6-inch, and 4-inch B.L. or B.L.C. 5-inch, Q.F. 4·7-inch B.L. 60-pr. and 30-pr., B.L. howitzers 9·45-inch, 6-inch, 5·4-inch, and 5-inch. Plate XXIII.

These shells are all made of forged steel, with solid bases so as to prevent any chance of premature action from the penetration of gas through a base fuze, or between the plug and body of the shell.

The head of the shell is struck with a radius of two diameters, the point truncated, and screwed to receive a gun-metal bush, the threads of which are coated with Pettman's cement, before being screwed in. The interior of the bush is bored out, screwed to the G.S. gauge, and countersunk for the flange of a special fuze-hole plug. The usual undercut groove with waved ribs for driving band is turned near the base, the interior is varnished with a hard brown varnish and filled with lyddite, a central cavity being left for the exploder; in later issues an asbestos paper cylinder lines this cavity. Certain issues, 6 inch and up, are without the central cavity, a slight depression being left at the top, the shell is then filled with from 8 to 10 exploders, lyddite shell, 7 drams, picric powder in waterproof bags. From the 8-inch and up (except 9·2-inch light) they have the hole in the side for a lifting eyebolt.

Paint yellow all over.

The exploder for lyddite shells consist of a cylindrical shallow bag filled with picric powder. It is about  $\frac{3}{4}$  inch diameter, and from 9 inches to 17·5 inches in length. The bag is choked at one end; on it is printed, in black, particulars of the weight, etc., of the picric powder. The bag fits into a waterproof paper cylinder in order to keep it dry, which is important; with 5·4-inch calibres and up, an 8-dram black powder primer enclosed in shallow is placed on top of the picric powder. The top of the cylinder is closed by a perforated aluminium cap shellaced on, a disc of paper being shellaced inside. Earlier issues had a paper cap. The cylinder is fitted with a silk loop to facilitate its removal from the shell on examination. On it is marked in black its length, weight of exploder, a disc if an 8-dram primer is used; D.M. if dry mixed picric powder is used; contractor's initials,  $\lambda$ , and mark.

The first issues of exploders were not enclosed in waterproof paper cylinders.

ISSUED SPARE in Box, Exploders, Lyddite, Marks I and II:—

Case, powder, M.L., whole.

Cylinder, No. 6, for inspecting ordnance officers; for transport three of these cylinders may be placed in Cylinder, Ammunition, half-barrel.

Lead discs.

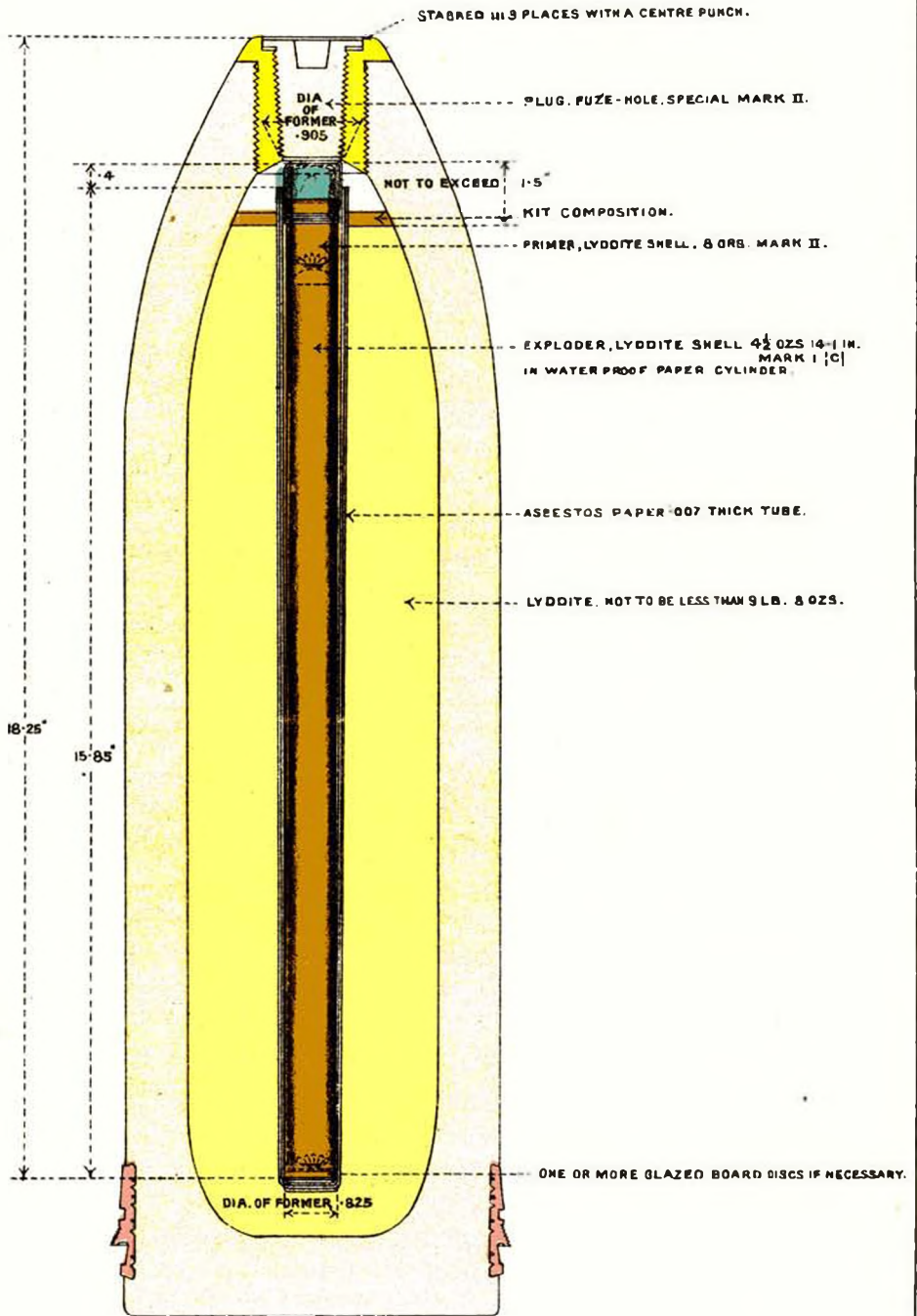
§§ 4137, 5083.

As mentioned above, *Discs, base plug*, are employed with B.L. cast-iron common shells, 6-inch and upwards, and 6-inch cast-steel, Marks IV and V, to seal the joint when the base plug is screwed in.

# SHELL B.L.Q.F. OR Q.F.C. COMMON, LYDDITE, 6 INCH GUN MARK IV | C

FORGED STEEL.

SCALE  $\frac{1}{3}$ .



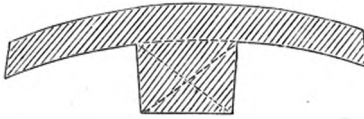
SECTION.

They are made of lead, slightly concave, and have a square projection which fits into the hole in the base plug. When hammered flat they fit tightly into the slightly undercut recess in the base of the shell.

There are two sizes.

The small one is about 1.89 inches diameter, weighs  $3\frac{3}{4}$  oz., and is used in the 6-inch (cast-iron) and 8-inch.

The large is about 2.13 inches diameter, weighs 5 oz., and is used in 6-inch Marks IV and V (cast-steel), 9.2-inch, and 12-inch.



*Shell, B.L., Common, pointed, practice, of cast-iron were made for the following calibres:—B.L. guns, 16.25-inch; 13.5-inch; 12-inch, heavy; 12-inch, light; 10-inch; 9.2-inch; 8-inch; 6-inch B.L., Q.F., or Q.F.C.; 5-inch; 4.7-inch Q.F.; 4-inch B.L., Q.F., or Q.F.C.; and 12-pr.*

Practice shell.

These shell differ from the cast-steel common pointed, as follows: The cavity is not lacquered, being filled with salt cake, the base is closed by plug, base, shell, No. 4, for 6-inch and up; No. 5 for shells below 6-inch. The letter P is stamped on the base (12-pr. on the side). They are obsolete for future manufacture, being superseded by the solid shot.

12-pr. Q.F. pointed common shell, iron, Marks I and II. These shell are lacquered, may take a bursting charge and may be used for service on emergency. The 4.7-inch Q.F., Marks I and II are fitted for the Armstrong base fuze or plug, and the Mark V is lacquered inside.

§§ 8481, 997.

§ 8715.

They are painted black all over, with a yellow band round the centre of the body (denoting practice). The 12-pr. Marks I and II have no yellow band, unless issued filled with salt.

Paint.

Filled with salt and plugged.

Issue.

#### A.P. Shell.

*Armour-piercing Shell*, as their name implies, are intended for the attack of armour. They have a comparatively small cavity for the bursting charge, and are carefully hardened by special processes, the point being made extremely hard, while the body is softer so as to give greater tenacity and enable the shell to hold together when it strikes hard-faced armour.

Caps of mild steel have been introduced, which are fixed over the points of recently manufactured shell. They are found to give increased penetration, especially with high striking velocities and normal impact.

A.P. shell are stored for three months before being filled, owing to their liability to split spontaneously from the strains set up in the metal by the hardening processes. The sudden fracture of the metal might be sufficient to cause the explosion of the bursting charge.

Recently manufactured A.P. shell are varnished internally, and have a bursting charge of blank L.G. or R.L.G.<sup>4</sup> powder enclosed in a lasting cloth bag, but there are large numbers of shell in the service which are lacquered internally, and have a bursting charge of P mixture enclosed in a dowlas bag.

*Armour-piercing Shell* are employed with B.L. guns, 13.5-inch; 12-inch, heavy and light; 10-inch; 9.2-inch; 8-inch; 8-inch special Marks VII and VIII A guns; 7.5-inch B.L.; Q.F. or Q.F.C. 6-inch and 4-inch; Q.F. 4.7-inch. They are of steel, forged or cast, the head being ogival struck with a radius of two diameters, and hardened for the penetration of armour. The cavity is so formed as to leave a considerable amount of metal in the head, the metal regularly decreasing in thickness towards the shoulder of the shell. The base is closed by the plug, base, shell, No. 1, for 6-inch and up, No. 2 for shell below 6-inch. With shells 6-inch and above a steel bush may be screwed into the base and riveted over; this bush is bored out and tapped to receive the fuze or plug. The driving band is pressed into an undercut groove near the base. 7.5-inch and above have bands formed on the shell, but no eyebolt hole, as this would be a point of weakness in the shell, and it is important that the skin of the shell should be intact. The letters A.P. are stamped on the base. The 4-inch and 4.7-inch are of forged steel. Plate XXIV.

Paint.

They are painted black with two white bands,  $\frac{1}{2}$ -inch wide, the first 1 inch from the point and the second  $\frac{1}{2}$  inch below it.

§ 12413.

*Models, Points, A.P. Projectiles* for guidance of I.O.O.'s in sentencing A.P. shot and shell with damaged points. Projectiles with points which are not damaged to a greater extent than the model points will be considered serviceable. Those with points which have sustained greater damage than is shown in the model points will be sentenced for practice, unless in the opinion of the I.O.O. such projectiles are not suitable for practice. A complete set comprises No. 1, all calibres; No. 2, 8-inch and below; No. 3, 9.2-inch and above.

### *Shrapnel Shell.*

Shrapnel shell.

Shrapnel shell have been manufactured for all calibres of B.L. guns, except 12-inch heavy, and, like the common, will be found made from cast iron, cast steel, and forged steel; but it may be said that for these guns steel, either cast or forged, has almost entirely superseded iron for this particular class of projectile. The latest patterns from the 6-inch upwards (except the 16.25-inch) are of cast steel—below 6-inch of forged steel.

A description of the various types will be given in detail.

Shrapnel shell are designed to hold as many bullets as possible, but the shell must be strong enough to hold together on discharge and during flight. The bursting charge is just sufficient to open the shell and release the bullets, which are the only useful part of the shell so far as its man-killing effect is concerned.

9.2-inch shrapnel.  
§ 12120.

*Shell, B.L., Shrapnel, 9.2-inch, cast steel*, may be taken as a good representative of the heavy type. From 9.2-inch and upwards, the construction of B.L. shrapnel is identical, the principal point of difference being in the material from which the bodies are made, and consequent capacity, for sand shot. The cast iron have six longitudinal weakening grooves in the powder chamber to ensure their breaking up; the steel have no weakening grooves, as they are not intended to break up.

Description.

It consists of a cast steel body, the walls of which are nearly as thick as those of the common shell of the same calibre; near the base the walls are thickened, so as to form a shoulder, on which rests a steel disc, beneath which is the powder chamber. The bursting charge is contained in a tin cup, which is coned at the top (to

# SHELL B.L. ARMOUR PIERCING. 9.2-IN. (MARK III) | C |

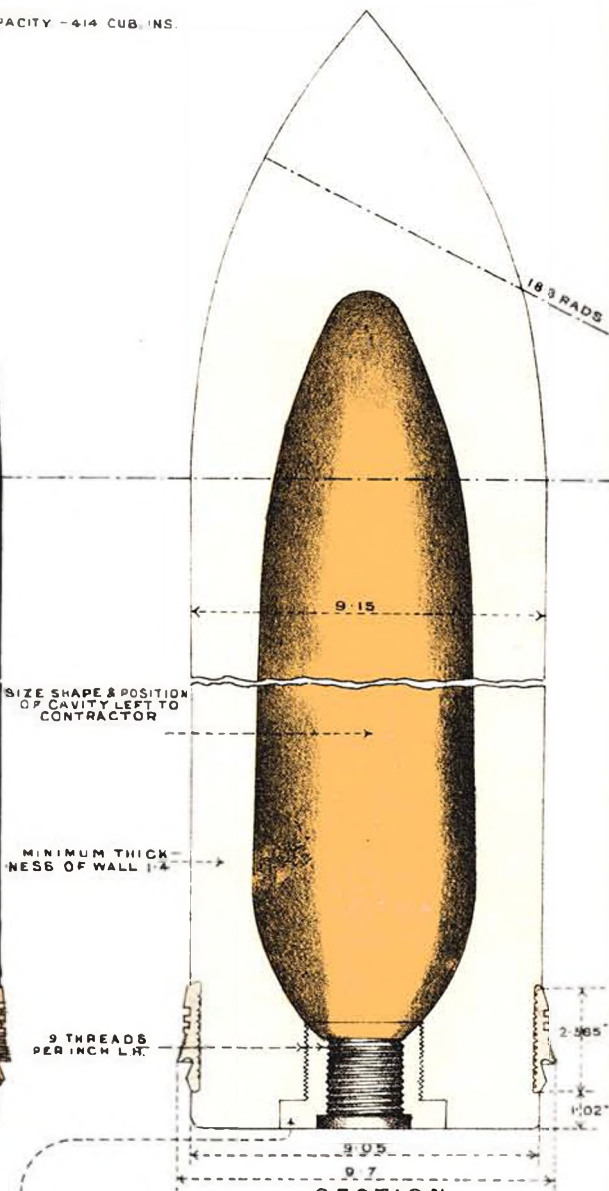
STEEL; FOR LARGE BASE FUZE

SCALE 1/5

CAPACITY - 414 CUB. INS.

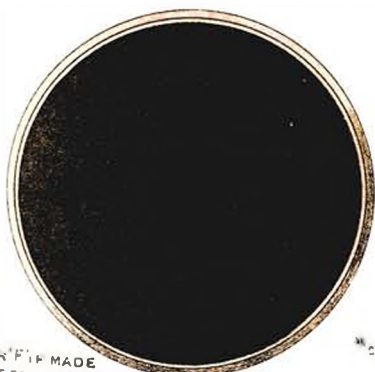


ELEVATION



SECTION

STEEL BUSH CREWED IN AS TIGHTLY AS POSSIBLE AND THE JOINT RIVETED UP  
 N.B. THE USE OF THIS BUSH IS OPTIONAL



PLAN OF BASE

OR FIT MADE OF FORGED STEEL

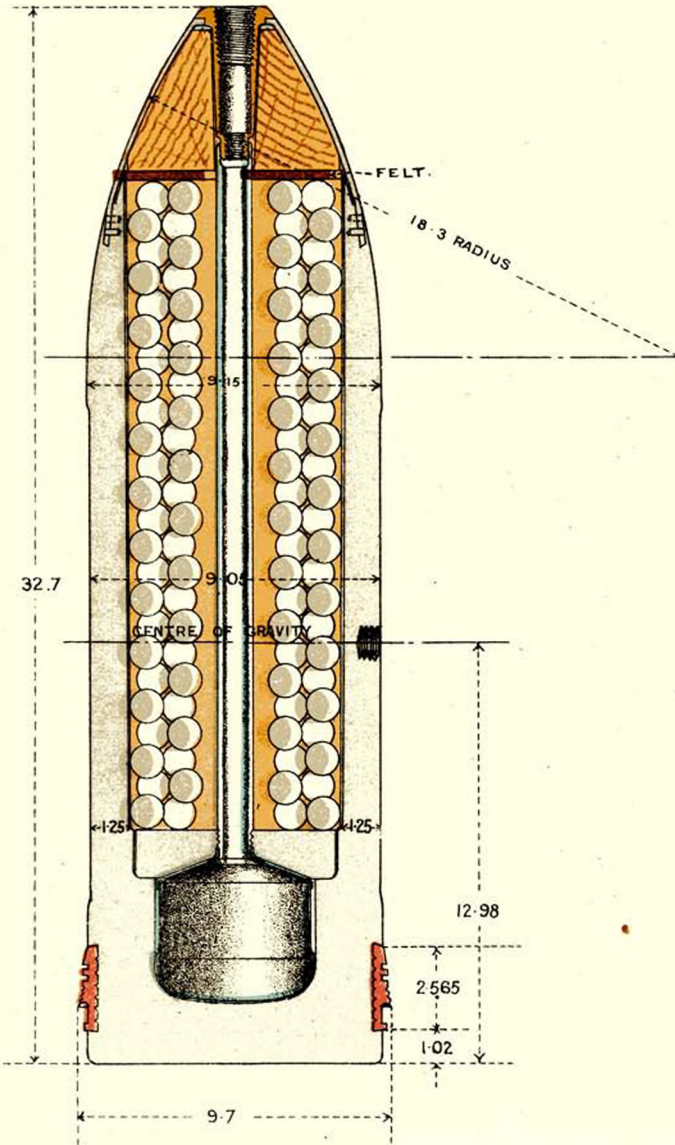
CONTRACTORS INITIALS OR RECOGNISED TRADE MARK.



**SHELL B.L. SHRAPNEL 9.2 INCH CAST STEEL MARK VI | C |**

**SCALE 1/6.**

	LB	OZS.
AVERAGE TOTAL WEIGHT	380	0
ABOUT 638 SAND SHOT (2 OZ)	79	12
BURSTING CHARGE	2	3



facilitate unloading) and the neck of which fits on to the bottom of the wrought-iron pipe. The use of this cup is to guard against possible prematures from the roughness of the interior of the shell, and to prevent loss of powder. The bottom of the pipe has asbestos wrapped round it and is treated with Pettman cement in order to make a tight joint with the tin cup and so prevent rosin working in among the powder. The disc, which rests upon the shoulder of the powder chamber, is of steel, and into it is screwed a wrought-iron pipe, lacquered inside. The interior of the shell is lined with brown paper, and contains 2-oz. sand shot, the interstices being filled with melted rosin, and over the top of which is placed a felt washer. The exterior of the body, at the end, is turned down to receive the head. The latter is of mild steel, and is attached to the body by two rows of rivets, but as the lower row are only intended to prevent the head twisting off in flight, they are called "twisting pins," and to prevent them forming too strong an attachment, the metal of the head is slotted out to the edge, so as to offer no resistance to a direct blow from the rear. A band of solder round the exterior of the shell at the junction of the head and body prevents these rivets and pins from falling out. At the point the head is flattened down to receive a gun-metal socket, the flange of which projects over the head and forms the nose of the shell. (See Plate XXV.)

The upper part of this socket is tapped inside to the G.S. gauge, and the lower part to receive the "primer shrapnel shell." (See p. 148.) The socket is attached to the head by a ring of solder inside, and the head is lined with wood.

There is no attachment between the gun-metal socket and the wrought-iron tube; but the end of the latter is slightly recessed to receive the socket, which is carefully turned to fit it.

The shell is rotated by means of the driving band, which is pressed into an undercut groove near the base.

In the plate will be noticed the hole for the lifting eyebolt, which is bored in the side of all B.L. shrapnel, 8-inch and upwards, and is in line with the centre of gravity.

Painted black, with a red tip.

The action is as follows:—The fuze fires the primer, which conveys the flash down the pipe to the bursting charge, the explosion of which blows off the head, and liberates the balls.

The 10-inch and 12-inch differ from the 9·2-inch in having 4-oz. sand shot.

The 8-inch and 7·5-inch differ in being fitted with a central pipe of gun-metal, screwed internally at the top for the primer. The socket is shorter and connected by a conical tin tube to the top of the central pipe.

The 6-inch and 4-inch are similar to the 7·5-inch, but filled with mixed metal bullets, and the head fits inside the front end of the body. The 5-inch has the central pipe of gunmetal, but the socket is similar to that for the 9·2-inch, only shorter.

The 4·7-inch latest Mark has a gun-metal pipe and a short socket fitting round the top of the pipe, the socket is countersunk, and a wad fuze hole G.S. is placed at the bottom of the socket. No shrapnel primer is used.

The shrapnel shell for the 10-pr., 12-pr., 15-pr., and 30-pr. are alike in construction. Plate XXVI.

The body is made of forged steel, with shoulder and powder chamber. The charge is contained in a tin cup, above which is a

Paint.  
Action.

Description.



steel diaphragm, into which the brass or metal pipe screws. This pipe is in two parts, screwed and sweated together, and the top part is enlarged and screw-threaded inside to receive the shrapnel primer. It is also screw-threaded on the exterior to receive a nut. The usual asbestos and Pettman cement are employed to make a tight joint between the bottom of the pipe and tin cup. The bullets are contained in a tin cage. This cage consists of a tin cylinder, which rests upon the steel diaphragm and has perforations to let the bullets pass through. There is the usual brown paper lining between the walls of the shell and the cylinder. The cylinder is filled with mixed metal bullets, and a few buck-shot may be used to adjust the weight. On top of the bullets is placed a flanged tin ring, and the top of the cylinder, which is fringed, is bent over and soldered to this ring. The space between the bullets is filled in with molten rosin.

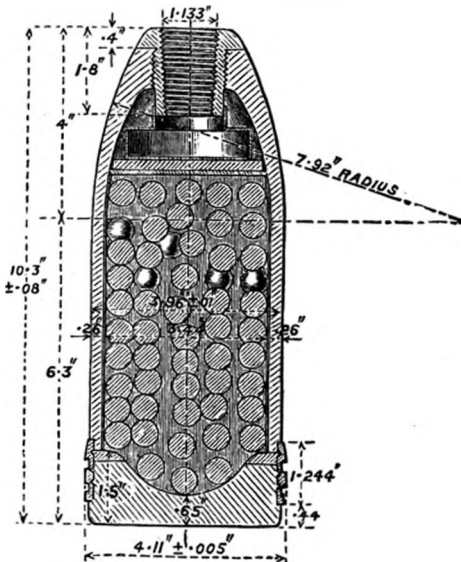
The head is made of mild steel, lined with wood, except for the 15-pr., and a felt washer is placed between it and the top of the tin cylinder.

A short gun-metal socket screws into the head and is further secured by solder. This socket is threaded inside to the G.S. taper and pitch, and a flange formed on the inside at the bottom fits round the top of the central pipe, to which it is secured by a locking nut screwed on the top of the pipe, and prevented from working loose by four centre punch dabs.

*Shell, B.L., Q.F., or Q.F.C., Shrapnel, Forged Steel.*

Scale,  $\frac{1}{4}$ .

4-inch, Mark VI.

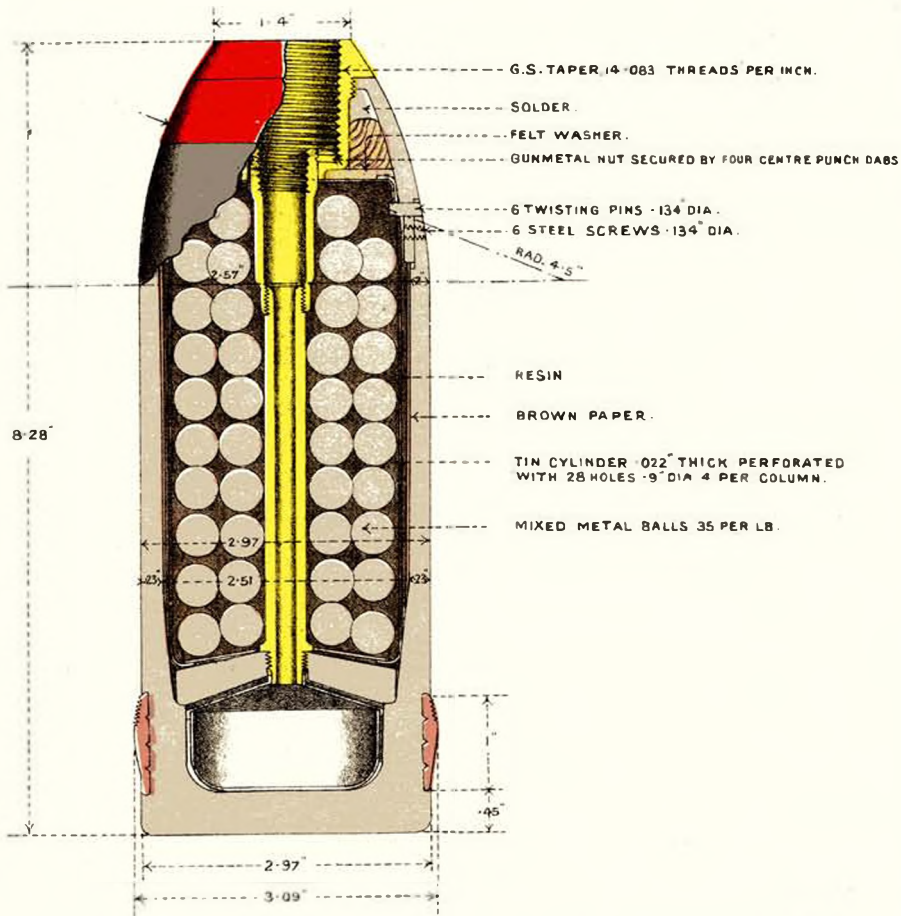


The head is attached by means of six steel screws and six steel twisting pins, which are covered with solder. The twisting pins are in the top row and fasten the cage to the head.

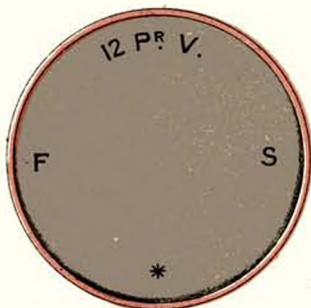
SHELL, B.L. OR Q.F. SHRAPNEL 12-PR., 12, 8, & 6 CWT.

(MARK V) | C |  
FORGED STEEL.

SCALE 1/2



	LB.	OZ.
AVERAGE WEIGHT EMPTY	11	9 1/2
WITH DRIVING BAND	0	1 1/2
BURSTING CHARGE R.F.G. <sup>2</sup>	0	13
FUZE (T & P)	0	13
AVERAGE TOTAL WEIGHT	12	8
FILLED AND FUZED		



\* CONTRACTORS INITIALS OR RECOGNISED TRADE MARK

The driving band is pressed into an undercut groove with waved ribs near the base of the shell.

The shell, B.L., Shrapnel, 4-inch, Marks IV, V and VI, have the bursting charge contained in the head. 4-inch, Marks IV, V, and VI. §§ 5011, 5705, 5515, 9957.

This shell has a body of forged steel tubing, head and body in one piece, and malleable cast-iron or mild steel base. A flanged gun-metal socket screws into the nose, and is tapped to the G.S. pitch and taper, being made long enough to take the T. and P. fuze over the G.S. wad. A tin cup is placed inside the head to contain the bursting charge, the neck of the tin cup fitting over the lower portion of the socket, and the space between the projecting portion of the latter and the tin cup is filled by a wood block. A felt disc is placed next the tin cup, then a wrought-iron one, which presses on top of the bullets and prevents the rosin from working up. The body is lined with brown paper, and the bullets inserted from the base, molten rosin being afterwards run in amongst them. The base is then lightly attached by six steel shearing pins and two steel keys, the latter fitting into undercut slots in the body and base. They prevent the base being twisted off, but do not offer any resistance to a direct blow from the front. § 9957. 4-inch, Mark VI. Description.

The driving band is pressed into a groove at the junction of the base and body.

The explosion of the bursting charge slightly checks the velocity of the bullets, and acting through them blows off the base of the shell. The body then slides over them, the bullets continuing their course with a velocity slightly reduced. It must be remembered that steel shrapnel are not intended to break up. Action.

Shrapnel shell are painted black over the body, except the driving band, which is left unpainted. The tip for a depth of one inch is painted red. There is no distinguishing paint mark between steel and cast-iron shrapnel. Paint.

The 15-pr. B.L. shrapnel have lead-coloured bodies, and the fuze hole plugs are painted black, in order to readily distinguish them from the 12-pr. B.L. shrapnel, which they closely resemble in size. § 8354.

Those shrapnel having gas-check driving bands are fitted with rope grummetts before issue.

## STAR SHELL.

Star shell are for the purpose of giving light, and are only indirectly offensive to the enemy.

They are made more or less on the lines of shrapnel shell, with cylinders of light-giving composition in place of bullets.

They are intended to be burst high up in the air, the burst igniting and scattering the cylinders or stars, which fall slowly to the ground, emitting a bright light.

Star shell are used with the 6-inch, 5.4-inch, and 5-inch howitzers and 10-pr. and 2.95-inch guns.

*Shell, B.L., Star, 6-inch Howitzer, Mark I.* The body is of forged or cast steel, with a small recess in the base for the bursting charge, which consists of 10 drams of R.F.G.<sup>2</sup> powder, enclosed in a shalloon bag, which is threaded with quickmatth.

A wrought-iron or mild steel disc is placed on top of a washer stitched to a ring of felt, resting on a shoulder above the burster; a pin fitting into a slot in the disc keeps it from turning. Four wrought-

iron pins are fitted in the top face of this disc. A central wrought-iron pipe is screwed and sweated into the disc; the pipe is in two parts, connected by a gun-metal junction piece. This is perforated, and supports a shalloon bag, containing 70 grains of R.F.G.<sup>2</sup> powder, kept in position by copper wire. The pipe is perforated to allow the flash to pass to the stars.

The stars are in two tiers, six in each tier. They consist of a brown paper case, driven with star composition, and primed near each end with quickmatch and mealed powder; a disc of fine white paper closes the end. Four corrugated steel supports, two in each tier, are placed round the stars to prevent them being crushed. A perforated iron disc separates the two tiers of stars; studs projecting from both faces of this disc, together with the studs on the bottom disc, lock the supports, so as to keep them from turning. The stars rest on felt rings, the top tier being covered by a felt ring and iron washer.

The interior of the shell is lacquered.

The head is of mild steel or iron, truncated and fitted with a fuze hole socket, and lined with a wood block. The head is attached to the body by brass screws and steel twisting screws; the latter are riveted and soldered; the joint between the head and body is coated with Pettman cement. A lead washer is placed in the recess at the top of the body.

The usual groove for driving band is formed near the base.

The charge to be used with this shell is the core only of the cartridge.

Paint.

Black all over except the driving band, which is not painted. The distinguishing mark is a white disc, upon which a red star is painted. Star shell will also have a red band,  $1\frac{1}{2}$  inches from the point, and  $\frac{1}{2}$  inch wide, denoting filled, since these shell are filled in manufacture.

Fuze.

These shell take the middle sensitive time fuze.

The 5-inch and 5.4-inch howitzer star shell differ from the 6-inch principally in having a central pipe in one piece and no powder primer. The stars are supported by triangular wood wedges instead of by the corrugated steel supports. A brown paper lining is used. The fuze socket screws into the head from the inside, and is held by a nut screwed on at the front.

11278.

The 5-inch has 8 stars; 5.4-inch, 10.

§§ 12804.

The 10-pr. star shell has 10 stars, and is generally similar to the 5-inch in construction. The central tube is of gun-metal; a perforated bridge near the centre supports a shalloon primer containing about 15 grains of R.F.G.<sup>2</sup> powder; the primer is fastened by copper wire. The fuze hole socket screws into the head, and is further secured by solder. The stars are of sheet brass and brown paper rolled to form a cylinder, pressed with star composition and threaded near each end with quick match, and primed with saltpetre, sulphur and mealed powder; a paper disc closes each end. Fuze No. 25, is used with this shell, Plate XXVII.

#### *Armour-piercing Shot.*

Armour-piercing shot.

*Shot, B.L., Armour-piercing*, are fired from B.L. guns 6-inch and upwards and from the 6-inch Q.F. or Q.F.C.; also 5-inch B.L. for testing plates.

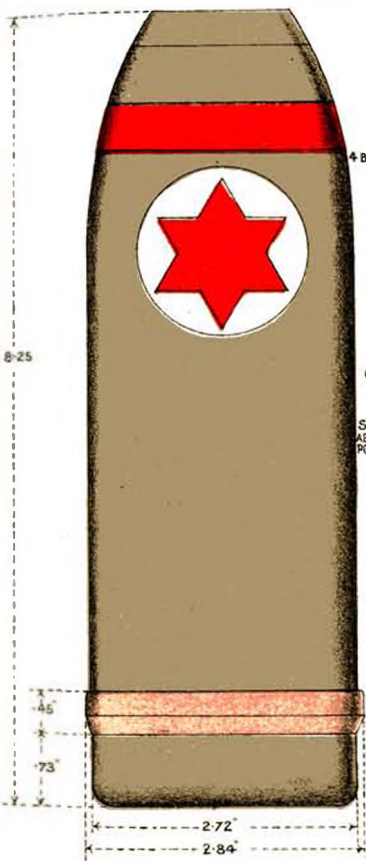
Armour-piercing shot are manufactured in a similar way to A.P.

# SHELL, B.L., STAR, 10-PR (MARK II.) | L |

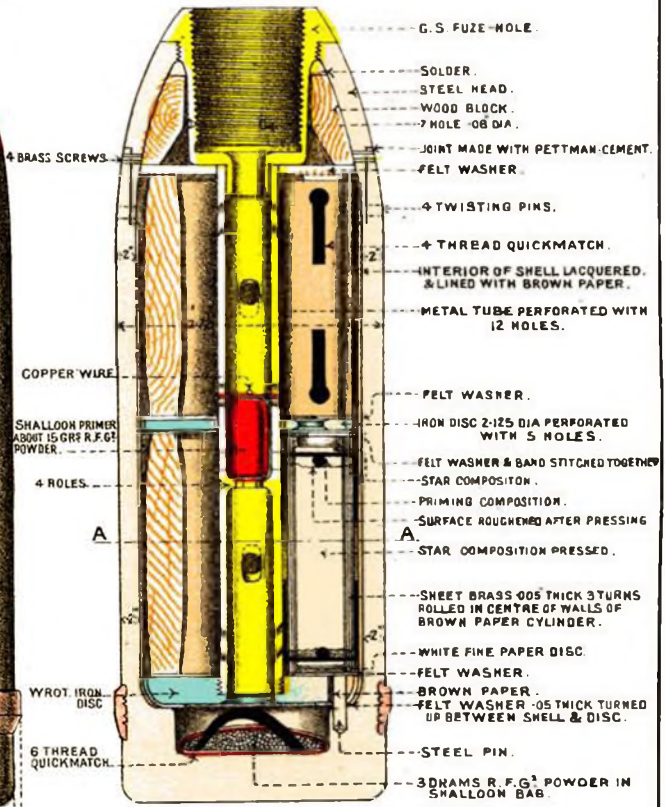
STEEL.

MEAN TOTAL WEIGHT, FUZED 6-LB. 15 OZ.

SCALE 1/2.



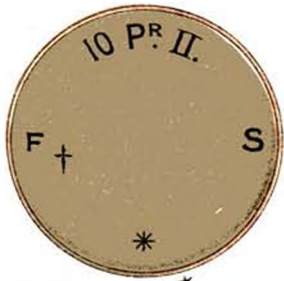
ELEVATION



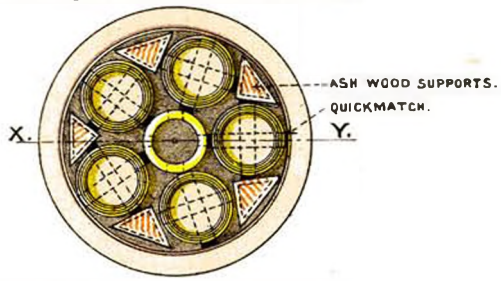
SECTION AT X.Y.



PART PLAN OF IRON DISC.



PLAN OF BASE.



SECTION AT A.A.

† OF C IF MADE OF CAST STEEL

\* CONTRACTORS INITIALS OR RECOGNISED TRADE MARK.

shell, but the interior cavity is smaller and they have no bursting charge. They have more penetrative power than A.P. shell.

The weight, form of head, maximum length, diameter over bands, and size and shape of driving band are laid down, but the material, shape, size and position of core, and closing of the base are left to the discretion of the manufacturer. The base, however, must be closed by some form of screw plug having two slots to take a service key.

Each shot is stamped with a distinctive number on the front band. Later shot have the groove for the driving band undercut, and this causes an advance in the numeral of the shot.

There is no hole in the side of these projectiles for lifting purposes, as it is desirable to keep the surface intact, but the 12-inch light has a hole in the base plug to take the "bolt-eye lifting."

These shot will be brought up to the mean Service weight by §§ 6402, 6972. inserting the required quantity of dust shot and sawdust. Shot so weighted will have the letter "W" stencilled in white on the head, and stamped on the base plug. Those up to weight will be filled with sawdust (except in case of projectiles on board ship), and will be similarly marked.

The body is painted black and the tip white (denoting shot), Paint. with a white band (denoting steel),  $\frac{1}{2}$  inch wide and 1 inch below the white tip.

#### *Palliser Shot.*

Palliser shot were introduced in the early days of armour plates. § 11104. They are made of cast iron with chilled points and are practically useless against modern hard-faced armour.

Those in the Naval Service will be used up for practice. For Land Service Palliser projectiles forming part of the equipment will be retained until the guns have been withdrawn from the service, or the projectiles gradually used up for practice.

#### *Solid Shot.*

Shot, solid, have been introduced for practice over sea ranges; they are comparatively cheap, being made of cast iron with ogival heads with the usual groove for driving band near the base. The 8-inch and up are provided with bands, and have the eyebolt hole for lifting; the letter P denoting practice is stamped on the base.

*Paint.*—Black with white tip and a yellow band round the body.

#### *Case Shot.*

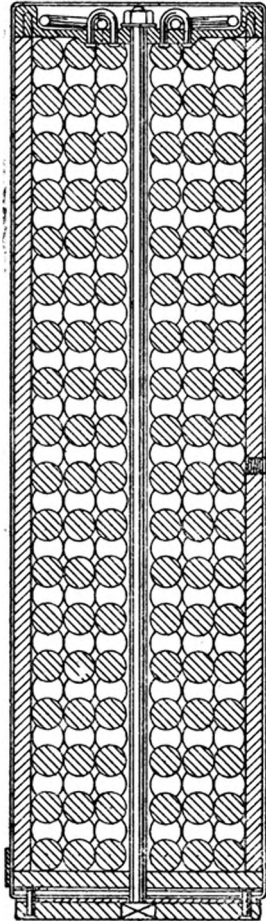
Case shot is essentially a close-quarter projectile. It consists of an envelope containing sand shot or mixed metal balls. The envelope must be weak enough to break up at the muzzle of the gun and release the bullets, but it must also be strong enough not to set up on discharge, as this would cause it to take the rifling, and did a case shot leave the box with the spin of other projectiles, the dispersion of the bullets laterally would be very great and their range to the front very small.

The case shot for the 9.2-inch is made of tinned sheet iron, Description. in three pieces, fastened by longitudinal rows of rivets. At the bottom it is fringed, and turned in and riveted to a disc of sheet iron.



Through the centre of the case shot passes a wrought-iron stay-bolt, fastened by a nut and washer at the top, and prevented from turning round by a square head fitted into a similarly shaped hole in a circular plate; above this plate is another disc of W.I., and

*Shot, B.L., Case.*



both discs are riveted to the bottom. The top is of cast-iron lined with wood, and is recessed for two rings by which the shot is lifted, and which are retained in their recesses when not required for use by springs.

On the exterior of the case, and close to the base, are eight stops of soft metal (lead and antimony) to prevent the shot being rammed too far down the bore.

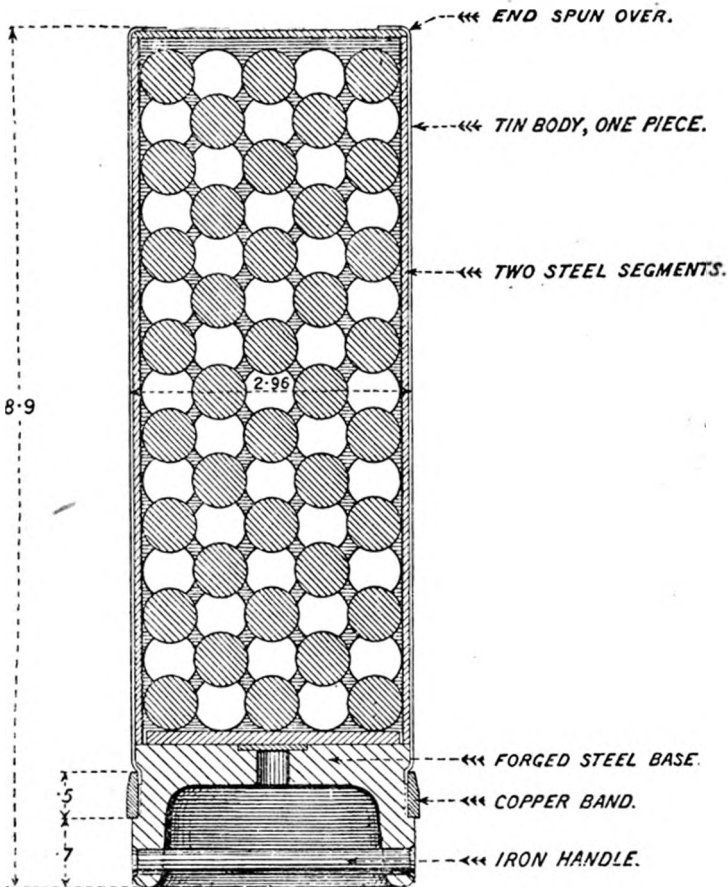
In common with all projectiles for the 7.5-inch B.L. and higher calibres, there is a lifting-hole for the eye-bolt in line with the centre of gravity, which in this case is bored and tapped through the exterior into one of the loose segments. Inside there is a loose base disc, through a hole in the centre of which passes the stay-bolt and

eight loose segments line the sides. The contents are 8-oz. sand shot packed in clay and sand. Case of this type are made for 9·2-inch and upwards, except 16·25-inch.

The 6-inch case shot differs principally from the 9·2-inch in having 6-inch. no central stay-bolt, and no eye-bolt hole for lifting. The top is of sheet iron with one handle attached by two staples. The bottom is of sheet iron strengthened by a ring of the same material riveted on the outside, and an iron disc laid loose outside. Three metal stops are fixed round the base; 4-oz. sand shot are used. The case shot for the 5-inch and 4-inch guns are constructed on the same lines as the 6-inch.

*Shot, B.L. or Q.F., Case, 15-pr. and 12-pr., Mark V, | C | .*

Scale,  $\frac{1}{2}$ .



A case shot, designed to ensure breaking up on leaving the gun, has been adopted for the 10-pr., 12 and 15-pr. guns, and 5-inch and 5·4-inch B.L. howitzers. The same shot is for use with the 12-pr. B.L. or Q.F. and 15-pr. B.L.; it is used with the 12-pr. Q.F. in the N.S. also.

*Shot, B.L. or Q.F., case, 15-pr. and 12-pr., Mark V, has a body of* Description. §§ 9456, 9815.



steel and is secured to the body by the bottom of the latter being pressed into a recess for, and being held by, a copper band. The bottom of the recess is milled. The base is recessed and is fitted with a straight wrought-iron handle. A small hole is bored through the bottom of the recess and is closed on the inside by a thin wrought-iron disc soldered into a shallow recess. Inside the body are two steel segments, and between them, resting loosely upon the base, is a wrought-iron or mild steel disc. The body contains mixed metal balls (34 per lb.), the interstices being filled with clay and sand. The top is closed by a mild steel disc, over which the body is spun and lightly soldered.

**Action.** On firing the band seals the bore; the gas rushes through the hole in the base, forcing out the soldered disc, and, acting upon the loose disc and the bullets, breaks the body away from the base, thus ensuring the release of the bullets before the shot leaves the bore of the gun.

§ 8736. Mark IV differs from the above in the base being attached to the body by a coarse left-handed screw-thread and light soldering. There is no hole through the base, and the handle is not straight across but projects slightly to the rear. The base has a narrow copper band as in Mark V.

The base of this shot is intended to unscrew itself from the body as the shot passes up the bore of the gun, the rotation of the base effecting this.

§ 10283. Mark IV has been converted to Mark IV\*, for N.S. only, by having two weakening holes bored in the base; these holes do not pass quite through.

§ 8107, 8235. Mark III is like the ordinary field service type, but has three corrugations round it, and the segmental linings are made of zinc.

*Shot, B.L., case, 10-pr. B.L. Mark I | L |* only differs in weight and dimensions from 12-pr. and 15-pr. Mark V.

§ 9515. *Shot, B.L., Case, 5-inch howitzer, Mark II,* only differs from the Mark V 12-pr. and 15-pr. in having an iron base, three iron segmental linings, and in the contents, which are 2-oz. sand shot.

Mark I case shot for 5.4-inch howitzer only differs in weight and dimensions from the above, and in the base being made of steel.

§ 8234. *Shot, B.L., Case, 5-inch howitzer, Mark I,* is of tin in three longitudinal pieces. The top is sheet iron fitted with a wrought-iron handle. It is lined with four wrought-iron segments. A wrought-iron disc is riveted on to form the base, and carries an iron stud in the centre, to which is attached a wooden block. A copper band is let into the wooden block.

**Range.** Case shot from the 9.2-inch B.L. gun is effective up to 1,100 yards, from field guns up to 300 yards.

**Paint.** Case shot are painted black, except the copper rings, which are unpainted; in future they will be oiled and not painted.

**Proof shot.** Are of the best forged steel, cylindrical throughout; of the same weight, and provided with a driving band to agree with the corresponding Service projectiles.

#### *Shot Paper.*

§§ 7542, 9341, 9452, 10330. *Shot, Paper, Empty,* are intended for use in land service, when specially ordered, for firing from guns from which, owing to their position, Service projectiles cannot be fired in time of peace.

The shot are designed to cause the same amount of recoil as a Service projectile, and to break up in the bore of the gun.

The body is made of wood pulp sufficiently strong to stand loading and slinging when filled, the ends being strongly secured by oak pins and glue, the shot is coated with black japan lacquer, and is filled with small shot and sawdust. Earlier marks were made of papier-mâché.

In the case of B.L. guns, 12-inch to 9·2-inch, the shot is made up as follows:—

	Weight, filled.
	lb. oz.
12-inch front portion, Mark V, comprising six $\frac{1}{7}$ charges,	127 8
12-inch rear " " " one $\frac{1}{7}$ charge,	127 8
10-inch front " Mark IV, " three $\frac{1}{4}$ charges,	125 0
10-inch rear " " " one $\frac{1}{4}$ charge,	125 0
9·2-inch front " Mark V, " three $\frac{1}{4}$ charges,	107 0
9·2-inch rear portion, Mark V, comprising one $\frac{1}{4}$ charge,	107 0
6-inch B.L. or Q.F., Mark IV .. .. .	120 0
5-inch B.L., Mark I .. .. .	60 0
4·7-inch Q.F., Marks I to III .. .. .	45 0
4-inch B.L., Mark I .. .. .	25 0
12-pr., 12 cwt., I .. .. .	12 8

The "rear" shot has the body enlarged near the base, in order to prevent its being rammed too far in the gun, and to facilitate identification is marked "Rear"; the Q.F. 4·7-inch and B.L. 6-inch shot also have the enlargement; the "front" shot being made cylindrical throughout.

The shot are issued empty: when required for use they are filled with a sufficient quantity of small shot (Nos. 1-5 waste) and sawdust, through a hole in the top, until they are of the required weight; the filling hole is then closed with a cork bung.

Shot of earlier patterns for the 9·2-inch to 12-inch were made in halves and quarters. They will be used up, but the number of portions per round will be in the proportions shown above, and each portion will be adjusted to the new weight by employing a larger quantity of sawdust to waste shot in filling.

With Mark I pattern: where the shot was made up of  $\frac{1}{2}$  and  $\frac{1}{4}$  charges, the latter were fastened together in loading, by means of a loop on one being placed over the toggle of that in rear.

Paper shot are only to be fired with powder charges and the words § 9931.  
"not to be fired with cordite" will be stencilled on them in white paint, in 1-inch letters. Existing paper shot will be so marked locally.

#### *Drill Shell.*

Drill shell are issued for B.L. guns and howitzers, and Q.F. guns up to and including the 13·5-inch, except for Horse or Field Artillery equipments, namely 12-pr. B.L. of 6 cwt. and 15-pr. B.L. guns and the 5-inch howitzer. Drill shell. §§ 6659, 9052, 9303, 11637.

They are all Mark I, except the 6-inch, of which there are Marks I, II, III, and IV. These shells, except 6-inch Marks I and III, are made of cast iron of about the same dimensions and weight as the Service common shell, and are filled with sand and plugged. They are provided with two gun-metal bands, one near the base, the other at the shoulder. The base end of the shell is turned down and screwed to take a gun-metal ring, which projects over the side, and prevents injury to the gun in loading. The base is closed by a large gun-metal screw plug, which is recessed, a

bridge being formed across the recess for the extractor to engage when withdrawing the shell in unloading. A groove is formed round the junction of the base and body to take a tarred rope grummet, which prevents the shell jamming when rammed home. From 9·2-inch and upwards they are fitted with a hole in the side to take the "bolt-eye, lifting."

In future manufacture of 9·2-inch, 10-inch, and 12-inch for L.S., the side lifting holes will be dispensed with.

§ 7491.

When difficulty is experienced in the use of the 10-inch or 9·2-inch drill shell with the earlier patterns of loading tray, the following course will be taken, viz.:—Unscrew the gun-metal base ring of the shell one turn, well grease the grummet, and then carefully hammer it down all round with a mallet, until it is sufficiently reduced in diameter to admit of the shell being easily loaded. The base ring can be gradually screwed up as the grummet wears.

The 4-inch, 5-inch, and 6-inch differ from the heavier natures in having the base made of gun-metal in one piece.

§§ 7612, 8454.  
Mark III.

*Shell, B.L., Drill, 6-inch, Naval, Mark III*, is of gun-metal, and generally resembles the Mark I. The hollow in the base has a bayonet joint recess to receive the extractor, when the latter is employed in withdrawing the projectile. It is weighted up to 100 lb. with lead ash, and is stamped with the letters B.L. on the body.

§§ 12253,  
12454.

Mark V drill shell has been sealed to govern future manufacture for use with all B.L. and Q.F. 6-inch guns in Land Service.

The shell differs from the B.L. 6-inch Mark IV drill shell in being bound with spun yarn between the lower band and the base, in lieu of having a rope grummet.

The binding should be smeared over with Russian tallow before the shell is taken into use, and again when necessary, to prevent difficulty in extraction.

Existing B.L. 6-inch Marks II and IV drill shells will be bound with spun yarn, locally, and a star (\*) added to their numerals.

Consequent upon the adoption of the above-mentioned shell for drill purposes with Q.F. 6-inch guns in Land Service, the use of the Q.F. or Q.F.C. 6-inch drill shell will be restricted to Naval Service.

§ 12168.

*Shell, B.L., Common, 9·2-inch, Iron*, where drill shell have not been provided, one of the above shell per gun will be set aside for drill purposes, being marked "DRILL" in 1-inch white letters round the nose. They are rammed home at the first round of drill only, and extracted on conclusion of the drill. Arrangements for the extraction of the shell will be made locally.

Drill shells for 4·7-inch Q.F., and 4-inch, 6-inch, Q.F. or Q.F.C. guns, also 5-inch B.L.C., differ from those in use with B.L. guns, in being made of wood, weighted with lead. The base has a gun-metal plate, and on the body are two bands, the front of copper, the rear of gun-metal; the latter, which is placed 1 inch from the base, is of sufficient diameter to prevent the shell being rammed too far. The base is fitted with a recess to take the T-extractor.

Extractors.  
§§ 8453,  
11395.

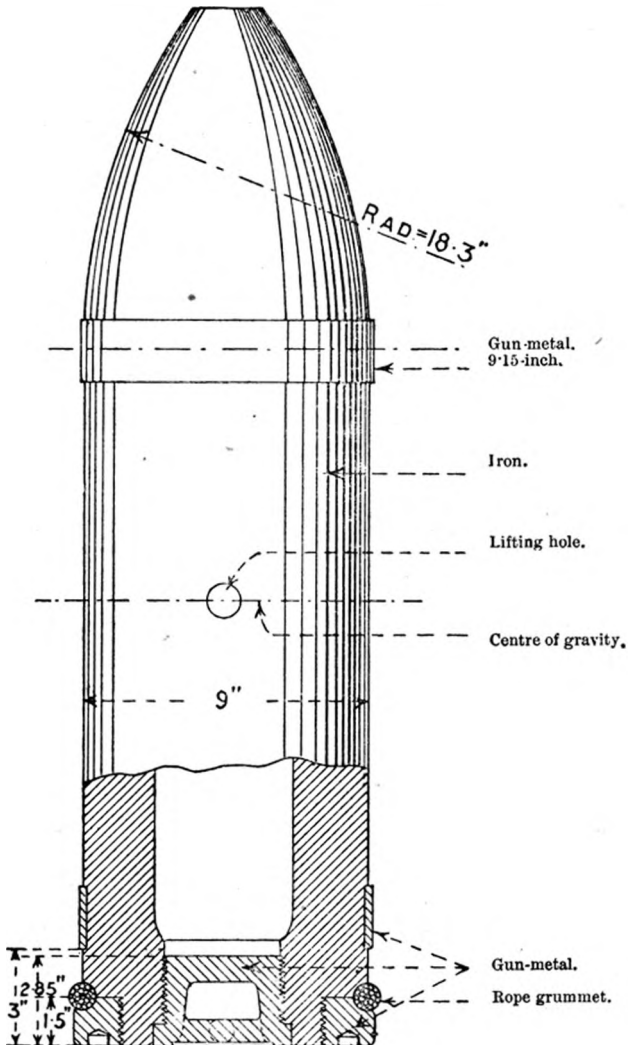
*Extractor, Drill, Shell, No. 1, Mark I*, consists of a wood stave, 5 feet long, grooved spirally at one end, and fitted at the other with a steel hook, which fits over the metal bar across the base plug of the drill shell. It is for use with B.L. 6-inch, Marks III, IV to VI, and Mark II drill guns; 5-inch and 4-inch, in the L.S.

§ 8098.

*Extractor, Drill, Shell, No. 2, Mark I*, is similar to the above, but the stave is 8 feet long, and the hook larger. For use with B.L. 8-inch to 13·5-inch (except 9·2-inch Mark IX on Mark III barbette carriage) in the L.S.

*Shell, B.L., Drill, 9-2-inch, Mark I, Iron.*

Scale,  $\frac{1}{4}$ . Total weight, 380 lbs.



*Extractor, Drill, Shell, No. 3, Mark I,* is similar to the above, but § 11395. the stave is 13 feet 4 inches long. For use with B.L. 9 2-inch Mark IX on Mark III barbette carriage.

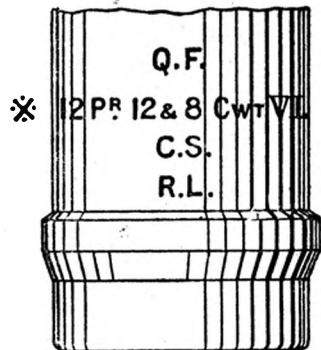
*Extractor, Drill, Shell, No. 4, Mark II,* consists of a steel bar, § 9503. 3 feet 11.6 inches long, fitted with a T-shaped handle at one end and with a T-projection to fit the slot in the base of drill shells at the other. For use with Q.F. or Q.F.C. 6-inch to 4-inch and 6-inch B.L., all marks for N.S. and Marks VII and VII<sup>V</sup> in L.S., also B.L.C. 5-inch.

Mark I is shorter, being only 3 feet 7.6 inches long. It is used §§ 8454, 8628. with Q.F. or Q.F.C., 6-inch to 4-inch, and B.L. 6-inch Naval.

*Extractor, Drill, Shell, No. 5, Mark I,* is similar to the above, but §§ 8454, 8628. only 2 feet long. For use with the Q.F. 12-pr.

## MARKING STAMPED ON PROJECTILES.

All projectiles will have the calibre, numeral, and contractor's initials or trade mark stamped on the base. The 12-pr. common pointed shell have this information on the side, owing to there not being sufficient room on the base. Lyddite, shrapnel, common iron for practice, and solid shot for practice have the date of manufacture on the base. Armour-piercing shell have A.P. on base. Practice projectiles are marked with "P" on the base. Armour-piercing shell and shot have a distinctive number marked on the front band. Armour-piercing shell have the date of manufacture on the front band.



In the case of 12-inch, 9-2-inch guns, 6-inch and 5-inch howitzers, the letters "L" or "H," indicating light or heavy, are stamped on the base. Earlier issues may be found without these letters.

Projectiles for the 8-inch Marks VII and VIIA guns are stamped "SPECIAL."

The letters "C.S." are stamped on the base of cast steel, and "F.S." on forged steel projectiles. Common pointed shell of cast steel have a number or date stamped on the head.

The position of these marks may vary. After inspection the projectiles are stamped on the side  $\uparrow$  and date. This may be found on the shoulder or near the driving band.

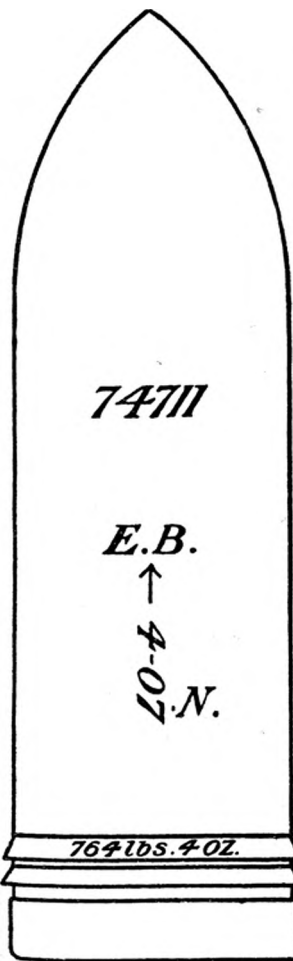
\* Earlier issues were marked "12-pr. IV."

Page 110.—The following drawings show the latest markings that are now “stamped” and “stencilled” on projectiles.

MARKING STAMPED AND STENCILLED ON COM-POINTED SHELL.

Stamped.

Stencilled.



White band denoting steel shell.  
Red band denoting filled shell.

No. of blow in “Converter” from which shell has been cast. (R.L. Work only.)  
Shell made by Contractor have date of manufacture instead.

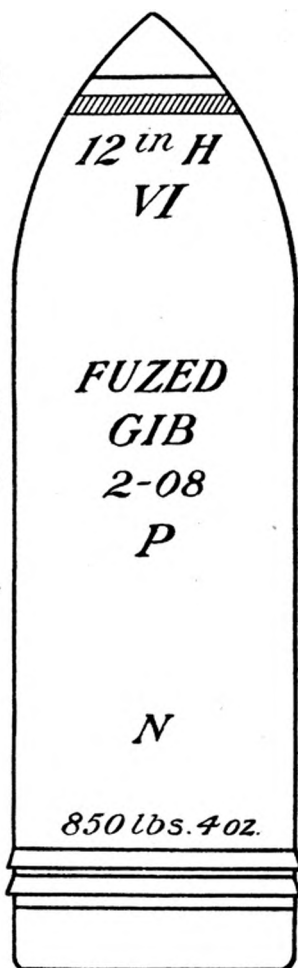
Examiner's initials.

I.L.S. Mark.

Date of final inspection.

For Naval Service.

Weight of empty shell.



Calibre of gun. } With  
“H” for heavy shell. } white  
Mark of shell. } paint.

If shell is fuzed.

Monogram of filling station.

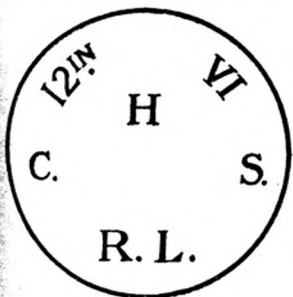
Date of filling.

Nature of powder “P” mixture.

Naval service.

Weight of filled shell.

With red paint.



Calibre of gun.

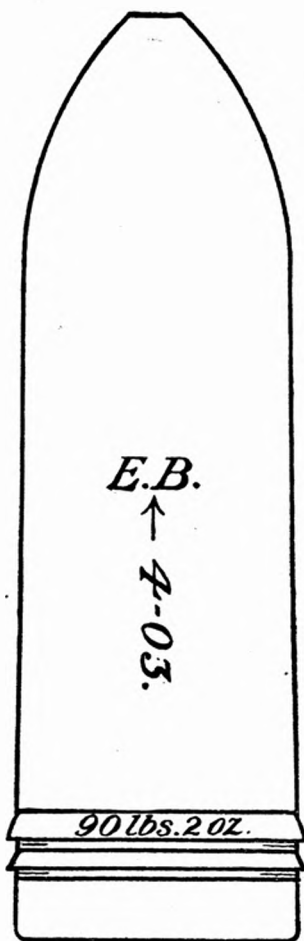
Mark of shell.  
“H” for heavy shell.

“C. S.” for cast steel.

Manufacturer's initials.

NOTE.—The new capped C.P. shell are stamped with a consecutive number on body and screwed base.

MARKS STAMPED AND STENCILLED ON LYDDITE SHELL.



Red band denoting filled shell.

Examiner's initials.

.L.S. mark.

Date of examination.

Weight of shell empty.



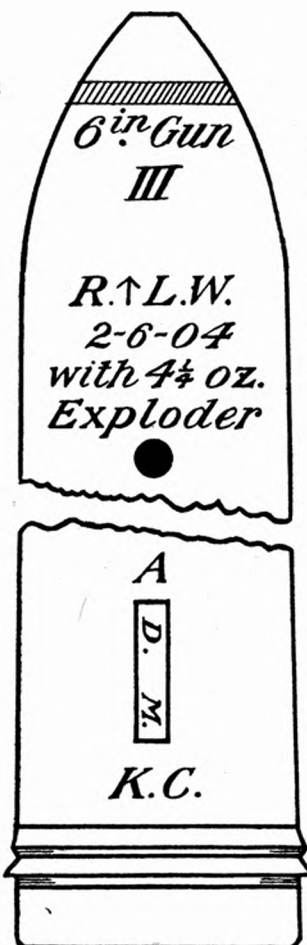
Calibre of gun.

Mark of shell.

Forged steel.

Contractor's initials.

Date of manufacture.



Calibre of gun.

Mark of shell.

Monogram of filling station.

Date of filling.

Weight of exploder.

-dram primer of R.F.G.<sup>2</sup> with exploder.

Aluminium cap.

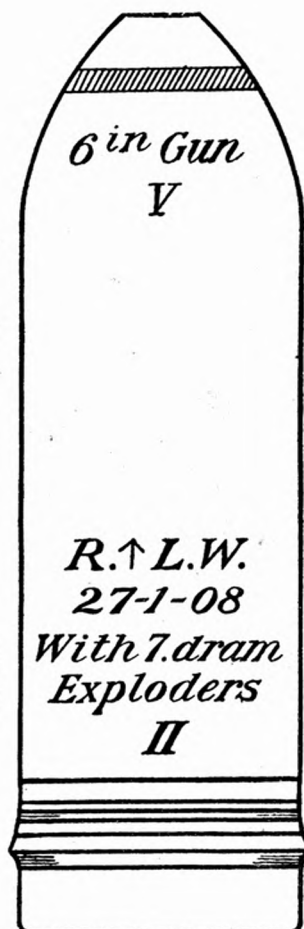
Waterproof paper. Cylinder.

"D.M."= Dry mixed Picric powder.

Lyddite covered with kit composition and asbestos tube in cavity for exploder.

On one side.

On reverse.



Calibre of gun.

Mark of shell.

Monogram of filling station.

Date of filling.

Nature of exploder.

Mark of exploder.

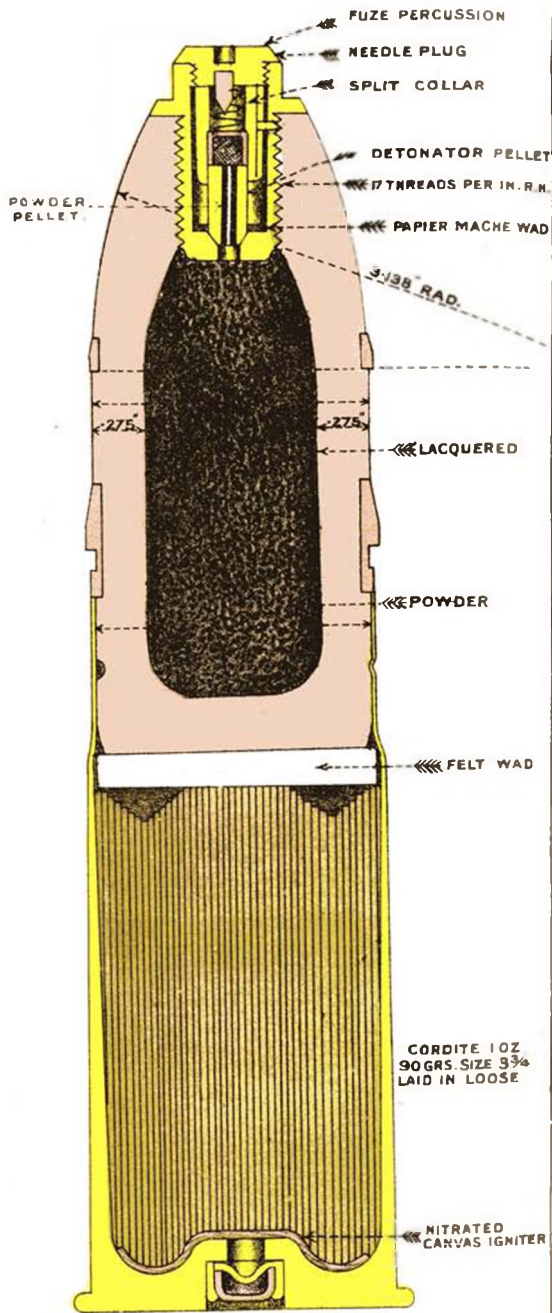
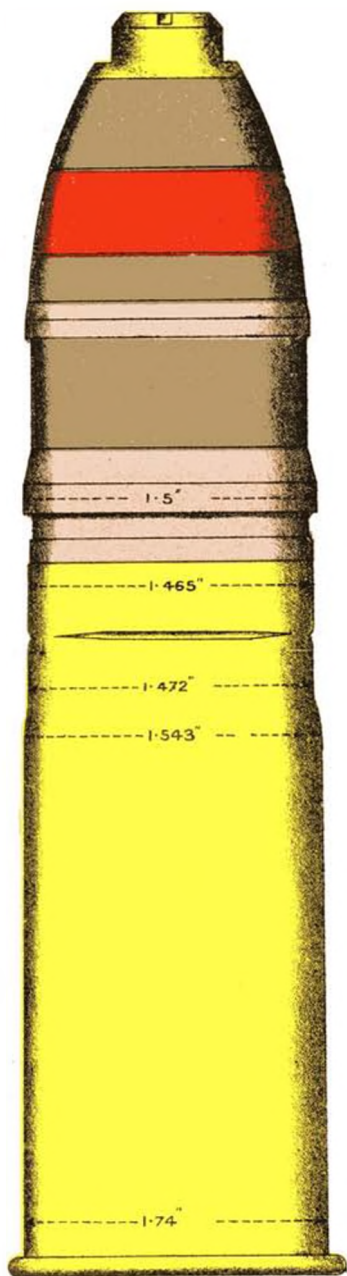
White band on all shell having cupro-nickel driving bands.

NOTE.—All stencilling on lyddite now done with black paint. Lyddite shell filled on old system (with cylindrical exploder) from the 5-4-in. calibre and up were fitted with exploders having an 8-dram primer of black powder.

NOTE.—Lyddite shell 6-in. and up since November, 1904 have been filled on solid system. No cylindrical cavity is left in lyddite but recess in nose filled up with 7-dram exploders. 6-in. take 12 to 15, 7-5-in. to 10-in. take 8 to 10.

# CARTRIDGE. Q.F. I.P.<sup>R</sup> COMMON SHELL.

*Full Size.*





## CHAPTER XI.—AMMUNITION FOR QUICK-FIRING GUNS.

A *quick-firing* gun, as regards its ammunition, differs from a B.L. gun in having its charge and the means of ignition contained in a metal case.

The quick-firing guns at present in the Service are the 1-pr., 3-pr., 6-pr., 2.95-inch, 12-pr. of 8 cwt., 12-pr. of 12 cwt., and 12-pr. of 18 cwt., 12½-pr., 13-pr., 15-pr. and 18-pr. 4-inch, 4.7-inch and 6-inch.

The projectiles for the 1-pr., 3-pr., 6-pr. 2.95-inch, and 12½-pr., 13-pr. and 18-pr. are attached to the case, such ammunition is termed "fixed."

There are 3 different cartridges for the 1-pr. Q.F.: (a) common shell of cast iron; (b) pointed steel shell; (c) practice shell. A certain number of blank charges have also been issued.

*Cartridge, Q.F., 1-pr., Common Shell, Mark I* consists of brass case, with cap, igniter, charge and fuze projectile. Plate XXVIII. § 10963.

The case is of solid drawn brass as shown in the plate, with a projecting rim at the base for extraction. The cap is similar to those described for the 6-pr. Q.F. and fits into the base of the case in the same way. The case is lacquered with transparent lacquer inside only.

The igniter consists of nitrated canvas, which is shellaced to the bottom of the case. Above it is the charge consisting of about 1 oz. 90 grains of cordite, size 3¾, covered by a felt wad on each side of which is shellaced a paper disc.

The common shell is made of cast iron, and is fitted for a nose fuze. It has a cannellure near the base by which it is secured in the case and above it a driving band is pressed into a groove. There is also a narrow copper steadying band pressed into a groove near the shoulder. Common shell.

The shell is lacquered inside and contains a bursting charge of about 270 grains of F.G. powder. The weight of the shell is 1 lb. It is pressed into the mouth of the case and secured by the metal of the case being indented into the cannellure.

The percussion fuze consists of a metal body screw threaded on the outside to fit into the nose of the shell. The head is flanged, to fit over the nose of the shell, and cut away to take the fuze key. The body is bored out from the top, and the bottom pierced by a fire-hole. In it is placed a detonator pellet, carrying the detonator and having a channel driven with powder. The composition in the detonator contains no fulminate of mercury, and is the same as in the cap of the cartridge.

Encircling the front end of the pellet is a split collar of brass, which prevents the pellet moving forward against the needle.

The top of the fuze is closed by a screw plug, carrying a steel needle and creep spring on its underside, the plug is secured by a set screw.

**Action.** On shock of discharge, the split collar sets back over the pellet, thus unmasking the detonator; on impact the pellet and collar are thrown violently forward and the needle pierces the detonator, thus firing it. The flash from detonator and powder in the pellet passes through the fire-hole and ignites the bursting charge in the shell.

**Paint.** The shell is painted black all over, except the bands which are left unpainted.

**Steel shell.** The cartridge with steel shell is similar to the above, but the shell is made of steel, is pointed, and carries a base fuze. This fuze is similar to the nose fuze, but there are two fire-holes through the top plug, which are driven with powder. The action is identical. The bursting charge is about 270 grains of F.G. powder.

**Paint.** The shell is painted black, except the bands which are left unpainted, and it has the usual white ring denoting steel near the point.

For practice the common shell is employed, it is filled with salt, an empty fuze body closing the nose; a yellow band round the body denotes practice.

**Clips.** The cartridges are provided with brass clips, which cover the cap in the base and are similar to those issued for 6-pr. or 3-pr. Q.F. cartridges.

§ 11373. *Cartridge, Q.F., Blank, 1-pr., Mark I*, is the ordinary service capped case containing a charge of 2 oz. 30 grains of F.G. powder, over which is placed a thick brown felt wad, kept in position by a cardboard cylinder. A jute wad is then placed on top of the cylinder and the mouth of the case coned over and filled up with paraffin wax.

§ 12151. *Box, Ammunition, Q.F., 1-pr., 50 rounds | L |*, is of deal, with elm ends, having cleats and rope handles. The lid is fastened by a hasp and turnbuckle. The box is provided with a lining of tinned steel, having three diaphragms and a lid. The diaphragms are perforated in 50 places, the lid of the lining fits into a luten groove.

Length 23.5 inches, width 13.5 inches, diameter 8.65 inches; weight, empty 25 lbs., filled 99½ lbs.

Early issues were made in deal boxes, holding 80. The ends of the box are furnished with cleats and rope handles and the lid is attached by screws. The box is lined with tin, with a top soldered on which has to be torn off, similarly to small-arm ammunition boxes. Inside the tin lining there are two wood-packing pieces, running the length of the box and having grooves to take the noses of the shells. The cartridges are packed heads and tails, each cartridge being placed in a cover of corrugated paper or else of straw similar to those used for wine bottles. These boxes are used for storage and transport only; not for use in the field. The approximate weight of a package is 157 lbs.

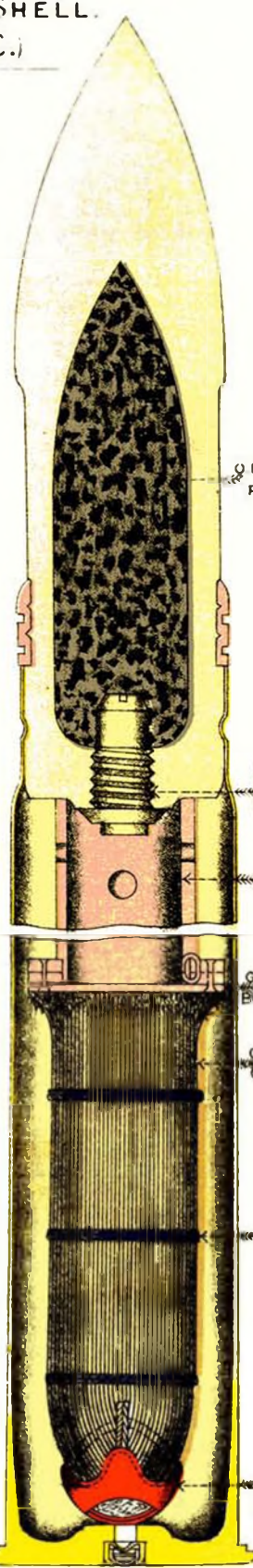
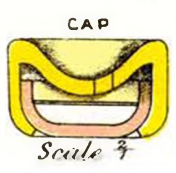
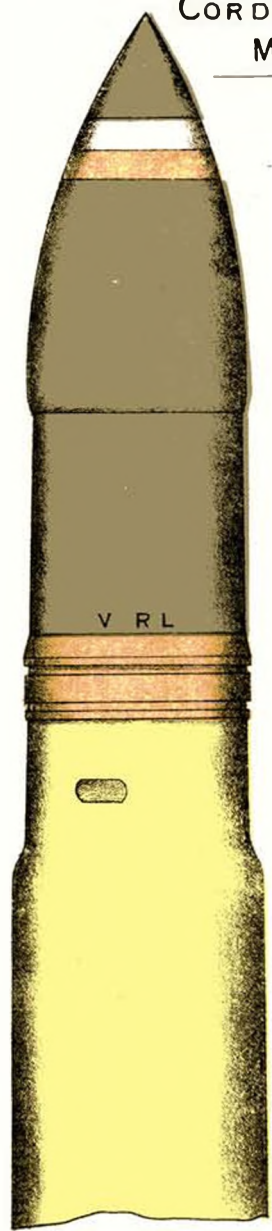
The following ammunition is employed with the 6-pr. Q.F.:—Cordite charge with steel shell; cordite charge with iron shell; powder charge, steel shell; powder charge, iron shell; practice, both powder and cordite charges, iron and steel shell; saluting charge, and dummy drill.

**6-pr. ammunition.**  
§ 12295. *Cartridge, Q.F. 6-pr. Cordite, Steel Shell, Mark VIII*, consists of a brass case with cap, igniter, charge, paper cylinder, and fuzed projectile. (See plate XXIX.)

The case is made of solid-drawn brass of the dimensions shown in the plate, and has a projecting rim on the base to allow of extraction. A hole is bored through the centre of the base, the rear portion of which is enlarged to contain the cap chamber. The case

# CARTRIDGE QUICK FIRING 6 PR. CORDITE STEEL SHELL. MARK VIII. (C.)

Scale 1/2.



OF SHELL F.G. POWDER

HOTCH KISS  
BASE FUZE  
MARK IV

PAPER  
CYLINDER

GLAZED  
BOARD DISC.

CORDITE  
CHARGE

SILK SEWING

IGNITER MKN  
(CCYARN)

is lacquered inside and out with the usual transparent lacquer. The cap chamber, Mark II, is of brass, and has a raised anvil and three fire-holes in the bottom. It contains a copper cap filled with 1.2 grains of a special cap composition, containing no fulminate of mercury, pressed in, varnished, and covered with a tinfoil disc. The cap is secured by the metal being spun over it. The cap chamber is pressed into the hole in the centre of the base.

The charge consists of 7½-oz. of cordite, size 5. The sticks, about 12-inches long, are folded double and bound together in ~~three places with silk sewing.~~ *2 places with shallon braid.*

The igniter (Mark IV) consists of guncotton yarn enclosed in a circular flat shallon bag which is tied to the fold of the cordite by securing strings of silk sewing, as shown in the plate.

The charge is inserted in the case, igniter downwards, so as to come next the cap. A paper cylinder, placed over the cordite, keeps the charge in position at the bottom of the case. This consists of a hollow cylinder of brown paper, pierced with holes, to one end of which two discs of millboard, also pierced with holes, are glued and secured by copper wire. To the outside of these discs a glazed board disc is attached by rivets, so that the glazed board is next the cordite when the cylinder is in position.

The shell, Mark V, is made of forged steel, pointed, the head being § 12251. struck with a radius of nearly three calibres. It is rotated by means of a driving band, which is pressed into an undercut groove, some distance from the base, so as to allow the shell to be held in the case. Near the base is a cannellure for the purpose of securing it to the case, and below this the diameter is slightly reduced to facilitate insertion into the mouth of the case.

The interior of the shell is bored out to take a bursting charge, leaving a considerable thickness of metal in the head. The interior is painted.

The base has a central hole, threaded with a left-handed screw thread to take the Hotchkiss base percussion fuze.

The shell is oil hardened. When filled with salt and plugged, it should be strong enough to pass entirely through 3 inches of steel, the striking velocity being 1770 f.s.

The shell is filled with 4 oz. of Q.F. shell F.G. powder and the Mark IV Hotchkiss base fuze (see below) is screwed in, the threads and flange being lubricated with Mark III luting in a similar manner to the large base fuze.

The body of the shell below the driving band is varnished and the shell is pressed into the mouth of the case, until the edge of the case bears against the driving band. It is then secured by three indents which force the brass into the cannellure round the base of the shell.

The shell is painted black, except the driving band which is left Paint. unpainted. A white ring, denoting steel, is painted round the head and below it a red ring showing that the shell is filled. The numeral and contractor's initials are stamped on the body above the driving band.

Mark IV shell, which may be used for making up Mark VIII cartridges, has a differently shaped base, and the capacity is slightly smaller, earlier issues being water hardened and lacquered internally.

On the base of the cartridge are stencilled in red the word "Cordite" and the lot number of the cordite, and are stamped the mark of the case, and trade mark or initials of contractor, and the letters "C" or "P" indicating powder or cordite charges, these letters being

followed by " F " or " R " showing the number of times it has been filled.

The fuze used with the cartridge described above is the Mark IV Hotchkiss base fuze, of which a description follows.

Hotchkiss  
base fuze,  
Mark IV.  
§§ 9451, 9814.

*Fuze, Percussion, Base, Hotchkiss, Mark IV,* consists of a body, percussion pellet, spiral spring, screwed cap, screw plug, and detonator.

The body is of copper alloy, Class A, screwed externally with a left-handed screw (12 threads to the inch) and the base is formed with a flange to act as a gas check, and a projection to take the key by which it is screwed into the shell. (*See plate XXX.*)

The body is bored out from the front to take the percussion pellet, the interior at the top screwed to receive the screwed cap, and has an undercut recess, the top edge of which is slightly rounded, formed at the bottom.

The percussion pellet consists of a brass casing, filled with an alloy (12 parts lead, 1 part tin), into which a roughened needle holder of hard brass wire, carrying a steel needle at its front end, is embedded.

The brass casing is reduced in diameter on the exterior at the front end.

The needle holder has an enlarged base and rests in the undercut recess and supports the pellet; the latter projects beyond the point of the needle and prevents it reaching the detonator.

The brass spiral spring fits round the smaller part of the brass casing and prevents rebound of the pellet.

The screwed cap is threaded left-handed and closes the front end of the fuze, the rear portion is bored out to take the screw-plug, and through the centre of the front end a fire-hole is bored to allow the flash from the detonator to pass out.

The screw-plug contains the detonator, which is similar, except in dimensions and amount of composition, to the R.L. cap, described on p. 76. It screws into the rear of the screwed cap. The fuze is lacquered externally. The fuze is marked on the head with the numeral and contractor's initials or trade mark, the number of thousand stamped on the top of the head.

Action.

On the shock of discharge, the pellet sets back over the needle holder, thus allowing the steel needle to project beyond it. The lead at the bottom of the pellet cushions against the bottom of the fuze, and a small portion of it dovetails into the undercut recess, round the base of the needle. This forms a weak connection between the pellet and fuze body, and assists the spring in checking rebound action. On graze or impact the pellet and needle set forward, the needle pierces the detonator, and the flash passes through to the bursting charge of the shell.

Mark III.  
§§ 7490 8220.

Mark III fuze differs from Mark IV in the following particulars :—There is no undercut recess for the lead of the pellet to dovetail into; the needle is shorter and is formed entirely of roughened brass wire, having no steel needle let into it; the spiral spring is weaker and is placed round the needle instead of round the pellet, and the front end of the brass casing of the pellet is consequently not decreased in diameter.

Action.

On the shock of discharge, the pellet sets back over the needle, allowing the point of the latter to project beyond it. On graze the needle and pellet set forward and the needle fires the cap.

§§ 5944, 7009.

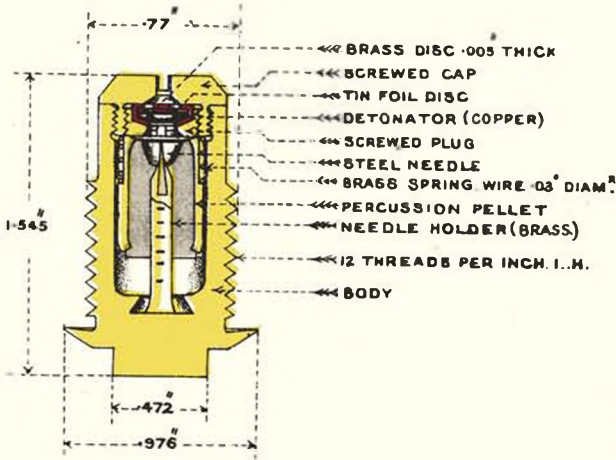
Mark II fuze had no spring, and the base of needle is smaller in diameter than that of Mark III, and it had a smaller detonator.

§ 5006.

Mark I fuze had 14 threads to the inch.

# FUZE PERCUSSION BASE HOTCHKISS MARK IV | C |

METAL.  
FULL SIZE.



SECTION

Some Mark II fuzes have been converted to the same as Mark III, and known as Mark II\*.

Plug, base, shell, No. 3, Mark I, is used with such shells as § 8141. take the Hotchkiss base fuze when fired plugged. It is of gun-metal, and resembles the fuze in shape and dimensions. It is stamped with the letter "P," and numbered.

*Cartridge, Q.F., 6-pr., Cordite, Steel Shell, Mark VII*, differs from the Mark VIII in having a gunpowder igniter (4 drams of R.F.G.<sup>2</sup> or Blank F.G. new); the Mark IV shell is used and the indents in the case for securing it are shorter. The cap first used with the case was Mark I; it has a thicker copper shield than Mark II. When fitted with guncotton priming, the cartridge is known as Mark VII\* ; 6-pr. Q.F. cartridges when fitted with Mark II cap are stamped on the base with (1).

*Cartridge, Q.F., 6-pr., Cordite, Common Shell, Mark VI | L |* is § 12295. similar to the Mark VIII steel shell cordite cartridge. The shell, however, differs; it is made of cast iron with a truncated point, and contains a 3-oz. bursting charge. The shell is Mark IV, the Mark IV Hotchkiss base fuze is used. The shell is painted black all over, with the usual red ring.

*Cartridge, Q.F., 6-pr., Steel Shell and Cartridge, Q.F., 6-pr. Common Shell* may be met with. The charge is 1 lb. 15 oz. Q.F.<sup>1</sup> powder, § § 5944, 6316. nearly filling the case, and covered by a felt wad instead of a paper cylinder.

The inside of the case is varnished; should such a case be used for cordite a paper lining is inserted.

The 6-pr. cartridges used on H.M.S. Swiftsure and Triumph are special, also the Ammunition Box.

Cartridges the shells of which are fitted with Mark I Hotchkiss § 9512. base fuze or have brass driving bands have been returned to Woolwich, those with brass driving bands are declared obsolete, those with copper driving bands being plugged and utilized for practice purposes.

*Cartridge, Q.F., 6-pr., Practice*, are generally similar to the service § § 5944, cartridges, but the shell is filled with salt and plugged instead 10503. of being fuzed. Plugs or fuze bodies used as plugs are stamped with the letter P to prevent fuzed shell on recovery being mistaken for plugged shell. The shell is painted black, with a yellow band round the centre and the word "Salt" stencilled on it in white.

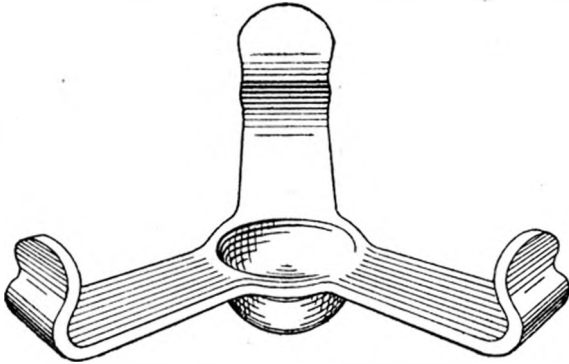
There are the following practice cartridges :—

Cartridges, Q.F., 6-pr., Practice—

Powder	{	Mark I	C	} Steel or common shell.
		" II	C	
		" III	C	
Cordite	{	" II	C	} Common shell.
		" III	C	
		" V	C	} Steel shell.
		" VI	C	

The caps in the cases of 3-pr. and 6-pr. cartridges are protected § § 5006, 5127, by a *Clip, Cartridge, Q.F.* Those of present pattern (Mark III) are 5055, 6824, of brass, with three arms and a central dome. The arms at the end 7151. are bent and clip on to projecting base of cartridge, the dome protects the cap from an accidental blow. Mark II had a felt



*Clip, Cartridge, Quick-Firing, 6-pr., Mark III | C | ; Protecting Cap.*

cushion bearing against the cap, and Mark I had an india-rubber one.

§§ 8285, 8686, 9622, 9769, 10270, 10407, 12216, 12745. The above cartridges are issued, transported, and stored in *Box, Ammunition, Q. F., 6-pr., Mark VI, | C |*, of teak or mahogany, with a lid working on gun-metal hinges and fastened by a hasp and turnbuckle of the same material, the latter being secured by a short lanyard of white line. Two strong cleats secured by copper rivets, extend across the front and back and to these are attached handles of copper wire, 24 inches long, and covered with leather at the upper portion. These cleats also strengthen the box.

The box is lined with a zinc lining, having a channel formed round the top to receive luting and so make a water-tight joint. This lining is closed by a zinc lid, having a flanged edge to rest in the luting channel. Two diaphragms are soldered to the inside of the lining. These diaphragms are perforated by eleven holes to support the eleven cartridges which the box will hold. Underneath the lower diaphragm is a wood bottom, consisting of eleven sections, each of which has a recess lined with metal to take the point of a projectile. These sections are kept in position by a thin zinc plate, soldered to the lining and are capable of slight lateral movement so as to accommodate themselves to the points of the projectiles.

Paint.  
§ 9622.  
§§ 10270,  
10407.

The wooden box is painted stone colour inside and out, but the zinc lining is neither painted nor varnished.

Mark V boxes have removable diaphragms, attached by screws to ledges of zinc which are soldered to the lining. These boxes are to be converted to Mark V\* by having the diaphragms soldered to the linings.

§§ 8285, 8686,  
9087, 9769,  
10407, 12292.

Mark IV box is made of oak. The early boxes have shorter handles and the wood bottom in one piece for the points of the projectiles. The zinc lining was varnished black. In future linings will not be painted or varnished. Some of these boxes have the diaphragms soldered to the lining, and are then Mark IV\*.

§§ 5706, 5820,  
6209, 6769,  
10107.

Mark III boxes had the diaphragms supported on metal corner pieces. They are converted by having these altered and are then Mark III\*; but all boxes are to be altered by having the diaphragms soldered in, as they pass through Ordnance Factories. They then become Mark III\*\*.

Closing boxes.

To close 6-pr. boxes, Marks II to VI, fill the channel round the top edge with Mark III luting, press the flange of the zinc lid well into the luting, then fill up the recess round the lid with luting,

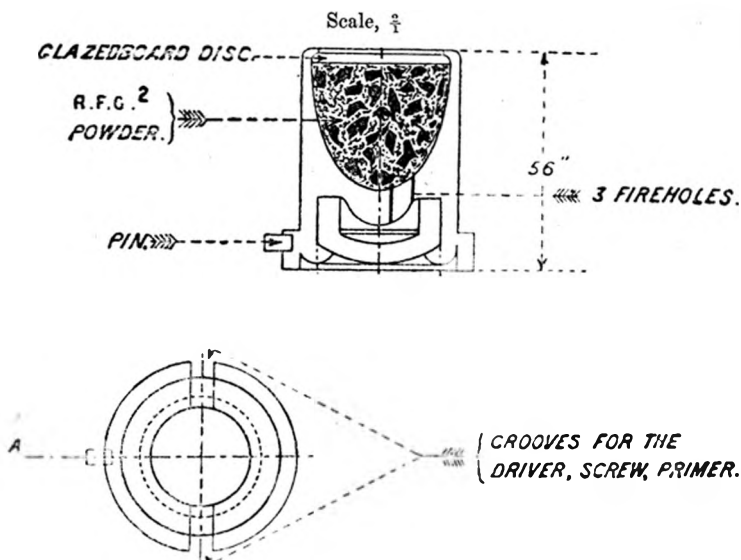


smoothing it well down with the thumb. Wipe off the surplus luting, and close the outer lid, securing the turnbuckle with the lanyard. Before closing the wooden lid see the labels are in position; after closing the usual labels are pasted on.

*Cartridge, Q.F., Saluting, 6-pr., Mark IV, | C |*, consists of a case, §§ 8299, 8440, primer, charge, felt jacket and wads. The case (Mark IV) is of 9235.

*Cartridge, Q.F., Saluting, 6-pr.,  
Filled, Mark IV, C.: brass,  
15-oz., Blank, L.G.*

*Primer, Mark III, 6-pr. or 3-pr. With Cap; for Mark IV Case.*



solid-drawn brass, varnished inside. A hole is bored through the centre of the base. The hole is recessed, and a spiral groove is cut in the recess to take a removable primer, two slots are made in the case near the mouth. The primer is of brass, with a cap chamber and anvil formed in its rear end; three fire-holes communicate the flash from the copper percussion cap to about  $5\frac{1}{2}$  grains of R.F.G.<sup>2</sup> powder, with which the body of the primer is filled. The front is closed

with a glazed-board disc, spun over and coated with shellac. A small brass pin projects from the head of the primer, by which it is secured to the case. There are also two slots in the head to take the "driver, screw, primer," for inserting or removing it. The primers are issued in hermetically-sealed cylinders.

§ 6542.

The charge Mark IV is 15 oz. blank L.G. powder, contained in a red shalloon bag, hooped with silk sewing. The red shalloon bag is sewn into a felt jacket, having a loop on the top. Over the charge is placed a felt and a millboard wad, the loop on jacket being passed through holes in them; the whole is secured in the case by a piece of narrow silk braid, which is passed through the loop, then through the slots in the case, and finally tied to the loop. The charges are issued, 37 in half metal-lined cases, which for Naval Service are painted red.

§§ 5943, 8611,  
9062.

*Box, Cartridge, Cases, Q.F., 6-pr., Mark II, Saluting*, is made of deal with elm ends, having cleats and rope handles; the lids are hinged and fastened by a hasp and turnbuckle in front. They are fitted with two mahogany fittings, perforated with 20 holes for the cases, which stand base upwards. The underside of the lid is recessed so that safety clips may remain on the bases of the cases.

Printed instructions for filling, and lithograph showing method of filling, are fixed on the inside of the lids of these boxes.

For Naval Service these boxes are painted red.

§ 9062.  
§ 6542.

*Box, Cartridge, Q.F., 6-pr. and 3-pr., Saluting, Tools, Mark III.*—The box for saluting tools, primers and wads is fitted inside to take a set of tools, and for the primers and wads. It is painted stone colour, and its contents are as under. These boxes have printed instructions for filling, and a lithograph showing method of filling, fixed on the underside of the lids:—

Articles.	For 6-pr.	For 3-pr.	Remarks.
Primers, Mark III (20 in a tin cylinder)	100	200	
Wads, felt, Mark III .. .. .	125	250	
„ paper, „ .. .. .	125	250	
Tools { rods 12·7-inch .. .. .		1	
{ drivers, screw, primer.. .. .		1	

Complete boxes only are issued.

§ 9197.

*Cartridge, Dummy Drill, Q.F., 6-pr., Mark II*, consists of an ordinary Service case into the base of which a receiver screws. The receiver is of gun-metal, and contains in its outer end a coned india-rubber plug, backed up by a spring. The front end is closed by a gun-metal screw plug. The case is fitted with a teak block, a portion of which projects outside the case, and is shaped like the common shell. The block is secured by three brass screws, and is varnished. Holes are bored through the case to distinguish it from the service case, and numeral advanced to Mark III.

The edge of the flange of the case is milled.

§ 12746.  
Issuc.  
9062.

In Mark I boxes, which have the word "Dummy" painted on front and top. Painted black for Naval Service.

§ 10094.

Cartridges issued for instruction will have two holes,  $\frac{1}{2}$ -inch in diameter, drilled through the case at right angles so that it may be seen that the cartridge is not a service one.

The ammunition used with the 3-pr. Q.F. is similar to that for

the 6-pr., differing in weight of charge and dimensions. Details as to the various Marks, &c., will be found in Table No. 24.

3-pr. boxes differ from the 6-pr. in dimensions. They hold sixteen cartridges and in order to readily distinguish them from the 6-pr. they are painted lead colour. Dimensions, 22·775" × 14·65" × 12·375".

Mark VII 3-pr. box corresponds to the Mark VI, 6-pr.

" VI " " " " " " V "  
" V " " " " " " IV "

Mark IV 3-pr. box differs from the 6-pr. Mark III in having no holes in the wood bottom for the points of the projectiles. The lid and bottom are also slightly thicker, giving greater strength.

Marks VI\*, V\*, and IV\* have the diaphragms soldered in.

Marks III, II, and I boxes follow the corresponding marks of the 6-pr. boxes.

2·95-inch Q.F.—The projectiles fired from the 2·95-inch Q.F. gun, are shrapnel, double, case shot and star shell.

The latest case, Mark III, is solid drawn, differing from the 6-pr. in having a threaded hole in the base to take a percussion primer. The body of the primer is of brass; threaded externally to fit the cartridge case, and fitted with a percussion cap similar to the 6-pr. Two recesses are cut in the primer to allow of the use of the key inserting and removing percussion primer. The Mark II case has a similar cap to the 6-pr. Mark I\* is Mark I fitted with 6-pr. and 3-pr. cap. Weight of case, about 1 lb. 10 $\frac{3}{4}$  oz.

The charges are of cordite, a circular bundle enclosed in a shalloon bag, secured by a draw string; it is primed with 1 dram of gun-cotton yarn, stemmed into a pocket formed by a disc of shalloon, sewn to the bottom of the bag. The charge is held in position by a perforated paper cylinder with two perforated paper discs at each end.

Weights of charges:—Shrapnel shell, 5 oz. 4 drs. cordite, Size 5

Double	"	5	"	"	5
Case Shot	"	5 $\frac{3}{4}$	"	"	5
Star Shell	"	2 $\frac{3}{4}$	"	"	3 $\frac{3}{4}$

The latest charge for double shell is cordite M.D. 5 $\frac{9}{16}$  oz., size 4 $\frac{1}{4}$ , bundled together and tied with silk sewing; the centre sticks are slightly shorter, leaving a recess at the lower end, in which is placed a shalloon bag filled with F.G. powder, 2 $\frac{1}{2}$  drams. The charge for the shrapnel shell is similar, but weighs 6 $\frac{3}{16}$  ozs.

Ballistite charges were first issued.

*Shrapnel Shell, Mark II*, differs from the 12-pr. shrapnel in being without the tin cage for bullets; the head is lined with wood and screwed into the body. The fuze hole socket screws into the head, and the lower end is reduced to fit inside the central pipe and tapped for the primer. A cannellure in rear of the driving band allows for securing it to the case. The driving band has two cannellures. Mark I shell had a gun-metal head and no tin cup for bursting charge.

The shell, Mark III, is made of cast-iron with truncated point and is tapped at the base to receive the medium base fuze, No. 12.

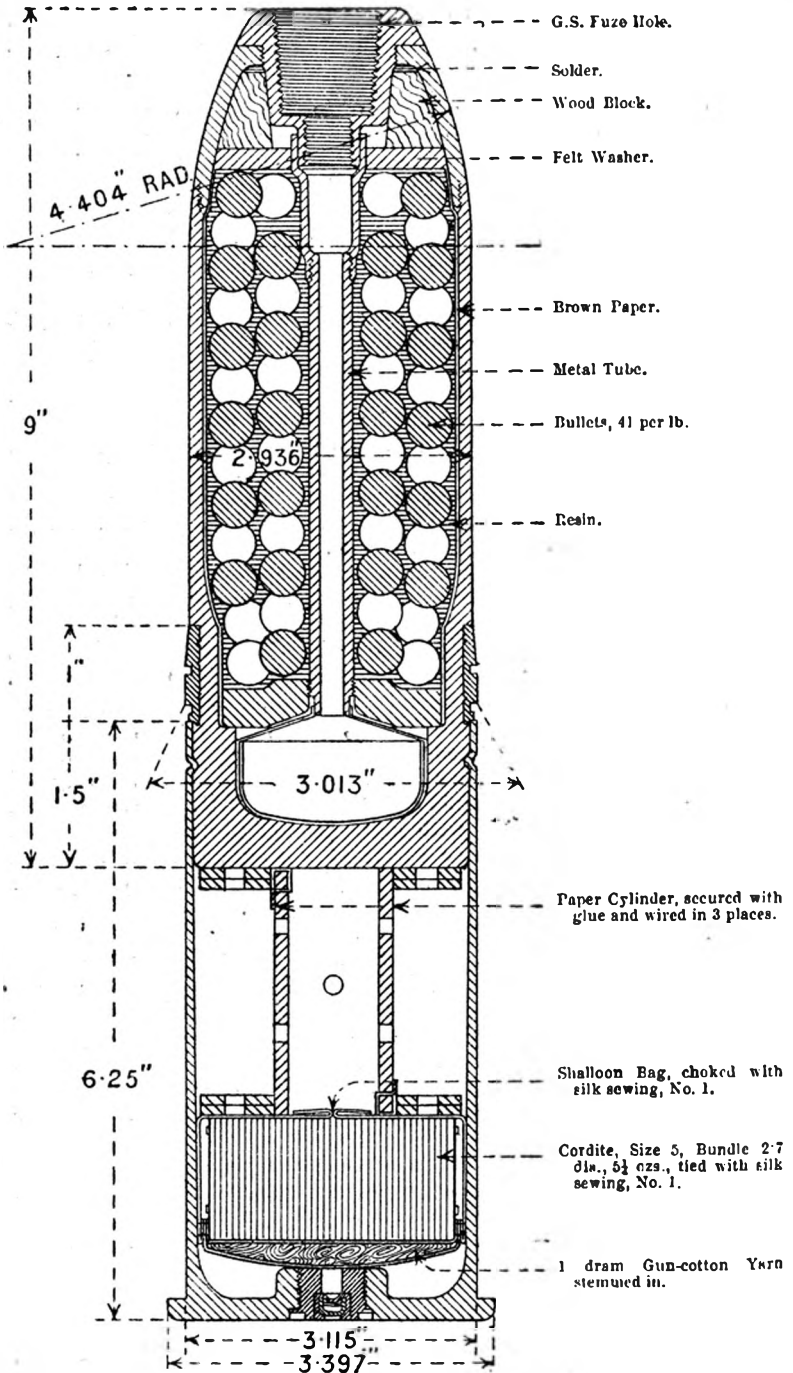
The shell is lacquered inside and takes a bursting charge of 15 oz. of P mixture. It is rotated by a driving-band like that of the shrapnel and is secured in the case in the same way.

The shell weighs 18 lb. when filled and fuzed; it is painted black all over, except the driving-band, with the usual red band to denote filled.

† Clips, cartridge, Q.F., 2·95-inch, are similar to those for 6-pr. and 3-pr., differing in dimensions.

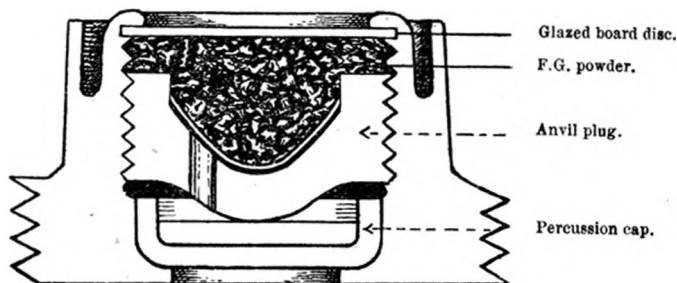
Cartridge, Q.F., 2.95-in., Cordite, Shrapnel Shell, Mark III | L | .

Scale  $\frac{1}{2}$ .



Page 121.—§ 14029. *Cartridge, Q.F. 15-pr. Primer, Percussion Mk. I.*  
 † L. †

Consists of a body, percussion cap, anvil plug, charge of F.G. powder and a glazed board disc.



Page 121—  
*continued.*

The primer, externally is similar to the Q.F. 6 and 3-pr. primer, percussion Mk. I, differing in the following particulars:—The anvil plug has 3 fire holes, there is no copper ball, and the body above the plug contains 1.3 grains of F.G. powder, covered by a glazed board coated with Pettman Cement.

Packing 20 in cylinder No. 108.

Existing Q.F. 15-pr. Mks. I and II empty cartridges when prepared to take the above primer will be known as Mks. I\* and II\*.

Weight 15 lb.

*Cartridge, Q.F., Drill, 2.95-inch, Mark I.* Consists of a brass case fitted with a wooden shell, fixed to the neck of the case by three brass screws. The base of the cartridge is fitted with a dummy primer, containing a spiral spring and indiarubber pad for the firing-spring of the striker to impinge against. Three holes are drilled through the base and three through the walls for identification. §11749.

Details of the ammunition for the 12½-pr. Q.F. (of which only a few exist) will be found in the handbook for that gun. 12½-pr. Q.F.

The ammunition for the 15-pr. Q.F. gun consists of a capped brass case, shrapnel shell and fuze. The shell is not attached to the case. 15-pr. Q.F.

*Cartridge, Q.F., 15-pr., empty, Mark II,* is a solid drawn brass case, recessed in the base for the 6-pr. and 3-pr. cap. §10839,10726.

Three tongues are formed at the front of the case for securing the lid in position. The case is blackened. Mark I differed in the cap, fitted with the 6-pr. and 3-pr. cap, becomes Mark I\*.

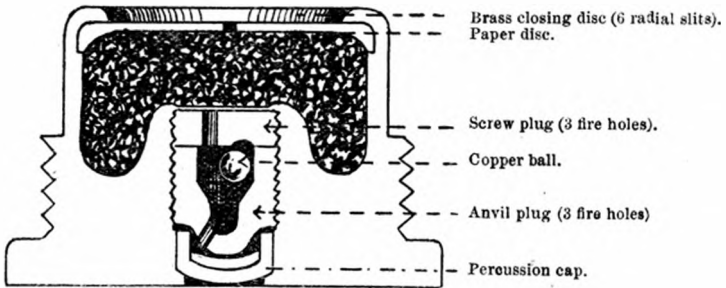
1 lb. 2⅞ oz. of cordite M.D.T., Size 20-10, Mark I. The cordite is bundled together and tied with two shallon hoops; the bottom rests on the igniter. Charge. § 12294.

The shallon igniter contains 4 drams of R.F.G.<sup>2</sup> powder. It is made in two parts, to cover the bottom of the charge, one part being in the form of a ring to fit round the bottom of the case, and the other in the form of a disc to rest on the boss. The disc portion is tied to the ring by silk sewing. The charge is held in position by a cupped-shaped glazed-board lid, which is pressed into the mouth of the case hollow side up, and secured by Pettman cement and the three clips. § 12231.

Page 122.—§ 13921. *Cartridge, Q.F. 13-pr. and 18-pr. Primer, Percussion Mk. II.* | L. |

The Mark II primer differs from Mark I, in having no cap chamber pressed into recess in the base; the cap is of copper, and is placed in a recess in the body, over which screws an anvil plug having a cone-seating into which is placed a soft copper ball. Three fire holes are bored through the anvil plug to allow flash from the cap to pass into cone-seating.

The copper ball is retained in position by a perforated screw plug. A fillet of Pettman cement is placed between the cap and the body to prevent the ingress of damp. A metal disc with six radial slits instead of a disc of cordite is used to close the front end of the primer.



*Cartridge, Q.F. 13 and 18-pr. Primer, Percussion Mk. I\*.* | L. |

A certain number of Mark I primers have been converted by the removal of cordite closing disc, and the front of the primer closed with a metal disc having six radial slits.

Primers so altered will be known as Mk. I\*.

The new covers and fuze sockets are attached to the bodies with brass screws and steel twisting pins.

A perforated metal tube is screwed into a wrought iron diaphragm over the bursting charge, and is fitted at the top into the fuze socket. The shells are velvilled, lined with brown paper, and contain 10 stars in two tiers of five. A perforated iron disc separates the tiers and is supported by wood supports placed between the stars in each tier.

Page 122.—In future manufacture of Q.F. 13 and 18-pr. ammunition, the numeral, lot number, and initials of maker of the fuze used will be stencilled in black paint on the tin band of the fuze cover.

metal of the primer is varnished. Issued spare 4 in a tin box.

The total weight of the round is 16-lbs.  $6\frac{1}{6}$ -oz., the weight of the filled and fused shell being  $12\frac{1}{2}$  lbs.

A four-armed clip protects the cap, one arm is painted red and projects, so as to fit in a groove near the outer end of the cartridge tube of the limber or wagon, and so hold the cartridge in position. The clip is fitted with a web strap for handling.

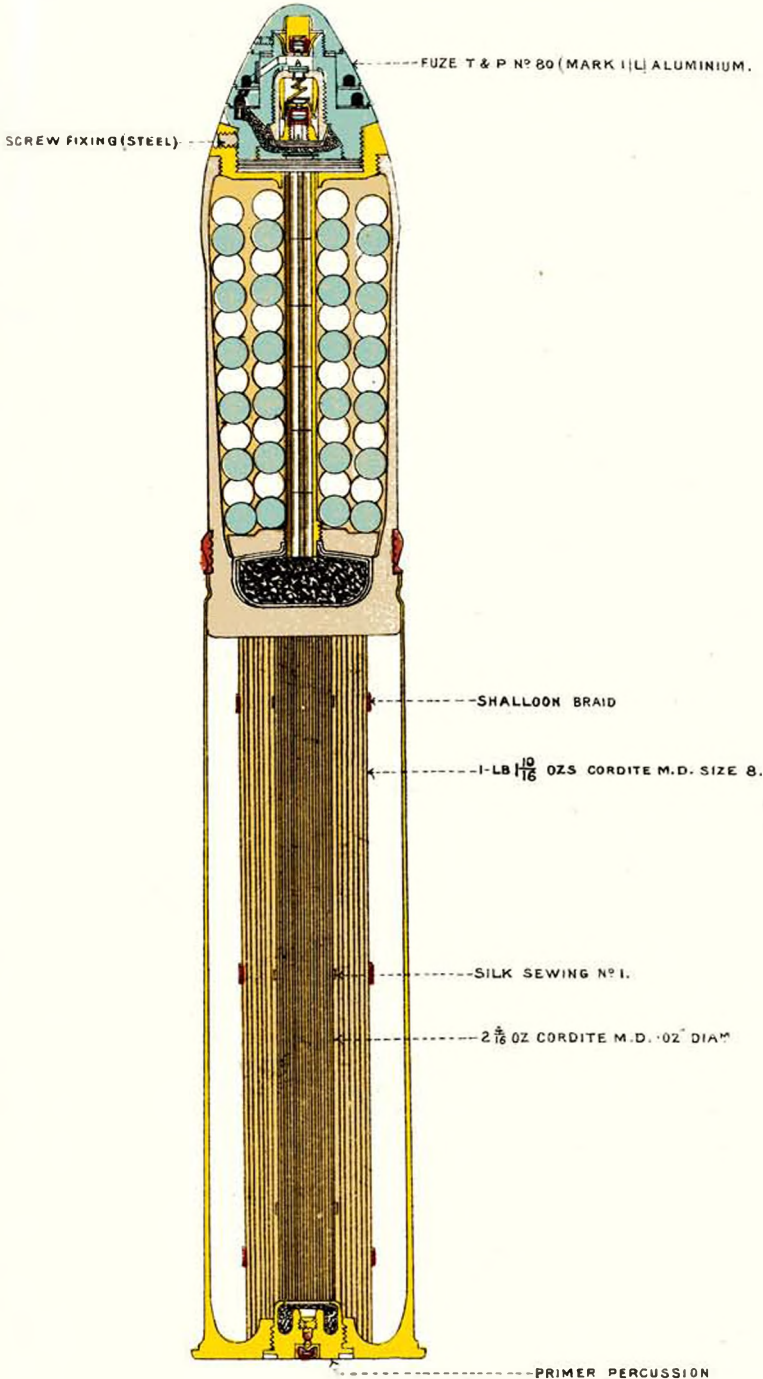
*Cartridge, Q.F., 18-pr.* This is similar to the 13-pr. cartridge and takes the same primer.

The charge consists of 1-lb.  $6\frac{1}{8}$ -oz. of M.D. cordite, size 8.

The total weight of the round is 22 lb.  $10\frac{1}{8}$  oz., the weight of the filled and fused shell being 18 lb. 8 oz.

# CARTRIDGE Q.F. 13-PR. SHRAPNEL SHELL MARK I | L | FUZED.

SCALE  $\frac{1}{3}$



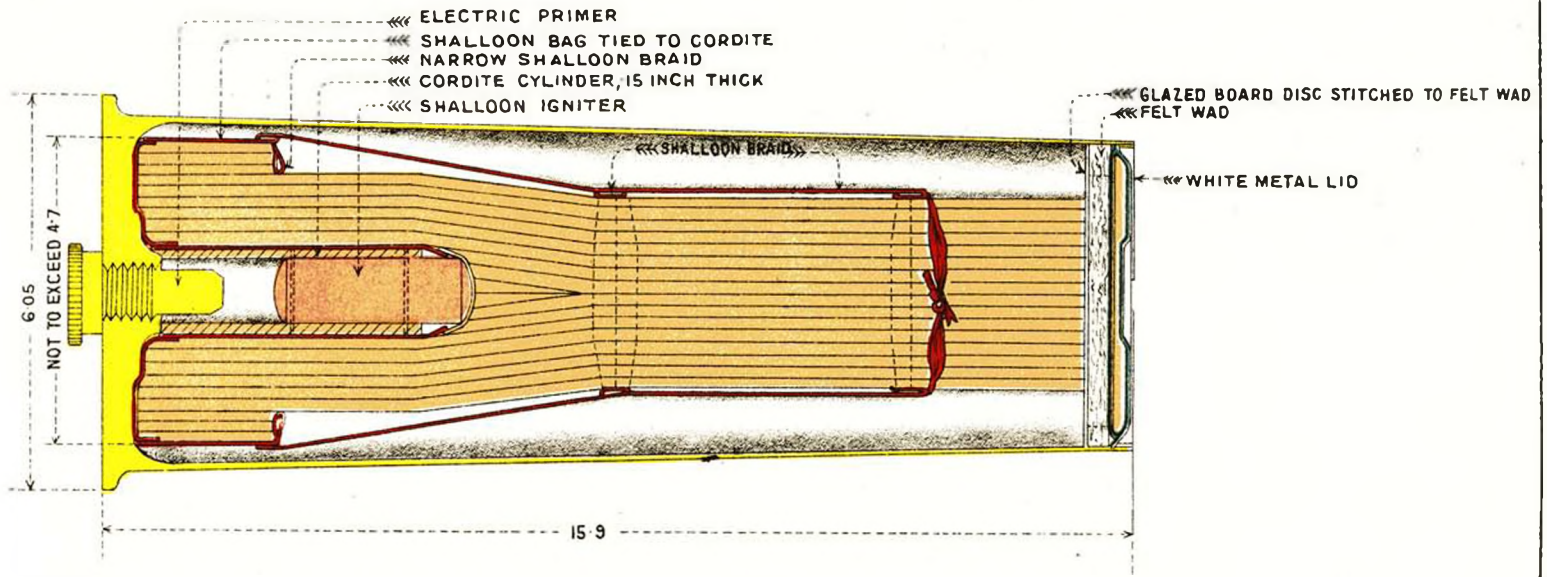
SECTION



CARTRIDGE. Q.F. 4.7 INCH MARK I TO IV\* GUNS. 5 LB. 7oz. CORDITE, SIZE 20, MARK V. C

BRASS, WITH LID AND ELECTRIC PRIMER.

SCALE 3





† In the ammunition used with the 12-pr. Q.F., 4-inch Q.F. or Q.F.C., 4.7-inch Q.F., 6-inch Q.F. or Q.F.C., the projectiles are not attached to the brass case, but are stored, transported and loaded separately. These projectiles, having been already described in Chapter X, reference only will be made to them here.

The cartridges for these guns are all made up on the same model, and differ from each other in slight details which will be noted under the different calibres; these guns are fired electrically, either by an electric primer, or by using an adapter and V.S. electric wire-less tube. In the event of a breakdown in the electrical arrangements, an adapter and percussion tube must be used.

The projectiles fired by the 4.7-inch Q.F. gun are:—Armour-piercing shell; pointed common shell, cast-steel and cast-iron; Lyddite shell; and shrapnel shell; solid shot for practice; common iron for guns on travelling carriages; paper shot in the L.S. 4.7-inch Q.F. projectiles.

*Cartridge, Q.F., 4.7-inch, Marks I to IV\* Guns, filled, 5 lb. 7 oz. Cordite, Size 20, Mark V* consists of a case, igniter, cordite cylinder, shalloon bag, felt and glazed-board wad, and lid (See plate XXXII). A primer, electric large, or an adapter being screwed into the base. Cartridge, Mark V. § 9511.

The case is made of brass which is usually solid drawn but may be built up. It has a projecting rim round the base to allow of extraction and a central hole through the base is screw-threaded to receive the electric primer or adapter. Round the mouth three tongues are formed by which to secure the lid. The case is lacquered inside and out with the usual transparent lacquer. On the base are stamped the initials or trademark of the contractor, the date and the numeral or mark; the letter C. or P., followed by F. or R., according to the charge and number of times fired. The numeral refers only to the empty case, not to the filled cartridge. The empty case weighs about 10½ lb. The charge, consisting of 5-lb. 7-oz. cordite, size 20, is weighed and divided into two portions. The larger portion consists of sticks nearly the full length of the case, which are secured together by two pieces of shalloon braid. Round the bottom of these sticks a short shalloon bag, with a pocket for the igniter, is placed and the short sticks, which form the second portion of the charge, are packed in this bag, thus enlarging the diameter of the charge at the bottom. The bag is provided with a draw-string of shalloon braid which is pulled in and tied tightly above the short sticks. Two pieces of shalloon braid, attached to the bag, are passed up round the securing braid on the long sticks and fastened in the centre of the cordite by a reef knot. Silk braid was used with earlier issues. § 9396.

The igniter (Mark III) consists of a cylindrical shalloon bag, containing 1¼-oz. of R.F.G.<sup>2</sup> or new blank F.G. powder, and stitched into a cordite cylinder, 1.5-inch thick, which is inserted into the pocket of the bag, mentioned before, and fits up the centre of the charge. The weight of this cylinder is included in the weight of the charge. § 8873.

Above the charge is placed a felt wad, to the underside of which a glazed-board disc is attached.

The case is closed by a lid, Mark IV., of white metal made by soldering two pieces of white metal together, a lubricant of beeswax and tallow being placed between them, it is weakened by radial and Lid. §§ 7215, 8732, 9624, 10951. § 7869. § 8501.

† §§ 10973, 11107, 11201. Common pointed practice shell for these guns for practice in Naval Service have a wood plug fitted in the key-hole of plug to prevent the lid of the cartridge from taking a seating. The 4.7 A.P. shell, Marks I to III, have in addition the space round head of plug filled in with lead.

concentric grooves to ensure it breaking up easily, and has a recess in the centre in which a paper label is placed, showing the size of the cordite, the word "Cordite," the weight of the charge, the lot No. of the cordite, and the numeral of the filled cartridge. Three notches are made round the rim for securing it and it has a small projecting flange by which it is supported on the top edge of the case. Before insertion it is painted round the edge with Pettman cement, to make a tight joint and it is retained in the case by the three tongues being bent over on it.

The numeral of the filled cartridge refers to the mode of filling, not to the empty case.

An electric primer or adapter is screwed into the base, the front end of it projecting into the cordite cylinder.

Mark IV,  
cartridge.  
§ 9511.

Mark IV cartridge differs from Mark V in the following points: the lengths to which the cordite is cut; the shalloon bag is longer, and above the charge is a paper cylinder, with a disc of silk cloth on its underside, and above it a felt wad.

§ 10381.

A certain number of Mark IV cartridges have been altered to Mark IV\* by omitting the paper cylinder, and filling up the space by a glazed-board disc and felt wads.

Mark III,  
cartridge.  
§ 8419.

Mark III 4·7-inch cartridge differs from Mark IV in having the Mark II igniter and no shalloon bag.

Owing to the fact that portions of this igniter sometimes remained in the chamber, unconsumed, and caused the shell to jam, when loading the next round, Mark III cartridges have been altered to Mark III\*.

Mark III\* cartridges are made to conform as far as possible to Mark V, but the cordite being shorter, the space above the felt and glazed-board wad is filled in by one or more felt wads.

§ 9531.

*Cartridge, Q.F., 4·7-inch, Marks I to IV\* Guns, filled, 2-lb. 2½-oz., Cordite, Size 7½, Mark I, N.,* is a reduced charge for Naval Service. The charge is of cordite in two lengths, made up in the same manner as the charges for the Mark V service cartridge, with a similar shalloon bag and igniter, but with .05-inch cordite cylinder. The same brass case is used and as the reduced charge is very short. the space above it is filled up by a paper cylinder. This consists of a cylinder of brown paper, perforated, and fitted with double perforated discs at each end. A disc of glazed-board is attached by rivets to the end of the cylinder which is placed next the charge and the cartridge is closed by the white metal lid in the usual way.

§ 12118.

*Cartridge, Q.F., 4·7-inch, Marks I to IV\* Guns, filled, 2-lb. 5¼-oz., Cordite, Size 7½, with adapter, Mark I | C |,* differs from the 2-lb. 2½-oz., charge in weight. It is used with the common iron shell for guns on travelling carriages.

§§ 6244, 6273.  
6420.

*Cartridge, Q.F., 4·7-inch, filled, 12-lb., S.P., Mark II,* is similar to the above. The charge is 12-lb. S.P., covered by a millboard disc and a felt wad. The inside of the case is lacquered, with brown lacquer. The mouth of the case is closed by a brass lid, with concentric and radial weakening grooves.

§ 10960.

*Cartridge, Q.F., 4·7-inch, Marks I to IV\* Guns, filled, 12½-lb. of S.P., Mark I,* is similar to the above, but over the charge is a felt and glazed-board wad; this charge is for paper shot.

These cartridges are issued, transported and stored in

§§ 10270,  
10462, 11191,  
11351.

*Box, Cartridge, Q.F., 4·7-inch, Marks I to IV\* guns, I.S., Mark II,* with 12 lifting bands, 1 bottom and 6 spring packing pieces to hold 6, is made of teak or mahogany, with strengthening battens along the sides, top and bottom. Two rope handles are secured to

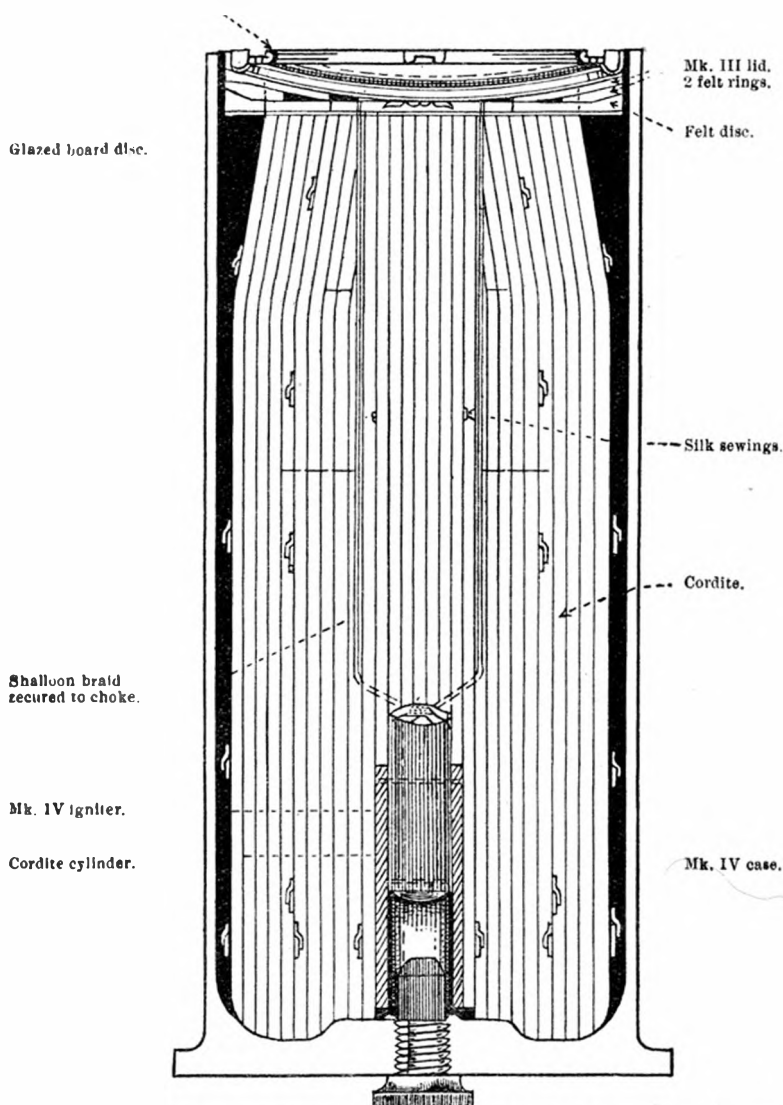
Page 124—  
continued.

on top of the felt disc, and the whole sewn together, thus making the wad thicker at the edge than in the centre.

*Cartridge, Q.F. or Q.F.C. 6-inch gun, short empty, Mark IV.*

The Mark IV empty cartridge differs from previous mark in having six tongues at the mouth to suit the Mark III lid.

Q.F. 6-inch cartridges with damaged Mark I or II lids will have the lid and wad replaced by the Mark III lid and wad, the cartridge being first emptied and three additional tongues cut in the mouth. Cartridges so altered will have a star (\*) added to the numeral of empty case, and also to the numeral of filled cartridge.



CARTRIDGE, Q.F. OR Q.F.C. 6-IN. GUN, SHORT, FILLED, 13 LB. 4 OZ., CORDITE, SIZE 30.

the upper battens. Four gunmetal plates are attached to the upper battens, and hinged to these plates are studs carrying wing-nuts. The body has a zinc lining, the top edges of which project slightly above the box.

The lid is lined with zinc, and in it a luten groove is formed, into which the top of the lining fits. It is strengthened by battens. Four slots are cut in the edge, and strengthened by metal plates for the wing-nuts to screw down on. The lid is also fitted with two handles of white line, for lifting it off.

The box is fitted with seven packing pieces, one bottom and six end pieces. The end pieces are made of wood (teak, or padouk) with brass spring cups. The box is also provided with twelve canvas lifting bands two per cartridge, and the six cartridges are packed heads and tails.

To close the box, fill the groove on the underside of the lid with Mark III luting. Place the lid in position and tap it home. Turn the studs, with wing-nuts, up into the recesses in the lid and screw down the nuts. Dimensions, 19'1" × 18'9" × 17'85".

Closing.

Mark I box differs considerably from Mark II.

§§ 6568, 8285.

It is made of deal, with elm ends, the sides and ends being dove-tailed, and the bottom secured by brass screws. It is strengthened by deal battens extending up the sides and across the bottom. At each end there are two cleats of elm, to which rope handles are attached. It contains six cartridges, which fit into zinc cylinders, which rest on the bottom of the box. These cylinders have lids, inside which arc indiarubber rings for the purpose of making an airtight joint. A zinc plate secured inside near the top by screws keeps the cylinders in position. The lid of the box is secured by eight brass screws, and is strengthened by two battens fastened diagonally across it. It is painted stone colour.

*Box, Cartridge, Q.F., 4'7-inch, Marks I to IV\* Guns, Land Service* covered was originally introduced for the 4'7-inch, Mark V gun cartridges; it is fitted inside with five wood strips covered with zinc. External dimensions 18'9" × 14'5" × 19'375". It carries 6 cartridges, and is provided with packing pieces similar to the Mark II box.

§§ 11020, 12158.

For Naval Service they are packed in:—

*Box, Cartridge, Q.F., 4'7-inch, Naval Outfit, Mark II* differs as follows from the L.S. box in having copper wire handles with leather at the hook joint. The lid is fastened by a locking plate. The locking plate engages four metal bolts in the body of the box and is moved by an eccentric, which may be turned by the Mark IV key used with rectangular brass cases. The bolts fit into holes in the lid. Dimensions, 19'1" × 18'9" × 14'25".

§ 10462.

Mark I had wood packing pieces and when fitted with spring packing pieces becomes Mark 1\*.

§§ 7035, 7247, 7298, 8193, 8285. §§ 6027, 9122.

*Box, Cartridge, Q.F., 4'7-inch, Naval Transport* may be met with, it becomes obsolete when used up. It holds six cartridges, and is similar to the Naval Outfit Box internally, the lid is fastened by brass screws.

*Case, Powder, Rectangular, M, Mark II.*—The case is made of brass, the sides being corrugated. The bottom is strengthened with a gun-metal band, is lined with teak, and has recesses to receive the ends of the cartridges. The case is fitted with a false top and bottom, both of brass, each perforated with six holes to receive the 4'7-inch cartridges; the flange of the cartridge rests on the false top, and a spring clip projects over the head and secures each in position.

M case. §§ 5917, 7249, 7449.

The lid is secured by bolts with feathers on the end, which lock, by a one-third turn, into holes in the top of the case. The bolts pass through the lid, the heads on the outside being square, so that they can be turned with the key. The lid has a projecting rim round the edge which fits into the groove in the top of the case. The lid is fitted with two twine loops for lifting it, and the case has a handle attached to each of the top corners of one side, so that when slung or lifted the cartridges in the case are horizontal.

Securing.

The groove round the top edge of the case is filled with Mark III luting, the projection on the lid is placed in this groove and the lid tapped well home. Mark IV key is used to turn the bolts into the locked position, as indicated by the arrows. The surplus luting is then wiped off. For Extractor, Cartridge, M, powder case, see p. 136.

Mark I cases are altered to conform as far as possible to Mark II and will be known as Mark I\*.

*Cartridge, Q.F., Blank, 4.7-inch, filled, Mark III.*


Blank cart-  
ridges.  
§ 10324.

The charge of 3-lb. blank L.G. is enclosed in a silk cloth bag with a dome-shaped igniter into which is secured a bag containing  $8\frac{1}{2}$  drams R.F.G.<sup>2</sup> or new blank F.G. powder. The bag is hooped in the ordinary way, but the hoops pass under strips of silk braid, which are attached to the bag so as to form loops, instead of through the silk cloth. This prevents the escape of powder dust from the bag into the interior of the brass case. The Service case is used, and the space above the charge is filled by a paper cylinder, similar to that used with the reduced cordite charge, but without the glazed-board disc. The mouth is closed in the usual way with the white metal lid.

Issue.

† Thirty in whole metal lined case, 12 in half, 5 in quarter, for L.S. For N.S. issued made up in service boxes painted red.

§ 3269.

Q.F. Cartridges, 12-pr. to 6-inch, which are condemned for service but are utilized as dummies are stamped on the base thus  When so stamped they will on no account be used again as service cartridges.

Electric  
primer.  
§ 10900.

*Primer, Electric, Large, Mark V,* consists of a body, cone, contact disc, ebonite insulator, two poles, iridio-platinum wire bridge, ebonite washer, screwed collar, brass cylinder, priming composition and glazed-board closing disc. (See Plate XXXIII.)

The body is of manganese or aluminium bronze, made to the form and dimensions shown in plate, and screwed below the shoulder to fit the hole in the base of the Q.F. cartridges, the end of the body is reduced in diameter, and threaded to receive a brass cylinder; the face of the body between the screwed portions is cupped out to a depth of .25 inch to form a gas-check. The head is recessed in the centre and screw-threaded to receive the insulator and contact disc, the inside is bored out and the part near the head coned to receive the cone, and a small hole drilled through to the recess for contact disc.

Two slots are formed in the head to take a key by which the primer is screwed into the case.

The ebonite insulator is screwed into the recess in the body and is hollowed out and undercut. The contact disc is of pure tin; the top is smooth and slightly below the surface of the body.

The letter T, denoting pure tin, was stamped upon the head and also marked upon all packages containing such primers, but this is now discontinued.

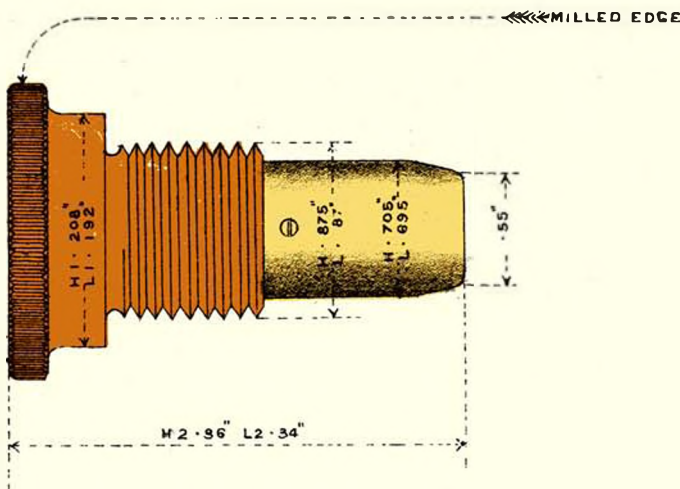
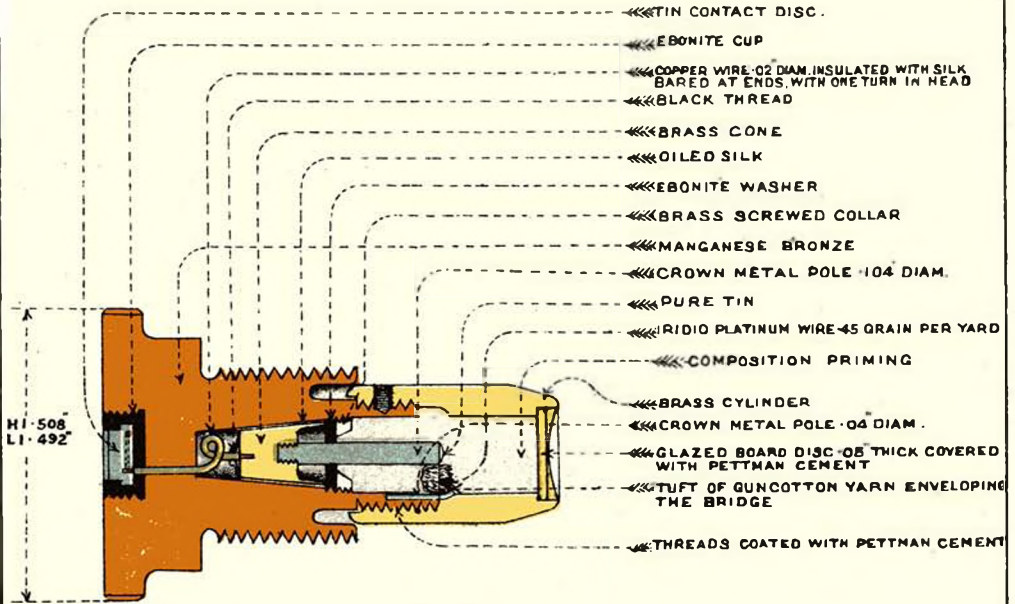
§ 10300.

† Blank or saluting Q.F. cartridges are issued complete, when required.

# CARTRIDGE Q.F. OR Q.F.C. PRIMER ELECTRIC LARGE MARK V.C

MANGANESE OF ALUMINUM BRONZE.

FULL SIZE.



The cone is made of brass, cupped out in front to form a gas-check and insulated from the body by oiled silk. To the base of the cone a piece of insulated copper wire is soldered; a turn is taken in this wire and it is passed through the hole to the recess for the contact disc. At the bottom of this recess a thin disc of tin is laid. The wire, bared of its insulation, is coiled down upon this and the recess is filled up with molten tin.

The poles are of crown metal. One screws into the front of the cone and is kept central by an ebonite washer which in turn is kept in place by a brass screwed collar.

The other pole is fixed to the face of the body; and joining the two poles is a bridge of iridio-platinum, .25 inch long and having a resistance of from .75 to .95 ohm.

This bridge is attached to the poles by pure tin. It is stronger than those fitted to earlier primers.

The cylinder is made of brass; one end is screw-threaded inside to fit the body, on to which it screws, the joint being made tight by Pettman cement. It is prevented from unscrewing by a small set screw.

The mouth is recessed to receive the glazed-board disc.

A tuft of gun-cotton is wrapped completely round the bridge and the interior of body and cylinder is filled with priming composition (2 parts gun-cotton dust, 3 parts mealed powder), and the top is closed by a glazed-board disc cemented in and covered with Pettman cement.

The primer is lacquered inside and out, except the exterior of the body below the shoulder. Primers have the initial of contractor or trade mark stamped on the head; those of Ordnance Factory manufacture have the number of thousand and year of manufacture and those obtained from contractors, the month and year of manufacture stamped on them. § 8970.

These primers are packed 10 in a tin cylinder, 20 cylinders in a packing case. Issue.

On the circuit being completed, the current flows through the wire to the brass cone and so through the bridge, which becomes incandescent and fires the gun-cotton and composition priming which in turn fires the charge. The return path of the current is by the metal of primer, cartridge, gun, etc. to battery. The cone is driven by the force of the explosion into its seating, and the cupped out portion expands, thus effectually sealing any escape of gas through the head. The cupped out portion of the body expands and prevents any escape of gas over the exterior. § 7568. Action.

The principal improvements embodied in Mark V are:—

- (a) Contact piece of tin instead of white metal which was found to corrode and become covered with a deposit of high resistance.
- (b) The ebonite cup for contact disc is screwed in.
- (c) The cone plug is cupped out in front, to give better gas sealing.
- (d) The central pole is steadied by ebonite plug and a brass washer.
- (e) The body pole is bent inward, to clear the cylinder.
- (f) Strengthened bridge.
- (g) Waterproofing threads with Pettman's cement.
- (h) Closing the end of primer with glazed-board disc and Pettman's cement.

Primers may be divided into "unconverted," "converted," and those with strengthened bridges.

*Unconverted* primers are Marks I\*, II, III, and IV. They have the double bridge of platinum-silver, resistance .6 to .9 ohms, body filled with mealed powder and the top closed by a brass washer and cork plug shellaced in.

§ 10542.

*Converted* primers are Marks I\*\*, II\*, II\*\*, III\*, III\*\* and IV\*. They have a single bridge of platinum-silver, resistance 1.5 to 1.8 ohms, surrounded by a tuft of gun-cotton, body filled with priming composition and top closed by a glazed-board disc secured with Pettman cement.

*Strengthened bridge primers* are Marks I\*\*\*, II\*\*\*, III\*\*\*, IV\*\*, and V. They have an iridio-platinum wire bridge, resistance .75 to .95 ohm.

§ 7835.

In replacing a primer in a 4.7-inch (or 6-inch) Q.F. powder cartridge, care must be taken to ascertain before inserting the primer that there is a clear space for it in the cartridge, and that there is no liability of the end of the primer being screwed against a pebble or prism of powder, and so injured, and with a cordite charge it should enter the cordite cylinder.

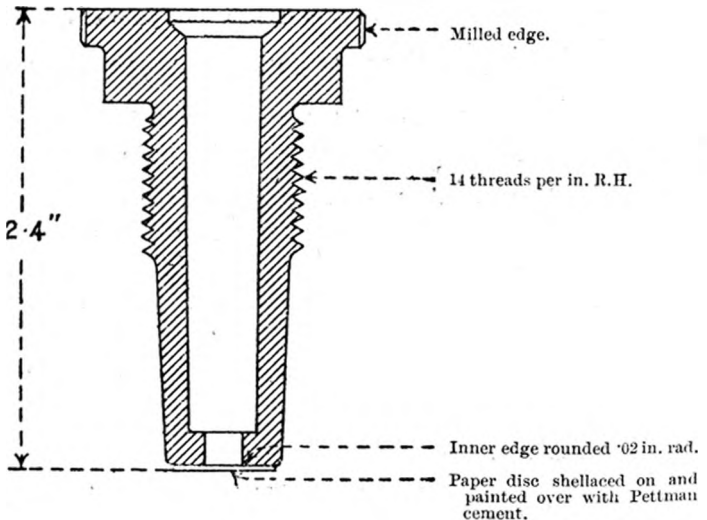
*Adapters* which may be met with are Marks I, II, and IV; Mark I converted.

§ 11756.

Mark IV is of aluminium or manganese bronze, similar to the primer in external appearance, but without the gas check portion.

Full size.

*Cartridge, Q.F. or Q.F.C., Adapter (Mark IV) | C |*  
*Aluminium or Manganese Bronze.*



It is bored out to take a V.S. tube, the front end is closed by a disc of foolscap paper, shellaced on and coated with Pettman's cement, to exclude damp from the cartridge.

§ 11878.

*Adapter, Mark I, converted*, is the body of a primer electric large (Mark II to V), bored out to take a V.S. tube. A brown paper ring is shellaced into the recess at the small end, which is then closed similarly to Mark IV. This adapter can only be used once.



CARTRIDGE, Q.F. OR Q.F.C., DRILL, 6 INCH SHORT, (MARK IV). (C).  
 CARTRIDGE, Q.F. DRILL 4 7/8 INCH, MARKS I TO IV. GUNS, (MARK V). (C).  
 CARTRIDGE, Q.F. DRILL 12 PR. (MARK IV). (C).

NUT SECURED WITH 2  
 CENTRE-PUNCHED INDENTS

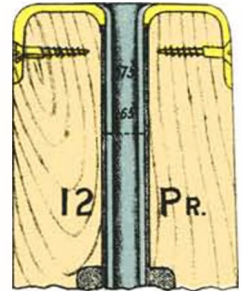
WOOD, WITH CUNMETAL ENDS.

WOOD PLUG

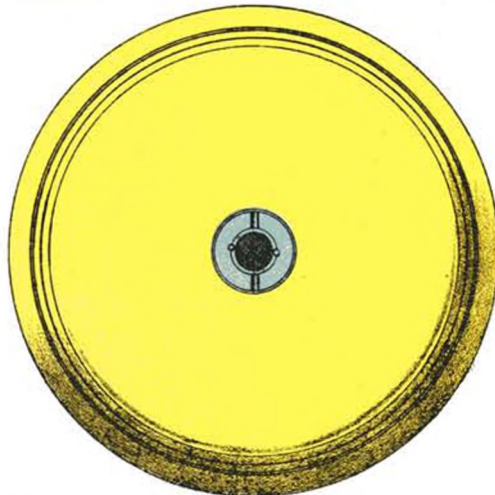
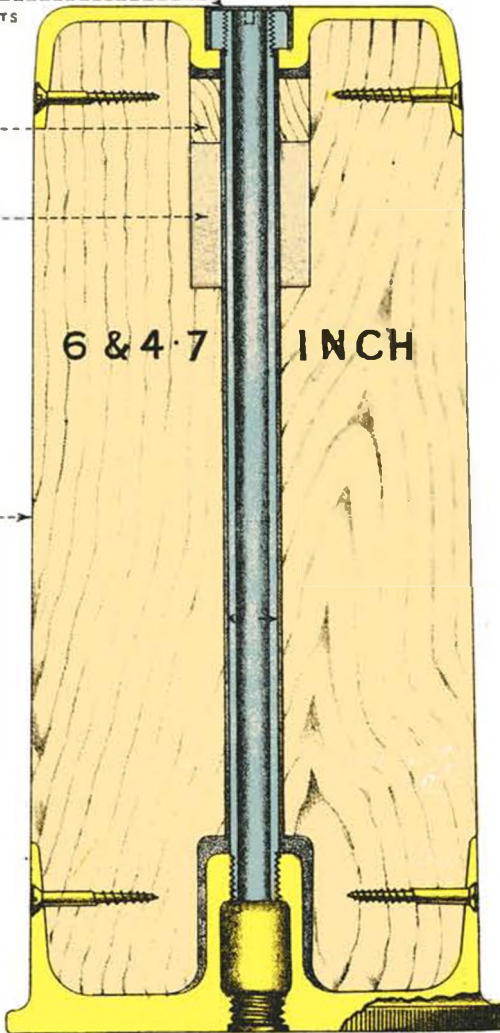
LEAD

WOOD PLUG

6 & 4 7/8 INCH



(§ 11,354)



The Mark I and II adapters are of hardened steel. Mark II is § 7400. threaded at the small end.

As a general rule steel adapters should not be stored in cart- § 12153. ridges, and therefore they do not require the paper discs, excepting those for certain issues of 4.7-inch Q.F. cartridges for guns on travelling carriages.

Before inserting a primer or adapter in a Q.F. cartridge stand the cartridge upright on the small end.

Insert a finger in the hole in the base to ascertain that the cordite cylinder is in the correct position.

Insert the adapter or primer, so that it enters the cordite cylinder and screw it well home.

If a steel adapter is used, it should be free from rust.

*Cartridge, Drill, Q.F., 4.7-inch, Marks I to IV\* Guns, Mark V,* is §§9197,1135<sup>1</sup>/<sub>2</sub>, used at drill. The cartridge is made of teak, with a gun-metal base and end, of the same dimensions and weight as the service cartridge. 11525. The edge of the flange at the base is milled, to identify it from the service cartridge when packed. It is weighted with lead. A steel tube passing through cartridge allows of electrical testing of tubes and primers in the Land Service. Mark IV, when fitted for electrical testing becomes Mark IV\*. Plate XXXIV.

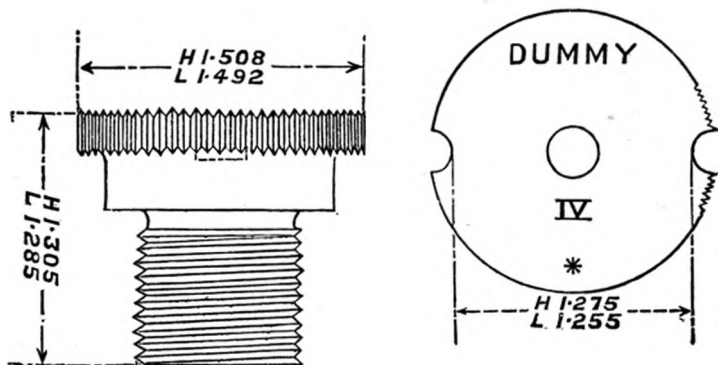
*Primer Dummy, Mark IV | C |* 6-inch, 4.7-inch, 4-inch 14-pr., § 12449. and 12-pr. is a solid piece of steel the same shape as the body of the primer; it is blackened, and has a hole  $\frac{1}{4}$  inch diameter in the head.

Surplus steel adapters may be used in lieu of dummy primers for drill purposes as follows:—

*Land Service.*—With such guns as are equipped with Service electric primers.

*Naval Service.*—With all Q.F. or Q.F.C. guns, 12-pr. and above, until stock is used up.

In Land Service, dummy primers will be replaced by V.S. percussion drill tubes and adapters for drill purposes with such guns as are provided with V.S. tubes and adapters for Service requirements.



Mark III is of metal the same shape as the primer, the head is § 9197. hexagonal and fitted with an indiarubber plng.

*Shell, Q.F., 4.7-inch Drill, Marks II\* and III.*

The shell is of wood weighted with lead. The base has a gun- § 7834. metal plate, and on the body are two bands, the front of copper,

the rear of gun-metal; the latter, which is placed 1 inch from the base, is of sufficient diameter to prevent the shell being rammed too far. The base is fitted with a recess to take an extractor.

§ 11693.

*Cartridge, Q.F., 4.7-inch, Mark V gun, filled, 8-lb. 10-oz., Cordite, M.D., Size 16 (Mark I).*—The case differs from that for Marks I to IV\* guns in being longer. Mark I case was also slightly wider at the mouth and took a special white metal lid, Mark II case is same diameter at the mouth as the case for Marks I to IV\* guns, and takes the same lid. Charges of 7-lb. 8-oz. cordite, size 20, were first issued. Weight of case about 15-lb. 6-oz.

Projectiles. Common pointed C.S.; Lyddite; A.P. shell, shrapnel, solid shot.

§ 12158.

*Box, Cartridge, Q.F. 4.7-inch, Mark V Gun, Mark I,* differs from the 4.7-inch I to IV\* gun box in dimensions. It takes four cartridges, and is fitted with lifting bands and packing pieces to correspond.

§ 11353.

The drill cartridge differs from the I to IV\* gun cartridge in dimensions.

There are three natures of 12-pr. guns—8-cwt. | N |, 12-cwt. | C |, 18-cwt. | N |.

The 8 and 12-cwt. fire the same projectiles, shrapnel, common-pointed cast-steel, cast-iron practice, case shot, solid shot for practice. The 12-cwt. gun also used a paper shot in the Land Service.

12-pr. 8-cwt. cartridge.

§§ 8514, 8610, 9268, 10095.

*Cartridge, Q.F., 12-pr., 8-cwt., filled, 13½-oz. Cordite, Size 10, Mark I, N,* is similar to the 4.7-inch Mark V cartridge.

The cordite cylinder is .05-inch thick.

§ 11191.

*Box, Cartridge, Q.F., 12-pr., 8-cwt., Mark I, N,* is similar to the 4.7-inch Naval outfit box, but the locking frame of the lid has a longitudinal instead of a circular motion. It has one canvas lifting band with a loop at one end, one of the bottom cartridges is passed through the loop and the band is wound alternately above and below the other cartridges. The box holds 10 cartridges, and has 10 end and one bottom packing pieces. Dimensions, 10.55" × 9.95" × 20.45". Weight, 32 lb.

§ 11191.

Mark II box is stronger. Dimensions, 21.1" × 11.15" × 11.0". It was issued with spring packing pieces.

7738.

Mark I\* is Mark I fitted with spring packing pieces.

Saluting.

§§ 8915, 9235, 12250, 12371, 12801.

*Cartridge, Q.F., Saluting, 12-pr., 8-cwt., filled, Mark I.* The charge of 1 lb. 8 oz. blank L.G. is enclosed in a silk cloth bag, with igniter in the base similar to that used with the 4.7-inch blank charge. This bag is completely covered, except the base, by a felt jacket, with a draw-string at the bottom which is pulled in and tied. There is a loop of silk braid at the top and over the charge comes a felt wad to the underside of which a felt ring is attached. The loop on the jacket passes through a slit in the centre of the wad. The Service case is employed, with a primer or adapter.

Issuc.

In M.L., painted red.

§ 12030.

§ 12837.

*Cartridge, Q.F., 12-pr., 12-cwt., filled, 2-lb. Cordite, M.D., Size 11, Mark I.*—Is similar to the 4.7-inch, Mark V, cartridge. It is issued either with adapters or primers. The cylinder containing the igniter is Mark I cordite.

12-pr. 12-cwt. cartridge.

§§ 10619, 11351.

*Cartridge, Q.F., 12-pr., 12-cwt., filled, 1-lb. 15-oz. Cordite, Size 15, Mark II,* is similar to the 4.7-inch Mark V cartridge, except that it may have an extra felt wad if necessary. Weight of case about 5½ lb.

§§ 8420, 10323.

Its cordite cylinder is .05-inch thick.

Cartridges containing 1-lb. 9½-oz. cordite, Size 10, have been made.

*Cartridge, Q.F., 12-pr., 12-cwt., filled, 12½-oz. Cordite, Size 5, Mark I, N,* is a reduced charge for Naval Service. It is made up in a similar manner to the 4·7-inch reduced charge. It has the 0·5-inch cordite cylinder. Reduced. § 9531.

A powder charge of 3¾-lb., S.P., is for use with paper shot for the 12-pr. 12-cwt. in the Land Service. It is hooped and choked in the ordinary manner, and has a calico and paper dome shaped igniter. Powder charge. § 10357.

*Box, Cartridge, Q.F., 12-pr. of 12-cwt. Mark II, N,* holds ten cartridges. It is similar to the 4·7-inch Naval outfit box, but the bolts fit into slots in the lid instead of into holes. It has spring packing pieces. Dimensions, 20·625" × 18·5" × 11". §§ 10462, 12701.

Mark I is of stronger construction, has wood packing pieces, and the studs work in holes in the lid. When this box is fitted with spring packing pieces it becomes Mark I\*. §§ 7739, 8285, 8192, 11191,

*Box, Cartridge, Q.F., 12-pr. of 12-cwt., L.S., Mark III,* is made of teak or mahogany, and is similar to the 4·7-inch Land Service box, Mark II. It holds ten cartridges, and has one lifting band. § 10462.

Mark II box differs from Mark III in not having spring packing pieces. When fitted with them it becomes Mark II\*.

Mark I is made of yellow deal, and the lid is secured by four brass screws instead of the wing-nuts. When fitted with spring packing pieces it becomes Mark I\*. Dimensions, 20·625" × 18·5" × 11". §§ 7908, 8285.

Special packing pieces are used with these 12-pr. boxes in L.S. for packing saluting cartridges. The box will hold 20 cartridges, without primers, in five tiers of four each lying heads and tails. § 10501.

*Cartridge, Q.F., Saluting, 12-pr., 12-cwt., filled, Mark II | C | .* The Service 12-pr., 12-cwt., Service case is used. The charge is 1-lb. 8-oz. blank L.G., made up in a silk cloth bag. A calico and paper dome igniter fits into a pocket in the base. The charge is choked and hooped in the ordinary manner. A felt wad is placed on top of the charge, and a leather board cup driven in the mouth of the case. A ring, inserting cup, and a drift is used to insert the cup. A primer or adapter and tube is used. §§ 12250, 12371.

*Case Powder, M.L.*—Whole 65, half 30, quarter 11.

*Shell, Q.F., Drill, 12-pr., Marks I\* and II,* are of gun metal, tapped at the head with the G.S. fuze-hole. Issue. 12-pr. Q.F. § 7931.

*Cartridge, Q.F., Drill, 12-pr., Marks III and IV* resembles the 4·7-inch Marks IV and V. §§ 9197, 11354, 11525.

*Cartridge, Q.F., 12-pr., 18-cwt.*—The case is longer than the 12-cwt. case, and weighs about 8 lb. 2 oz. It takes the same lid as the 12-cwt. case.

The charge consists of M.D. Cordite, Size 11, 2 lb. 12 oz. 2 drs., bundled together so that a recess is formed for the primer or adapter to fit in. The igniter is F.G. powder held between two discs at the bottom of a shalloon bag. The bag fits round the lower end of the centre bundle, and is turned back over the top end of the outer bundle and tied with silk sewing.

*Box, cartridge, Q.F., 12-pr., 18 cwt. | N |* holds eight; it differs from the latest 12-pr. 12-cwt. box in dimensions, 23·1" × 17·75" × 10·85". § 12888.

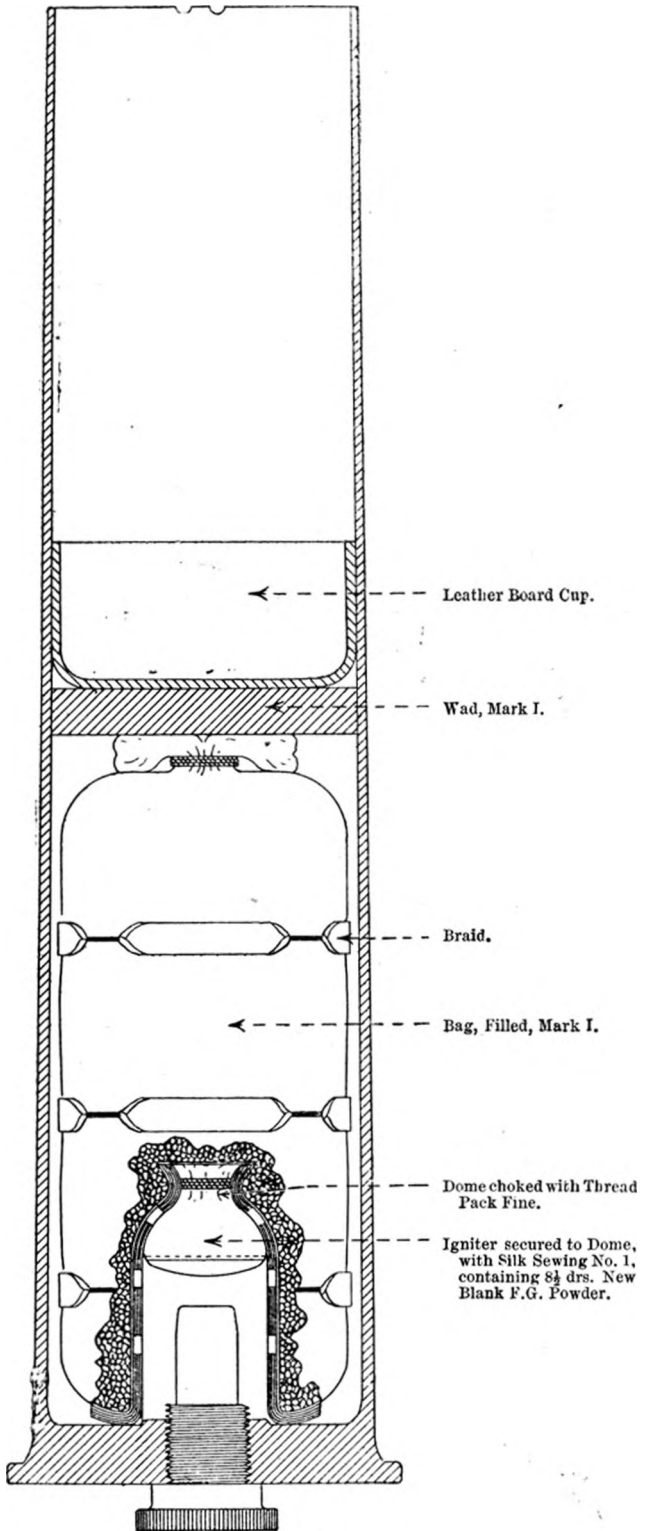
Projectiles, common, pointed cast-steel and solid shot for practice.

*Cartridge, Q.F., 14-pr., Mark I | N |* is issued for H.M.S. Swiftsure. (6139) K 2

*Method of Filling:*

*Cartridge, Q.F., Saluting, 12-pr., 12-cut., filled, { with Primer | C | .  
Mark II { ,, Adapter | C | .  
Brass, 1½ lb., Blank, L.G., in Silk Cloth Bag, with Felt Wad,  
Leather Board Cup, and Igniter.*

Scale, ½.



Part Elevation, part Section.

and Triumph. The case is similar to the 12-pr. but longer, and weighs 8 lbs. 3 ozs.

The charge, 2 lb. 15½ oz. cordite, size 11 M.D. The cordite sticks are bundled together, so that a recess is formed for the primer as with the 12-pr. 18 cwt. The igniter is ½ oz. F.G. powder. Issue, 10 in a box. Projectiles similar to the 12-pr.

The projectiles fired by the 4-inch Q.F. or Q.F.C. are:—Shrapnel 4-inch Q.F. shell; common; pointed common, cast-steel and practice, cast-iron; projectiles. Lyddite and armour-piercing shell; solid shot for practice.

Cartridge, Q.F., or Q.F.C., 4-inch, filled, 3-lb. 9-oz. Cordite, Cartridge. Size 15, Mark II, N, resembles the 4·7-inch Mark V it has the same § 9532. cordite cylinder. Weight of case about 8½ lbs.

Mark I cartridge resembles the 4·7-inch Mark III but has no §§ 8477, 9396. paper cylinder.

It is to be converted to Mark II as already mentioned for the § 10323. conversion of the 4·7-inch Mark III to Mark II\*.

Cartridge, Q.F., or Q.F.C., 4-inch, filled, 1-lb. 8-oz. Cordite, Reduced. Size 5, Mark I, N, is a reduced charge for Naval Service. It is § 9531. similar to the 4·7-inch reduced charge already described, and has the ·05-inch cordite cylinder.

Box, Cartridge, Q.F. or Q.F.C., 4-inch, Mark III, N, holds eight §§ 11191, cartridges. It is similar to the 4·7-inch, Mark II, outfit box, the 12701. bolts fit into slots in lid. It has spring packing pieces but only one lifting band. Dimensions, 17·4" × 12·45" × 21·625". Weight 50 lb.

Mark II is of stronger construction. The bolts fit into holes in the lid. It was fitted with spring packing pieces.

Mark I has wood packing pieces, and when fitted with spring §§ 8193, 8285. packing pieces becomes Mark I\*. Dimensions, 22·25" × 17·75" × 13·5".

Cartridge, Q.F. or Q.F.C., blank, 4-inch, filled, Mark II, is § 10324. made up in a similar manner to the 4·7-inch, Mark III. The charge is 3 lb. blank L.G.

Issued made up in Service boxes painted red.

4-inch, Drill, Cartridge, Mark IV, is similar to the 4·7-inch, §§ 8154, 9197. Mark V, but not fitted for electrical testing.

Drill shell, Marks I\* and II, similar to 4·7-inch.

The projectiles for the 6-inch Q.F. or Q.F.C. guns are:— Common: Common pointed cast-steel; common pointed practice; lyddite; shrapnel; armour piercing shell; armour piercing shot; solid shot for practice, and paper shot in L.S.

There are two different brass cases for the 6-inch, the "long" and the "short." The former was introduced for powder charges, and is still so used.

It has also been filled with cordite charges, but in future these will be made up in short cases. In consequence of this the word "long" or "short" is found in the name of each filled cartridge.

Long cases which are not required for powder charges are cut § 10175. down to the same length as the short cases, and take the same white metal lid, Mark I. Weight about 27 lb.

The empty short case is known as Mark III and the long case as § 7398. Mark II. When cut down the case is known as Mark II\*, but some cut down cases of E.O.C. manufacture differ in dimensions at the mouth and require a slightly larger lid. These cases and lids are known as Mark III\* and Mark I\* respectively; and Mark I\* lids must be used with Mark III\* cases. Weight of the short case, about 25 lb.

Cartridge, Q.F., or Q.F.C., 6-inch gun, short, filled, 13-lb. 4-oz. Cartridges. Cordite, Size 30, Mark VII, is similar to the 4·7-inch Mark V, except §§ 9677, 12159.

that the bottom of the bag and the pocket are made of silk cloth to give additional strength.

The 2-inch cordite cylinder is used.

Mark VI short cartridge only differs from the above in having the bag made entirely of shalloon, as in the 4.7-inch Mark V.

§ 8875. Mark IV short cartridge is similar to the 4.7-inch Mark IV, but has no paper cylinder, and has millboard and felt wads over the charge.

§ 8378. Mark III short cartridge resembles the 4.7-inch Mark II, the cordite being loose and the Mark I igniter being used.

§ 7742. Mark II long cartridge resembles the last but the space above the cordite is filled up by a paper cylinder.

Reduced.  
§§ 9531, 9976. Cartridge, *Q.F.*, or *Q.F.C.*, 6-inch, filled, 5-lb. 8-oz. Cordite, Size 10, Mark II, N, is a reduced charge for Naval Service. It is similar to the 4.7-inch reduced charge Mark I, but takes a cordite cylinder 1-inch thick.

Powder cart-  
ridge.  
§ 9646. Cartridge *Q.F.*, or *Q.F.C.*, 6-inch, filled, 27 $\frac{3}{4}$  lb. powder, Mark II, N, is a practice cartridge for use on gunnery ships. The long case is used and the charge is made up in four portions as follows. The bottom portion consists of a ring of shalloon, containing 2 lb. R.L.G.<sup>4</sup> powder, and this is placed at the bottom of the case. Above this comes a pad of shalloon containing 2 $\frac{1}{4}$  lb. R.L.G.<sup>4</sup> The middle and top portions consist of E.X.E. powder. The middle portion, of 6 $\frac{3}{4}$  lb., is built up in five layers, enclosed in a silk cloth bag, choked with silk sewing. The top portion, of 16 $\frac{3}{4}$  lb., is built up in 13 layers, and also enclosed in a silk cloth bag, choked with silk sewing. Over the top portion one or more felt rings are placed, the whole being covered by a felt wad and the top secured by a lid in the ordinary manner. The lid for this cartridge is made of brass instead of white metal.

Mark I cartridge only differs from the above in the bags for the middle and top portions being made of shalloon instead of silk cloth.

§ 11366. Cartridge, *Q.F.* or *Q.F.C.*, 6-inch gun, filled, 26 lb. 15 oz., powder, Mark I, is for practice in gunnery ships, in order to use up the stock of large prisms. The empty case, lid, bags, pad and rings are used as in the 27 $\frac{3}{4}$ -lb. charge with three additional shalloon bags, each containing 7 oz. R.L.G.<sup>4</sup> contained in the top portion silk cloth bag. The weight of powder in the shalloon ring and pad is the same as in the 27 $\frac{3}{4}$ -lb. charge. The middle portion contains 6 tiers of 12 large E.X.E. prisms each; the top portion 14 lb. 4 oz. E.X.E. large prisms, 12 in a tier, the three larger spaces being filled up with the three shalloon bags mentioned above.

§ 11697. Cartridge, *Q.F.* 6-inch gun, long, filled, 29 $\frac{3}{4}$  lb. E.X.E., Mark I, is for use with paper shot. It is made up in two portions. The first portion, consisting of 13 lb powder placed in the case by hand, in nine layers, the bottom and second layers having a priming of prism<sup>1</sup> black in the centre. The second portion, consisting of 16 $\frac{3}{4}$  lb. of powder, is built up in 13 layers and enclosed in a shalloon bag choked with silk sewing; a felt wad is placed over the second portion, and the mouth of the case closed by a brass lid.

§ 11191. Box, Cartridge, *Q.F.*, 6-inch, L.S., Mark III, with 2 whole or 4 half spring packing pieces, holds four short cartridges, packed vertically heads and tails, fitting in a spring packing piece at each end of the box; the packing pieces are in halves. The lid is fastened by wing-nuts, in the same manner as the Mark II 4.7-inch L.S. box. The box is made of teak or mahogany.

Mark II had wood packing pieces; when fitted with spring packing pieces becomes Mark II.\* § 10270.

Mark I box is made of deal, and the lid is fastened by brass screws. §§ 8139, 8285, 8598.

*Boxes, Cartridge, Q.F. or Q.F.C., 6-inch, Naval Cordite, Marks I\*, I\*\*, II, II\*, and III,* differ from the L.S. box in having the locking plate instead of winged nuts for closing. The handles are on the sides of the box, so that when the boxes are lifted the cartridges lie horizontally. §§ 8153, 8598, 9469, 11191, 11326.

Mark I box had the handles at right angles to the above position; when the position of the handles is changed a \* is added; spring packing pieces add a second \*. Mark II box was made with handles at the side; a \* is added with spring packing pieces.

† *Box, Cartridge, Q.F. or Q.F.C., 6-inch, Naval Outfit, Mark II,* is similar in construction to the Naval Cordite box, but differs in dimensions. It was intended to hold three long powder cartridges, two packing pieces being used; it will also take four short cordite cartridges, three heads and tails vertically and the fourth horizontally, an additional packing piece being placed at each end and two lifting bands round the cartridge. Mark I differed in the position of the handles; a star is added when the handles are altered. §§ 6729, 7247, 7516, 7604, 8192, 8285, 11191, 11765.

† *Box, Cartridge, Q.F. or Q.F.C., 6-inch, Transport, Mark I | N |* with two packing pieces to hold three long powder cartridges, or four packing pieces and two lifting bands to hold four short cordite cartridges. This box has the lid secured by screws. §§ 7247, 7516, 7604, 8285,

*Cartridge, Q.F. or Q.F.C., Blank, 6-inch, gun, filled, Mark III.*—The charge consists of 7-lb. blank L.G. made up in a similar way to the 4.7-inch blank Mark III Issue Fourteen in whole metal lined cases, 6 in a half for L.S. or N.S. made up, in service boxes painted red. § 10324.

*Cartridge, Q.F. drill 6-inch gun, short Mark IV,* resembles the 4.7-inch Marks I to IV\* drills (Mark V).

*Shell Q.F. or Q.F.C. drill 6-inch gun (Marks I\* and II) N* is similar to the 4.7-inch Mark III. §§ 12253, 8459.

In the Land Service the same drill shell is employed as for B.L. guns. §§ 12253, 12454.

The following implements are used in connection with Q.F. ammunition.

*Brush, fuze-hole, Mark I, | C |*, wire-handled, for use in cleaning the fuze-holes of 6-pr. and 3-pr. shells when breaking up ammunition. It is 3.75-inch long. § 10271.

*Brush, primer-hole, Mark I, | C |*, wire-handled, for cleaning the primer holes of Q.F. cartridges previous to filling. It is about 8-inch long. § 10083.

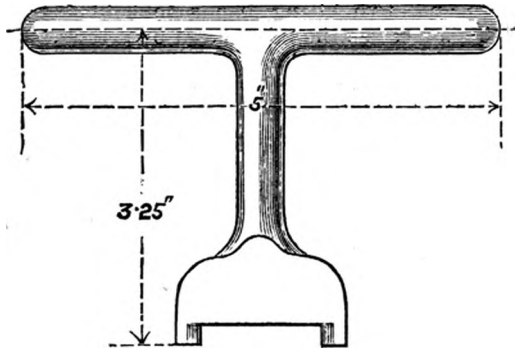
*Extractor, Cartridge, Hand, Q.F., or Q.F.C., Large, Mark I,* for use with 6-inch Q.F. guns. It is made of steel, with jaw at one end to grip the head of the primer or adapter when withdrawing the cartridge. The other end is flattened, so as to fit under the forearm when the hand grasps the cross bar. §§ 6778, 7768.

*Extractor, Cartridge, Hand, Q.F., Small, Mark I,* for use with 4.7-inch, 4-inch, and 12-pr. Q.F. guns, is made of steel, and intended for extracting the cartridge from the gun when necessary. It is provided with jaws at one end to grip the primer under the head. The handle of the extractor is roughened, and is fitted with a loop of white line for placing over the wrist. §§ 5918, 7768, § 5918.

† A certain number of these boxes were converted to take three short cartridges. No more are to be made. § 11765.

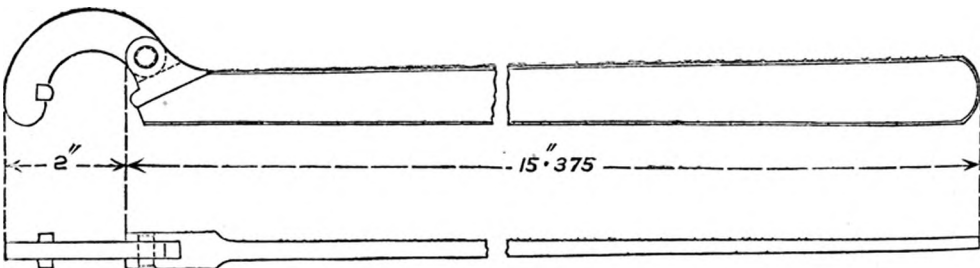


- § 6649. *Extractor, Cartridge, M, Powder Case, Mark I*, made of metal, for extracting the 4.7-inch cartridge from the M powder cases. It differs principally from the small in the material of which it is made.
- § 9355. *Gauges, Cartridge, ring, 2.5-inches diameter and 2.15-inches diameter, Mark I, | N |*, are of gun metal, for gauging 6-pr. and 3-pr. Q.F. saluting cartridges when enclosed in their felt jackets. The cartridges should be a tight fit in the gauges.
- § 9355. *Holder, Cordite charges, 6 and 3-pr. Mark I, | N |*, consists of a gun-metal pillar and stand which may be screwed to a table. It has a projecting arm fitted with a circular slot; the outer part being hinged and fitted with a spring catch for closing it. It is for use in tying up the cordite charges for 6 and 3-pr. cartridges.
- §§ 6576, 7273, 7723, 8916. *Holder cartridge Q.F. are steel bands with handles and a link, and are used to grip the cases when unscrewing primers, etc.*
- Key, fuze, Hotchkiss, Mark I*, for screwing in and removing the Hotchkiss base fuze.
- Keys.** *Key, Inserting Primer, Electric, Q.F., or Q.F.C., Large, Mark I* is used for screwing home electric primers or adapters, it can also be used to remove unfired primers.

Scale,  $\frac{1}{2}$ .

- § 12047. *Key removing adapter or electric primer, Mark IV* is self-adjusting and suitable for removing all adapters and electric primers either before or after firing. (See cnt).

Mark IV.

Scale,  $\frac{1}{2}$ .

§ 11833.

*Key removing primer electric Q.F. or Q.F.C. large Mark III* has the central part shaped to fit over the head of the primer. Two

projections are formed on the inside, to engage the slots in the head of the primer.

Mark II is a straight bar with a boss in the centre, two studs for fitting over the slots in head of the primer, being formed on the boss. Mark I differed in the shape of studs.

*Key inserting and removing percussion primer, Q.F., 2.95-inch* § 11877.  
 Mark I is of steel, about 7½ inches long, one end being bent over, and having two projections formed on it, to fit the holes formed in the percussion primer.

*Spanner fuze, Q.F., 1-pr., Mark I.*—This is of steel, the jaw being shaped to fit the flats formed on the Q.F. 1-pr. nose fuze. § 10957.

*Tool, Opening, Cartridge, Q.F. or Q.F.C., Mark I,* is a pair of curved pincers made of steel, and is intended for use with Q.F. cartridges for prising up the clips over the lid when it is necessary to remove the latter. § 8286.

*Tools, Cartridge, Q.F. Saluting.*

*Driver, Screw Primer,* a steel blade, fitted into a wood handle, shaped at the front to fit the slots in the primer for 6-pr., 3-pr. and 15-pr. saluting. §§ 6542, 10748.

*Rods, 12.7-inch* used for driving out primers of the last-named cartridges. § 10748, 5944.

*Rings, inserting cup, 12-pr., 12 cwt.,* a metal ring which fits on the mouth of the case, to form a support when inserting the cup.

*Drifts, 12-pr., 12 cwt.,* a wooden drift for driving the cup in position.

*Cup, 12-pr., 12 cwt.,* is of leather paper, used to keep the charge in position, it is placed in with the hollow side uppermost.

Tools, reforming cartridges Q.F., or Q.F.C. comprise a number of implements the use of which follows. They are :—

- Drift.
- Holder.
- Mandrel.
- Plug, rectifying.
- Press, screw.
- Press, hydraulic.
- Pump, pressure.
- Set.
- Tap.
- Also for 6-pr. and 3-pr.
- Drift wood.
- Machine, extracting shells.
- Machine, indenting.
- Rods, 17-inch and 12.7-inch.

*Drifts, 12-pr., 4-inch, 4.7-inch and 6-inch* are gun-metal rings §§ 8421, 8917. for use in inserting the lids of Q.F. cartridges, 12-pr. and above.

*Drifts, 6 and 3-pr.* are bars of wood about 2-ft. long, used for turning 6 and 3-pr. cases. § 6576, 6625.

*Funnels, Cartridge,* an ordinary copper funnel for filling powder charges, 6 and 3-pr.

*Gauges, chamber, low, 6 and 3-pr.,* are of cast iron to the low dimensions of the chamber of the gun, and are intended for use in gauging cartridges after re-painting, re-filling, etc. § 5329.

Similar gauges are used for cases 12-pr. and above after rectifying, etc.

*Bushes, Primer, hole* are used for bushing cartridges at laboratories as may be specially authorised. Key inserting bushes, taps, etc., are used in connection with the operation. §§ 7610, 8342, 367.

A copper-headed hammer is used to remove bulges from the base of Q.F. cartridges in reforming.

§ 6756.

*Holder* consists of a wheel in the centre of which is a bolt screwed to fit the primer hole. It is used for turning the cases in the press.

§§ 6576, 8421, 8917.

*Mandrels* are for use in removing bulges, etc., from the bodies of cases, and *sets* are for turning down the tongues.

§§ 8421, 8917, 9397.

*Plugs* are for use in rectifying the mouths of the cases if they are deformed. The plug is driven in with a wooden mallet; a lip on the upper edge prevents it being inserted too far.

*Press screw* has two dies between which the body of the 4.7-inch cartridge is reduced to correct size, the upper die is attached to a double-threaded screw, worked by a horizontal lever with handle and counterweight. Dies to suit other cartridges can be secured to the press by end plates and bolts.

*Press*, hydraulic, with adapters, dies, ejectors, pump pressure, etc., is issued to Naval service for the above purpose.

§§ 8421 9999.

*Machine extracting shell*, 6-pr, with 3-pr., bush, spanner, and tommy, consists of a steel bush bored out to take a 6-pr. cartridge; the bush fits into a cast iron stand, to which it is secured by set screws, a feather fitting into a featherway prevents it turning. The front end of the bush is threaded and carries a handwheel. Two guide bolts fit into slots at the front end of the bush, and are free to slide in and out. At the front end they are square and support a clamp, which is secured by nuts. Each guide bolt is provided with two projections, between which the handwheel fits; a collar fits on the rear projections and is fixed by a set screw; the front projections are also fitted with a collar which bears against the clamp. When the handwheel is turned it moves along the bush, the guide bolts sliding in the slots of the bush, thus forcing out the clamp and extracting the shell from the case. The clamp is provided with two clamping blocks to grip the shell; these blocks are worked by screws. At the rear of the bush are two studs for securing a metal protecting cap. A bush bored to receive the 3-pr. cartridge can be screwed on to the rear of the 6-pr. bush. Plate XXXV.

The safety clip should remain on the cartridge.

§ 10208.

The machine when in use is covered by a rope mantlet.

§ 12034.

*Machine extracting 2.95-inch Q.F.* differs from the above in dimensions.

§§ 6576, 9910, 11295.

*Machine, indenting*, 6-pr., consists of a cylindrical steel body, bolted to a bed plate, which can be bolted to a bench. The body is chambered to take the cartridge, and fitted with three spring indenting pins, actuated by a short lever and cam. The shell can be forced into the cartridge case, before the latter is indented, by a screw bolt and hand wheel. The machine is arranged so that the cartridge can be placed in it with its clip on, and the clip is always to be on the cartridge when it is placed in the machine.

The length of the indent was increased in 1904, and the machines are altered to suit this, and also with 3-pr. machines the altered position of the cannellure on the shell.

*Machine indenting 3-pr. cartridges* differs in dimensions.

*Pricker cartridge* is a piece of brass wire sharpened at one end and a loop formed at the other. It is for use in removing wads and charges 6 and 3-pr. saluting.

§ 6325.

*Rod 17-inch* is a steel rod for driving out the caps from service cases 6 and 3-pr.

§ 6576.

*Wrench Tap* is a steel wrench with screw tap for rectifying primer holes of Q.F. cartridges, 12-pr. and above.

# MACHINE EXTRACTING SHELL

WITH 3-PR. BUSH

BORED TO 6 PR LOW CHAMBER GAUGE

BORED TO 3 PR LOW CHAMBER GAUGE

3 PR CARTRIDGE

4.55

2.35

8

5.5

13.4

14

SECTIONAL ELEVATION

5907.5.06.

Weller & Graham, Ltd. Litho. London

6-PR & 3-PR (MARK I) | C

SCALE  $\frac{1}{6}$ .

14-5

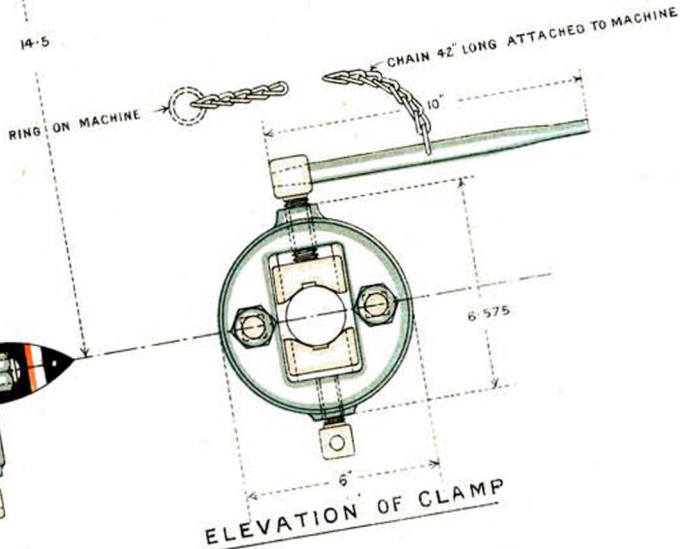
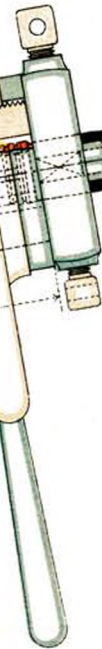
RING ON MACHINE

CHAIN 42" LONG ATTACHED TO MACHINE

10"

6.575

ELEVATION OF CLAMP



## CHAPTER XII.

*Implements, Fuze, Shell and Cartridge.*

The following articles used in filling shell, in preparing fuzes, etc., are grouped together under the general heading of "Implements, fuze, shell, and cartridge."

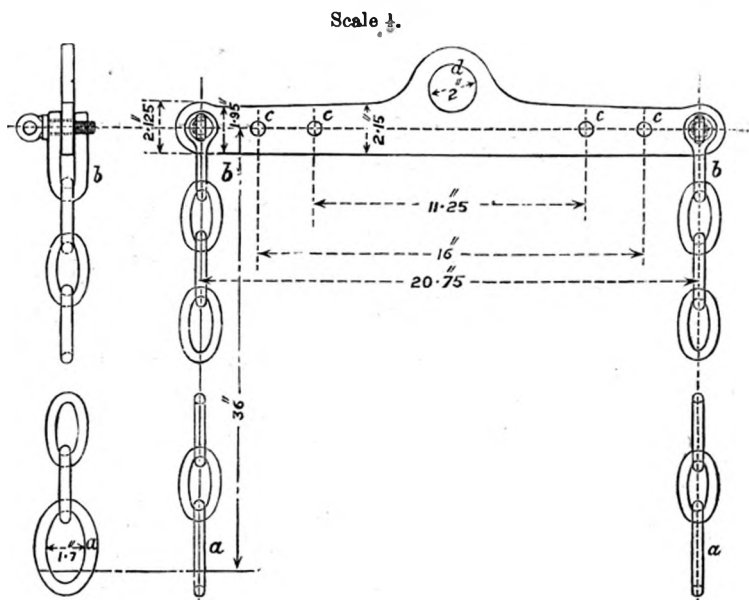
*Bar, lifting shell Mark I* is for use with shell holders in laboratories for fuzing projectiles with base fuzes. It consists of a steel bar about 2 feet long with a central hole for the reception of the

§ 9160.

**Page 139.**—§ 13162. *Adapter, 2-inch fuze hole Mk. I.*

The adapter is made of aluminium, and is screwed externally below the shoulder to suit the new field service gauge, and screwed internally to the G.S. gauge. A slot is cut in the shoulder to take the key for fixing or removing and a steel set screw for fixing the fuze is inserted in a hole bored and screwed in the shoulder.

the holder. Pass the bottom loops (a) of the chain on the bar over the trunnions of the holder, adjusting the chains so as to keep them



parallel by attaching the shackles (b) into the required holes (c). The raising tackle will then be hooked in the bar (d), and the projectile lifted and placed in position.

*Blocks, Nos. 1 and 2 Mark I* are for use in fixing base fuzes, etc., They may also be used for filling shell as required. No. 1 is for

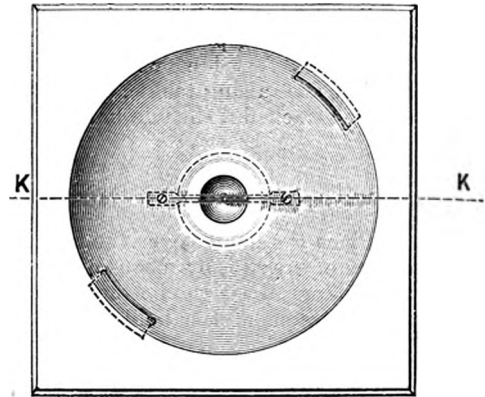
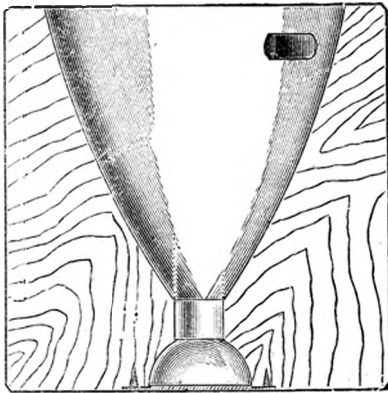
§ 9199, 10274,

§ 10507.

12-inch calibre and above, No. 2 is for 8-inch to 11-inch. They are cubical blocks of wood, measuring 1 foot each way, bored out to take the head of the projectiles. A hole will be made in the floor to receive the block, so that it is flush with the floor. When not required for use, the block will be inserted in the floor, with the hole for shell downwards. Two recesses are provided in the sides of the cavity, and a bar across the hole in the bottom (see drawing) to facilitate lifting the blocks out of the floor.

Blocks for projectiles under 8-inch will be made locally as required, no fixed size being necessary, as they will stand on the floor or a bench at the most convenient height.

Section on KK.

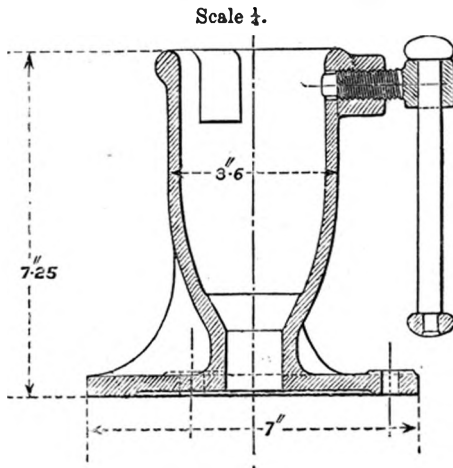


Plan.

- §§ 6456, 7728. *Chisel, Metal, Mark I.*, is a cross-cut chisel, about  $7\frac{1}{2}$  inches long and  $\frac{1}{4}$  inch wide, and is intended for cutting out the lead rings and base discs from shells.
- § 5887. *Chisel, preparing cannellures, Mark I.*, is of steel, about 6 inches long,  $\frac{1}{4}$  inch wide at the point, which is slightly curved. It is intended for preparing the cannellures of B.L. or Q.F. projectiles to take augmenting strips.
- § 10842. *Discs, Cleaning Fuze Holes, Large*, for shells taking large base fuze; *Medium*, for shells with medium base fuze.
- These are made of phosphor bronze formed with a stem which is shaped at the end to fit the "brace magazine," and are for use in cleaning the recess for the flange of the base fuze in the bases of shells.
- § 7602. *Drift, G.S. long, Mark I.*, is a round piece of boxwood about  $\frac{1}{4}$  inches long, the lower portion for a length of 1.6 inch is coned to fit the G.S. fuze hole. It is used for inserting G.S. wads in shrapnel shell,  $\frac{1}{4}$  inch, Marks V and VI, and  $\frac{1}{2}$  inch, Mark IV.
- § 1717. *Driver, screw, shrapnel, large, Mark IV.* An ordinary screw-driver, the blade being of phosphor bronze, used for unscrewing primers, shrapnel shell. Mark III fitted with blades similar to Mark IV are known as Mark III\*.
- § 12047. *Funnel, Shell, Copper, Large*, is intended for use with 16-inch and larger natures of shell filled with bags; the *Small* for lower natures. Mark II, of the small pattern and the Mark I of large are made without seam in cone or spout.
- §§ 4107, 2493.

Holder, Shell, Q.F., 12-pr., Mark I; B.L. 5-inch or Q.F. 4·7-inch, § 9511. Mark II; and B.L., Q.F., or Q.F.C., 6-inch, Mark II, are made of cast iron, to the form shown in the woodcut, those for 12-pr. 5-inch

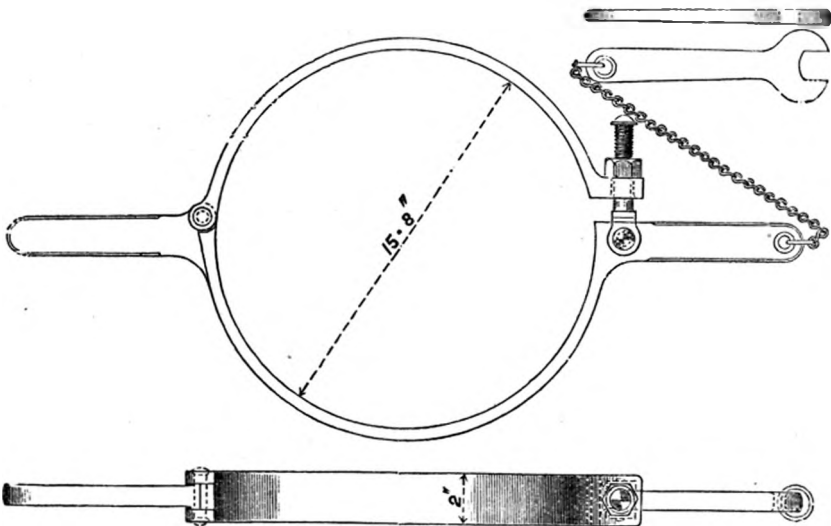
Holder, Shell, Q.F., 12-pr., Mark I.



and 4·7-inch having flat bases with three screw holes for securing them to a bench or table; a clamping screw (with lever handle attached) being provided for retaining the shell in position.

Holder, shell, B.L., with spanner attached.

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



The holder for 6-inch has a wood block fixed in the base for the reception of the point of the shell, and the semi-circular band, with fly nut, hinged to the top for retaining the shell in position.



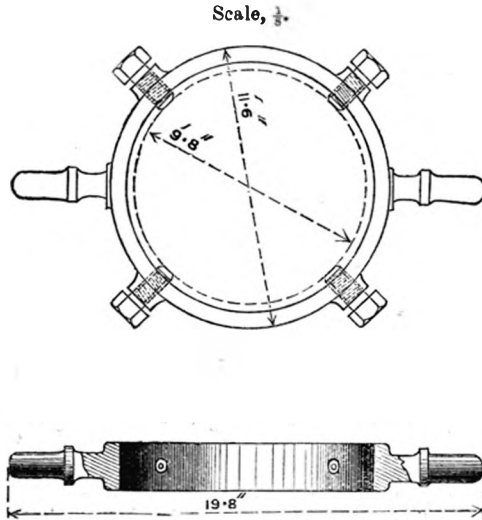
§ 6456.

*Hammer, Metal, 1 lb. 12 oz., Mark I*, resembles an ordinary hammer, and is for use with the metal chisel. There is also a 12-oz. hammer.

*Holders, Shell, B.L., and Studless*, it consists of handles attached to a jointed ring, which is tightened by means of a nut working on a screw bolt. For use with the nut a spanner is attached by a chain to one of the handles. The same pattern of holder is used with R.M.L. studless, and with B.L. shell, and where the calibre is the same as in the 12-inch the same holder is supplied for both projectiles.

§§ 6846, 7233.

*Holders, Shell, for Laboratories*, are intended for use in holding and slinging shell in laboratories.



*Incendiary Stars* are brown paper cylinders driven with star composition and primed at the ends with quickmatch.

§§ 10238.

10359, 11399.

*Instruments Adjusting Driving Bands of Projectiles, B.L., 12-inch, heavy, and 10-inch*; is for use in deepening the serrations on the rear slope of 12 inch heavy projectiles, and for reducing the gascheck lip of 10-inch projectiles.

Cutters and guides are issued to suit 12-inch and 10-inch projectiles.

§ 3895.

*Hook, G.S. wad*, is a piece of stout copper wire (.165 inch in diameter) having one end bent into a hook, and the other end fitted into a wooden handle. The total length is about 7 inches.

§ 1962.

*Key, Plug, General Service*, is for screwing or unscrewing G.S. plugs, and R.L. and D.A. with cap and II, D.A. Delay, Mark III and D.A. Impact percussion fuzes.

§§ 8730, 9158.

*Key, Fuze, Universal, Mark III* is made of steel of the form and dimensions shown in the cut, and has a long lanyard attached. It will supersede all former keys (except the Armstrong, E).

§§ 6049, 6617.

*Key, Fuze, Universal, Mark II* differed from Mark III in being thinner and weaker.

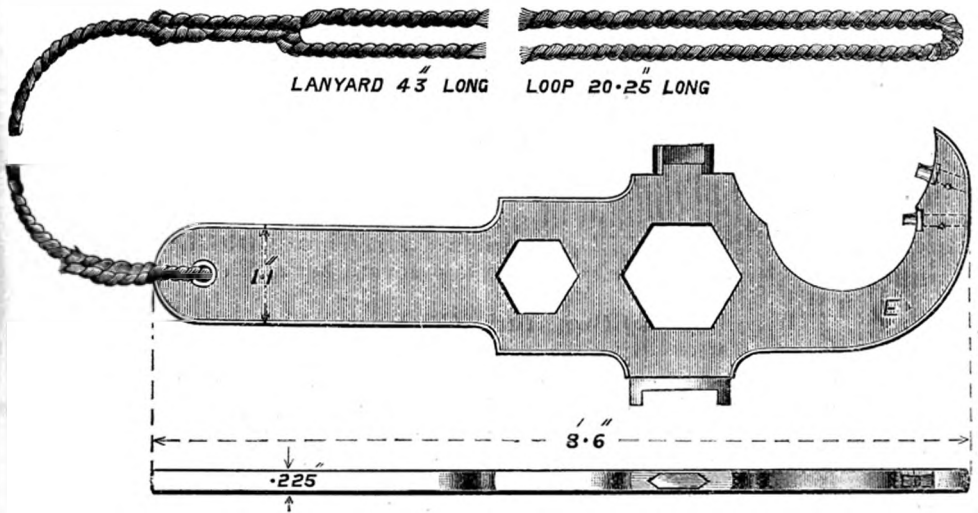
§§ 4924, 6395.

*Key, Fuze, Universal, Mark I* is of a different shape to Marks II or III and the existing store is to be used up.

§ 9447.

*Key, Base, Fuze and Plug, Mark II* is made of mild forged steel with projections on each side to fit the holes in bases of the medium and large base fuzes. It has also a projection to fit base plugs.

## Key, Fuze, Universal, Mark III.

Scale,  $\frac{1}{2}$ .

*Key, Base, Fuze and Plug, Mark I*, differed from Mark II in the handles being weaker.

*Key, Fixing, T. and P. Fuze, No. 80*, is a steel ring with handle, § 12799.  
a projecting stud on the inside fits into a notch on the fuze body.

*Key, Setting Fuze, T. and P., No. 80*, is similar but slightly § 12799.  
smaller; it is provided with a prong on the underside, this fits over the stud on lower ring of fuze. It is provided with a lanyard.

*Key, Setting Fuze, T. and P., No. 63*, is a short steel fork; the § 12502.  
arms of the fork are semi-circular; teeth to grip the milled ring are formed at the ends of the arms and in the centre; a lanyard is attached.

*Key, Base, Fuze and Plug, B.L., 9.45-inch Howitzer, Mark I | L |* § 12355.  
*Steel*, is a bar about 20.75 inches long with a stud to fit the recess in plug; also a slot to fit over the head of the base fuze.

*Key, Percussion Primer, B.L., 9.45-inch Howitzer, Mark I | L |* § 12355.  
*Steel*, is a small T-shaped key with three studs to fit the holes in the primer.

*Keys, Removing, Fuze Plugs, Nos. 1 to 4*, are for use of I.O.O. § 11228.  
They are of steel, with wood handles, and fitted with a clamping arrangement and nut, in order that the pins may be re-adjusted or replaced—

No. 1. Bottom plug of D.A. fuzes.

No. 2. Magazine plug of large base fuze.

No. 3. " " medium "

No. 4. Bottom plug of T. and P. fuzes and top plug of No. 8 small percussion.

*Spanner, Keys, Removing Fuze Plugs*, is of steel to fit the bottom of the blade of the keys.

*Pincers, Shrapnel, Primers, Mark II*, are made of stout brass wire, §§ 3895, 4790.  
and resemble a pair of round sugar-tongs. At the end of each branch of the fork the wire is flattened on the inner side and ends in a double bend to grip the primer and so enable it to be withdrawn from the shell when unscrewed.

§§ 2493, 4107. *Rod, Filling Shell, Large*, is of brass 4 inch diameter, and about 5 feet long. It is intended for use with the 16-inch shell, and other large natures of shell. The *small* rod is 3 inch diameter, and 3 feet long. Both have a wooden handle at one end, and at the other a brass knob for pressing on the powder.

§§ 2174, 2823,  
3895, 4421,  
6041, 9339. *Scrapers, Shell*, are used in removing wetted powder from filled shell, or searching empty shells. They are copper rods, having both ends flattened out. One end is turned up nearly at right angles to the line of the rod, the other has a slight bend in the opposite direction. There are five sizes, viz. :—62-inch, 42-inch, 32-inch, 20-inch,

**Page 144.**—§ 12974. *Tongs, Extracting, Exploders from Lyddite shell.*

The Mark II tongs differs from previous patterns in being made of Manganese bronze, hinged, and with handles similar to a pair of scissors.

§ 13988. The Mark III differs from Mark II in having shorter and thicker jaws and in the hinge being placed nearer the jaws.

§§ 3395,  
10088. Mark II is a flat bar of steel, with pins on each side, so arranged as to fit the plugs of different fuzes. It is being superseded by keys removing fuze-plugs.

§ 7347. Mark I had pins at one side only.

§ 12593. *Wrench, Extracting D.A. Fuzes, Mark I*, is a steel bar with a circular hinged clamp, to fit round the head of the fuze. It is arranged so as to grip the fuze in unscrewing. Length, 17 inches.

§§ 2648, 8734. Plates, stencil, are issued cut with the word "Bag," and others cut with a series of numbers. Those having the circular 1-inch disc and the letter P are to be cut locally.

The following articles though not under the general heading of "Implements, fuze, shell, and cartridge," are used in connection with shells or shell-filling :—

6381, 7299,  
7421, 7447,  
8411, 8412,  
9004, 9270,  
9301, 9314,  
9344, 9912,  
10206, 10207,  
10331, 10383,  
10413, 10417,  
10506. *Bags, Burster*, are used with common, common-pointed, and A.P. shell, 4-inch and above. The body of the bag is of dowlas; those for nose-fuzed shells, filled through the base, have the tip of shalloon; while those for shells filled through the nose, and for base-fuzed shell, have shalloon neck and shoulder. Shalloon is used to lessen the resistance to the penetration of the flash from the fuze. With certain bags collar cloth is employed at the shoulder to form a cushion for the powder. Earlier bags were made of serge and shalloon, and No. 3 class silk cloth was used for certain cast-steel shell.

The latest bags for A.P. shell are of lasting cloth.

Burster bags for iron or steel shells of the same calibre are not interchangeable, the capacities of shells of different material may vary considerably. The bags have the numeral, nature of shell, and contractor's mark on them.

Marking.

The following shows the marking on burster bags :—

R. $\uparrow$ L. II 6-IN. B.L., Q.F., OR Q.F.C. A.P. MARK I SHELL.	R. $\uparrow$ L. I 7-5-IN. B.L. COMMON POINTED. MARK I GUN.	R. $\uparrow$ L. II 9-2-IN. B.L. COMMON IRON.
---	--	--

The 4-inch shrapnel Mark IV employed a shalloon burster bag.

*Bags, Primer, 7 drams, Mark I*, are small shalloon bags containing §§ 4165, 4264, 7 drams of Service F.G. powder (pistol, F.G., R.F.G. or R.F.G.<sup>2</sup>), or 6965, 9724, Mark F.G. powder or shell F.G. powder. Two or more of these bags may be used.

**Page 145.**—§ 13987. *Gauge, depth fuze hole, base Percussion fuzes.*

No. 1, for shell with No. 11 Mk. V, and No. 15 Mks. II and III fuzes.

No. 2, for shell with No. 11 Mks. I to IV, and No. 15 Mk. I fuzes.

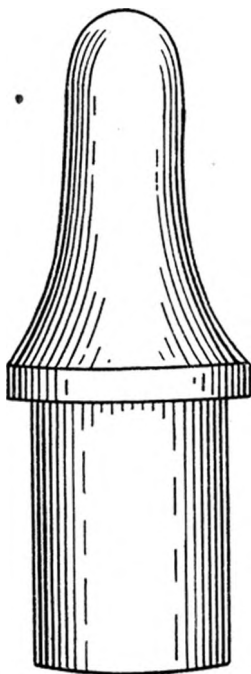
No. 3, for shell with No. 12 Mks. V and VI fuzes.

No. 4, for shell with No. 12 Mks. I to IV fuzes.

A GROOVE IS CUT IN THE CENTRE TO RECEIVE THE SELVAGE BY

**Page 145**—  
*continued.*

The above gauges are made of hard wood to the form shown on accompanying drawing; they have their name and number stamped on the handle as a means of identification. When using these gauges care is to be taken that the flange of the gauge entirely enters the recess in the base of the shell, otherwise the shell is not fit for fuzing.



ABOVE, BUT STRONGER, THE SREW PORTION BEING 1/4 INCHES IN DIAMETER.

*Cage, Projectile, B.L. or Q.F., 6-inch, Mark I*, for use in circular § 6212. lifts with 6-inch B.L. or Q.F. projectiles; it is of brass, the projectile is placed in upright and secured by a ring, which slides down.

*Driver, grummet, Mark I*, is made of hard wood and is used in the § 9399. L.S. for removing the grummets from projectiles with gas-check driving bands.

*Gauges, Shell, Ring, B.L., B.L. or Q.F., B.L., Q.F. or Q.F.C., and Q.F., Body-high; Band-high and low, and Gas-check-high*, are plain wrought-iron rings with handles formed on them.

Some care is required to use a gauge properly; unless held quite Using. fair it will not pass over the projectiles.

§ 8734.

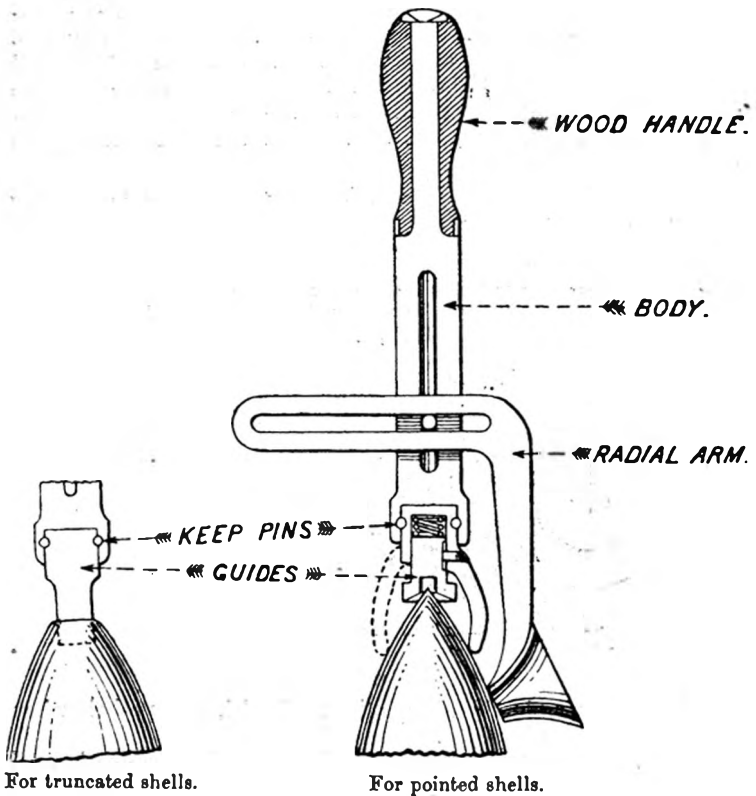
*Instrument, marking Projectiles, Mark I*, is for use in place of the copper stencil plates hitherto used for marking projectiles.

The complete instrument consists of a brass body to which is fitted a revolving wood handle, a radial arm, two guides, two keep pins, a wing-nut, washer and screw.

The body is slotted to receive the radial arm, which has a hole at one end to receive a brush, and is secured at the other end in any desired position in the slot by means of the wing-nut, washer and screw.

The two guides are for use with pointed and truncated projectiles respectively; both are secured by pins to the end of the body. That

*Instrument Marking Projectiles, Mark I.*



for pointed projectiles has three claws and a centering bit which works, by means of a spring, in a slot in the guide. That for truncated projectiles is made to fit into the key hole in the plug of the projectile.

*Plates, stencil, copper ring.*

Consequent on the adoption of the instrument described above no more stencil plates will be provided for marking projectiles, and so soon as the existing stock shall have been used up they will become obsolete.

*Lever, Extracting Eye-bolt, Mark I*, is intended for unscrewing the eye-bolt from projectiles so fitted. It is made of steel  $\frac{7}{8}$ -inch diameter and 3 feet 9 inches in length, and is flattened at one end. When the stock is used up it will be superseded by "lever grummet," which will be used for removing eye-bolts. §§ 4890, 7727.

Projectiles should not be stacked in contact with the ground, but a base should be formed of old shot or shell. Stacking projectiles. § 9005.

*Plank, stacking, projectiles, Mark I*, is suitable for use in stacking all natures of projectiles for which planks are required. It is 7 feet by 12 inches by 3 inches, made of elm, bevelled at one end, and strengthened by iron bands at both ends.

The following plugs will be found in various Service shell:— Plugs.

*Plug, Fuze-hole, G.S., with Loop, Mark I*, | L | is a conical plug without shoulder, having a square hole in the head to take the G.S. key, and a loop of tarred white line about  $1\frac{1}{4}$  inch long. It is for use with shells of G.S. gauge for field, mountain, and position guns. §§ 7729, 8230, 8643, 10209.

*Plug, Fuze-hole, G.S., without Loop, Mark I* | C | differs from the above in having no loop; it is for use in shells of G.S. gauge, except those that take the G.S. plug without loop, Naval Mark II or G.S. plug with loop Mark I, or lyddite shell. §§ 7729, 10209.

*Plug, Fuze-hole, G.S., without Loop, Naval, Mark II* | N | has a flange .19 inches wide, under which is a leather washer, soaked in ozokerine, to make a water-tight joint. It is for use with all Naval shells of G.S. gauge except lyddite. §§ 7729, 10209.

*Plug, Fuze-hole, Special, Mark I*, resembles the G.S. plug, without loop, Mark II, but is longer and is flanged at the top, under the flange is a leather washer. It has been superseded by the Mark II plug for lyddite common shells. § 4631.

*Plug, Fuze-hole, Special, Mark II* | C | differs from Mark I in having the head recessed so as to leave a narrow rim round the edge. §§ 10031, 10306.

*Plug, Fuze-hole, Special, Mark I\** is Mark I plug with a groove cut near the outer edge, thus leaving a rim. § 12252.

These plugs will be fixed in the socket, after being screwed into the shell, by "stabbing" the rim into the bush of the shell in three places at about equal distances. This operation can be performed with any pointed metal instrument.

*Plug, Base, Shell, No. 1, Mark I*, is a metal plug of the same gauge as the large base fuze, it is for shell fitted for base fuzes, 6-inch and upwards. It is stamped with the letter P and "No. 1," and has a recess to take the wrench base plug, or key, base, fuze, and plug. §§ 8101, 9674, 10029, 11873.

*Plug, Base, Shell, No. 2, Mark I*, is a metal plug of same gauge as medium fuze, for shell fitted for medium base fuzes B.L. or Q.F. 5-inch to 12-pr. It is stamped with the letter P and No. 2, and has a recess to take the key base plug, or key, base, fuze and plug. §§ 5102, 9674, 10029, 11873.

*Plugs, Base, Shell, Nos. 1 and 2*, were supplied with lead washers under the flange, these are now discontinued. § 9674.

*Plug, Base, Shell, No. 3, Mark I*, is used for shells taking Hotchkiss base fuzes. It is stamped with the letter P and No. 3.

*Plug, Base, Shell No. 4, Mark I*, for empty pointed shell, B.L., Q.F. or Q.F.C. 6-inch and above. §§ 10582, 11232.

*Plug, Base, Shell, No. 5, Mark I*, for empty pointed shell, B.L., Q.F. or Q.F.C., 5-inch to 12-pr. §§ 10582, 11232.

These plugs resemble Nos. 1 and 2, but are shorter, the inner ends being cut off flat at the termination of the screw thread, they are stamped P and No. 4 or 5 as the case may be.

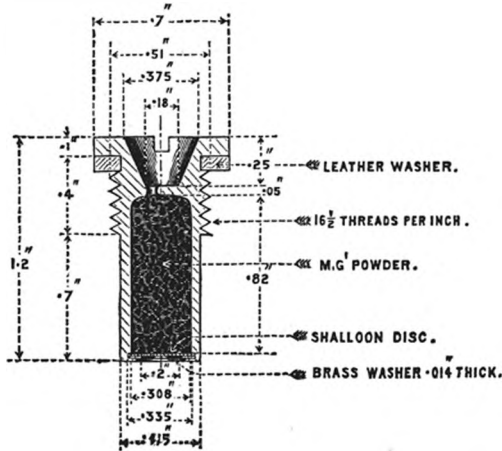
*Primers, Shrapnel Shell, Mark III*.—In most shrapnel shell having Primers.

the bursting charge in the base a primer is generally used; it serves to convey the flash from the fuze to the powder, and also prevents the powder from working up into the fuze socket.

It is filled with M.G.<sup>1</sup> powder.

Primers are issued in a tin cylinder holding 10, closed with a tin band.

Full Size.



§§ 6518, 8658.

*Protectors, Armour-piercing, Projectiles, B.L., Mark I.*—These were for B.L. armour-piercing shot, 6-inch and upwards. The protector consists of an elm block cored out to receive the point of the projectile, fitted with an iron band to receive the screwed ends of an iron strap, which passes round the base, and is tightened by two nuts. This band has also two studs, which fit into the keyholes of the base plug, and retain the strap in position.

§§ 10328,  
10622, 10901.

*Protectors, projectiles* are placed in a numbered series from 1 to 8.

No. 1,	Mark II	N	B.L.,	16·25-inch.
No. 2,	"	II to IV	N	B.L., 13·5-inch.
No. 3,	"	I to III	N	B.L., 12-inch heavy.
No. 4,	"	II to IV	C	B.L., 12-inch light.
No. 5,	"	II to IV	C	B.L., 10-inch.
No. 6,	"	II to IV	C	B.L., 9·2-inch.
No. 7,	"	II to IV	C	B.L., 8-inch.
No. 8,	"	II to IV	C	B.L., B.L.C., Q.F. or Q.F.C. 6-inch.

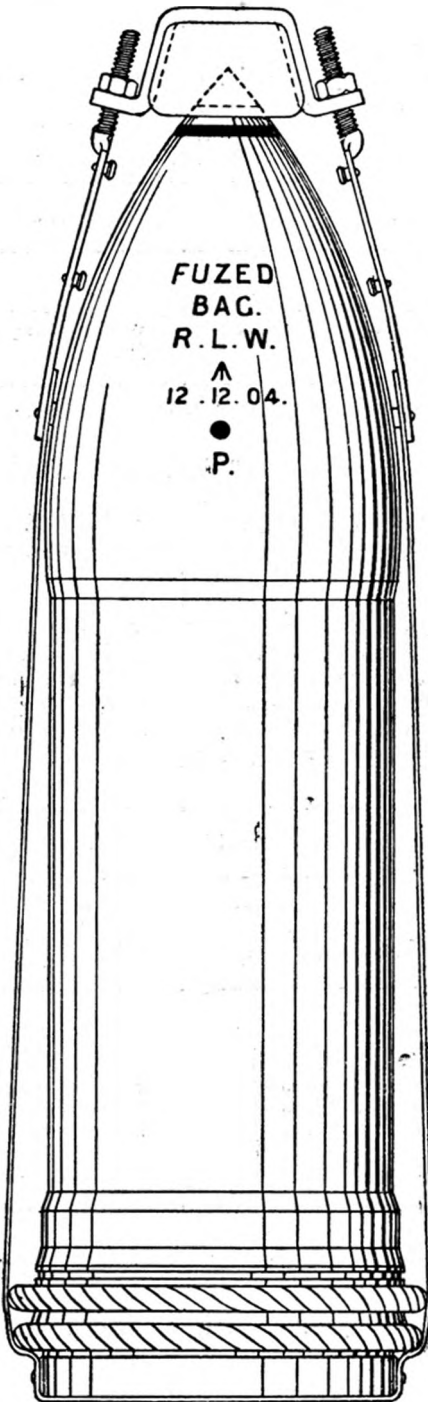
The protectors are suitable for use with all B.L. pointed projectiles of the above-named calibres (except capped projectiles).

They differ from the "protectors, armour-piercing projectiles" in the form of the strap, which is a band of hoop iron, in one piece, bent, and riveted at the bottom to a dish-shaped plate which fits over the base of the projectile. The top of the protector is secured to the band by two strap bolts, each fitted with studs, which engage in slots at the top of the band. By engaging any two opposite studs in the slots, the protector can be lengthened or shortened as required, being clamped on to the projectile by the nuts on the strap bolts; in earlier marks the band was in two pieces.

Certain issues of protectors (B.L. or Q.F. 6-inch to 13·5-inch) differed from the above in being provided with only two studs on the strap bolts. These were suitable only for B.L. armour-piercing, shot, and B.L., common pointed (except iron) shell.

Protectors of this description will, when converted to the later pattern (by having the additional studs added to the strap bolts), be distinguished by having the symbol \* added to the numeral.

Shell B.L. Common Pointed 9.2-inch. Ready for issue. Fitted with Protector.  
Scale,  $\frac{1}{2}$ .





§§ 11826,  
11914, 12569.

*Puff, Cordite, 4-oz., Mark I | L |*; for instructional purposes to represent the flash of guns; S.B. howitzers or mortar.

The puff consists of 4 oz. of "Cordite, blank, size  $\frac{20}{S.C.}$ ," contained in a shalloon bag which is choked with sewing silk.

The puffs are fired in a smooth-bore howitzer or mortar, a mill-board wad being used to increase the pressure, and thus reduce the time of burning. They are fired by means of tube *friction copper solid drawn without ball, Mark I.*

*Packing.*

Package.	Number of Puffs, &c.
Case, powder, M.L., half, lined with non-absorbent paper.. .. .	140 puffs (7 layers of 20 each separated by non-absorbent paper).

NOTE.—The wads will be issued separately.

§ 12448.

*Puff, Powder, 2-oz., Mark I*, is 2 oz. of blank L.G. powder contained in a serge bag choked with worsted.

§ 6429.

*Puff, Powder, 4-oz., Mark I, also Pin, Mark I.* These are for instructional purposes in judging the distance of burst of projectiles. The puff is of serge containing 4 oz. blank L.G. powder, and the pin is of iron 13.5 inches long, one end being bent at right angles, and having an eye to take the friction tube by which the puff is fired.

§§ 5064, 5741.

*Screws, Preserving, Eye-bolt, Holes*, large and small, Mark I, have been introduced for projectiles having eye-bolt holes in the side. Their use is to prevent dirt, &c., filling up the hole. The large is for 16.25-inch B.L. guns, and the small for B.L. 8-inch to 13.5-inch.

§§ 3259, 4268,  
9567.

*Selvagees* are used for slinging projectiles in the L.S., when loading.

Designation.	Service.	Detail.		—
		Length (inside when stretched straight).	No. of strands.	
Selvagees—		(3-thread yarn.)		For projectiles, B.L. or R.M.L.—
		in. in.		
29-inch .. L		29 to 30	6	6-inch to 7-inch.
36-inch .. L		36 to 37	12	9-inch and 9.2-inch.
43-inch .. L		43 to 44	18	10-inch to 11-inch.
48-inch .. L		48 to 49	27	12-inch to 12.5-inch, also for G.S. purposes.
53-inch .. L		53 to 54	26	B.L. 5-inch howitzer.

Page 150.—§ 14033. *Sling projectile, B.L. 6-pr. Mk. I.*

The sling consists of four wood battens braced together by two transverse bands of webbing. A handle and base is formed by webbing fixed to the two transverse bands. A short length of white line is provided to secure the projectile in the sling. The sling, which will carry one projectile, is for use in place of boxes in transporting shell in wagons.

*Slings, Lifting, Projectiles, B.L., Mark I.*—These slings are made for B.L. guns, 8-inch and up, and are intended for use with armour-piercing projectiles only. They consist of a band of spring steel, 4 inches wide, having at each end a lifting eye, one being made smaller than the other. The band fits round the centre of the projectile, the smaller eye being passed through the larger one, and the lifting gear attached to the former. § § 5868, 5956, 10240.

*Wad, Fuze-hole, Naval, with Loop*, is a millboard wad, saturated with beeswax, and fitted with a small loop of preller leather on the top. § § 2370, 2413, 6348, 7427.

It is fitted into the recess provided for it in shells, common filled with powder and plugged with the Mark I G.S. plug. The wad is coated with Venetian red cement.

*Wad, Fuze-hole, G.S., Mark III*, is used with 4-inch B.L. shrapnel, Marks V and VI, and the 4.7-inch, Mark IV, serves to prevent the powder from working up in the fuze-hole of shell. It is made of papier-mâché, and has a hole in the centre covered by thin black shalloon cemented to one side. It is unnecessary to remove the wad before inserting the fuze. § 10032.

The side covered with shalloon is placed downwards in the shell.

The following stores are for use in connection with Laboratories and Magazines:—

*Adze, Cooper's, Magazine.* In heading, unheading, and hooping, &c., of powder barrels. It is an ordinary metal adze.

*Brace, Magazine, Mark II, with Bit*, is for use in removing screws of powder cases, &c. The bit is a phosphor bronze screw driver, and is fixed to the brace by a set screw. § 9245.

*Driver, Cooper's, Socket, Metal*, with wood handle, is for use with the adze mentioned above in removing hoops, &c., from powder barrels. In removing hoops the driver must always be employed.

*Drivers, Screw, Magazine, 12-inch, Mark I | C |*,  $\frac{3}{8}$ " end; 6-inch, Mark I | C |,  $\frac{1}{8}$ " end; 1 $\frac{3}{8}$ -inch, Mark I | C |,  $\frac{9}{16}$ " end. They are wood handles, with phosphor bronze ends of the dimensions given above. § 11912.

*Knife, Magazine, Mark II*, is of phosphor bronze, with a wood handle. § 11912.

*Needle, Magazine, Curved*, is for use in making up Q.F. cartridges, 12-pr., 4-inch, 4.7-inch, and 6-inch. § 10083.

*Needle, Magazine, Phosphor Bronze, 9-inch*, is for inserting silk braid hoops of cartridges. § 8719.

The 4-inch needle is for choking.

The 1 $\frac{3}{4}$ -inch for sewing. This is of nickel silver.

*Pincers, Magazine*, are ordinary metal pincers, with a claw formed on one handle.

*Scales, Weighing, Magazine*, with pans and weights, are issued. § 13380.

*Scissors, Magazine*, are of phosphor bronze, 9 $\frac{1}{2}$  inch in length. § 3278.

*Thimbles, Tailors', Magazine.* An ordinary thimble of metal.

*Scissors, Laboratory, and Knives, Laboratory*, are steel articles.

*Funnels, cartridge*, are of copper similar to, but larger than funnels, shell.

*Prickers, cartridge*, consisting of a phosphor bronze needle fitted into a wood handle, is used for making holes for the needle to pass through when making up cartridges.

## CHAPTER XIII.

*Aiming Rifle, Machine Gun, and Small Arm Ammunition.*

§ 12450.

*Cartridge, Aiming Rifle, 1-inch, Electric, Mark VM*, consists of a solid drawn brass case, with a hole in the base tapped to receive the primer. Plate XXXVI.

The interior of the case, except that part which envelops the bullet, is coated with a hard brown varnish.

The primer, Mark I, consists of a brass tube with an enlarged head; it is threaded near the head, so as to screw into the case, the head fitting into a recess. The tube is bored out, the metal being thinned at the front end.

Fitting in the tube is a brass contact pin, which is insulated with ebonite plugs, the front plug being coned to suit the coned seating in the primer. An iridio-platinum wire bridge resistance (1 to 1.5 ohms) is soldered, with pure tin, to the point of the contact pin and front edge of the body, the bridge being surrounded with gun-cotton dust or cotton powder, and the primer is closed with a card wad shellaced in. Two slots are cut in the head for the key removing and inserting primer.

The charge, which consists of 400 grains of R.F.G.<sup>2</sup> or other suitable gunpowder, is covered by a grease-proof card wad, a felt wad lubricated with beeswax, and a white card wad on top, next the bullet.

The bullet is made from an alloy of 12 parts lead, 1 part tin. It has three cannelures round it filled with beeswax, and the base is hollowed out. The bullet is partly covered with a patch of fine white paper, which is lubricated with beeswax at the base after being crimped over.

The bullet weighs 9 oz. 408 grains,  $\pm$  70 grains. It is firmly pressed into the case, which is then reduced at the mouth by coning to hold the bullet tightly.

The cartridge is stamped on the base with the numeral and contractor's initials.

*Key, inserting and removing primer Cartridge, aiming rifle, 1-inch, electric, Mark I | C |*, steel, is used with the cartridge.

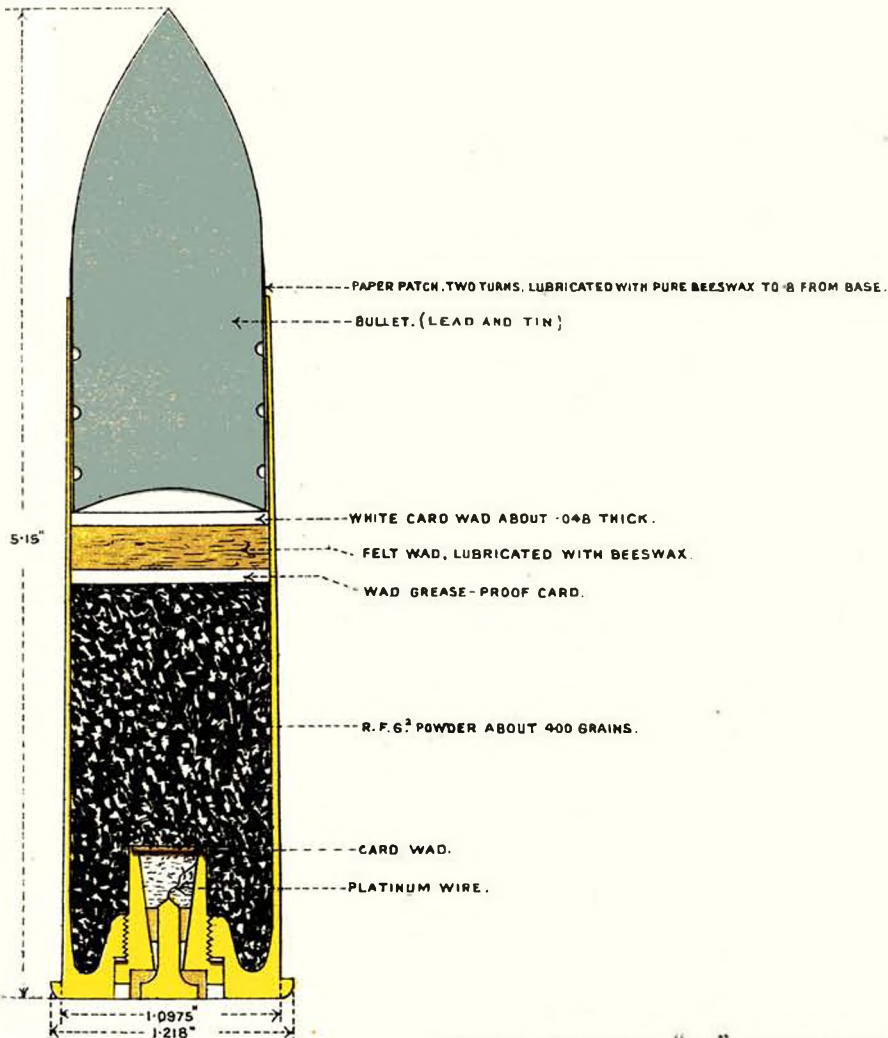
§§ 9056,  
9517, 10000.

*Cartridge, Aiming Rifle, 1-inch, Electric, Mark IV, M | C |* differs from the above in the primer, which is pressed instead of being screwed in. Most of these cartridges were without the paper patch, and the earlier issues had the bullet secured by indenting the case into the rear cannelure. The case is weaker.

*Cartridge, Aiming Rifle, 1-inch, Electric, Mark IV, KN, | C |* differs from the Mark IV M in the primer only, which is of different dimensions and internal arrangements. The primer consists of a brass tube with enlarged head, bored out to receive a copper contact piece, which is insulated from the body by ebonite. The contact piece is cupped out in front, and into this fits a brass centre piece insulated from the body by ebonite. An iridio-platinum wire bridge (resistance 1 to 1.5 ohms) is soldered, with pure tin, to the centre piece and into a slot in the front edge of the body, the bridge being surrounded with gun-cotton dust or cotton powder, and the primer is closed with a card wad shellaced in.

# CARTRIDGE, AIMING RIFLE, 1 INCH, ELECTRIC, MARK V. M | C |

FULL SIZE



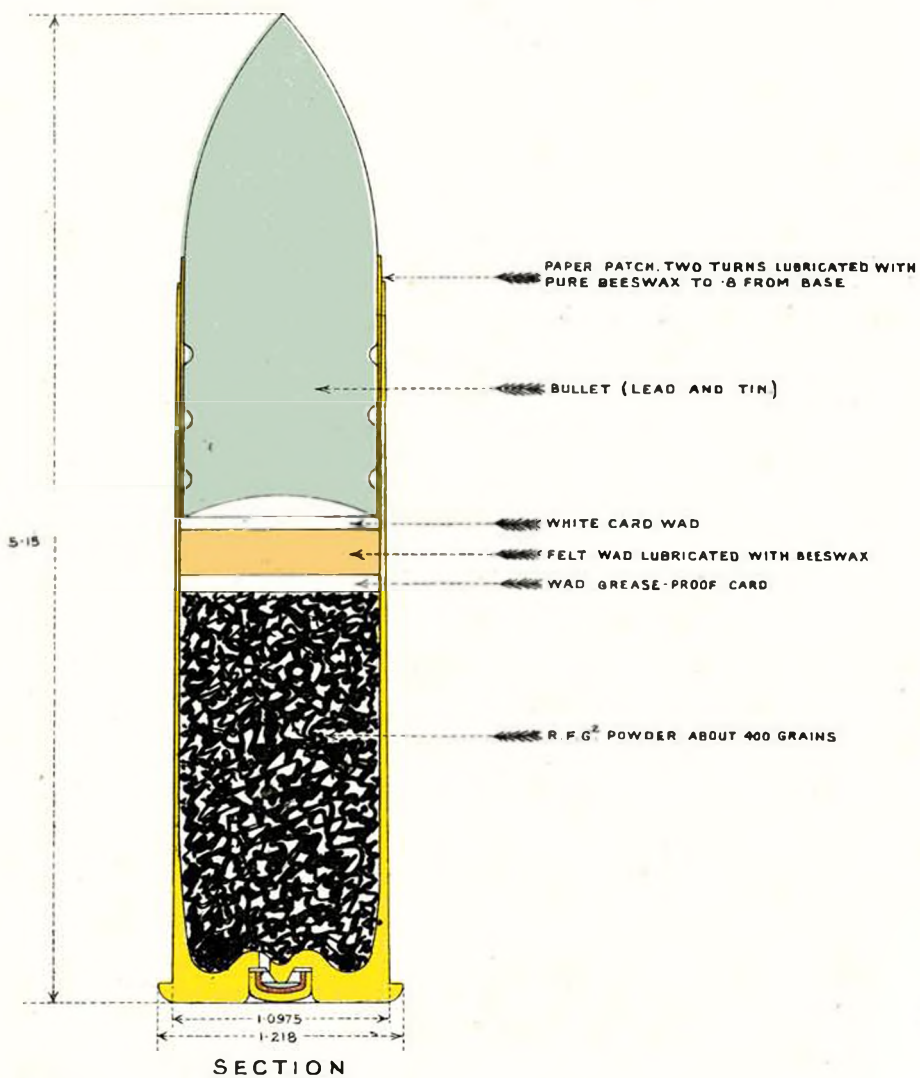
SECTION.

## PRIMER, MARK IV "KN" CARTRIDGE.



# CARTRIDGE, AIMING, RIFLE, 1-INCH PERCUSSION MARK I | L |

FULL SIZE.



In order to facilitate identification of the pattern of primer in the Mark IV cartridges, the letters "M" or "KN" will be found stamped on the cartridge, and printed on the wrapper, after the numeral, to indicate that the primers are, respectively, of the Morris, or Kings Norton Company's pattern.

Early issues similar to the Mark IV KN cartridge were made for Naval Service and designated Mark III. Mark II cartridge differed in the primer. § 8461.

The Mark I cartridge only differed from the Mark II in the bullet being made of brass, flat headed, with a lead core, and weighing 11 oz. 130 grains. § 7605.

The cartridges are made up into bundles of 12, wrapped in brown paper, pieces of cardboard being placed along two sides of the bundle against the points of the bullets. Packing.

The distinguishing mark on the box and wrapper is a hollow black diamond with solid black diamond in the centre, the corners of the latter being connected with the outer one by thin black lines.

Eight bundles in Mark XI S.A.A. box.

Issue.

*Cartridge, Aiming Rifle, 1-inch, Percussion, Mark I | L |* consists of a brass case, cap, charge, wads and bullet. Plate XXXVII. §§ 9057, 1000.

The case is of solid drawn brass, with a cap chamber formed in the base, in which is an anvil made by a projection of the material, round the head of which there are three fire-holes.

The cap is a double one, the outer of brass, the inner of copper, and contains .3 grain cap composition pressed in and varnished, and may be covered with a tinfoil disc.

The interior of the case is varnished (except where it envelops the bullet), and contains a charge of 465 grains of M.G.<sup>1</sup> or 400 grains of R.F.G.,<sup>2</sup> gunpowder, which is covered by a grease-proof card wad, a felt wad lubricated with beeswax and a white caru wad on top.

The bullet, of 12 parts lead and 1 part tin, weighs 9 oz. 403 grains, is pointed, and has three cannelures, which are filled with beeswax. It is fitted with a paper patch, the same as the bullet for the electric cartridge. It is secured in the mouth of the case by being firmly pressed in and by coning the mouth of the case. Earlier issues were without the paper patch, and the case was indented into the rear cannelure.

These cartridges are packed like the 1-inch electric cartridges, viz. :—12 in a bundle, 96 in Mark XI S.A.A. box. Packing and issue.

The distinguishing mark on the box and wrapper is a hollow black diamond with solid black diamond in the centre, the corners not being connected as for the 1-inch electric cartridge.

*Cartridge, Aiming Rifle, 1-inch, Percussion, Mark I,* of "Eley" manufacture prior to 1900, are to be used up with 1-inch Morris aiming rifles in Q.F. guns, or with Mark II 1-inch Elswick B. aiming rifles. § 11917.

*Cartridges, Aiming Rifle, 1-inch, Percussion,* in the L.S. may be refilled; they are cleaned and returned to Woolwich to be refilled, a soft felt wad being inserted in front of the one lubricated with beeswax. §§ 10000, 10845, 10902.

The cases of fired cartridges, Mark V M, electric, may be used for refilling for both Naval and Land Services. Cases should be cleaned after firing, in the manner laid down in paragraph 311, "Regulations for Magazines, &c., 1902," and returned to store, where they will be examined, and any found to be unserviceable set aside.

Mark V M cases which are fit for refilling, and also Mark IV M

which are fit for refilling for blank, as mentioned in § 12410, should be sent to Woolwich at the first opportunity.

§ 10845.

Electric aiming rifle cartridges not to be refilled for L.S. will now be understood as applying to cartridges of earlier Marks than Mark V M, excepting that the cases of Mark IV M fired cartridges will be used for refilling as blank cartridges.

§ 12410.

*Cartridge, Aiming Rifle, 1-inch, Electric, Blank, Mark I | I | .* The cartridge consists of the Service charge and the Morris pattern case and primer, the charge being covered by two asbestos discs, which are coated with Pettman cement on the top and edges.

The mouth of the case is turned in.

Fired cases of Mark IV M pattern may be used for making up these cartridges, the original numeral and contractor's initials (if necessary) being barred out and the new numeral and initials substituted.

§§ 10094,  
10327.

*Cartridge for instruction, Aiming Rifle, 1-inch,* differs from the service cartridge it represents, in having a wood block about 2.5 inches long, made to the form of the interior of the case, secured with shellac below the bullet instead of the charge. The bullet is secured by three indents of the case into the rear cannellure, and two holes are bored through the case at right angles to each other, so that it can at once be seen that the cartridge is not a service one.

§ 4458.

*Cartridge, Aiming-Tube, Mark I.*—To enable rifle practice to be carried on in confined spaces and without the expense entailed by using the Service cartridges.

Accuracy.

These cartridges should put 95 per cent. of their bullets in a circle of 3 inches diameter at 25 yards, the rifle being fired from a fixed rest.

The case is of solid drawn brass with the cap chamber and anvil formed in the base. Two fire-holes in the latter, as shown in the cut, communicate from the brass cap to the powder charge.

The charge is  $3\frac{1}{4}$  grains Curtis and Harvey's Diamond No. 2.

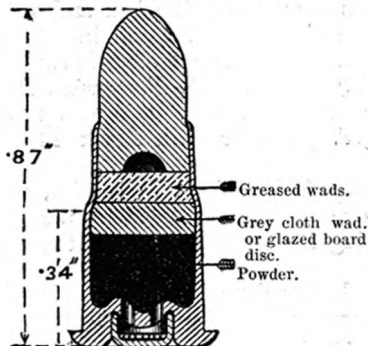
The bullet is of 12 parts lead and one part tin, and weighs  $37 \pm 3$  grains, and there are two wads fastened to its base, that next the bullet being greased and the other of grey cloth.

§ 6301.

Mark II differs only from Mark I in the arrangement of the wads and in having the base of the bullet slightly recessed.

### Mark II.

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



Issue.

100 rounds are packed in a cardboard box about the size of a bundle of 10 rounds of the Service ammunition, tied with string.

The distinguishing mark on the wrapper or box is a black circle with a black dot in the centre.

Supplies of 20,000 have been made in deal boxes, zinc lined, and hermetically sealed. Smaller quantities are supplied in packing cases.

Future supplies of cartridges, aiming tube, will be made in tin-lined boxes, each containing 10,000 rounds, but when required for the Royal Navy they will be repacked in quarter metal-lined cases locally as required.

§§ 6188, 6487.

*Cartridge, Machine Gun, Ball, .45-inch, powder, Mark IV, | C |*  
Gardner and Nordenfelt.

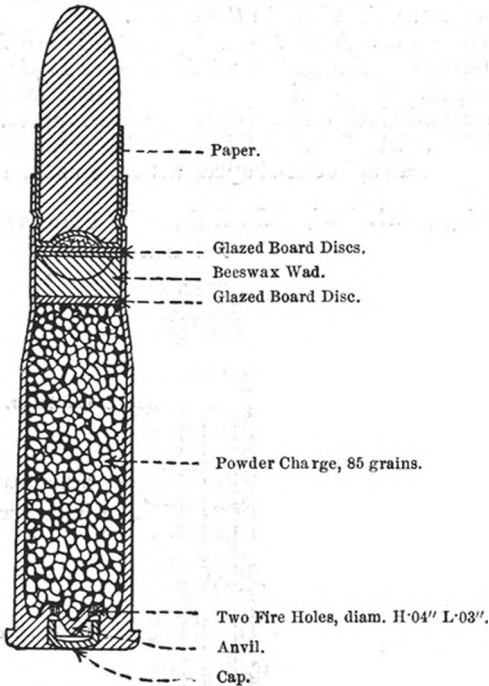
§§ 4193, 5023,  
5074, 5452,  
6544.

The case is made from solid drawn brass, with a cap chamber with raised anvil formed in the metal of the base and two fire-holes pass from the bottom of the chamber to the interior. The inside of the case where the powder charge rests is coated with hard brown

Case.

*Cartridge, Machine Gun, Ball, .45-inch, Mark IV, | C |*, Gardner and Nordenfelt.

Full size.



varnish, which is removed from that part which envelops the bullet. This was in consequence of the liability of empty cases to stick in the gun after firing which was attributed to the surplus varnish at the end of the case.

The cap is of copper, and contains .3 grain of cap composition.

Cap.

The charge is 85 grains of R.F.G.<sup>2</sup> powder, over which is placed a glazed-board disc, then a beeswax wad cupped out in front, and then two glazed-board discs.

Charge.

The bullet is of 12 parts lead to one part tin, a cannellure is formed near the base, it is covered for about two-thirds up the body



with fine white paper wrapped round from right to left, the paper is crimped over at the base and lubricated. The case is choked into the cannellure.

Packing and  
issue.

These cartridges are packed by tens, heads and tails, in brown paper wrappers, and issued in S.A.A. boxes containing 680 rounds each. The distinguishing mark is a solid black triangle.

§ 8365.

*Cartridge, Machine Gun, Ball, .45-inch Cordite, Mark I, | N |*. The cartridge consists of a case, cap, charge, wad, and bullet. The case is similar to the powder case described above, but is not varnished inside, and the letter C is stamped on the base.

The cap is of copper, and contains .7 grain of cap composition pressed in and varnished, and may be covered with a tinfoil disc.

The charge is about 38 grains of size 3 cordite in 100 strands, covered by a millboard wad paraffin waxed.

The bullet is similar to the one for the powder cartridge, but the paper patch is orange coloured; the mouth of the case is choked into the cannellure, the rim fitting against a small shoulder which is formed on the bullet.

Packing and  
issue.

The cartridges are packed in bundles of 10; 680 rounds in a Mark XI S.A.A. box. The distinguishing mark is a red triangle with the letter C in white in the centre.

§ § 4911, 5455.

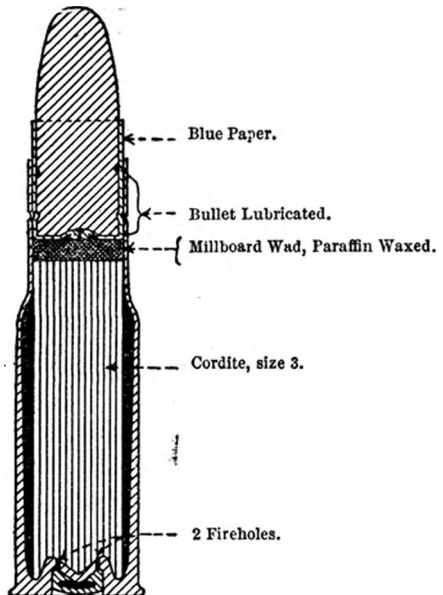
*Cartridge, S.A., Ball, M.-H. Rifle, Solid Case, Mark II*, is similar to the *Cartridge, M.G., Ball, .45-inch, Mark IV*, but the case is more bottle shaped. The distinguishing mark is a solid rectangle in red on the box and black on the brown paper wrappers.

§ 11752.

*Cartridge, S.A., Ball, M.H. Rifle, Solid Case, Cordite, Mark I*.—The case is solid drawn, bottle-shaped, with the usual rim for extraction,

*Cartridge, S.A. Ball, M.H. Rifle, Solid Case Cordite (Mark I).*

Full size.



an anvil with two fire holes is formed in the base. The cap is of copper, and contains .7 grains of cap composition pressed in and varnished; a tinfoil disc may be used.

The mark of the case "I," contractor's mark and the letter C being marked on the base of the cartridge.

The charge consists of 35·8 grains of cordite, size 3, on top of which is placed a waxed millboard wad.

The bullet weighs 480 grains, and is provided with two cannelures, the neck of the case being choked into the rear cannelure. The bullet is covered for about two-thirds up the body with paper which is coloured *blue*, to facilitate identification.

Certain issues have been made in which the bullets were provided with *orange* coloured paper, but no more will be issued so covered. The wrappers of these cartridges were stamped "For rifle only."

Issue 10 in a bundle, 580 in a Mark XIV box. Distinguishing mark, solid red rectangle with C in white.

*Cartridge, S.A. Ball, M.H. Carbine, Solid Case Cordite, Mark I, § 11752.* differs from the rifle as follows: The charge consists of 34 grains of cordite, size 3, on top of which is placed a waxed millboard wad. The bullet weighs 410 grains, and is provided with one cannelure, into which the neck of the case is choked. The bullet is covered for about two-thirds up the body with paper, which is coloured *green* to facilitate identification.

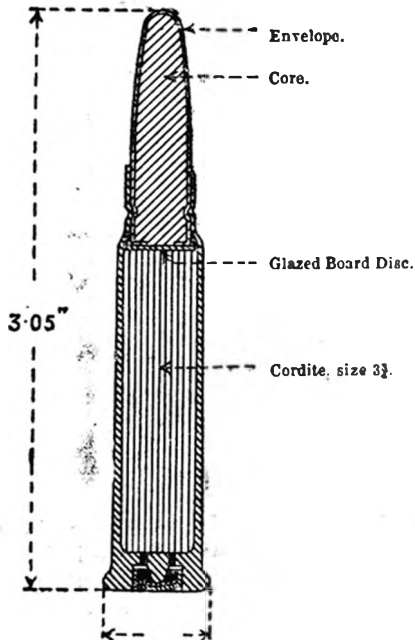
Issue 10 in a bundle, 600 in Mark XIV box. Distinguishing mark, red rectangle with C in red.

*Cartridge, S.A. Blank, M.-H., or Snider, Rifle or Carbine Mark IV. § 6845.* The case is made of brown paper; it has one base-cup and the base of the service cartridge. It contains about 68 grains of blank F.G. powder.

*Cartridge, S.A., Ball, .303-inch, Cordite, Mark VI, consists of a § 12411.* case, cap, charge, wad, and bullet.

*Cartridge, S.A., Ball, .303-inch Cordite, Mark VI | C | Solid Case,*  
*all .303-inch Small Arms and Machine Guns.*

Full size.



The case is of solid drawn brass, with a cap chamber formed in the base, in which an anvil is made by a projection of the material, and two fire-holes are drilled. The letter C, contractor's initials and mark of cartridge are stamped on the base, it is not lacquered.

The cap is of copper, and contains .6 grain of cap composition pressed in and varnished, and it may be covered with a tinfoil disc.

The charge consists of about 31 grains of cordite, size  $3\frac{1}{4}$ , in 60 strands.

A glazed-board disc is placed on top of the cordite.

The bullet consists of a core (98 parts lead, 2 parts antimony), enclosed in a cupro-nickel envelope, and weighs about 215 grains. The envelope is solid drawn from an alloy of about 80 per cent. copper, 20 per cent. nickel, and the core is secured inside it by turning over the end of the envelope, a cannellure runs round the bullet near the base. The bottom part of the bullet, except the base, but including the cannellure, is coated with beeswax. It is secured in the case by the latter being coned and indented in three places into the cannellure, and requires a force of not less than 60 lb. to extract it. The base of the bullet is stamped with the contractor's initials or recognised trade mark.

*Cartridges, S.A., Ball, .303-inch Cordite, Marks III, IV and V,* have hollow-nose bullets. They are to be used up for practice.

§§ 7278, 7905.

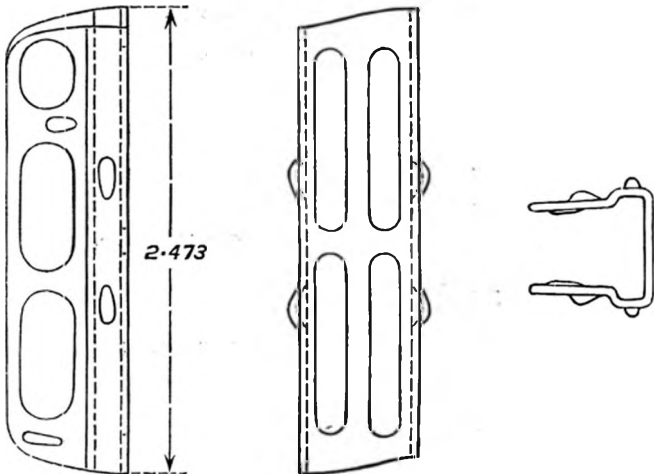
*Cartridge, S.A., Ball, .303-inch Cordite, Mark II,* differs from Mark VI in the bullet which has the envelope thicker at the nose, and 5 per cent. of iron was used in its alloy. The later issues have the rim made to suit the charger.

§ 11753.

*Charger, .303-inch Cartridge Mark I | C |* The charger, which is for use with the "Rifle, short, M.L.E.," is made of steel, to the form and dimensions shown on the accompanying drawings, and holds five .303-inch cartridges.

*Charger, .303-inch Cartridges. (Mark I.)*

Full size.



Issue.

These cartridges are issued four chargers in a leather board box; 1,000 rounds in boxes, Nos. 1 and 2, 840 in Mark XIV box for L.S. or Mark XI box for G.S., and in a 600 round box. Issues have been made of 600 rounds in the 780. round box.

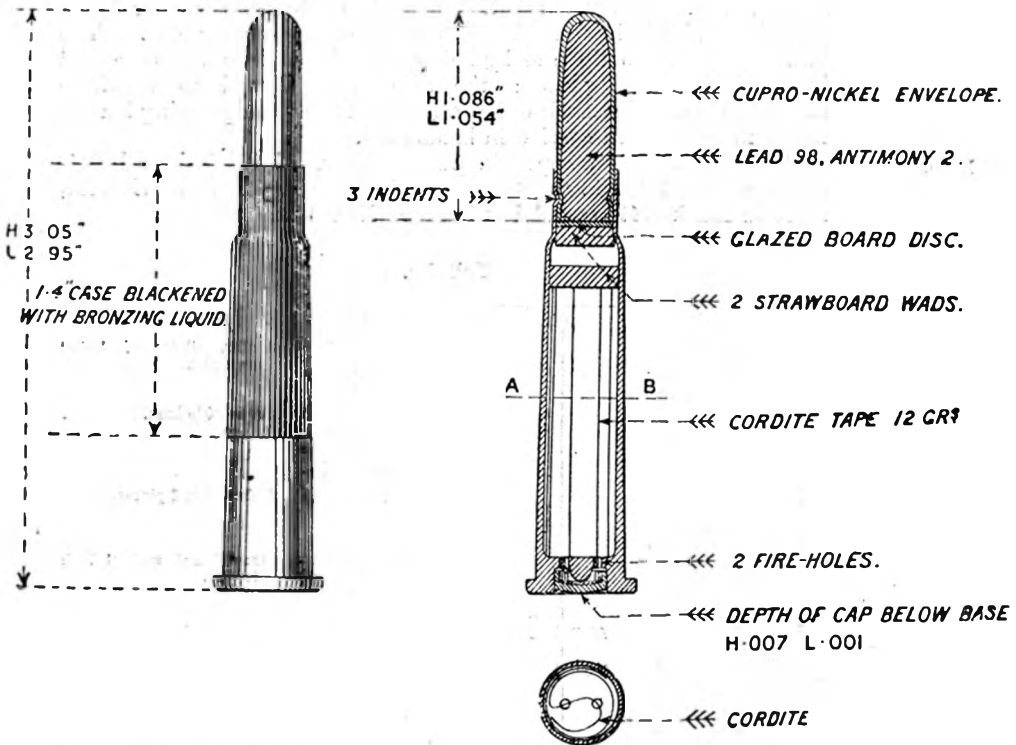
These cartridges also are packed heads and tails in bundles of 10, 1,100 rounds in S.A.A. boxes, Marks XI or XIV, 840 rounds in the 600 round box, and a few issues in the 750 round box. The distinguishing mark is a red rectangle with two uncoloured bars on both wrapper and box, but for the latter the word cordite is painted in red on each uncoloured bar. Those packed in charges have the words "IN CHARGERS" on the box.

Cartridge, S.A., Ball, .303-inch Cordite, Short Range, Practice Mark II, N, consists of a case, cap, charge, wads, and bullet. §§ 5883, 6683, 7541.

The case differs from the Service cartridge case in being blackened with a bronzing liquid for 1.4-inch from the mouth. § 9876.

Cartridge, S.A., Ball, .303-inch, Short Range, Practice, Mark II, | N |. Solid Case; for use at certain Coastguard Ranges.

Full size.



#### SECTION AT A. B.

The cap is the same as that for the service cartridge and secured in a similar way.

The charge consists of about 12 grains of cordite tape.

Two strawboard wads are placed, one on top of the cordite, and the other in the neck of the case, and between this and the bullet a glazed-board disc.

The bullet is of similar construction to the Mark II service bullet, but is slightly shorter, more rounded at the point, and weighs 188 grains. It is lubricated at the base and secured into the case by being coned and indented similarly to the service .303-inch cartridges and it requires a force of not less than 24 lb. to extract it.

Packing and  
issue.

Short-range cartridges are packed heads and tails, in bundles of 10, in yellow paper wrappers. The labels on the boxes are of yellow paper also, and the distinguishing mark on both is a rectangle containing two diagonal lines and the letter C near each end. The letters and distinguishing marks are printed in black.

400 Mark II cartridges are packed in "Box, A.S.A., pistol, Enfield, 600 rounds," for which special packing pieces will be provided as required.

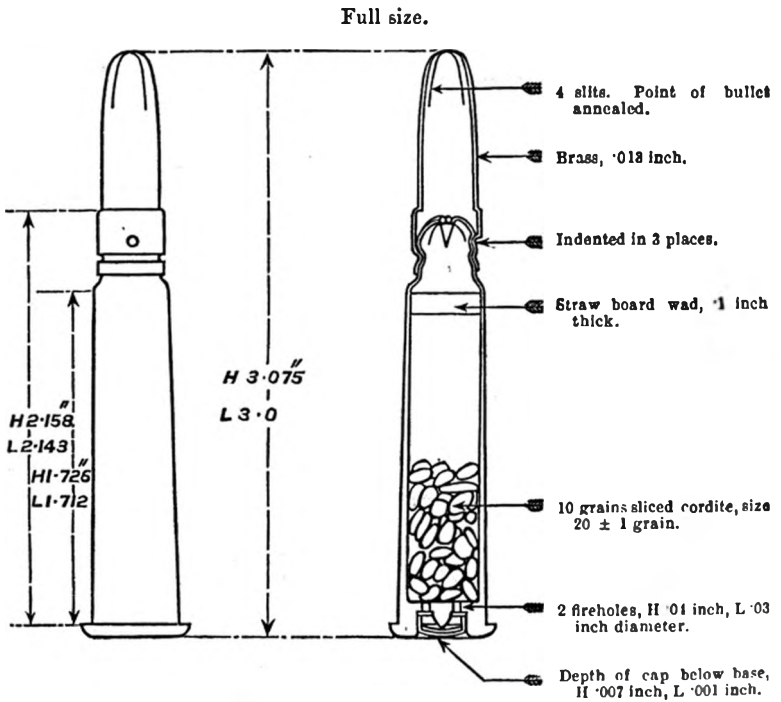
§§ 11317.

*Cartridge, S.A. Blank, .303-inch (Cordite), with Mock Bullet, Mark VI | C |* The case is similar to the ordinary Service case. The charge is 10 grains of cordite, size  $\frac{20}{S.C.}$ . A straw board wad is

placed near the mouth of the case, which is crimped over. A cannellure is formed near the mouth of the case for securing the mock bullet. The mock bullet is made of brass, the nose being annealed and slit in four places to allow of its opening out. The bullet is secured to the case by being cannellured into the case and indented in three places; the case is blackened to facilitate identification. The mock bullet allows of the cartridge being loaded in the magazine and carried in bandoliers.

Issue.

Ten in a bundle wrapped in purple paper. 1,400 in barrel cartridge quarter, 2,400 in the half-barrel for Land and Naval Service, 2,000 in Mark XIII box, 1,100 in Mark XIV box.



§§ 7519, 8379.

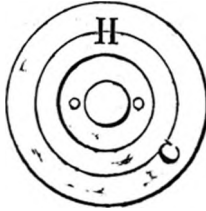
Mark V was without the mock bullet and the case was not blackened. It is used up in the L.S. with units equipped with pouches.

§ 7401.

*Blank Ammunition* for small arms may be issued in S.A.A. boxes (not Mark XIII) for manoeuvres.

In some .303-inch cartridge cases the numeral on the base §§ 86:9, 87:8, 98:1.  
 may not always be applicable to pattern of cartridge. For instance  
 a case marked "IV" may be used for a Mark V service cartridge, or  
 a Mark II case for a Mark V blank cartridge, or for the short-range  
 practice Mark I cartridge. The wrong numeral is cancelled by  
 having a ring stamped on the base, over the numeral, as shown in  
 woodcut.

Cartridge, S.A., Ball, .303-inch, Cordite.  
 Scale  $\frac{1}{2}$ .



Page 161.—§ 13926. Cartridge, S.A., Dummy drill .303-inch, rifle or  
 carbines, Mk. III.

In future the wooden bullet of the Mk. III cartridges  
 will be coloured red.

an empty service case without cap. A hollow brass bullet, or § 9519.  
 the envelope of the service bullet, is secured in the case by coning  
 and indenting the case into the cannellure as in the service cartridge.  
 The exterior of the cartridge is tinned all over to distinguish it.

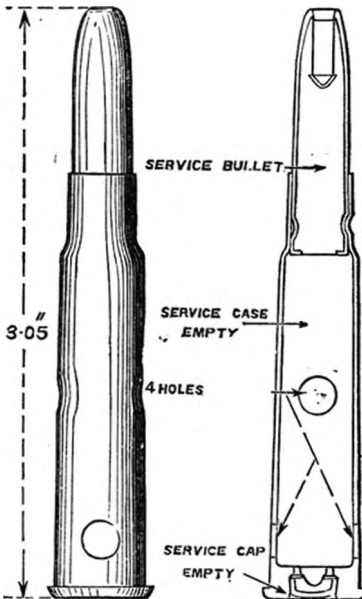
Mark I dummy drill cartridge differed from Mark II in the § 6057.  
 bullet not being so securely fastened to the case.

Marks I and II now have the two holes drilled through the case.

These cartridges are issued as required, loose in a packing case. Issue.

The distinguishing mark on the wrapper and box is a black  
 rectangle with two uncoloured bars, and the letter D, in black, across  
 the centre.

Typical.  
 Full size.



§ 10094.

*Cartridges for instruction, machine gun, and Small arm, which are issued for instructional purposes, will be pierced with two holes at right angles through the case, so that it can at once be seen that the cartridge is not a service one.*

§§ 9159,  
10,273.

*Cartridge, S.A., ball, pistol, Webley, cordite, Mark II | C | also Enfield, consists of a case, cap, charge, wad, and bullet.*

The case is of solid-drawn brass, with a cap chamber formed in the base, in which is an anvil made by a projection of the material, and two fire-holes. It has the letter C stamped on the base and the interior is not varnished.

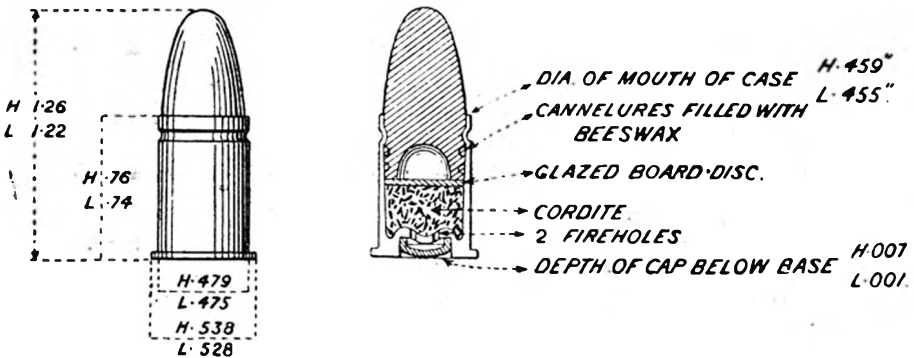
The cap is of copper, and contains 4 grains of cap composition pressed in and varnished and may be covered with a tin-foil disc.

The charge consists of about  $7\frac{1}{2}$  grains of cordite, size .015, a glazed-board disc is now placed on top of the cordite, but this was not used in the earlier issues.

The bullet, of 12 parts lead and 1 part tin, weighs 265 grains. It

*Cartridge, S.A., Ball, pistol, Webley, cordite, Mark II | C | also Enfield.*

Full size.



has a cavity formed in the base and three cannellures round the body, these cannellures are filled with beeswax, and the bullet is secured in the case by choking the latter into the front cannellure, and must require a force of 60 lb. to 80 lb. to extract it.

Packing and issue.

They are packed in bundles of 12 for L.S., 6 for N.S., heads and tails, in brown paper wrappers, and are issued, for L.S., 276 rounds in "box, A.S.A., pistol, Enfield"; for N.S., 828 rounds in "box, A.S.A., half, naval." The distinguishing mark is a circle with bar across and the letter C above and below the bar, printed in red on both wrapper and box.

§§ 9159,  
10,273.

*Cartridge, S.A., ball, pistol, Webley, cordite, Mark III* differs from Mark II in having a somewhat smaller charge, in the bullet having a cavity in the head and weighing only  $218\frac{1}{2}$  grains. The existing stock, in the L.S., at home stations will be used up for practice.

§ 9632.

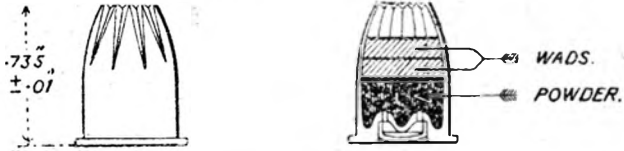
*Cartridge, S.A., blank, pistol, Webley, Mark II | L | also Enfield.*

The case is of solid-drawn brass, with cap chamber and anvil formed in the base and two fire-holes.

The cap is of copper and contains 25 grain of cap composition pressed in and varnished and may be covered with a tin-foil disc. It is secured in the case by four indents.

The charge consists of 8 grains R F G<sup>2</sup> powder covered with two  
**Page 163.**—§ 14232. *Box, ammunition, small-arm, 1,000 rounds in charges. No. 2,* will, as soon as existing stock are used up, be declared obsolete.

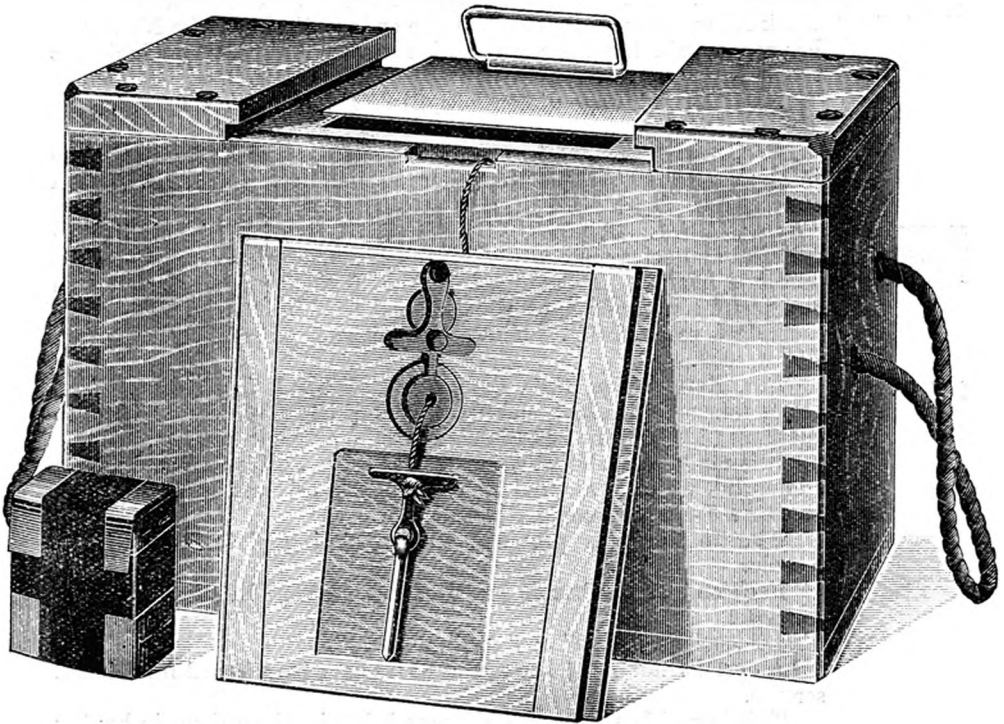
The No. 1 box will be treated with oil, mineral, preserving wood, so as to make it suitable for use in tropical climates.



S.A. AMMUNITION BOXES, &C.

*Barrels, Cartridge,* are of three sizes—half, quarter, and eighth; they have no copper hoops, and are used for conveyance and storage of S.A. ammunition. The half size is used for blank cartridge (the weight would be inconveniently great with ball cartridge), the quarter size for ball, and the eighth for small supplies.

Box, ammunition, S.A., 1,000 rounds in charges. No. 1. (Mark I.)



Case, charges, .303 cartridges. (Mark I.)

For ball cartridge they are superseded by boxes, but are still occasionally used for home service.

*Box, Ammunition, S.A., 1,000 rounds, .303-inch, in charges. No. 1,* § 11980.  
*Mark I | L | ; No. 2, Mark I | L | .* No. 1 box, which is used for



packing 1,000 rounds of .303-inch cartridges in chargers, is of deal  
 Page 164.—*Boxes, ammunition, small-arm, | C. |*

The lot number of cordite will in future be omitted from the label on lining and from the stencilled marking on the above-mentioned boxes. In order to identify the maker of the ammunition when the boxes are stacked, the initials of the manufacturer of the cartridges will be stencilled on both ends of the box in addition to the date.

rope handle passes through holes in each end of the box.

The box has a removable tin lining coated with black varnish, the lining is closed by a tin lid soldered on.

No. 2 box differs from No. 1 in being made of teak or mahogany and is for G.S.

Dimensions 17" × 8.312" × 10.85".

These boxes superseded for L.S., boxes, A.S.A., Marks XIV and XI respectively.

*Case Chargers* is made of leather board, glued and shaped together as shown in the drawing. It takes 20 rounds, held in four chargers.

§§ 6963, 7455, 7488, 8285, 8767, 9516, 10844, 11316, 11632, 12292.  
*Boxes, Ammunition, S.A., G.S. (Land, Mark XI), (Naval, Mark XI), (Home and Special, Mark XIV).* The XI is of teak or mahogany, the XIV of deal and elm. They differ from the Nos. 1 and 2 boxes in dimensions, and a few minor details of the lid. The handles in the Mark XI are secured by cleats at the ends of the box; the Naval box has copper wire handles covered with leather for about four inches at the joint.

Mark XI stowage dimensions, 21.812" × 8.312" × 6.937".

" XIV " " 22.187" × 8.5" × 7.02".

*Box, Ammunition, S.A., Home and Special, Mark XII,* was similar to Mark XIV but had cleats for the handles. Mark XV had a cheaper lid. Mark XIII differed in dimensions.

§§ 6383, 6963, 7455, 8285, 11632, 12156.  
*Box, A.S.A., .303-inch, half, Naval, Mark I | N |* is similar in material and construction to the Mark XI box but has only one cleat and one handle. It is used in the N.S. for packing .303-inch and pistol ammunition, of which it will contain 500 and 828 cordite cartridges respectively. Stowage dimensions, 10.875" × 8.375" × 7.0" ± .05".

§ 12117.  
*Box, Ammunition, S.A., 600 rounds, .303-inch in chargers.* The box is for use in packing either 600 rounds of .303-inch cartridges in chargers (§ 11753), or 840 rounds in ordinary paper packets.

It is made of mahogany, with a tin lining, and is provided with a sliding lid, which is secured by means of a half round brass split pin, having a T-shaped handle attached to it.

The tin lining is provided with a closing plate fitted with a handle.

Each end of the box is provided with a rope handle for lifting purposes.

Dimensions, 12.375" × 9.812" × 8.625".

A certain number of 780 round boxes have been issued for colonial service.

This box differs from the 600 rounds box in dimensions, in having a rope handle at one end only, and in being provided with three tin boxes, instead of a single tin lining. The tin boxes will each contain 260 rounds of .303-inch cartridges in ordinary paper packets, or 200 rounds in chargers.

§§ 7455, 7488, 8285, 11632, 10751, 12156.  
*Box, Ammunition, S.A., Pistol, Enfield, 240 Rounds, Mark III | L |* is of the same construction as No. 1 S.A.A. box except that

# DISTINGUISHING MARKS FOR S.A. AMMUNITION BOXES.

§§ 7603, 9111, 9300, 12155.



CARTRIDGE, AIMING RIFLE  
1 INCH ELECTRIC



CARTRIDGE S.A. BALL .303  
INCH, CORDITE. (IN PACKETS)  
IF IN CHARGERS THE WORDS  
"CHARGERS" IN BLACK  
IS PRINTED DIAGONALLY ACROSS.



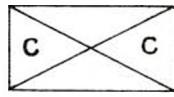
CARTRIDGE AIMING RIFLE  
1 INCH, PERCUSSION



CARTRIDGE S.A. BALL PISTOL  
WEBLEY, CORDITE.



CARTRIDGE AIMING TUBE



CARTRIDGE S.A. BALL, .303  
INCH CORDITE, SHORT RANGE  
PRACTICE.



CARTRIDGE M.G. BALL .45 INCH



CARTRIDGE, S.A. DUMMY DRILL  
MAGAZINE RIFLE



CARTRIDGE M.G. BALL .45 INCH  
CORDITE



CARTRIDGE S.A. BALL.  
M.H. RIFE POWDER.



CARTRIDGE BALL M.H.  
CHAMBER, CORDITE



CARTRIDGE S.A. BALL M.H.  
CARBINE, POWDER.



CARTRIDGE M.H. CARBINE  
BALL CORDITE

it is much smaller, has a top of teak, one cleat and one rope handle. Stowage dimensions, 8'625" × 6'5" × 4'625".

Marks I and II boxes only differed from Mark III in minor details.

*Box, Cartridge, Aiming tube, Mark I | L |*, is of deal with elm ends; the lid is secured by brass screws with leather washers. It has a tin lining and a closing plate with handle. Cleats and rope handles are attached to each end of the box. Dimensions, 18 $\frac{7}{8}$ " × 7 $\frac{1}{4}$ " × 11". § 10813.

Camel and bullock boxes are special for India; but the first is also used for the issue of S.A.A. to Colonial Governments.

In order that the particular kind of ammunition packed in S.A.A. boxes may be readily distinguished, all such boxes issued from

Camel and bullock box.

Distinguishing marks on boxes.

§§ 3757, 3812.


*Example of marking on a .303-inch Cartridge Wrapper.*

**CARTRIDGES**  
**S.A. BALL**  
**.303 Inch**  
**CORDITE**

---

5	7	00
---	---	----

---

**E. Mark II** 

*Example of marking on a descriptive Label on a S.A.A. Box.*


1100

**CARTRIDGES**  
**S.A. BALL**  
**.303 Inch**  
**CORDITE**

---

7	4	00
---	---	----

---

↑ **Mark II** ↑ 

R.L. I.L.S.

Woolwich have now labels with distinguishing marks of various colours. The distinguishing labels are placed on each side and on each end. The detail is given on the attached Plate XXXVIII.

§§ 7603, 7662.

The device will be printed on the wrappers of each bundle of ammunition the same colour as the printing, *i.e.*, black for gun-powder (service), red for cordite (except .303-inch short-range cartridges), and yellow for practice cartridges.

The distinguishing mark will be printed on the distinguishing labels which are placed at the sides and ends of the box, also on the descriptive labels which are fixed, one to the centre of the closing plate of the inner lining, and one in a recess on the top of the box, in the colour shown in the plate.

The manufacturer's initials will always be found in the lower line of the descriptive label; when there are two initials as shown in the above example, that in the left hand corner is the contractor's initials.

The initials are as follows:—

Manufacturer.	Initials.
Royal Laboratory .. ..	R <sup>^</sup> L, or ILS, with no other initials.
Kynoch .. ..	K.
Birmingham Small-Arms and Metal Company ..	B.
Eley .. ..	E.
Greenwood and Batley ..	GB.
Grenfell and Accles ..	GA.
Henry Rifled Barrel Com- pany .. ..	HRB.

S.A.A. boxes have the following information stencilled on them: gross weight at one end, date of packing at each end; on top, the number of the box, and, if containing cordite cartridges, the word cordite and particulars of the batch. The number of the box and particulars of the batch of cordite are also marked on the closing plate of the inner lining after it is soldered down. If the box contains powder cartridges, it will be stencilled on top with the nature of powder contained in the cartridges.

They have the usual Government Explosive Label sealing the junction of lid and box, and in addition a small calico label, with a number in red, instead of an ordinary station label, which fits in a circular recess over the wire attached to the pin, and seals the box; also a calico label with directions for opening over the string. The classification label is placed on in the most convenient position.

§ 7769.

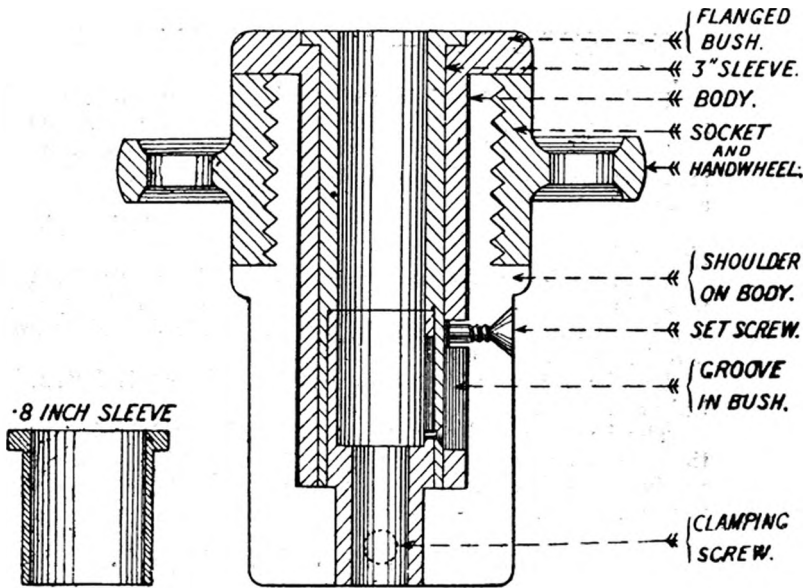
*Tool, extracting bullets, small-arm, Mark I*, is for the use of Inspecting Ordnance Officers in opening S.A. and .45-inch M.G. cartridges.

Steel body; gun-metal socket, fitted with milled handwheel; steel flanged bush, secured in the body by a small screw; steel milled-headed clamping screw, and two steel sleeves .8 inch and  $\frac{3}{4}$  inches long respectively.

The body has a shoulder on the outside, a screw thread being cut behind the latter to take the socket. The body is bored out (the diameter being greater in rear) to take the steel flanged bush. In this form the tool is adapted for use in extracting bullets from M.-H. rolled and solid case cartridges.

Instructions  
for use.

1. *M.-H. Rolled and Solid Case Cartridges*.—Insert the cartridge in the bush of the tool, and grip the bullet with the clamping screw; turn the handwheel, and withdraw the body of the cartridge from the bullet.

*Tool, Extracting Bullets, Small-arm, Mark I.*

2. *G.G. Cartridges.*—Insert the ·8-inch steel sleeve in the bush, and proceed as in 1.

3. *·303-inch Cartridges.*—Insert the 3-inch steel sleeve in the bush and proceed as in 1.

Care must be taken in inserting the 3-inch sleeve that the lines on it and on the head of the body of the tool coincide, so as to ensure that the clamping screw will pass through the hole in the sleeve and thus be free to grip the bullet.

## CHAPTER XIV.—ROCKETS AND LIGHTS.

Rockets are employed in the service for signalling, for display, as weapons of war, and in conjunction with the life-saving apparatus.

There are also in the Service sundry portfires and lights, the manufacture of which is analogous to that of rockets, and which will accordingly be described in this chapter.

*Rocket, War, 24-pr., Mark VII, | C |* consists of a body, head, base piece, tail piece, and safety cap.

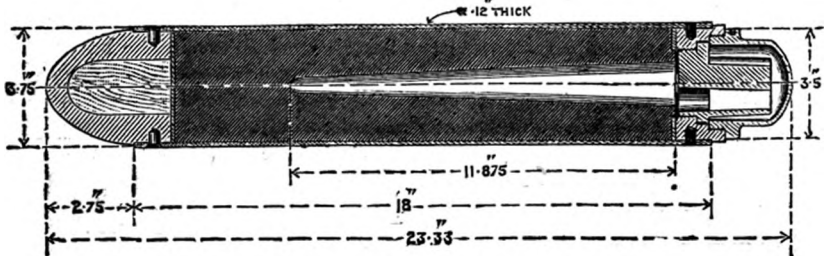
The body is made of steel tubing, cut to the required length, and tested internally by hydraulic pressure to 1 ton on the square inch. The interior is then roughened by scoring it spirally and scoured till it is quite clean and bright.

The head is of cast iron lined with wood, and is fastened to the body by screws.

The base piece of wrought iron or mild steel fits into the end of the case and is secured by screws. It is bored out and screwed to receive the tail piece and also to receive the safety cap as shown in the woodcut.

*Rocket, War, 24-pr., Mark VII, | C |*.

Scale,  $\frac{1}{2}$ .



Tail piece.

The tail piece is of cast iron, and contains three conical vents, the larger part of the cone being towards the interior of the rocket. The vents are cut away on one side; hence the gas issuing from the vents meets with resistance on the side where they are prolonged, and, there being no counterbalancing resistance where they are cut away, rotation is given to the rocket.

Safety cap.

The safety cap is of mild steel and is screwed on to the base piece. Its object is to cause the rocket to burst, instead of becoming

a dangerous missile, should it be accidentally ignited. Between the face of the cap and the base piece an asbestos washer makes a water-tight joint.

*Rocket, War, Key, 24-pr., Mark I*, is for unscrewing these caps. § 5154.

The composition consists of ground saltpetre, sulphur, and alder charcoal. Filling.

This is first pressed into pellets for convenience of handling, and the hole for the tail piece having been filled up with a false base, the rocket is placed base downwards in the press and the pellets put in from the top and subjected to pressure.

An asbestos disc is placed over the top of the composition, the edges of the disc being turned up round a disc of millboard which is placed over the asbestos. The upper surface of the millboard and the interior of the top part of the case are coated with thinned luting, and the head is pressed in on top of the millboard and fastened on. The false base piece is then removed and a conical hole 11/875 inches long drilled in the composition. Round the edge of the base piece inside there is a lead ring, so as to seal the joint and prevent the escape of gas in that direction, and between the base piece and the composition is a millboard washer.

When screwed in, the tail piece is retained in position by a keep screw.

Before screwing the safety cap into the base piece the threads are lubricated with thinned luting.

The numeral and date are stamped on the base of the rocket.

Each rocket also has a letter of the alphabet and a number stamped on both head and case. The numbers run up to 1,000, and then the letter is changed. § 1515.  
§ 1985.  
§ 2441.

*Rocket, War, 9-pr., Mark VII, | C |* is similar in construction to the 24-pr. Mark VII, but the proportions of the ingredients of the composition are slightly different. § 5111.

All war rockets are painted red.

Paint.

War rockets are issued in wooden cases fitted to hold three 24-pr., and four 9-pr. rockets respectively.

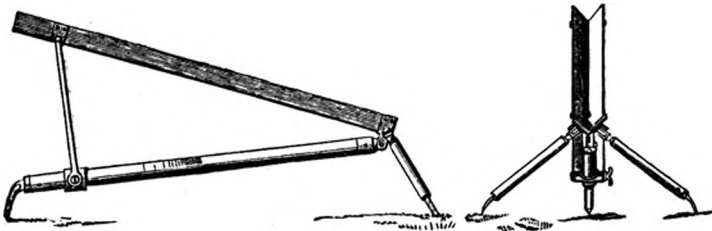
New war rockets will not be issued from Woolwich until one year after the date of their manufacture.

Age of rockets.

The average range of the 24-pr. rocket is about 1,800 yards. The 9-pr. 1,200 yards.

#### Rocket Machines.

*Machines, Rocket, War, 24-pr. and 9-pr., | L |* differ from each other in dimensions and weight. §§1637, 1651.



The following general description applies to both:—

Each size consists of a sheet-iron V trough, supported at rear by three legs made of wrought-iron tubing, two short ones opening right

and left, and one long one to the front beneath the trough, each terminating in a prong. On the front one runs a gun-metal ring connected by two bars with a V near the front of the trough, the bars pivot on V and ring; the elevation is given by slipping the ring up and down the front leg, and clamping it with the arrow on the rear edge of the ring at the required line of graduation up to 15° of elevation for 9-pr., and 25° for 24-pr. machine, with reference to the plane on which the machine stands.

At the back end of the trough is an iron stop preventing the rocket sliding back; it is slotted to form a crutch for copper friction tube.

§§ 5598, 5747. *Tube friction quill, long*, is used in the N.S., and *Tube friction copper, short*, in the I.S.

There is also a Machine, Rocket, War, 24-pr., for Naval Service.

#### *Life-saving Rockets.*

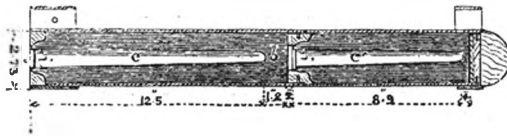
§ 10354.

*Rocket, Life-saving, Boxer, Mark VI, | L |* consists of body with pins and screws, 2 clips, front disc, head, and closing plug.

The body is of solid-drawn steel, in two parts, connected by a wrought-iron or mild-steel connecting piece, which is secured to the front portion by pins and brazing, and to the rear portion by screws.

A wrought-iron or mild-steel base piece, threaded internally to receive a closing plug, is secured in the end of the rear portion by

#### *Rocket, L. S., Boxer.*



*Section.*

pins and brazing and burring over the edge of the case. The two parts of the body and the screws are blackened in boiled linseed oil and the interior of the body receives three coats of white paint.

The clips for securing the stick are of sheet iron and connected to the body by screws.

The front disc is of wrought iron or mild steel, the head of wood, and the closing plug of gun-metal, with a square recess to fit the G.S. key.

The composition is pressed into pellets for convenience of handling and inserted into the front and rear parts of the body. A millboard disc is placed on top of the composition in the front part, the top of the disc and inner surface of case being coated with thinned luting. A lead disc, coated with thinned luting, is placed above the millboard disc, and over this the front disc which is secured to the body by screws. A conical cavity is formed up the centre of the composition. The rear part of the body has the composition pellet at the top made quicker burning than the remainder, this is covered by a millboard washer, with its upper surface and the interior of the case coated with thinned luting. Two lead washers, coated with thinned luting, are placed above. A conical cavity is formed in the rear part and the bottom of cavity is covered by a paper disc, giving instructions to "break through before firing," shellaced on. The threads of the closing plug are slightly greased with



thinned luting. The plug is to ensure the rocket bursting, instead of being projected, if the composition should be accidentally ignited.

The front clip is secured by screws, and the wood head by tacks. The rear clip has its rear edge turned over the end of the body and the clip secured by screws.

These rockets range from about 300 to 470 yards, giving a mean range of 375 yards, and a mean deviation of 37.5 yards down wind.

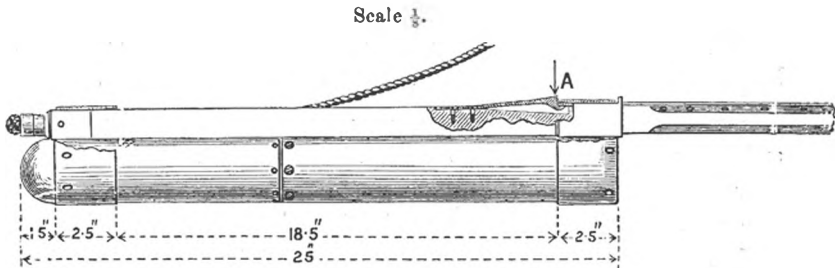
The numeral and contractor's initials, or trade mark, are stamped on the base piece, and the numeral and date of manufacture stencilled on the body. Marking.

Exterior of rocket, except the plug, painted red. Paint.

The reason for having the two rockets, one fixed in prolongation of the other, is to give great length of burning and continue the propulsion through a much longer period without any excessive strain upon the line.

Six rockets in a packing case. Issue.

Rocket, stick 9 feet 6 inches, Mark IV, | L | is of deal, square, with the corners rounded off. The upper part is recessed to fit close to the rocket, and has two iron plates, one close to the end, the other where the stick fits into the bottom clip. The latter has a flange to rest against the base clip of the rocket. Below this the rocket stick is plated with tin to prevent its being burned by the flame of the rocket. On the back of the stick is fitted in a slot a flat spring with a catch to hold the stick in position when inserted. § 3988.



The bottom end of the stick is bound with an iron ring, and the line is passed through a hollow in each end of the stick. After coming out through the top it passes through two indiarubber and one brass washer, and is secured by an overhand knot.

The indiarubber washers are intended to reduce the effect of the sudden jerk when the rocket is fired. A second knot is usually made in the rope near the hinder end of the stick in case the upper part of the line should be burnt through by the flame of the rocket.

Nine sticks in a bundle. Issue.

*Machine, Rocket, Life-saving Boxer, Mark V, | L |* forms part of the life-saving apparatus; it is intended for firing the life-saving rocket.

The following combustible stores are also issued in connection with the life-saving rocket, viz. :— Other combustible stores.

*Fuze, Rocket, Boxer, Mark III.*

*Light, Long, G.S., Mark I.* When for use with the life-saving rocket, it is issued with metal handle. § 6490.

*Portfire, Life-saving.*

A metal handle is issued with this portfire. § 1271.

§ 1271.

§ 6490.

*Fuze, Rocket, Boxer, No. 20, Mark III.*—The exterior is conical to fit into the vent of the life-saving rocket. The body is of paper, 2.75 inches long, and is driven with composition, which burns 10 seconds. The exterior of the fuze is covered with kamptulicon. Over the priming there is a waterproof paper cap tied on with twine, which need not be removed before firing.

The fuzes, etc., are issued in a *Box, Life-saving Fuze, Mark III*, of tin, which contains 12 fuzes, 12 indiarubber washers, six brass washers.

The lights are issued in a deal box, closed with hinged lid, secured by hasp and staple, called *Box, Life-saving Lights, Mark II*, which contains 12 long lights, two handles, and 15 G.S. primers in a tin cylinder.

A similar *Box, Life-saving Portfires, Mark I*, contains 24 portfires, two handles, and 30 G.S. primers in a tin cylinder.

§ 11349.

*Rocket, Life-saving, 3lbs, Mark I, | L | with chain.*

This rocket consists of steel body, steel head, wrought-iron base piece, gun-metal closing plug, and chain attachment for line.

The body consists of a solid drawn steel tube. A wrought-iron or mild steel disc is attached to the interior of the body at the head to take the head attachment screws. The head is of steel and is attached to the body by steel screws.

The composition for filling the body of the rocket is compressed into pellets and then pressed into the rocket, a conical cavity being afterwards bored up the centre of the composition.

The base piece is of wrought-iron attached to the end of the body by pins and by brazing. It is recessed and screw threaded to receive the gun-metal closing plug.

A steel band is secured to the body near the bottom. This band has three lugs intended for the chain attachment for the line.

The rocket is painted red.

The numeral and contractor's initials are stamped on the band, and the numeral and date of manufacture stencilled on the body.

The fuze employed is *fuze, rocket, 3lb., life-saving, No. 21*.

Range 160 yards with an elevation of 45°.

The line is issued separately.

It is fired from *machine, rocket, life-saving, 3lb.*

Caution.

The life-saving rockets must, like other stores of a similar nature, be treated with due care and respect. If accidentally ignited when pointed in the wrong direction, or when lying about on the ground, they may become life-destroyers instead of life-savers. It is well, then, to remember that the life-saving rocket is not a mere firework, but a powerful missile, safe when used properly, but dangerous when accidentally or carelessly misused.

#### SIGNAL ROCKETS.

§ 4572.

*Rocket, Signal, 1 lb. Service, Mark III*, has a case made of brown paper, rolled into a cylinder. The composition is driven by hand, and has a conical hollow at the rear.

A paper case is attached to the head, terminating in a cone; this serves to contain the stars and some mealed powder which serves to open the case and scatter the 28 stars. The star chamber is separated from the rocket composition by some clay driven in at the top of the composition, having a central hole forming a communication; the rocket is choked near the base, and has a priming made up of L.G. powder and isinglass.

The vent is closed by a wooden screw-plug, intended to reduce the area over which the destructive effect of the accidental ignition of a store of rockets would extend, as rockets so fitted will burst, instead of being projected in the usual way.

The sticks are 5 feet long, tapered to the end. For Naval Service, the stick is only about 1 foot 6 inches long, and has a rope tail 5 feet long. This is more convenient than the long stick for use in confined spaces, such as boats, &c.

*Stick, 5 feet, with notch, Mark I, | C |*, is used with blue, green, red and service; also combined light and sound. § 12742.

*Rocket, Signal, ½ lb., Service*, resembles the 1-lb. rocket, except in size and in having the paper case larger in diameter than the body of the rocket and containing only 20 stars.

Each rocket is packed in a tin cylinder, the lid of which is secured by a tape band shellaced on. Fifteen of these cylinders are issued in a deal box. Issue. §§ 4909, 5852.

*Rocket, Signal, 1 lb., Red*, are made for the purposes of display. They resemble the Service signal rockets, but the heads are more rounded, and contain coloured stars. Coloured rockets.

These rockets are made in the ½-lb. as well as in the 1-lb. size, and to contain red, blue, or green stars.

The heads are in all cases opened by quick-match packed in with the stars.

The 1-lb. size in whole metal-lined cases containing 42, and the ½-lb. 84 in a whole metal-lined case. Issue.

*Rocket, Signal, 1 lb., Red and White, Mark II*, differs somewhat from the above. It is the same in external form as the 1-lb. red signal rocket, Mark II, and has the head painted in longitudinal stripes of red and white. It contains 25 red and 24 white stars. § 4632.

Sixteen red and white rockets in a packing case.

Issue.

The sticks are issued in bundles to correspond with the number of rockets.

*Rocket Light, ½ lb., Mark II, and Rocket, Sound, ½ lb., Mark II*, are issued to the Board of Trade. § 4652.

The body of the rocket proper, paper-case, and the fitting of the stick are similar to those of the ordinary ½-lb. signal rocket. They have, however, a different arrangement for firing. About 4 inches of safety fuze is laid up alongside the copper socket for the stick. One end of this fuze passes into the vent round the lower edge of the case; the other end, protected by a paper cap, may be ignited by a vesuvian or other convenient means.

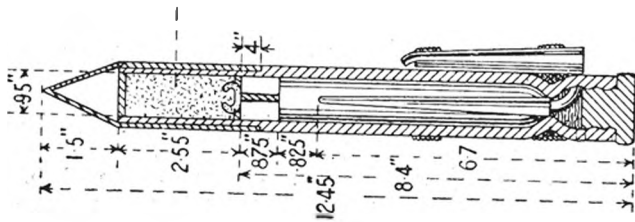
The base of the rocket is closed by the usual wooden plug screwed in.

The light rocket has the head filled with a single star of magnesium light composition contained in a paper case, and matched and primed. It is ignited and blown off when the rocket has reached its maximum height. The star burns about 15 seconds.

The sound rocket has instead of a star a 2-oz. primer of dry gun-cotton, coated with paraffin, and a detonator. These are carried separate from the rocket and from each other until required for use. The head is a cylindrical paper case, rather larger in diameter than the body of the rocket. It has a piece of calico at the top fitted with a tape. When the gun-cotton is inserted into the head the calico and tape fasten it in, the calico being tied up by the tape like a bag. The detonator is a small tin tube, containing fulminate of mercury, and is ignited by quick-match passing into the top of the rocket composition.

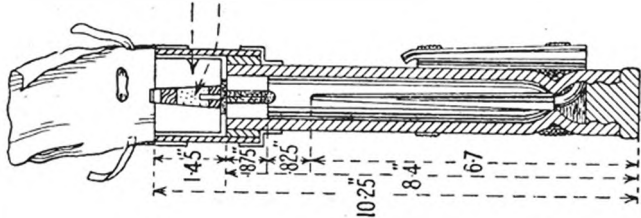
*Rocket, Light,  $\frac{1}{2}$  lb., Mark II.*

Magnesium Light Composition.



*Rocket, Sound,  $\frac{1}{2}$  lb., Mark II.*

Gun Cotton. Fulminate of Mercury.



Should the safety fuze get damp and refuse to act, the rocket may be ignited by a portfire after removing the plug or breaking through the paper covering according to the pattern.

Stick, 4-feet, 2-inch, Mark I | C |, is used with  $\frac{1}{2}$ -lb., blue, green, red, light, and sound, Mark II.

**Use.** The above rockets are intended for use in giving signals from lighthouses, lightships, etc.

**Issued.** *Light* and *Sound* rockets are packed in half metal-lined cases containing 42 of the former and 25 of the latter.

**Paint, and marking.** The above-mentioned signal service, light, and sound rockets are painted drab; the red, red and white, blue, and green signal rockets also have the bodies painted drab, but the heads are painted the same colour as given in the nomenclature of the rocket. They have the numeral, date of manufacture, and contractor's initials or recognised trade-mark stencilled in blue paint on the body. The latter is also stamped on the wooden plug along with the numeral.

A label showing the method of fixing the stick, etc., is pasted on the body.

**Method of firing.** Signal rockets may be fired from a T-frame with cleats, from off a nail in a post, or even with the end of the stick stuck into soft ground; there is, however, a signal rocket-tube machine, for firing 1-lb. and  $\frac{1}{2}$ -lb. signal rockets from boats, and under circumstances when the back rush of flame might do injury.

**§ 11066.** *Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III,* is generally similar to the Mark II. It is painted black. The head of the rocket is closed with a removable wooden plug, which is secured by a bayonet joint. This plug must be in position before firing.

Issued 25 in a half M.L. case.

*Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III, Charge Tonite, Mark I | C |.* This consists of 1,729 grains of tonite (equal parts gun-cotton and

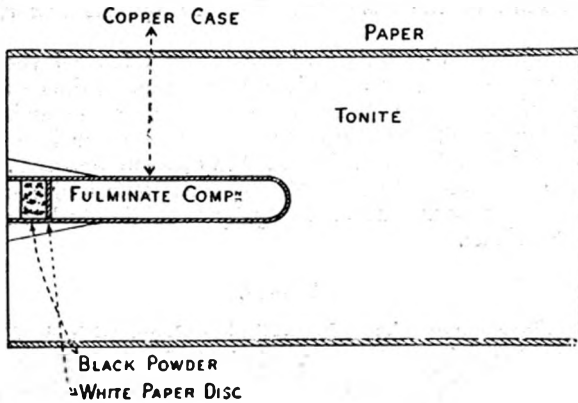
barium nitrate), recessed to receive a detonator. It is covered with paper, except the top and bottom. Dimensions, 2.95 inches long and 1.55 inches diameter.

Issued 50 in a quarter M.L. case.

*Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III, Detonator, Mark I | C |*.—This is made of copper and is filled with fulminate composition (fulminate of mercury, chlorate of potash, and gun-cotton) strongly pressed in. It is primed with mealed powder, a disc of paper being placed between the mealed powder and composition. Dimensions, 1.25 inches long and 0.256 inch diameter. Issue 5 in No. 71 cylinder. Stick used is 4 ft. 6 in.

*Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III, Charge and Detonator.*

Scale  $\frac{1}{4}$ .



*Machine, Rocket, Signal, Mark II*, consists of an oval tube of sheet iron to take the rocket with the portion of the stick at its side, a round tube of sheet iron being fixed on to it to take the remainder of the stick in its interior. §§1373,12742.

The two tubes are joined together by a middle piece of gun-metal, to which both are riveted.

The larger part of the finished tube is about 1 foot 8 inches, and the smaller 4 feet 6 inches long.

The metal at the mouth of the finished tube is wire edged, at the opposite end is a ground spike.

A vent is made in the close portion of the base of the oval tube opposite to the vent of the rocket to take a quill tube for firing, which is prevented from falling out when the tube machine is pointed up into the air, by a hinged piece of gun-metal which shuts in behind the head.

*Rocket, Light and Sound, 1-lb., Mark I | L |*, is similar to the § 11442.

The star consists of a brown paper cylinder filled with a composition to give a red light, and has a piece of quick-match at one end. The star is inserted in the head of the rocket, primed end downwards, after having two pieces of quick-match passed round it. On the top of the star is placed a felt wad, with a central hole for the flash of quick-match round the star to pass to the detonator.

The tonite charge is similar to that of the "Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III," but smaller.

The detonator is the same as that for the "Rocket, Sound,  $\frac{1}{2}$ -lb., Mark III."

The tonite charge and detonator are issued separately, and the space in the rocket is occupied by a brown paper cylinder until the rocket is required for use.

The 5-ft. stick is used. The height of burst should be at least 600 feet.

Care should be taken in inserting the detonator and replacing the charge, and in subsequent handling.

Very signal  
cartridges.  
§ 12878.

*Cartridges, Signal, Very, Marks II and III*, are issued for signalling purposes and contain a single green, red, white or blue star. The cartridge consists of a brass case, rolled for Mark II, solid drawn for Mark III, lined with brown paper which projects beyond the mouth. The case is provided with a percussion cap and the charge consists of gunpowder. Above the charge is the star, the mouth of the case being secured by felt and cardboard wads.

The portion of the lining, which projects beyond the case, is painted the same colour as that given by the star in the cartridge.

The rim of the base of the cartridge for a green star is smooth; for a red star is milled all round; for a white star is milled half way round and for a blue star is milled in opposite quarters.

When fired from a Very pistol, the star should ignite and rise to a height of 300 feet without breaking up, and should burn brightly for about 9 seconds.

#### LIGHTS.

Common  
Portfire.

*Portfire, Common*, consists of a cylinder about 16 inches long, and rather more than  $\frac{1}{2}$  inch diameter. It is made of stout brown paper pasted, rolled, and, when dry, turned in at one end to form a bottom. The case or cylinder is driven with portfire composition.

The top has a small hole bored in the composition, and is primed with mealed powder to make it light easily. They burn from 12 to 15 minutes, and are generally lighted by a slow match.\*

Painted flesh colour.

Issued.

In bundles of 12, packed in deal boxes; the exposed ends are secured by a paper cap tied on with twine.

§ 1271.

*Portfire, Life-saving*.—Differs from a common portfire in being 8 inches long, and in being made so as to ignite by means of a detonating primer, the end being closed by a paper cap, and strengthened by a tin band, perforated to take the detonating primer, which enters into a small space beneath the paper cap. The composition is primed in the usual method with mealed powder, perforated in the centre. This portfire is used with a metal handle similar to that for the G.S. long light.

Coastguard  
light.

*Light, Coastguard, Mark II, | N |* burns about five minutes. The spike at the end is to enable the light to be stuck in the ground.

§ 1724.

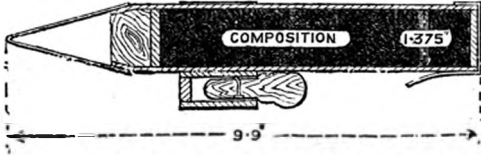
§ 6911.

The composition is contained in a paper case fitted with Brock's patent igniting arrangement. A wooden plug with composition at one end is contained in a paper cylinder attached to one side of the light. The top of the light is primed with composition

\* They may be lit also by any means handy, as a revivian, a burning stick, &c., In the field, if no other means are handy, put a friction tube on the ground, under a brick or stone, leaving the ends out. With one hand pull the lanyard to ignite the tube, keeping the stone firmly pressed down under the foot, and with the other hold the end of the portfire to the end of the tube, so that the flash of the latter may ignite it.

and covered and protected by a paper disc. To ignite the light tear off the disc, pull out the plug, and draw its primed end smartly across the exposed surface of the light, holding the latter so that it points away from the body.

*Light, Coastguard, Mark II, | N |.*



One in a tin cylinder.

Mark I differed in the igniting arrangement.

*Light, Long, G.S., Mark III | C |*, is a brown paper case driven with composition, consisting of saltpetre, sulphur, and red orpiment, a beechwood handle is inserted in the bottom of the case and bears against a clay plug. The igniting end is closed by means of a piece of thin calico on which a thin layer of composition is placed; the linen overlaps the body of the light for 1 inch all round; it is protected by a paper disc and cap with a piece of tape attached to it. It is painted drab colour. Issued one in a tin cylinder.

*Light, Long, Blue, Green, and Red, Mark III | N |*, also *Short G.S., Mark II | N |*, are generally similar to the above. The first three are painted the colour they are intended to show in burning.

Long lights burn about 5 minutes, short  $1\frac{1}{2}$  to 2 minutes. Earlier Marks differed in the handle and method of lighting.

*Quick-match* is made of cotton wick boiled with a solution of meal powder and gum, and afterwards dusted over with meal powder before it is quite dry.

Unenclosed it burns at the rate of about 1 yard in 13 seconds; when enclosed in a tube of any kind it burns much more rapidly, the pressure causing the gas to rush forward and fire the whole length practically simultaneously. *Quick-match* is made up in paper or calico tubes when this rapid action is required, and when so made up is termed a "leader."

The proportions of powder, etc., vary with the number of threads in the wick. *Quick-match* is largely used for priming, &c.

Either in packing, or metal-lined cases, it should be demanded by weight.

*Slow-match* is made of pure hemp slightly twisted and boiled in a ley of water and wood ashes in the proportion of water 50 gallons, wood ashes 1 bushel; this serves for 100 lb. of yarn. It burns at the rate of 1 yard in 8 hours; it is used for lighting portfires, etc. *Slow-match* may be equally well made by boiling in a solution of 8 oz. saltpetre to 1 gallon of water.

Loose, in skeins or parts of skeins, placed in a case with other stores. When large quantities are demanded it is issued in bales or casks. It should be demanded by weight; about 4 yards go to 1 lb.

*Fuze, Safety, No. 9, Mark II | C |*, consists of a train of F.G. powder enclosed in jute yarn, contained in a tube of gutta-percha covered by waterproof tape. It burns  $90 \pm 15$  seconds per yard. The rate of burning is shown on the label of the cylinder. It is easily ignited by

Issue.

§ 11830.

§ 10300.

Quick-match.

Issue.

Slow-match.

Issue.

§ 11314.

a portfire or vesuvian, but not always by a lighted piece of paper. To prepare the fuze the gutta-percha must be removed by an oblique cut, and the powder laid bare, both at the end in contact with the charge and at that which is to be ignited. It is also ignited by the pistol mentioned below, in the R.N., under certain circumstances.

Colour, black.

Old fuze should be tested before use as it sometimes deteriorates, and instances have occurred where it has burned much too rapidly.

Issue.

In tin cylinders containing 8 fathoms each.

§§ 6052, 7138.  
§ 3630.

*Fuze, Instantaneous, Mark III, | L |* consists of two or more strands of quick-match, enclosed in a tube of waterproof tape, round which cotton is twisted, the whole being contained in a gutta-percha covering. The gutta-percha covering is braided with yellow worsted and varnished red on the outside. This readily distinguishes it from the safety fuze. It burns at the rate of about 30 yards per second, or practically it is instantaneous. It can easily be ignited by a portfire or vesuvian, but it is unsafe to hold it in the hand like the safety fuze when lighting it.

§ 8399.

Mark I, which differed only in minor details, may be known by its being unpainted. Mark II is obsolete.

Issue.

It is issued in 100 yards lengths on a wood or tin reel, packed in a zinc box.

Instantaneous fuze is used by the Royal Engineers in connection with No. 8 detonator. It is fired with a special pistol which was formerly used in the Royal Navy for the same purpose, but as the use of instantaneous fuze has been discontinued for naval service, the pistol with its cartridge were retained for igniting safety fuze instead.

§ 4272, 6757.

*Pistol, B.L., Safety Fuze, Mark IV, | N |*, has a split cramping tube inside the brass barrel which secures the fuze when the barrel is screwed home on the body.

§ 3868.

*Cartridge, Pistol, Safety Fuze, Mark I, | N |* is a solid drawn brass case with a cap chamber formed in the base, containing an ordinary pistol cap and anvil such as are used with the Service revolvers. The cap chamber has one firehole. The charge is 3 grains of R.F.G. powder. On the top of the charge is a thin glazed millboard washer covered with a disc of white fine paper, secured by turning over the edge of the case all round and coating it with shellac varnish. They are issued in tin cylinders, each containing 25 cartridges, four of these cylinders being placed in a larger cylinder.



## APPENDIX I.

(1) B.L. cordite cartridges, 6-inch and above, in N.S., made up § 12818. with certain lots of cordite, will contain a greater or less amount of cordite (as may be found necessary to secure uniform ballistics) than that given in the designation of the cartridge.

The nominal weight of cordite will be stamped on the front of the cartridge, the amount deducted or added being shown by a plus (+) or minus (−) sign appended to the lot number of cordite.

Cordite issued in bulk to depôts for making up cartridges of weights other than the nominal will have the words "Adjusted charge" with the weight of such adjusted charge and the calibre and numeral of gun, in which it is to be used, stencilled on the cases.

(1A) *Cylinders, Cartridge* (see pp. 40–43). The method now adopted to hermetically close these cylinders is as follows:—

The cylinders are altered by having secured to them, near the top of the body and just below the threads, a flanged ring of zinc. In this ring is placed tow treated with luting. When the lid is screwed tightly home, its lower edge will bear hard against the luted tow, and make a tight joint.

(2) Fuze, percussion, base  $\left\{ \begin{array}{l} \text{large, No. 11, Mark V.} \\ \text{,, ,, 15, ,, II.} \\ \text{medium, No. 12, Mark V.} \end{array} \right.$

These fuzes differ from the previous marks as follows:—

- (a) In being slightly longer.
- (b) The pressure plate, instead of being flat, is curved and provided with a deep flange on its circumference; this flange is lipped out so as to form a gas-check.
- (c) The steel protecting disc screws in and bears against the gas-check lip of the pressure plate, and it has four holes instead of six.
- (d) The nut of the pressure plate spindle is not undercut, but fits into a recess formed at the top of the elongated hole in the retaining bolt.
- (e) The detonator is placed in the screwed cap from the front, and to secure it in position, a brass disc, with fireholes, is placed on top, and is itself secured by the metal of the cap being spun over.

(3) *Fuze T. and P., No. 62, Mark II*, differs from No. 63 in the following particulars:—

- (a) The fuze above the screw-threaded portion is larger.
- (b) The upper ring is graduated to 60.
- (c) A hexagonal nut is used (to secure dome and rings) instead of the round cap and set screw as in 63.
- (d) Two creep springs are used in the percussion arrangement.
- (e) The stem is hollow (for lightness) and is thicker at its base than at the upper part (so ensuring centring of the lower ring).

(4) *Cartridge, Q.F., 3-pr. Vickers, Mark I | N |*.—The case differs from the ordinary 3-pr. in the shape of the shoulder. The charge is  $13\frac{9}{16}$  ozs. of cordite, M.D., size 8, bundled together and tied with silk sewing. The igniter (Mark V) consists of F.G. powder, enclosed between shalloon discs, and has two pieces of braid to secure it to a braid band round the charge.

The paper cylinder is shorter than that used with the ordinary 3-pr.

(5) *Cartridge, Q.F., saluting 12-pr., 18 cwt., Mark I | N |* is similar to the 12-pr., 12 cwt., Mark II. A longer wooden drift is used to insert the leather board cup.

(6) *Tools, reforming cartridges, Q.F.*—The tools used with the 13-pr. and 18-pr., Q.F., are generally similar to those for the 6-pr. and 3-pr.

*Gauge, screw, primer hole, No. 2*, is used with both 13-pr. and 18-pr. cases.

*Machine, indenting, 18-pr., Q.F.*, differs from that used with the 6-pr. in dimensions. A worm wheel and worm is used to actuate the indenting pieces. The machine for the 13-pr. differs from the 18-pr. in dimensions.

*Machine, extracting shell, 13-pr. and 18-pr.*, differs from the 6-pr. and 3-pr. machine in dimensions; a bush is screwed on for use with 13-pr. ammunition.

§ 12802. (7) *Fuze hole 2 inches diameter* differs from the G.S. gauge in diameter.

§ 12803. *Plug, fuze hole, 2-inch, Mark I | L |* is for use with shell with fuze holes 2 inches diameter. The plug is made of white metal, the top is convex in shape, the edge of which projects over the screwed portion and forms a protecting flange for the fuze hole of the shell; and it has a square keyhole in the top.

(8) *Grummets, rope*.—The grummets used with the cupro-nickel driving bands are two rope rings loosely secured together by twine; the upper ring can be tightened on the shell when placed in position by a short length of twine.

§ 12805. (9) *Cartridge, aiming rifle, 1 inch, percussion, blank, Mark I*.—The cartridge M.G. Nordenfelt, blank, Mark I, described in Treatise on Ammunition, 1902, has been re-introduced for use in blank firing with 1-inch aiming rifles in the L.S.

Fired 1-inch percussion cartridges may be used for making up these cartridges, the original contractor's initials being barred out (if necessary), and those of the firm refilling substituted.

## CHAPTER XV.

*Notes on the Ammunition of Earlier Armaments.*

The 40-pr. R.B.L. was introduced about the middle of last century, but is still used for some saluting batteries and by our Volunteer Artillery.

The projectiles, common, segment and shrapnel shell, have hardened lead coats extending from the base to the shoulder. This coat takes the rifling and so imparts rotation to the projectile.

Case shot are also issued.

The charge consists of 5 lb. R.I.G.<sub>2</sub> powder, and is contained in a silk cloth cartridge, a paper cylinder being inserted to bring the filled cartridge up to the required length. The mouth of the cartridge is choked round a wooden socket to which is attached a lubricator containing a mixture of tallow and linseed oil, to prevent leading.

The saluting cartridge is made of silk cloth and is filled with 3 lb. of blank L.G. powder. It is choked and hooped in the ordinary way.

The charges are fired by means of solid drawn copper friction tubes.

The fuses used are:—

Fuse time 15 seconds with detonator No. 43.

Fuse percussion R.L. No. 7 with primer.

Fuse percussion small No. 8.

12 and 9-pr. R.B.L. ammunition is generally similar to that used with the 40-pr. except that the service cartridges have no paper cylinders and their lubricators are inside the cartridges.

Their saluting cartridges have, attached to the upper part, a bag containing sawdust, which forms a wad.

The 64-pr. R.M.L. may still be found mounted in some old batteries.

It was introduced into the service in the days of the Napoleonic Wars as a 32-pr. smooth bore, and was converted into a rifled gun about the year 1863.

The projectiles, common and shrapnel shell, are rotated by three rings of copper studs pressed into undercut holes in the body of the shell. These studs fit into the three grooves of the rifling.

Case shot are also issued.

The service charge is 8 $\frac{1}{4}$  lbs. R.L.G.<sub>4</sub> and is contained in a silk cloth cartridge.

The blank charge is 3 lb. L.G. powder.

The fuses used are the D.A. percussion and the T. and P. No. 54. and the charges are fired by means of solid drawn copper friction tubes.

Other R.M.L. armaments were introduced at various dates between 1864 and 1879, of which the following are still considered to be worth manning in time of war:—

12.5-inch, 10-inch, 9-inch, 16-pr., 13-pr., 9-pr., and 2.5-inch.

The 8-inch, 70-cwt. and 6.6-inch howitzers also remain in the service.

12.5-inch, 10-inch, and 9-inch guns, intended for anti-torpedo-boat defence only, have special case shot and cordite charges. Those guns approved for general defence have Palliser and case shot and common shell.

Heavy common pointed shell (360 lbs.) have been issued for some 9-inch guns.

The cordite charge is enclosed in a silk cloth cartridge and, with the exception of that for the 12.5-inch Mark I. gun, has a stick down the centre to give rigidity. Each end of the cartridge is choked round the stick with silk braid.

The 9-inch cartridge has an igniter round the centre formed of a double thickness of silk cloth, divided into six compartments, each of which is filled with R.F.G.<sub>2</sub> powder.

The 10-inch and 12.5-inch Mark I. gun cartridges have two similar igniters, a short distance apart near the centre. This is to ensure one igniter being immediately below the vent, no matter which end of the cartridge is loaded first.

The 12.5-inch Mark II. gun has an axial vent, and therefore the igniter is placed at one end of the cartridge round the stick and is contained in an annular shaped bag made of one ring of shalloon and one of silk cloth.

The special case shot are filled with chilled iron balls weighing 3 lbs. 9½ oz. each.

The earlier marks of Palliser shot and common shell are rotated by copper studs which fit the grooves of the rifling; they have also copper gas checks fastened to their bases to reduce windage.

The later patterns are studless and are rotated by means of automatic gas checks.

The gas check extends completely over the base of the projectile and is furnished with a flange about 1½ inches deep, on which are projections to fit the grooves of the rifling.

The base of the shell is prepared to receive the gas check by having a projection cast on it round the edge of which there is an undercut groove. The edge of the base also is rounded, and on it are cast fluted projections with sharp edges.

On discharge, the soft copper of the gas check is driven into the groove and the spaces between the flutings, and thus securely attaches the gas check to the projectile, to which at the same time it communicates its own rotation.

Full and reduced service charges of prism, P, and R.L.G.<sub>4</sub> powder are issued in silk cloth cartridges.

The D.A. and Pettman G.S. fuses are used with common shell, and the No. 11 large base fuse with the 9-inch common pointed shell.

"V" friction and electric tubes are used with axially vented guns; "P" electric tubes with guns having steel radial vents, and electric No. 10 or solid drawn copper friction tubes with guns having copper radial vents.

10-inch projectiles, fired at over 60° elevation with small charges, cannot be depended upon to hit point foremost.

The 16-pr. and 9-pr. have common and shrapnel shell fitted with studs in a similar way to 6.4-pr. shell. They are also provided with case shot.

The service charges of R.L.G.<sub>4</sub> and R.L.G.<sub>2</sub> powder are in silk cloth cartridges; blank ammunition has also been issued.

The fuses used are R.L. No. 7, small percussion No. 8, time 15 seconds No. 41, and time and percussion No. 56.

The guns are fired by solid drawn copper friction tubes.

The 13-pr. and 2.5-inch have common and shrapnel studless shell fitted with automatic gas checks spun on to their bases.

They also have case shot.

Their filled cartridges are generally similar to those used with the 16 and 9-prs.; and the same tube is used.

The fuzes used are the small percussion No. 8 and T. and P. No. 56.

The 2.5-inch gun is also provided with a star shell which is fired with a reduced charge specially issued for the purpose.

The 8-inch, 70-cwt. and 6.6 inch howitzers have each three service charges of different weights, other intermediate charges being made up as required.

They fire studless common and shrapnel shell fitted with automatic gas checks. The shrapnel have very large bursting charges, inserted from the base of the shell, to give the bullets additional velocity.

Case shot and spherical star shell are issued.

The fuses generally used are D.A., D.A. delay, and T. and P. No. 54.

These howitzers are fired by means of solid drawn copper friction tubes.

The Coehorn mortar and the 4 $\frac{2}{3}$ -inch bronze smooth bore howitzer have recently, after a considerable period of dis-use, been reintroduced into the service for firing the cordite puffs described on page 150; except for this purpose they may be regarded as obsolete.

---

TABLE NO. 1.

## DRY GUNCOTTON CHARGES AND PRIMERS.

Designation.		Service.	Detail.	Weight dry.	Remarks.
GUNCOTTON, DRY.					
Charges, priming—			In tin cylinder.	lb. oz.	
§ 4883.	A .. .. .	L	3 primers A; S.M. ..	4 8	In cylinder No. 59.
§ 4883.	B .. .. .	L	4 „ B; „ ..	2 4	In cylinder No. 60.
§ 4883.	C, 2½ lb. .. ..	N	4 „ B; Naval	2 4	In cylinder No. 61.
§ 10120.	2½ lb., Mark I ..	N	4 „ K; „	2 4	In brass case; for boat mine.
Primers—			Cylindrical. Diameter, thickness.		
§ 4883.	A .. .. .	L	5 in. × 1.95 in.; two perforations; S.M.	1 8	
§ 4883.	B .. .. .	C	3.1 in. × 1.95 in.; two perforations; Naval and S.M.	0 9	
§ 9670.	C .. .. .	N	1.5 in. × 1.97 in., unperforated.	0 2	
§ 9670.	D .. .. .	N	1.5 × 1.97 in.; one perforation; for Marks I and II plugs.	0 2	
§ 9670.	E .. .. .	N	1.5 in. × 1.97 in.; one perforation; for Mark III plug.	0 2	
§§ 4883, 9670.	F .. .. .	C	1.75 in. × 1.375 in.; one perforation; G.S.	0 2	
§ 4883.	G .. .. .	C	1.25 in. × 1.25 in., unperforated.	0 1	
§ 83, 12025.	H .. .. .	C	1.25 in. × 1.25 in.; one taper perforation. .254 in. and .23 in. diameters G.S.	0 1	
§ 4883.	J .. .. .	N	1.25 in. × 1.25 in.; partial perforation.	0 1	
§ 10889.	K .. .. .	N	3.1 in. × 1.95 in.; one partial preparation for boat mine.	0 9	
§ 11806.	L .. .. .	N	1.25 in. by 1.25 in.; one .4 in. perforation. Torpedo E., 6 oz.	0 1	

TABLE NO. 1—*continued.*

Designation.	Service.	Detail.	Weight dry.	Remarks.
Primers, torpedo—		In case.	lb. oz.	
A, 12½ oz. .. ..	N	5 C and 1 D primers; R.G.F. and Fiume short torpedoes.	0 12½	In tinned brass cylinder. § 8195.
B, 1 lb. 1 oz. ..	N	7 C and 1 D primers 18-in. R.G.F., and Fiume (except short) 14-in. Berlin, R.G.F. Mark X, and Weymouth, Mark I torpedoes, for primers with Marks I and II plugs.	1 1	In tinned brass cylinder. §§ 6662, 12468. To be converted to "C."
C, 1 lb. 1 oz. ..	N	7 C and 1 E primers; 18-in. R.G.F., and Fiume (except short) 14-in., R.G.F. Mark X, X* and XI, and Weymouth, Mark I torpedoes.	1 1	In tinned brass cylinder. §§ 6662, 12468.
D, 6 oz. .. ..	N	5 G and 1 J primers; 16 and 14-in. R.L., R.G.F. and Leeds Marks IV* to IX, and 14-in. Fiume torpedoes, except Mark I Fiume.	0 6	In copper cylinder. § 6662.
Brennan .. ..	L	Brennan torpedo ..	—	In brass cylinder.
E, 6 oz. .. ..	N	4 G, one L, and one J primers; Mark IX and earlier type 14-in. torpedoes.	0 6	Converted from "D." §§ 11600, 12608.

TABLE NO. 2.

## WET GUNCOTTON, SLABS.

Designation.	Service.	Detail.	Weight dry.	Remarks.
Slabs—		Rectangular.	lb. oz.	
A .. .. .	L	Shapes cut from slabs O locally for S.M. Not supplied from Woolwich; the descriptive letters are used in S.M. Manual.		
B .. .. .	L			
C .. .. .	L			
D .. .. .	L			
E .. .. .	L			
F .. .. .	L			
G .. .. .	L			

TABLE NO. 2—continued.

Designation.	Service.	Detail.	Weight dry.	Remarks.
		Rectangular.	lb. oz.	
§ 4833.	Slabs— H .. .. .	C	$6\frac{1}{2} \times 3\frac{1}{4} \times 1\frac{1}{2}$ in.; unperforated; Naval and S.M.	1 4
	J .. .. .	L	(See remarks A to G)	
§ 8313.	K .. .. .	L	Slab O with quadrant cut to radius, 2'7 in., S.M.	2 2
§ 4883.	L .. .. .	N	Slab O with semi-circle cut to radius 1'8 in., Naval.	2 2
	M .. .. .	L	(See remarks A to G)	
	N .. .. .	L	Slab O with quadrant cut to radius 1'7 in., S.M.	2 5
§ 4883.	O .. .. .	C	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in., unperforated; Naval and S.M.	2 8
§§ 4883, 10704.	O (torpedo) .. .. .	C	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in., unperforated.	2 8
	P .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in.; two perforations, for primer H, R.E.	2 0
§ 4853.	Q .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in.; two perforations, for primer H, R.E.	1 8
	R .. .. .	L	$6\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{1}{2}$ in.; one perforation, for primer H, R.A.	1 0
§§ 8415, 10705.	S .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in.; one 2-in. perforation, and one perforation for primer H, R.E.	1 12
§ 11827.	S Mark III .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in.; one perforation for primer F and one perforation for primer H, R.E.	1 12½
§ 8415.	T .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{1}{2}$ in.; one 2-in. perforation, and one perforation for primer H, R.E.	1 8
§ 11827.	T (Mark III) .. .. .	L	$6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{3}{4}$ in.; one perforation for primer F, and one perforation for primer H, R.E.	1 8
	U .. .. .	N	$6\frac{1}{2} \times 3\frac{1}{4} \times 1\frac{3}{4}$ in.; with semi-circle cut to radius 1'8 in., Naval.	0 14
§ 8313.	V .. .. .	L	$6\frac{1}{2} \times 3\frac{1}{4} \times 1\frac{3}{4}$ in.; one perforation for primer F; Cavalry Pioneers.	0 14
§ 5025.	Z .. .. .	N	$4\frac{1}{2} \times 4\frac{1}{2} \times 1\frac{1}{2}$ in.; unperforated Naval for 72-lb. mines.	1 8

No more of P and Q will be made. When existing stock is used up they will be replaced by S and T.



TABLE NO. 2A.

## WET GUNCOTTON, TORPEDO CHARGES.

GUNCOTTON, WET.			lb.	oz.
Charges, boat mine 16½ lb.	N	Slabs, in brass case with packing piece.	16	4
Charges, naval, 16½ lb.	N	In tin case. de Out- rigger torpe <sup>o</sup> s. Whitehead.	16	4
Charges, torpedo — Fiume, 18-inch—				
Long-head {	Mark I N	} In torpedo head {	197	10
" II	N		186	10½
Short-head {	Mark I N		94	0
" IA	N		88	0
" II	N		88	0
R.L. 14-inch—				
" V, .. ..	N	In torpedo head ..	60	0
" V*, VI, VI*				
" VII .. ..	N	" " " " ..	70	0
" VII* .. ..	N	Also Leeds, Mark VII* in torpedo head.	65	0
" VIII .. ..	N	Also Leeds, Mark VIII in torpedo head.	65	0
Weymouth, 14-inch—	N	.. .. ..	76	15
R.L., 14-inch—				
Mark VI*A .. ..	N	} In torpedo head {	53	13
" VIIA .. ..	N		69	0
" VII*A .. ..	N		64	0
" VIIIA .. ..	N		64	0
" IX .. ..	N		76	15
" X and X* .. ..	N		76	15
R.G.F., 18-inch—				
Long-head—				
Mark I .. ..	N	} In torpedo head {	189	0
" IA .. ..	N		189	0
" II .. ..	N		188	0
" III and IV .. ..	N		170	15
" V and V* .. ..	N		170	15
Short-head—				
Mark I .. ..	N	} In torpedo head {	85	8
" IA .. ..	N		85	8
" II .. ..	N		—	—
Brennan, Mark I, long	L	} In torpedo head {	—	—
" " I, short	L		—	—

TABLE NO. 3.

GUNS, HOWITZERS, SMALL ARMS, ETC. VARIOUS SIZES OF CORDITE.

B.L. GUNS.				lb.	oz.	
13.5-inch, I to IV	..	..	..	177	8	size 44, and 10 lb., size 3 $\frac{3}{4}$ (composite).
12	..	I to VII	.. ..	88	8	.. 30.
..	..	VIII	.. ..	166	8	.. 50, and 7 lb. 8 oz., size 3 $\frac{3}{4}$ (composite).
..	..	IX	.. ..	201	8	.. 50, and 9 lb. 8 oz., size 3 $\frac{3}{4}$ (composite).
..	..	IX	.. ..	246	0	.. 42 M.D.
10	..	I to IV	.. ..	76	0	.. 30.
9.2	..	I and II	.. ..	42	0	.. 30.
..	..	III to VII	.. ..	53	8	.. 30.
..	..	VIII	.. ..	63	0	.. 40.
..	..	VIII	.. ..	63	0	.. 44, and 3 lb., size 3 $\frac{3}{4}$ , (composite).
..	..	IX and X	.. ..	99	0	.. 41, and 4 lb., size 3 $\frac{3}{4}$ , (composite).
..	..	..	.. ..	120	0	.. 37 M.D.
8	..	III	.. ..	28	12	.. 20.
..	..	IV and VI	.. ..	32	10	.. 20.
..	..	VII and VIIA	.. ..	22	0	.. 20.
..	..	..	.. ..	32	8	.. 16 M.D.
6	..	III, chase hooped IV to VI	.. ..	14	12	.. 20.
..	..	IV and VI	.. ..	16	12	.. 16 M.D.
..	..	VII and VIII	.. ..	20	0	.. 20.
..	..	..	.. ..	23	0	.. 16 M.D.
..	..	..	.. ..	29	0	.. 26 M.D.
6 B.L.C.	..	..	.. ..	20	15	.. 16 M.D.
6-inch	..	IX and X	.. ..	20	0	.. 30.
5	..	II to V	.. ..	4	7 $\frac{1}{2}$	.. 7 $\frac{1}{2}$ .
5	..	B.L.C.	.. ..	5	4	.. 10.
..	..	..	.. ..	2	4	.. 7 $\frac{1}{2}$ .
60-pr.	..	B.L.	.. ..	9	7	.. 16 M.D.
40	..	II to VII	.. ..	3	1	.. 5.
..	..	jointed	.. ..	2	14	.. 5.
30	..	..	.. ..	2	6	.. 10.
15	..	I to IV	.. ..	15 $\frac{7}{8}$	..	.. 5, also 1 lb. 1 oz. 11 drs., 4 $\frac{1}{4}$ M.D.
12	..	6-cwt. I to IV	.. ..	12 $\frac{7}{16}$	..	.. 5.
10	..	..	.. ..	6 $\frac{1}{8}$	..	.. 5.
..	..	..	.. ..	3 $\frac{9}{16}$	..	.. 3 $\frac{3}{4}$ .
B.L. HOWITZERS.						
6-inch, 30-cwt.	..	..	..	1	12	.. 5
..	..	..	..	1	15 $\frac{1}{2}$	.. 5.
..	..	..	..	2	8 $\frac{1}{2}$	.. 4 $\frac{1}{2}$ M.D.
..	..	25-cwt.	..	2	1	.. 3 $\frac{3}{4}$ .
5.4	..	..	..	13 $\frac{1}{2}$	..	.. 3 $\frac{3}{4}$ .
5	..	..	..	11 $\frac{7}{16}$	..	.. 3 $\frac{3}{4}$ .

TABLE NO. 3.—*continued.*

Q.F. GUNS.					lb.	oz.	
6 - inch	..	..	..	..	13	4	size 30.
" "	..	..	..	..	5	8	" 10.
4.7 "	I to IV*	..	..	..	5	7	" 20.
" "	" "	..	..	..	2	2½	" 7½, also 2 lb. 5¼ oz., size 7½.
" "	V	..	..	..	7	8	" 20.
" "	" "	..	..	..	8	10	" 16 M.D.
4 "	" "	..	..	..	3	9	" 15.
" "	" "	..	..	..	1	8	" 5.
18 pr. Q.F	..	..	..	..	1	6½	" 8 M.D.
15 "	..	..	..	..	1	2½	" 20-10 M.D.T.
14 "	..	..	..	..	2	15¼	" 11 M.D.
13 "	..	..	..	..	1	1½	" 8 M.D., 2⅞ oz., size 2¼ M.D.
12 "	18-cwt.	..	..	..	2	12½	" 11 M.D.
12 "	12 "	..	..	..	1	15	" 15.
12 "	" "	..	..	..	2	0	" 11 M.D.
12 "	8 "	..	..	..	13	¾	" 10.
2.95 inch	..	..	..	..	5	oz., 5 oz., 4 dra., 5½ oz., size 5.	
" "	..	..	..	..	2¾	oz., 3¾, also 5⅞, and 6⅞ M.D. 4½	
6 - pr. ..	..	..	..	..	7¾	" size 5.	
3 "	..	..	..	..	6⅞	" " 5.	
1 "	..	..	..	..	1	" 90 grains, size 3½.	
45 G.G. machine gun	..	..	..	..	38	grains, size 3.	
M.H. rifle ..	..	..	..	..	35.8	" " 3.	
M.H. carbine	..	..	..	..	34	" " 3	
303 inch	..	..	..	..	31	" " 3½.	
" " short range ..	..	..	..	..	12	" cordite tape.	
" " blank ..	..	..	..	..	10	" size ¾.	
Webley pistol ..	..	..	..	..	7½	" " .35.	

TABLE NO. 4.

## CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	§Changeus in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>2</sup> or Blank F.G. new, or G.C. yarn.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
10-pr. ... ..	I	{ 11021 11916 }	ins. 4·4	ins. 2	6-oz. 14-drs., 5 ... ..	1-dr. G.C. yarn each end.	No hoops.	{ 256 in a whole M.L. case 115 in a half M.L. case ... 49 in a quarter M.L. case 445 in a whole M.L. case 220 in a half M.L. case ... 87 in a quarter M.L. case	Shalloon.
10-pr. ... ..	I	11022	3·1	1·8	3-oz. 8-drs., 3½ ... ..	1-dr. G.C. yarn each end.		Star shell.	
*12-pr. 6-cwt....	I	8137	5·7	2·2	12-oz. 7-drams, 5 ... ..	4-drs. at each end.		110 in a whole metal-lined case	Shalloon.
12-pr. 6-cwt. ...		0580 7597	5·7	2·2	12 oz. 7 drams, 5 ... ..	1-dr. G.C. prim- ing.		110 in a whole metal-lined case	"
15-pr. ... ..	I	{ 8314 8499 }	11·5	1·9	15¾-oz., 5 ... ..	2-drs. guncotton yarn near each end.		75 in a whole metal-lined case...	"
30-pr. ... ..	I	...	11·5	2·75	2-lb. 6-oz., 10 ... ..	½-oz. at each end		75 in a whole metal-lined case.	
30-pr. ... ..	II	...	11·5	2·75	2-lb. 6-oz., 10 ... ..	3-drs. G.C. at each end.		35 in a whole metal-lined case.	
4-inch ... ..	I	7856	11·5	3·2	3-lb. 1-oz., 5 ... ..	½-oz. at each end.		35 in a whole metal-lined case.	
4-inch ... ..	II	11919	11·5	3·2	3-lb. 1-oz., 5 ... ..	2-drs. G.C. yarn.		35 in a whole metal-lined case.	
4-inch jointed	I	...	11·5	{ 3·3 over pri- mer, 3·0 Base, 4·75 Neck, 3·0 }	2-lb. 14-oz., 5 ... ..	powder ... ..		...	
6-inch gun ... ..	I	{ 7595 7634 }	11·4	{ 3·3 over pri- mer, 3·0 Base, 4·75 Neck, 3·0 }	4-lb. 7½-oz., 7½ ... ..	1-oz. at the base	20 in a whole metal-lined case, or 24 in a case.		
5-inch gun ... ..	II	9334	11·8	3·84	4-lb. 7½-oz., 7½ ... ..	1-oz. at each end	26 in a whole metal-lined case.		
5-inch gun ... ..	III	11919	11·8	3·84	4-lb. 7½-oz., 7½ ... ..	3-drs. G.C. yarn.	26 in a whole metal lined case.		
5-inch howitzer	I	8224	3·2	3·8	11-oz. 7-drs., 3¾. Full. Core, 3-oz. 12-drs. 3 rings, 2-oz. 9-drs. each. Size 3¾.	8-drs. ... ..	80 in whole, 36 in half, or 12 in shalloon quarter metal-lined case.	Shalloon.	

\* 11978 Mk. 1° 12-pr. 6-cwt. is Mk. I fitted with G.C. igniter.

TABLE No. 4—continued

## CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	\$Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>2</sup> or Blank F.G. new, or G.C. yarn.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
B.L.—continued.									
5-inch howitzer ... ..	II	9263	3·2	3·8	11-oz. 7-drs., 3½. Full. Core, 3-oz. 12-drs. 3 rings, 2-oz. 9-drs. each. Size 3½.	8-drs. powder ... ..	...	80 in whole, 36 in half, or 12 in quarter metal-lined case.	Shalloon.
5 inch howitzer ... ..	III	10579	3·2	3·8	11-oz. 7-drs., 3½. Full. Core, 3-oz. 12-drs. 3 rings, 2-oz. 9-drs. each.	2-drs. G.C. yarn. ... ..	...	80 in a whole, 36 in half, or 12 in quarter metal-lined case.	
5 inch howitzer ... ..	IV	12452	3·2	3·8	11-oz. 7-drs., 3½. Full. Core, 3-oz. 12-drs. 3 rings, 2-oz. 9-drs. each.	2-drs. G.C. yarn. ... ..	...	60 in whole, 36 in half, or 12 in quarter metal-lined case.	Shalloon on base only.
5·4-inch howitzer ... ..	I	...	3·2	Base, 3·75	13½-oz., full. Core, 4½-oz. 3 rings, 3-oz. each. Size 3½.	8-drs. powder ... ..	...	100 in a whole metal-lined case.	
5·4-inch howitzer ... ..	II	...	3·2	Base, 3·75	13½-oz., full. Core, 4½-oz. 3 rings, 3-oz. each. Size 3½.	8-drs. ,, ... ..	...	100 in a whole metal-lined case.	
5·4-inch howitzer ... ..	III	10579	3·2	Base, 3·75	13½-oz., full. Core, 4½-oz. 3 rings, 3-oz. each. Size 3½.	2-drs. G.C. yarn. ... ..	...	100 in a whole metal-lined case.	
5·4-inch howitzer ... ..	IV	...	3·2	Base, 3·75	13½-oz., full. Core, 4½-oz. 3 rings, 3-oz. each. Size 3½.	2-drs. G.C. yarn. ... ..	...	100 in a whole metal-lined case.	Less shalloon.
60-pr. gun ... ..	I	...	17·0	4·5	9 lb. 7-oz. Size 16 M. D.	12-drs. powder each end.	4	12 in a whole metal-lined case.	
6-inch 25-cwt. howitzer ... ..	I	...	10	Base, 4·3	2-lb. 1-oz., full. Core, 15-oz. 3 rings, 11-oz., 5-oz., and 2-oz. Size 3½.	12-drs. .... ..	...	30 in whole, 16 in half, 5 in quarter metal-lined case.	Less shalloon or rings.
6-inch 25-cwt. howitzer ... ..	II	...	10	Base, 4·75	2-lb. 1-oz., full. Core 15-oz. 3 rings, 11-oz., 5-oz., and 2-oz. Size 3½.	12-drs. powder ... ..	...	30 in whole, 16 in half, 5 in quarter metal-lined case.	Shalloon.
6 inch 25-cwt. howitzer ... ..	III	...	10	Base, 4·75	2-lb. 1-oz., full. Core, 15-oz. 3 rings, 11-oz., 5-oz., and 2-oz. Size 3½.	12-drs. powder ... ..	...	30 in whole, 16 in half, 5 in quarter metal-lined case.	..
6-inch 25-cwt. howitzer ... ..	IV	...	10	Base, 4·75	2-lb. 1-oz., full. Core, 15-oz. 3 rings, 11-oz., 5-oz., and 2-oz. Size 3½.	2½-drs. G.C. yarn ... ..	...	30 in whole, 16 in half, 5 in quarter metal-lined case.	

TABLE NO. 4—continued.

CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	§Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>3</sup> or Blank F.G. new, or G.C. yarn.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
B.L.—continued.									
6-inch 25-cwt. howitzer	V	...	10	ins. Base, 4.75	2-lb. 1-oz., full. Core, 15-oz. 3 rings, 11-oz., 5-oz., and 2-oz. Size 3½.	2½ drs. G.C. yarn	...	50 in whole, 16 in half, 5 in quarter metal-lined case.	Less shalloon
6-inch 30-cwt. howitzer	I	9002	6.5	Base, 4.4	1-lb. 12-oz., full. Core, 14-oz. 3 rings, 8-oz., 4-oz., and 2-oz. Size 5.	12-drs. powder	...	50 in whole metal-lined case	" "
6-inch 30-cwt. howitzer	II	9263	6.5	Base, 4.4	1-lb. 12-oz., full. Core, 14-oz. 3 rings, 8-oz., 4-oz., and 2-oz. Size 5.	12-drs. "	...	50 in whole metal-lined case	" "
6-inch 30-cwt. howitzer	III	11919	6.5	Base, 4.4	1-lb. 12-oz., full. Core, 14-oz. 3 rings, 8-oz., 4-oz., and 2-oz. Size 5.	2½-drs. G.C. yarn	...	50 in whole metal-lined case.	
6-inch 30-cwt. howitzer	I	12297	6.5	Base, 4.4	1-lb. 16½-oz. Additional 3½-oz. ring.	2½-drs. G.C. yarn	...	50 in whole metal-lined case	Heavy shell, Mark I <sup>a</sup> . howitzer.
6-inch 30-cwt. howitzer	I	12550	6	5	2-lb. 8½-oz., M.D. 4½, full. Core, 16½-oz. Rings, 3½, 8½, and 13-oz.	12 drs. R.F.G. <sup>2</sup>	...	50 in whole metal-lined case	Light shell, Mark I <sup>a</sup> , howitzer.
6-inch, Mark III, C.H., and Marks IV to VI.	I	7594	11.6	{ Base 11.4 to 11.8 Neck 4.5 }	14-lb. 12-oz. Size 20	1-oz. powder at base.	Nil	5 in whole metal-lined case	
6-inch, Marks IV to VI	II	9770	17.5	5.5	14-lb. 12-oz. Size 20	2-oz. ...	4	7 in whole metal-lined case	
6-inch, Marks IV and VI	I	11584	17.5	5.75	16-lb. 12-oz. Size 16 M.D.	2-oz. ...	5	6 in whole metal-lined case, 1 in No. 89 cylinder.	
6-inch, B.L.C.	I	11357	11.75	5.75	10-lb. 7½-oz. Size 16 M.D.	2-oz. ...	3	2 in cylinder No. 34	½ charge.
6-inch, B.L.C.	I	11357	23.6	5.75	20-lb. 15-oz. Size 16 M.D.	2-oz. each end	6	2 in cylinder No. 34	Full charge.
6-inch, Marks VII, VIII	I	10108	11.75	5.75	10-lb. Size 20 (½ charge)	2-oz. ...	3	2 in cylinder No. 34. 14 in B case.	
6-inch, Marks VII, VIII	I	10108	23.5	5.75	20-lb. Size 20 (full charge)	2-oz. at each end	6	1 in cylinder No. 34. 14 in B case.	

TABLE NO. 4--continued.

## CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Ignitor R.F.G. <sup>2</sup> or Blank F.G. new, or G.C. Yarn.	Number of Hoops.	Number Packed and Description of Package.	Remarks.		
B.L.—continued.											
6-inch, Marks VII, VIII ...	I	11356	12·7	5·75	1½-lb. Size 16 M.D. (½ charge)	2-oz. ...	3	2 in cylinder No. 34. 14 in B case.	Except for guns on twin mountings.		
6-inch, Marks VII, VIII ...	I	11356	25·5	5·75	23-lb. Size 16 M.D. (full charge)	2-oz. each end	6	1 in cylinder No. 34. 14 in B case.	"Monmouth" class.		
6-inch, Marks VII, VIII ...	I	12266	13·75	6·1	1½-lb. Size 26 M.D. (½ charge)	2-oz. ...	3	4 in F case ...	For cupro nickel driving bands.		
6-inch, Marks VII, VIII ...	I	12266	27·5	6·1	29-lb. Size 26 M.D. (full charge)	2-oz. each end	6	4 in F case ...	For cupro nickel driving bands.		
6 inch, Marks VII and VIII	I	...	19·0	6·1	19-lb. 5½-oz. Size 26 M.D. ...	2-oz. ...	4	In F case ...	} charge } laced to-		
6-inch, Marks VII and VIII	I	...	10·0	6·1	9-lb. 10½-oz. Size 26 M.D. ...	2-oz. ...	2			11	gether.
6-inch, Mark XI ...	I	...	21·0	6·5	21-lb. 12-oz. Size 26 M.D. ...	2-oz. ...	5			11	laced to-
6-inch, Mark XI ...	I	...	11·0	6·5	10-lb. 14-oz. Size 26 M.D. ...	2-oz. ...	3			11	gether.
7·5-inch ...	I	12758	22·0	7·0	31-lb. 6-oz. Size 26 M.D. ...	6-oz. ...	Nil.			4 in rect. "O" case ...	New lifting bucket.
7·5-inch, I to I** ...	I	12758	11·25	7·0	15-lb. 11-oz. Size 26 M.D. ...	6-oz. ...	Nil.	8 in rect. "O" case ...	H.M.S. "Swiftsure" and "Triumph."		
7·5-inch ...	I	...	13·25	7·0	19-lb. 2-oz. Size 37 M.D. (½ charge)	6-oz. ...	...	...			
7·5-inch ...	I	...	26·7	7·0	38-lb. 4-oz. Size 37 M.D. (½ charge)	6-oz. ...	...	...			
7·5-inch ...	I	...	22·0	6·7	27-lb. 2-oz. Size 26 M.D. (½ charge)	6-oz. ...	...	...			
8-inch, Mark III ...	I	9740	8·5	{ Base, 7·0 Neck, 5·0 }	7-lb. 3-oz. Size 20 (½ charge) ...	6-oz. ...	3	12 in II case ...			
8-inch, Mark III ...	I	9740	15·0	{ Base, 7·0 Neck, 5·2 }	14-lb. 6-oz. Size 20 (½ charge) ...	6-oz. ...	4	6 in H case ...			
8-inch, Marks IV to VI ...	I	8513	8·5	Base, 7·2	8-lb. 2½-oz. Size 20 (½ charge) ...	6-oz. ...	3	12 in H case ...			
8-inch, Marks IV to VI ...	II	9645	8·5	Base, 7·2	8-lb. 2½-oz. Size 20 (½ charge) ...	6-oz. ...	3	12 in H case ...			
8-inch, Marks IV to VI ...	I	8513	16·5	Base, 7·2	16-lb. 5-oz. Size 20 (½ charge) ...	6-oz. ...	5	6 in H case ...			
8 inch, Marks IV to VI ...	II	9645	16·5	Base, 7·2	16-lb. 5-oz. Size 20 (½ charge) ...	6-oz. ...	5	6 in H case ...			
8-inch, Marks VII and VIIA	I	9805	15·0	{ Base, 7·0 Neck, 5·125 }	14-lb. 2-oz. Size 20 (½ charge) ...	6-oz. ...	4	1 in cylinder, cartridge, No. 18			
8-inch, Marks VII and VIIA	II	9805	15·0	{ Base, 7·0 Neck, 5·125 }	14-lb. 2-oz. Size 20 (½ charge) ...	6-oz. ...	4	1 in cylinder, cartridge, No. 18			
8-inch, Marks VII and VIIA	I	1583	13·25	6·75	16-lb. 4-oz. Size 16 M.D. (½ charge)	6-oz. ...	4	2 in cylinder, cartridge, No. 22			
9·2-inch, Marks I and II ...	I	9766	9·5	Base, 7·5	10-lb. 8-oz. Size 30 (½ charge) ...	8-oz. ...	3	12 in I case ...			
9·2-inch, Marks I and II ...	I	8766	19·0	Base, 7·5	21-lb. Size 30 (½ charge) ...	8-oz. ...	6	{ 1 in cylinder, cartridge, No. 22 (L.S.) 6 in I case (N.S.) ... }			

TABLE NO. 4—continued.

CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	\$Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>2</sup> or Blank F.G. new.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
B.L.—continued.									
9·2-inch, Marks III to VII...	I	9766	ins. 9·75	ins. Base, 7·5	13-lb. 6-oz. Size 30 (½ charge)...	8-oz. ... ..	3	72 in I case ... ..	
9·2-inch, Marks III to VII...	I	9766	19·5	Base, 7·5	26-lb. 12-oz. Size 30 (½ charge)	8-oz. ... ..	6	{ 1 in cylinder cartridge, No. 22 (L.S.) ... .. 6 in I case (N.S.) ... .. 1 in cylinder cartridge, No. 22 (L.S.) ... ..	
9·2-inch, Marks III to VII...	II	9766	19·5	Base, 7·5	26-lb. 12-oz. Size 30 (½ charge)	8-oz. ... ..	6	{ 6 in I case (N.S.) ... .. 9 in I case ... .. 9 in I case ... .. 5 in I case ... .. 5 in I case ... .. 9 in I case ... .. 6 in I case ... ..	
9·2-inch, Mark VIII ... ..	I	8512	12·5	Base, 7·5	15-lb. 12-oz. Size 40 (½ charge)	8-oz. ... ..	4	9 in I case ... ..	
9·2-inch, Mark VIII ... ..	II	9645	12·5	Base, 7·5	15-lb. 12-oz. Size 40 (½ charge)	8-oz. ... ..	4	9 in I case ... ..	
9·2-inch, Mark VIII ... ..	I	8512	21·5	Base, 7·5	31-lb. 8-oz. Size 40 (½ charge)...	8-oz. ... ..	5	5 in I case ... ..	
9·2-inch, Mark VIII ... ..	II	9766	21·5	Base, 7·5	31-lb. 8-oz. Size 40 (½ charge)...	8-oz. ... ..	6	5 in I case ... ..	
9·2-inch, Mark VIII ... ..	I	11766	12·5	7·5	16-lb. 8-oz. Size 44 and 3½ ...	6-oz. ... ..	4	9 in I case ... ..	½ charge.
9·2-inch, Mark VIII ... ..	I	11766	21·5	7·5	33-lb. Size 44 and 3½ ... ..	6-oz. ... ..	6	6 in I case ... ..	½ charge.
9·2-inch, Marks IX and X...	I	10233	16·5	Base, 8·25	24-lb. 12-oz. Size 44. 1-lb. Size 3½.	8-oz. ... ..	5	L.S., 2 in cylinder cartridge, No. 36. N.S., 8 in N case.	½ charge.
9·2-inch, Marks IX and X...	...	...	16·5	Base, 8·25	24-lb. 12-oz. Size 44. 1-lb. Size 3½.	8-oz. ... ..	...	L.S., 2 in cylinder cartridge, No. 36. N.S., 8 in N case.	No hoops, new form of lifting becket.
9·2-inch, Marks IX and X...	I	10233	33·0	Base, 8·25	49-lb. 8-oz. Size 44. 2-lb. Size 3½ (½ charge).	8-oz. ... ..	10	L.S., 1 in cylinder cartridge, No. 36. N.S., 4 in N case.	
9·2-inch, Marks IX and X...	II	10233	33·0	Base, 8·25	49-lb. 8-oz. Size 44. 2-lb. Size 3½ (½ charge).	8-oz. ... ..	5	L.S., 1 in cylinder cartridge, No. 36. N.S., 4 in N case.	New form of lifting becket.
9·2-inch, Mark IX ... ..	I	9767	16·5	Base, 8·25	25-lb. Size 44 (½ charge) ...	8-oz. ... ..	5	2 in cylinder cartridge, No. 36...	
9·2-inch, Mark IX ... ..	I	9766	33·0	Base, 8·25	50-lb. Size 44 (½ charge) ...	8-oz. ... ..	10	1 in cylinder cartridge, No. 36...	
9·2-inch, Marks IX to X <sup>v</sup> ...	I	12212	32·5	Base, 8	60-lb. Size 37 M.D. (½ charge)	8-oz. ... ..	8	L.S., 1 in cylinder, No. 36 N.S., 4 in N case.	
9·2-inch, Marks IX to X <sup>v</sup> ...	I	12212	16·25	Base, 8	30-lb. Size 37 M.D. (½ charge)	8-oz. ... ..	4	L.S., 2 in cylinder No. 36. N.S., 8 in N case.	
10-inch... ..	I	8558	13·5	Base, 8·25	19-lb. Size 30 (½ charge) ...	8-oz. ... ..	4	{ 6 in J case ... .. 2 in cylinder cartridge, No. 27 }	



## TABLE 4—continued.

## CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>2</sup> or Blank F.G. new.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
B.L.—continued.									
30-inch...	II	9645	13·5	8·25	19-lb. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	4	{ 6 in J case 2 in cylinder cartridge, No. 27 }	
10-inch...	I	8558	22·5	8·25	38-lb. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	6	{ 4 in J case 1 in cylinder cartridge, No. 27 }	
10-inch...	II	9671	22·5	8·25	38-lb. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	6	{ 4 in J case 1 in cylinder cartridge, No. 27 }	
10-inch...	III	9671	22·5	8·25	38-lb. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	6	{ 4 in J case 1 in cylinder cartridge, No. 27 }	
10-inch...	I	...	15·0	8·0	30-lb. 11-oz. Size 45 M.D. ( $\frac{1}{2}$ charge)	8-oz.	...	... ..	H.M.S. "Swiftsure and "Triumph."
10-inch...	I	12876	25·0	8·25	40-lb. M.D. Size 16 ( $\frac{1}{2}$ charge)	8-oz.	6	{ 4 in J case... 1 in No. 15 cylinder ... }	
10-inch...	I	12876	12·5	8·25	20-lb. M.D. Size 16 ( $\frac{1}{2}$ charge)	8-oz.	4	{ 8 in J case ... }	
12-inch, Marks I to VII	I	8685	11·5	9·2	22-lb. 2-oz. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	4	{ 2 in cylinder cartridge, No. 16... }	
12-inch, Marks I to VII	II	10205	11·5	9·2	22-lb. 2-oz. Size 30 ( $\frac{1}{2}$ charge)	8-oz.	4	{ 2 in cylinder cartridge, No. 16... }	
12-inch, Mark VIII	I	8512	16·5	9·5	41-lb. 14-oz. Size 50 ( $\frac{1}{2}$ charge)	8-oz.	5	{ 2 in R case 1 in cylinder cartridge, No. 17 }	
12 inch, Mark VIII	II	9739	16·5	9·5	41-lb. 14-oz. Size 50 ( $\frac{1}{2}$ charge)	8-oz.	5	{ 2 in R case 1 in cylinder cartridge, No. 17 2 in cylinder cartridge, No. 33 }	
12-inch, Mark VIII	III	9739	16·25	9·5	41-lb. 14-oz. Size 50 ( $\frac{1}{2}$ charge)	8-oz.	5	{ 2 in R case 1 in cylinder cartridge, No. 17 2 in cylinder cartridge, No. 33 }	
12-inch, Mark VIII	I	9739	32·5	9·5	83-lb. 12-oz. Size 50 ( $\frac{1}{2}$ charge)	8-oz.	9	{ 1 in R case 1 in cylinder cartridge, No. 33 2 in R case ... }	
12-inch, Mark VIII	I	9927	16·25	9·5	{ 41-lb. 10-oz. Size 50 1-lb. 14-oz. Size 3 $\frac{1}{2}$ } ( $\frac{1}{2}$ charge)	8 oz.	...	{ 1 in cylinder cartridge, No. 17 2 in cylinder cartridge, No. 33 }	
12-inch Mark VIII	II	Same	as	Mark I.	" " "	8-oz.	Nil.	... ..	New lifting bucket

TABLE 4—continued.

CORDITE CARTRIDGES, B.L.

Calibre.	Mark.	\$Changes in War Stores.	Length.	Diameter.	Weight and Description of Cordite.	Igniter R.F.G. <sup>2</sup> or Blank F.G. new.	Number of Hoops.	Number Packed and Description of Package.	Remarks.
B.L.—continued.									
12-inch, Mark VIII ...	I	9927	ins. 32·5	ins. 9·5	{ 83-lb. 4-oz. Size 50 } (½ charge)	8-oz. ...	9	{ 1 in R case ... } { 1 in cylinder cartridge, No. 33 }	New lifting bucket.
" "	II	Same	as	Mark I.	{ 3-lb. 12-oz. Size 3½ }	... ..	3	{ 1 in R case ... } { 1 in cylinder cartridge, No. 33 }	
12-inch, Mark IX ...	I	{ 10367 } { 10388 }	16·75	10·25	{ 50-lb. 6-oz. Size 50 } (½ charge) { 2-lb. 6-oz. Size 3½ } converted from 41-lb. 14-oz.	8-oz. ...	9	... ..	New lifting bucket.
" "	II	Same	as	Mark I.	... ..	... ..	Nil.	... ..	
12-inch Mark IX ...	I	11535	18·4	10·4	61½-lb., 42 M.D.	12-oz. ...	5	2 in Q case ...	½ charge.
12-inch, Mark IX ...	I	...	18·8	10·4	63½-lb. M.D. Size 45 ...	12-oz. ...	Nil.	... ..	
13·5 inch ...	I	9728	11·5	11·7	46-lb. 12-oz. Size 44 (½ charge)	8-oz. ...	5	2 in P case ...	New lifting bucket.
13·5-inch ...	I	9738	23·0	11·7	93-lb. 8-oz. Size 44 (½ charge)	8-oz. ...	4	1 in P case ...	
13·5 inch ...	I	10593	11·5	11·8	{ 88-lb. 12-oz. Size 44 } (½ charge) { 5-lb. Size 3½ }	8-oz. ...	4	1 in P case ...	New lifting bucket.
" "	II	Same	as	Mark I.	... ..	... ..	... ..	... ..	
13·5 inch ...	I	10592	23·0	11·8	{ 44-lb. 6-oz. Size 44 } (½ charge) { 2-lb. 8-oz. Size 3½ }	8-oz. ...	5	2 in P case ...	New lifting bucket.
" "	II	Same	as	Mark I.	... ..	... ..	... ..	... ..	

TABLE NO. 5.

POWDER CARTRIDGES, B.L. GUNS.

Calibre of Gun and Weight of Charge.	Mark.	Changes in War Stores.	Charge.	A Complete Layer of Prisms read.	Number of Layers.	Length when filled.	Diameter when filled.	Number and Nature of Hoops.	Packing.	Remarks.
						Not to exceed.	Not to exceed.			
16·25-inch, 120 lb. S.B.C.	I	5384	½ Full	{ 5, 8, 9, 10, 11, 12, 11, 12, 11, 10, 9, 8, 5, or } { 7, 8, 9, 10, 11, 12, 13, 12, 11, 10, 9, 8, 7 }	10	Inches 10·25	Inches 17·35	6 Broad	4 in S case...	
16·25-inch, 120 lb. S.B.C.	II	6151	"	4, 7, 10, 11, 12, 13, 12, 13, 12, 13, 12, 11, 10, 7	9	9·5	19·25	6 "	4 in S case ..	
13·5-inch, 157½ lb. S.B.C.	I	{ 5569 } { 6036 }	½ Full	{ 3, 6, 9, 10, 11, 10, 11, 10, 9, 8, 5, or } { 5, 8, 9, 10, 11, 11, 11, 11, 10, 10, 9, 6, 3 }	15	15·75	16·75	9 "	2 in T or V, 3 in X case	
12-inch, 73½ lb. Prism <sup>l</sup> brown	I	{ 4755 } { 4771 }	"			11·25	14·0	7 "	4 in K, U, V or W case ...	
12-inch, 73½ lb. Prism <sup>l</sup> brown	II	{ 5385 } { 5144 } { 5385 }	"	4, 7, 8, 9, 9, 9, 8, 7, 6, 5 ...	11	11·25	14·0	7 "	4 in U, V or W case ...	No 3 class, S.C.
12-inch, 73½ lb. Prism <sup>l</sup> brown	III	5385	"			11·25	14·0	7 "	4 in U, V or W case ...	Lining No. 2 class, S.C.
10-inch, 63 lb. Prism <sup>l</sup> brown	I	5822	"	3, 6, 7, 8, 7, 8, 7, 6, 3, or 4, 5, 6, 7, 6, 5, 4 ...	12	12·25	12·0	8 Broad	4 in J case	
9·2-inch, Marks I and II guns, 35 lb. Prism <sup>l</sup> brown	I	{ 5239 } { 6997 }	"	3, 6, 7, 6, 7, 6, 5, 2 ...	9	9·25	10·85	6 "	4 in C and I, 6 in D, F, G case, 5 in E, 2 in H	
9·2-inch, Marks III to VII guns, 41 lb. Prism <sup>l</sup> brown	I	{ 6004 } { 7658 }	"	3, 6, 7, 8, 7, 8, 7, 4 ...		9·25	11·7	6 "	4 in C and I, 6 in D, F, G	
8-inch Mark III guns, chase-hooped, 26 lb. Prism <sup>l</sup> brown	I	6707	"	2, 5, 6, 7, 6, 5, 4 ...	8	8·25	10·4	5 "	4 in H case	
8-inch Marks IV and VI guns, 29½ lb. Prism <sup>l</sup> brown	I	{ 6486 } { 5284 }	"	4, 6, 7, 6, 7, 6, 3, or 2, 5, 6, 7, 6, 6, 5, 2 ...	8	8·25	10·4	5 "	4 in H case	
8-inch Mark VII gun, 22½ lb. Prism <sup>l</sup> black, L.S.	I	5801	"	2, 5, 6, 5, 6, 5, 2 ...	8	8·125	9·25	5 "	2 in No. 18 or 22 cylinder	
6-inch Marks IV and V guns, 22½ lb. Prism <sup>l</sup> black, L.S.	II	5635	½ Full	3, 4, 5, 4, 3 ...	13	13·25	7·25	8 Narrow	2 in No. 22 cylinder	
6-inch, 12 lb. F.X.E. ¼ charge, Marks III, IV, and VI guns on V.P., V.C.P., or strengthened A.E. mountings: ¾ charge, Marks III, IV, and VI guns on unstrengthened A.B. mountings.	I	{ 5680 } { 9997 }	½ Full ¾ Full	3, 4, 5, 4, 3, or 4, 5, 4, 5, 4 ...	6	6·3	7·9	5 "	18 in C, 24 in L ...	
5-inch, 7½ lb. S.P.	I	{ 4348 } { 6724 }	¾ Full			9·25	5·52	7 "	16 in whole M. L. case; 6 in a half; 14 in whole pentagon case; 16 in A, 21 in B, 23 in C, 38 in D and F, 24 in E, 41 in G, 14 in H, 36 in I, 37 in L case.	
5-inch, 15½ lb. S.P.	I	{ 10540 } { 10838 }	Full			18·0	5·52	12 "	8 in whole M. L. case	
4-inch 12 lb. S.P.	I	4236	Full			18·0	4·8	10 "	9 in whole M. L. case, 3 in half, 9 in whole pentagon, 12 in A, 13 in B, 17 in C, 23 in D, 18 in E, 27 in F, 30 in G case	

TABLE NO. 6.

POWDER CARTRIDGES, B.L., REDUCED (SILK CLOTH) FOR USE IN GUNNERY SHIPS, AND FOR USE WITH PAPER SHOT.

Calibre, Nature, and Mark.	Para. in Changes of War Stores.	Charge.	Length, when filled not to exceed	Diameter, when filled not to exceed	Number and Description of Hoops.	Remarks.
B.L.			inches.	inches.		
9·2-inch, 53 lb., S.B.C., Mark I .. .. .	10858	Reduced	12·25	11·7	7 broad.	$\frac{1}{2}$ charge.
9·2-inch, 54 lb., Pm. <sup>1</sup> brown, Mark I .. .. .	11754	..	16·25	10	10 „	$\frac{1}{2}$ charge, for paper shot, Marks X and XV guns.
6-inch, 22 lb. E.X.E. (large prisms), Mark I .. .. .	10959	..	16·0	6·6	7 „	$\frac{1}{2}$ charge, paper shot, Marks VII and VII <sup>v</sup> guns.
6-inch, 24 $\frac{1}{2}$ lb. P <sup>2</sup> , Mark I .. .. .	6773	Practice	15·25	7·5	9 narrow.	
6-inch, 12 lb. E.X.E. (large prisms), Mark I .. .. .	10745	Practice	7·1	7·2	6 „	$\frac{1}{2}$ charge, Marks IV to VI guns on H.P. mountings.
6-inch 12 lb. E.X.E., Mark I .. .. .	..	..	..	..	..	$\frac{1}{2}$ charge, B.L.C. guns, for paper shot. Full charge, Mark VII guns in examination batteries; paper shot weighted up to 50 lb. only.
5-inch, 8 lb. 6 oz. P <sup>2</sup> , Mark I .. .. .	6939	Practice	12·0	5·2	7 „	

TABLE NO. 7.

## POWDER CARTRIDGES, B.L., SALTING.

Cartridge.	Change in War Stores.	Weight, Blank, L.G.	Length.	Diameter.	Number of Hoops.	Remarks.
6-inch B.L. gun, Mark I .. .. .	{ 8458 4213 1369 1415 }	7 lb.	Inches. 7·8	Inches. 6	4 narrow.	
6-inch B.L. Howitzer, Mark II .. .. .	{ 11237 11316 }	5 lb.	6·5	6	2 „ ..	Also 64-pr. 64-cwt., and 32-pr. S.B., at Gibraltar.
5-inch B.L. gun or Howitzer, Mark I .. .. .	{ 4313 5636 5743 7074 8458 }	3 lb.	6·75	4·5	4 „	
4-inch, Mark I .. .. .	4805	4 lb.	13·0	3·3	6 „	
12-pr., 6-cwt., Mark I .. .. .	{ 8311 10541 }	1 lb.	4·7	3	2 „ ..	To become obsolete.
*15 or 12-pr., Mark I .. .. .	10427	1½ lb.	5·5	3	3 „	
†10-pr. Mark I .. .. .	11068	1 lb.	5·25	2·7	3 „	

\* Packed for ordinary transport and storage in case, powder, M.L., whole 90, half 40, quarter 18.

† „ „ „ „ „ „ 102, „ 40, „ 18.

TABLE NO. 8.

## CYLINDERS, ZINC, FOR CARTRIDGES.

Description of Cylinder.	Numeral.	\$ Changes in War Stores.	Cartridges packed in each.			
			Cordite.			Powder.
Cylinder cartridge.						
†No. 1 ..	I & II	{ 6513 7078 8947 9233	..	..	..	{ B.L., 16.25-inch, one 120-lb., S.B.C.
„ 2 ..	I & II	{ 6513 7078 8947 9233	..	..	..	{ B.L., 13.5 inch, one 157½-lb., S.B.C.
„ 3 ..	I to V	{ 4195 7078 8947 9233	..	..	..	{ R.M.L., 17.72-inch, one 112½-lb., Prism.
„ 4 ..	I to III	{ 4773 7078 8947 9233	..	..	..	{ B.L., 12-inch, one 73¾-lb., Prism <sup>1</sup> brown.
„ 5 ..	II to IV	{ 6393 7078 8947 9233	..	..	..	{ B.L., 10-inch, one 68-lb., Prism <sup>1</sup> , brown.
„ 6 ..	I to IV	{ 4195 7078 8947 9233	..	..	..	{ R.M.L., 12.5-inch, two 52½-lb., Prism, or one 82½-lb., Prism, or one 80-lb., P <sup>2</sup> , or two 50-lb., E.X.E.
„ 7 ..	I to II	{ 6513 7078 8947 9233	..	..	..	{ B.L., 9.2-inch, 83-lb., Prism <sup>1</sup> brown.
„ 8 ..	II to V	{ 4195 7078 8947 9233	..	..	..	{ R.M.L., 12-inch, one 110-lb., P <sup>2</sup> or P, or two 35-lb., blank, L.G.
„ 9 ..	II to IV	{ 4195 7078 8947 9233	..	..	..	{ R.M.L., 12-inch, one 85-lb., P <sup>2</sup> or P.
„ 10 ..	II to IV	{ 4195 7078 8947 9233	..	..	..	{ R.M.L., 12-inch, one 55-lb., P, or one 35-lb., blank, L.G.
„ 11 ..	IV and V	{ 7078 8947 9233	..	..	..	..

† Obsolete for future manufacture.

TABLE NO. 8—*continued.*CYLINDERS, ZINC, FOR CARTRIDGES—*continued.*

Description of Cylinder.	Numeral.	\$ Changes in War Stores.	Cartridges packed in each.	
			Cordite.	Powder.
Cylinder cartridge.				
No. 12 ..	II to IV	{ 4195 7078 8947 9233 11481 }	.. .. .	
„ 13 ..	I and II	{ 6513 7078 8947 9233 }	.. .. .	B.L., 8-inch, two 29½-lb., Prism <sup>1</sup> brown, or one 45-lb., or two 22½-lb., Prism <sup>1</sup> black, or one 9·2-in. 54-lb., Prism <sup>1</sup> and brown.
„ 14 ..	I and II	{ 5215 7078 8947 9233 }	.. .. .	To be converted, as required, to No. 37.
„ 15 ..	III to VI	{ 7078 8947 9233 }	.. .. .	R.M.L., 10-inch, one 70-lb., P.
„ 16 ..	I	{ 8728 8947 9233 11634 }	B.L., 12-inch. 44½-lb., or two 22-lb. 2-oz.	.. .. .
† „ 17 ..	I and II	{ 8113 8947 9233 }	B.L., 12-inch, wire, one 43½-lb., or one 41-lb. 14-oz.	.. .. .
„ 18 ..	I and II	{ 5241 7078 8947 9233 }	B.L., 8-inch, one 14-lb. 2-oz.	B.L., 8-inch, two 22½-lb., E.X.E., or one 45-lb., or two 22½-lb., Prism <sup>1</sup> black.
„ 19 ..	III to V	{ 4195 7078 8947 9233 }	.. .. .	R.M.L., 10-inch, 44-lb., P.
„ 20 ..	III to VI	{ 4195 7078 8947 9233 }	{ B.L., 10-inch, one 38-lb.; or R.M.L., 12·5-inch, one 31-lb., or one 24-lb., or R.M.L., 9-inch, 14-lb. }	R.M.L., 9-inch, 50-lb., P.
„ 21 ..	I and II	{ 6547 7078 8947 9233 }	.. .. .	R.M.L., 9-inch, 25-lb., P.
„ 22 ..	I and III	{ 5326 7078 8947 9233 }	B.L., 9·2-inch, one 26½-lb., or one 21-lb., or two 8-inch, 16-lb. 4-oz.	B.L., 8-inch, two 22½-lb., E.X.E., or B.L., 6-in., four 12-lb., E.X.E., or two 22½-lb. Prism <sup>1</sup> black.
„ 26 ..	I	{ 5177 7078 9233 }	.. .. .	B.L., 9·2-inch, one 82-lb., Prism <sup>1</sup> brown, or two 41-lb., Prism <sup>1</sup> brown, or two 35-lb., Prism <sup>1</sup> brown.

† Obsolete for future manufacture.

TABLE No. 8—*continued.*CYLINDERS, ZINC, FOR CARTRIDGES—*continued.*

Description of Cylinder.	Numeral.	Changes in War Stores.	Cartridges packed in each.	
			Cordite.	Powder.
Cylinder cartridge.				
†No. 27 ..	I	9233	B.L., 10-inch, one 38-lb., or two 19-lb., or B.L. 9.2-inch, two 15-lb. 12-oz.	.. .. .
„ 28 ..	I & IA	{ 9233 12024 }	{ R.M.L., 11-inch, one 25-lb. 4-oz., or R.M.L., 10-inch, one 20-lb. 6-oz.	Converted from 20.
„ 29 ..	I	{ 4773 7078 9233 }	.. .. .	B.L., 12-inch, one 73½-lb., <sup>1</sup> Priem <sup>1</sup> brown.
„ 30 ..	I	{ 5345 9233 }	.. .. .	B.L., 6-inch, four 12-lb., F.X.E., without wood disc.
„ 31 ..	II & III	{ 4195 7078 9233 }	.. .. .	R.M.L., 11-inch, 85-lb., P.
„ 32 ..	IV & V	{ 4195 9233 }	.. .. .	R.M.L. 9-inch, one 33-lb., P.
† „ 33 ..	I	{ 9473 9852 }	{ B.L., 12-inch, one 83-lb. 12-oz. or two 41-lb. 1½-oz. or one 87-lb. or two 43-lb. 8-oz.	.. .. .
„ 34 ..	I & II	{ 9389 9852 11358 11633 }	{ B.L., 6-inch, Marks VII and VII guns, two ½ charges. B.L., 6-inch, Marks IX and X guns, one full charge.	.. .. .
„ 35 ..	I	—	.. .. .	.. .. .
„ 36 ..	I	{ 9507 9852 12212 }	{ B.L., 9.2-inch, one 51-lb. 8-oz., or two 25-lb. 12oz., or one 50-lb. or two 25-lb., one 60-lb. 37 M.D. or two 30-lb 37 M.D.	.. .. .
„ 37 ..	I	9951	.. .. .	R.M.L. 10-inch, one 48-lb. S.P.
„ 38 ..	I	11635	{ B.L. 6-inch, two 4½-lb. M.D. size 16.	Converted from No. 25.
„ 38A ..	I } II			
„ 39 ..	I	12749	{ B.L. 6-inch one 16-lb. 12-oz. M.D., size 16	

† Obsolete for future manufacture.



TABLE NO. 9.

## CASES, CARTRIDGE.

Description of case.	Numeral.	§ Changes in war stores.	Cartridges that may be carried in each.		Remarks.
			Cordite.	Powder.	
No. 16 ... ..	II (N)	§§ 3068, 3911, 6945	... ..	R.M.L. 12-5-inch two 52½-lb., and B.L. 10-inch two 63-lb. cartridges.	
No. 17c ... ..	I (N)	§§ 5785, 6270	... ..	B.L. 6-inch four 12-lb. cartridges.	
No. 18 ... ..	I (N)	§§ 5785, 6270	... ..	R.M.L. 12-5-inch 210-lb. prism or 200-lb. F.X.E. in four ½-charge.	
No. 19 ... ..	I (N)	§ 4553	... ..	B.L. 4-inch.	
No. 22 ... ..	I (N)	4553	... ..	H.L. 5-inch.	
No. 23 ... ..	I (N)	4553	... ..	B.L. 8-inch.	
No. 24 ... ..	II (N)	§§ 4653, 6946	... ..	B.L. 9-2 inch, Marks I to V guns.	
No. 25 ... ..	I (L)	§ 6271	... ..	H.L. 4-inch and 5-inch.	
No. 26 ... ..	I (N)	§ 7224	... ..	B.L. 12-inch.	
No. 27 ... ..	I (N)	7224	... ..	B.L. 13-5-inch.	
No. 28 ... ..	I (N)	8574	... ..	B.L. 16-25-inch.	
No. 29 ... ..	I (N)	§ 8674	... ..	B.L. 9-2 inch, Mark VIII gun.	
No. 30 ... ..	I (N)	§§ 10118, 11076	... ..	B.L. 6-inch, Mark VII.	
No. 31 ... ..	I (N)	§ 10119	... ..	B.L. 6-inch, Mark VII.	
No. 32 ... ..	I (N)	§ 10261	... ..	B.L. 12-inch, Mark VIII and IX guns.	
No. 33 ... ..	I (N)	§ 10340	... ..	B.L. 12-inch, Marks III to V.	
No. 34 ... ..	I (N)	§ 10340	... ..	B.L. 10-inch.	
No. 35 ... ..	I (N)	§ 10340	... ..	B.L. 8-inch, Marks III to VI.	
No. 36 ... ..	I (N)	§ 10340	... ..	B.L. 9-2-inch, Mark X.	
No. 37 ... ..	I (N)	§ 10912	... ..	B.L.C. 5-inch.	
No. 38 ... ..	I (N)	... ..	... ..	B.L. 6-inch, Marks VII and VIII guns.	
No. 39 ... ..	I (N)	... ..	... ..	B.L. 12-inch.	
No. 40 ... ..	I (N)	... ..	... ..	B.L. 9-2-inch.	
No. 41 ... ..	I (N)	... ..	... ..	B.L. 7-5-inch.	
No. 42 ... ..	I (N)	... ..	... ..	B.L. 6-inch.	

Nos. 1 to 15 are used with S.B. and R.M.L., also R.B.L.

TABLE NO. 10.

## CASES, POWDER, RECTANGULAR. | N |

Letter and Numeral.	§ Changes in War Matériel.	To Hold	Packing Pieces.	Remarks.
† "A"—Mark IV ...	3795, 1909	6-inch 12-lb. E.X.E....	When packed with 6-inch B.L. 12-lb. E.X.E. cartridge—1 bottom and 3 side pieces	
† "B"—Mark III ...	1700, 1909, 12607	10-inch R.M.L. cartridges, 6-inch 11½-lb. cordite M.D.	When packed with 6-inch 11½-lb. cordite M.D.—4 pieces	
† "C"—Mark III ...	1771, 1909, 8114	12-inch (25 ton) R.M.L. cartridges	When packed with 6-inch B.L. 12-lb. E.X.E. cartridge—2 side, 2 bottom, and 1 top piece	
† "D"—Mark III ...	2208, 9472, 10254	12-inch (35 ton) R.M.L., 12-inch, B.L., 63-lb., Prism <sup>1</sup> , brown, and 13.5-inch, 93-lb. 12-oz. and 46-lb. 14-oz. cordite cartridges	When packed with 10-inch B.L. 63-lb., Prism <sup>1</sup> , brown—2 bottom pieces When packed with 13.5-inch cordite cartridge—2 pieces	
† "E"—Mark III ...	2776			
"F"—Mark III ...	3061, 8577, 7633, 12266	12.5-inch or 12-inch (35 ton) R.M.L., or 8-inch and 9.2-inch B.L. cartridges, also 6-inch, 14½-lb. cordite, or 19 lb. 5½ oz. and 9 lb. 10½ oz.	When packed with 8-inch, 29½-lb.—2 end, 4 side, and 1 bottom piece When packed with 12.5-inch, 50-lb.—2 bottom, 2 side, 1 end, and 1 top piece When packed with 9.2-inch, 41-lb.—1 bottom, 4 side, 1 front, and 1 back piece When packed with 6-inch—4 pieces	
† "G"—Mark III ...	3878, 10254	12.5-inch R.M.L., and B.L. 13.5-inch, 93-lb. 12-oz. and 46-lb. 14-oz., and B.L.C. 5-inch, 5-lb. 4-oz.	When packed with 52½-lb., Prism <sup>2</sup> , and 50-lb. E.X.E.—1 bottom, 1 end, and two side pieces When packed with 58-lb. E.X.E.—2 bottom, 1 end, and 2 side pieces When packed with 13.5-inch cordite cartridge—2 packing pieces	
† "H"—Mark II ...	4682, 10255	8-inch B.L. cartridge	When packed with 29½-lb. cartridge—1 bottom, 1 end, and 1 side piece, strengthened by battens across the body When packed with 26-lb. cartridge—1 bottom, 2 end, and 2 side pieces When packed with 14-lb. 6-oz. cordite cartridge—2 pieces	

† Obsolete for future manufacture.

TABLE NO. 10—*continued.*

CASES, POWDER, RECTANGULAR. | N |

Letter and Numeral.	§ Changes in War Matériel.	To Hold	Packing Pieces.	Remarks.
† " I "—Mark II ...	4682, 5007, 9764, 11767, 11766	12-inch B.L. ... 9·2-inch B.L. ...	63½-lb. M. D.—7 to a set When packed with 41-lb. cartridge—1 bottom, 2 end, and 1 side pieces (In 2 pieces) When packed with 16-lb. 12-oz. cartridge—4 top pieces (also for 16½-lb. cartridge) When packed with 36-lb. cartridge—1 bottom, 2 end, and 2 side pieces When packed with 21-lb. and 10½-lb. cartridge—1 bottom, 1 back end, and 1 front end	
† " J "—Mark II ...	4682, 5077, 8716, 10636	10-inch B.L. ...	When packed with 10-inch, 38-lb. cartridge—1 back, 1 front, 1 bottom, and 4 side pieces When packed with 10-inch, 19-lb. cartridge—1 bottom piece	A canvas lifting band is supplied with the 38-lb. cartridges.
" K "—		12-inch B.L. ...		
† " L "—Mark IV ...	4867, 5823, 6512	6-inch B.L. ...	When packed with 10-lb. cartridge (cordite)—2 end pieces	
† " M "—Mark II ...	5917, 7249, 7449	4·7-inch Q.F. ...	Fitted with a false top and bottom of brass	
" N "—Mark I ...	10219, 12212, 12760	9·2-inch B.L., Marks IX to Xv guns ...	When packed with 60 or 30-lb. cartridges—2 bottom pieces	
" O "—Mark I ...	12761	7·6-inch B.L. ...	When packed with four 31½-lb., or eight 11½-lb.—2 bottom pieces	

† Obsolete for future manufacture.

TABLE NO. 11.

## CASES, POWDER, CYLINDRICAL. | N |

Letter and Numeral.	§ Changes in War Matériel.	To Hold	Packing Pieces.	Remarks.
"O"—Mark I ...	10218	Four $\frac{1}{2}$ -charges cordite) for B.L., 12-inch guns, Marks I to VII		
"P"—Mark I ... " II ...	9830	One $\frac{1}{2}$ or two $\frac{1}{4}$ cordite charges for B.L., 13.5-inch guns		
"Q"—Mark I ... " II ...	9584, 10369	One $\frac{1}{2}$ or two $\frac{1}{4}$ cordite charges for B.L., 12-inch Mark IX gun	A brass packing piece or stool is issued with this case	
"R" Small— Mark III " V	8852, 10521	One $\frac{1}{2}$ or two $\frac{1}{4}$ cordite charges for B.L., 12-inch, Mark VIII gun		The Mark II and IV large require packing pieces (1 bottom and 4 side pieces)
† "S"—Mark III ...	7225, 7565, 7743, 7914, 9353, 6511, 7513, 9979, 6151	Four $\frac{1}{2}$ powder charges for B.L., 16.25-inch gun	Rings of wood are secured under the lid. Additional rings are fixed when used for Mark II cartridges	
† "T"—Mark V ...	7565, 7743, 9317	Two $\frac{1}{2}$ powder charges for B.L., 13.5-inch gun		
† "U"—Mark II ...	5174, 7565, 7743, 7914	Four $\frac{1}{2}$ powder charges for B.L., 12-inch gun	... ..	These cases are not common to the several ships armed with 12-inch guns, but the patterns are specially adapted to the arrangements for stowing and working on board particular ships.
† "V"—Mark III...	7565, 7743, 7914, 9354			
† "W"—Mark II ...	4681, 7565, 7914, 9317, 12759			

† Obsolete for future manufacture.

TABLE NO. 13.

## EXPLODERS, LYDDITE SHELL.

Designation.	§ List of Changes in War Matériel.	Service.	Calibres of Shells in which used.	Packing.			Remarks.
				Package.	No.	Packing Pieces.	
5 oz., with primer, 17.5-inch, Mark I	11526, 11067, 11023, 11504, 10498	C	B.L., Q.F., or Q.F.C., 6-inch, Marks I and II*	Case, powder, M L., whole	290 standing	Felt ... ..	These shells formerly took the 5½-oz. exploder
4½-oz., with primer, 16.1-inch, Mark I	11526, 11067, 11023, 11504, 10498	C	B.L. howitzers, 5.4-inch and up ... B.L., Q.F., or Q.F.C. guns, 6-inch and up	Box, exploders, lyddite, Mark II	63 standing	Nil.	This exploder is fitted to the latest marks of shell, of the calibres mentioned, also early 8-inch and 6-inch gun and 6-inch howitzer to replace the 5½-oz. exploder which these shell formerly had.
4½-oz., without primer, 14.35-inch, Mark I	11526, 11067, 11023, 11504	L	B.L., 5-inch howitzer, Mark IV and and later marks	Box, exploders, lyddite, Mark II	63 standing	1 wood piece 1.75-inch thick, and felt for protection of caps	Also used in the 5-inch howitzer, Marks II and III, shell, to replace the 5½-oz. exploder which these shell formerly had.
4-oz., 13.35-inch, Mark I ... ..	11526, 11067, 11023, 11504, 12504	C	Q.F., 4.7-inch, Marks I and II shells	Box, exploders, lyddite, Mark II	63 standing	1 wood piece 2.75-inch thick, and felt	Except the Marks I and II, which have the 3½-oz. exploder.
3¾-oz., 12.5-inch, Mark I ... ..	11526, 11067, 11023, 10747	C	B.L. or B.L.C., 5-inch gun ... .. Q.F., 4.7-inch, Marks III and IV shells	Box, exploders, lyddite, Mark II	63 standing	1 wood piece 3.6-inch thick, and felt	
3½-oz., 11.4-inch, Mark I ... ..	11526, 11067, 11023, 11504	C	B.L., 9.2-inch, Mark I... .. B.L., Q.F., or Q.F.C., 6-inch, Mark I Q.F., 4.7-inch, Marks I and II B.L., 5-inch howitzer, Mark I B.L., 6-inch howitzer, Mark I	Box, exploders, lyddite, Mark II	63 standing	1 wood piece 1.47-inch thick, and felt	These shell formerly had a 4-oz. exploder.
3¼-oz., 10.75-inch, Mark I ... ..	11526	L	B.L., 30-pr. and 60-pr.				
3-oz., 9.0-inch, Mark I ... ..	11526, 11067, 11023, 11504	C	B.L., Q.F., or Q.F.C., 4-inch... .. B.L., 5-inch howitzer light shell	Box, exploders, lyddite, Mark II	110 lying ...	Nil.	

\* The B.L., Q.F., and Q.F.C., 6-inch, Mark I, first had a 4-oz. exploder, N.S. only (replaced by a 3½-oz. in waterproof cylinder), and afterwards had a 5½-oz. (replaced by a 5-oz. exploder in a waterproof paper cylinder).

NOTE.—The above exploders are contained in waterproof cylinder and have aluminium caps; all have silk loops except the 30-pr. (3½-oz.).

TABLE NO. 14.  
TIN CYLINDERS.

No.	To contain	Old No.	Nomencl.	Service.	Remarks.
1	5 Fuzes, percussion D.A., with cap, No 1	57	II	C	
2	5 " B.L., plain, No. 2 ... ..	49	II	C	
3	5 " percussion D.A., with plug, No. 3	87	II	C	
4	1 " graze, No. 4 ... ..	11	II	L	
5	5 " percussion, Pettman's G.S., No. 5, or beeswax for tor- pedo, $\frac{1}{2}$ lb. ... ..	20	II	C	
6	Exploders for lyddite shell ... ..	8	I	C	Painted yellow for I.O.O's. luten groove.
7P	25 Primers, vent piece... ..	7P	I	C	
7	5 Fuzes, percussion, R L., No. 7. ...	33	II	C	
8D	25 Detonators, No. 8 ... ..	25	I	L	
8F	1 Fuze, percussion, small, No. 8, Mk. IV	89	I	L	
9	25 Detonators, electric, No 9 ... ..	42	I	N	
10F	1 Fuze, percussion, D.A. delay, No. 10	6	I	L	
10R	25 Tubes, electric, No 10 ... ..	34	I	C	
11F	1 Fuze, percussion, base, large, Nos. 11 or 15 ... ..	2	I	C	Label indicates fuze con- tained.
11T	25 Tubes, electric, No. 11 ... ..	43	I	N	
12D	25 Detonators, electric, No. 12 ... ..	47	I	L	
12F	1 Fuze, percussion, base, medium, No. 12, or 50 plugs, indiarubber ...	1	I	C	
13D	25 Detonators, electric, No. 13 ... ..	47	I	L	
12F	1 Fuze, percussion, D.A. impact, No. 13	12	I	C	
14	25 Fuzes, electric, No. 14 ... ..	22	I	L	
15	25 Detonators, No. 15... ..	50	II	N	
16	25 Fuzes, electric, No. 16 ... ..	68	II	L	
17	25 Tubes, electric, No. 17 ... ..	32	II	L	
18	25 Detonators, electric, No. 18 ... ..	47	II	L	
19	15 Fuzes, electric, No. 19 ... ..	79	II	N	
20	25 Detonators, electric, No. 20 ... ..	47	II	L	
21	5,000 Discs, paper, tubes, electric, No. 11... ..	21	I	C	
22	1 Fuze time "E," No. 22 ... ..	4	II	C	
23	25 Portfires, life-saving ... ..	13	II	L	
24	25 Tubes, friction, copper, L.S., long	15	I	L	
25	25 " " " short	16	I	L	
26	18 Boxes Vesuvian matches ... ..	26	I	L	
27	22 Tubes, friction, copper, solid drawn	17	I	L	
28	25 " " quill, time gun ... ..	28	I	L	
29	25 " " quill, short ... ..	19	I	N	
30	10 Washers, leather, for plug insu- lating ... ..	30	I	C	
31	5 Primers, light, G.S., or 30 primers, portfire life-saving ... ..	31	I	L	
32	8 Fathoms, safety fuze, or 25 tubes, friction, quill, long ... ..	18	II	C	
33	1 2-oz. coil indiarubber tape ... ..	3	II	C	
34	1 Light, long, G.S. ... ..	—	I	C	
35	1 Light, coastguard, Mark II... ..	—	I	N	
36	1-lb. Luting, common, Mark III ... ..	36	I	C	
37	8 oz. 6-thread quickmatch, in lengths of 24 inches ... ..	37	I	C	
38	1 Light short G.S., or 1 light signal magnesium, Mark II ... ..	38	I	N	
39	1 Light, red, blue or green ... ..	—	—	—	

TABLE NO. 14—continued.

## TIN CYLINDERS.

No.	To contain	Old No.	Numeral.	Service.	Remarks.
40	5 Fuzes, time, 30 secs., M.L., No. 40	23	I	L	
41	5 " " 15 " " " 41	10	I	C	
42	5 " " 15 special priming, No. 42	86	III	L	
43	5 " " 15 with detonator, No. 43	5	II	C	
44	4 cylinders, No. 65	—	I	N	
45F	1 " 17 " No. 45	—	I	L	
45	6 Washers, leather, paraffined for mouthpiece, countermine naval, 500 lb.	45	—	N	
46	5 Detonators, torpedo, 38 grains	46	I	N	
47	150 Caps, percussion, 6-pr. and 3-pr.	—	I	C	
48	8 Detonators, No. 8, siege artillery, with 2-ft. safety fuze and rectifier	—	III	L	
49	8 Detonators, No. 8, cavalry, with 2-feet safety fuze	—	IV	L	
50	9 G.C. Primers "F," for cavalry pioneers	B	II	L	
51	5 guncotton Primers "F," for R.E.	C	III	L	
52	5 " " " " for R.E. & N.	F	I	C	
53	1 lb. Luting, common, Mark I	53	I	N	
54	1 Fuze, T. and P., middle, No. 54	88	I	C	
55	8 oz. Tallow jointers	55	I	L	
56	1 Fuze, T. and P., No. 56	66	II	L	
57	1 " " No. 57	66	II	L	
58F	1 " " No. 58	—	I	L	
58	8 Guncotton primers "H," for R.A.	D	II	L	
59	3 " " "A," for S.M.	G	II	L	
60	4 " " "B," for S.M.	H	II	L	
61	4 " " "B," for S.M.N.	J	III	C	
62	8 Washers, indiarubber fabric, 3-cell battery, Le Clanche	62	I	L	
62F	1 Fuze, T. & P., No. 62	—	I	C	
63	5 Detonators, rocket, sound, ½-lb.	63	I	C	
63F	Fuzes, T. & P., No. 63	—	I	C	
64	2-oz. No. 1 or 4 guncotton yarn, dry	64	I	C	
65	25 Cartridges, pistol, safety fuze	65	I	N	
66	12 Fog signals	—	II	L	
67	10 Igniters, Q.F. or Q.F.C., cordite, 1¼-oz.	—	II	C	
68	10 Igniters, Q.F. or Q.F.C., 8½ drams, R.F.G. <sup>2</sup>	—	II	C	
69	10 Primers, electric, large	—	III	C	
70	20 " removable, 6-pr. and 3-pr.	—	I	—	
71	5 Detonators, Mark III., ½-lb sound rocket	—	I	C	
72	10 Primers, shrapnel shell	72	I	C	
73	1 Guncotton primer, 16-oz., Berlin torpedo	—	I	—	
74					
75	1 Rocket, signal, 1-lb. service	75	I	C	
76	1 " " ½-lb. "	76	I	C	
77	25 Tubes, electric, No. 10A	—	I	C	
78					
79					
80F	Fuze, T. and P., No. 80	—	I	L	Painted green.
81	Tubing, indiarubber, ¾"	E	I	—	
82	" " ½"	F	I	—	





TABLE No. 15.

BURSTING CHARGES OF COMMON, COMMON POINTED, DOUBLE, AND  
ARMOUR-PIERCING (P. MIXTURE).

Nature of Shell.		Approximate bursting charges.		
		lb.	oz.	
B.L., 16-25- inch	cast steel, Mark III .. .. .	179	4	
	forged steel, Mark II .. .. .	187	8	
	pointed, cast steel, Mark I .. .. .	182	0	
B.L., 13-5- inch	cast steel, Mark I and II .. .. .	85	9	
	pointed, cast steel, Marks I to V .. .. .	84	8	
	A.P., Marks I and II .. .. .	62	8	
	iron, light, Mark II .. .. .	31	8	
	forged steel, light, Mark III .. .. .	95	0	
	cast steel, light, Marks IV and V .. .. .	79	0	
B.L., 12-inch	pointed, cast steel, light, Mark I .. .. .	77	4	
	.. .. . Marks III, IV, and V	76	13	
	A.P. light, Marks I, II, and III .. .. .	35	0	
	pointed, cast steel, heavy, Marks I and III .. .. .	80	4½	
	.. .. . Marks IV, V, and VI	83	4	
	A.P. heavy, Marks I and II .. .. .	42	8	
	common heavy, Mark I .. .. .	73	0	
	cast steel, Mark I .. .. .	37	12	
	B.L., 10-inch	pointed, cast steel, Marks I, III, IV, and V .. .. .	37	5
		A.P., Marks I and II .. .. .	25	0
iron, Mark VII .. .. .		18	8	
B.L., 9-2-inch	forged steel, Mark III .. .. .	33	0	
	cast steel, Marks IV and V .. .. .	31	14	
	pointed, cast steel, Marks I, II, III, IV, V, and VI .. .. .	30	0	
	A.P., Marks I, II, and III .. .. .	18	0	
	iron, Mark II .. .. .	13	8	
	forged steel, Mark III .. .. .	29	0	
	cast steel, Mark IV .. .. .	18	8	
B.L., 8-inch	pointed, cast steel, Marks I, II, III, IV, and V .. .. .	18	5	
	A.P., Marks I and II .. .. .	10	8	
	C.S. special for Marks VII and VIIA, guns Mark II and III.	15	13½	
	pointed C.S. special for Marks VII and VIIA guns Marks I, II, and III.	15	6½	
	A.P., Marks I to III .. .. .	9	0	
B.L. 7-5-inch,	common pointed .. .. .	16	4	
	iron, Mark III .. .. .	7	6	
	cast steel, Mark V .. .. .	9	1	
B.L., Q.F., or Q.F.C., 6-inch	.. .. . Marks VI and VIII .. .. .	9	13	
	pointed, cast steel, Marks I, II, and III .. .. .	9	4	
	.. .. . Marks IV, V, and VI .. .. .	8	14	
	steel A.P., Mark I .. .. .	4	4	
	.. .. . II, III, and IV .. .. .	5	8	
B.L. 5-inch..	iron, Mark III .. .. .	4	13½	
	forged steel, Mark IV .. .. .	7	12	
	.. .. . Marks V and VII .. .. .	6	15	
	pointed, cast steel, Marks I and II .. .. .	5	3	
Q.F. 4-7-inch	forged steel, A.P., Mark III .. .. .	1	15	
	.. .. . Marks IV and V .. .. .	1	12	
	cast steel, Mark III .. .. .	4	4	
B.L. 30-pr., cast steel, Mark I .. .. .	.. .. . Marks IV, VI, and VII .. .. .	4	3¾	
	.. .. .	3	0	
B.L., Q.F., or Q.F.C., 4-inch	iron, Mark III .. .. .	1	6	
	forged steel, Mark IV .. .. .	2	9½	
	.. .. . Marks V, VI, and VII .. .. .	3	3	
Q.F. or Q.F.C., 4-inch, forged steel, A.P., Marks II and III .. .. .	pointed, cast steel, Marks I, II, and III .. .. .	2	0	
	Q.F. 12-pr., cast steel, pointed, Mark I .. .. .	0	13½	
	Q.F. 12-pr., 12 and 8 cwt. .. .. .	1	8	
Q.F. 12-pr., 18 cwt., cast steel, common pointed, Mark I .. .. .	.. .. . Marks II, III, IV, V, and VI .. .. .	1	3	
	.. .. .	1	3½	

TABLE NO. 15A.

APPROXIMATE BURSTING CHARGES OF A.P. SHELL. (FILLED WITH  
BLANK L.G.)

Nature of Shell.	Approximate bursting charges.	
	lb.	oz.
A.P. 13·5-inch, Marks I and II .. .. .	55	0
12-inch { heavy, Marks I and II .. .. .	36	14
{ light, Marks I to III .. .. .	30	0
10-inch, Marks I and II .. .. .	21	0
9·2-inch, Marks I to III .. .. .	15	9
8-inch, Marks I to III.. .. .	8	0
7·5-inch, Mark I .. .. .	4	0
6-inch, Marks II to IV .. .. .	4	4
6-inch, Mark V, with cap .. .. .	1	11
4·7-inch, Mark III .. .. .	3	4
4·7-inch, Marks IV and V .. .. .	3	4
4-inch, Marks II and III .. .. .		

TABLE NO. 16.

SHELLS, B.L., B.L.C., Q.F., OR Q.F.C., COMMON AND COMMON POINTED.

Calibre.	Mark.	Change in War Stores.	Driving Band.		Length in Inches.	Diameter.		Weight, empty.	Weight, filled.	Material and Remarks.
			Type No. See Plate.	No. of Cannclures.		Bands or Body.	Driving Band.			
16-25-inch, common	I	5739	2	5	55-0	16-19	16-5	1607 0	1800 0	Forged steel, solid base.
" " " " " "	II	5802			Differs from above in being fitted with a large adapter.	16-19	16-5	1619 4	1800 0	Cast steel, large adapter. Cast steel, steel bush.
" " " " " "	III	6065	2	4		54-925	16-19	16-5	1619 4	
" " " " " " common, pointed	I	11234	2	4	57-35	16-205	16-503	1615 8	1800 0	Cast steel, large solid base plug.
13-5-inch, common	7	5349	2	4	48-5	13-45	13-65	1155 10	1250 0	
" " " " " " " " " "	II	5581			Differs from above in being fitted with a large adapter.	13-45	13-65	1163 4	1250 0	" " " " " " " " " "
" " " " " " " " " " common, pointed	I	8105	2	4		50-34	13-45	13-66	1163 4	
" " " " " " " " " " " " " "	II	9957	2	4	Same dimension, groove for D.B. undercut.	13-45	13-66	1163 4	1250 0	" " " " " " " " " "
" " " " " " " " " " " " " "	III	9963	3	1		50-96	13-465	14-0	1163 0	
" " " " " " " " " " " " " "	IV	10252	4	1	Same dimensions as Mark III.	13-465	14-0	1163 0	1250 0	" " " " " " " " " "
" " " " " " " " " " " " " "	V	11234	4	1						
12-inch, light, common	I	4475	1	--	36-1	11-95	12-11	686 14	714 0	Waved ribs. Cast iron.
" " " " " " " " " " " " " "	II	4510								
" " " " " " " " " " " " " "	III	4895	2	4	35-58	11-95	12-13	679 8	714 0	" " " " " " " " " "
" " " " " " " " " " " " " "	IV	5071	2	4	43-8	11-95	12-13	618 8	714 0	
" " " " " " " " " " " " " "	V	5349	2	4	41-75	11-95	12-13	634 1	714 0	Cast steel, large solid base plug.
" " " " " " " " " " " " " "	VI	5581			Same as Mark IV, but fitted with large adapter.	11-95	12-13	617 11	714 0	" " " " " " " " " "
" " " " " " " " " " " " " "	VII	8105	2	4		42-6	11-95	12-13	617 11	
" " " " " " " " " " " " " "	III	9963	3	2	42-98	11-965	12-61	634 11	714 0	" " " " " " " " " "
" " " " " " " " " " " " " "	IV	10177	4	2						
" " " " " " " " " " " " " "	V	12119	4	2	Same as Mark III.	11-965	12-76	764 4	850 0	" " " " " " " " " "
" " " " " " " " " " " " " "	VI	12119	4	2						
12-inch, heavy, common	I	12398	5	1	45-15	11-965	12-76	775 9	850 0	" " " " " " " " " "
" " " " " " " " " " " " " "	II	9270	3	1	48-6	11-965	12-5	766 10}	850 7	
" " " " " " " " " " " " " "	III	10039	3	1						" " " " " " " " " "
" " " " " " " " " " " " " "	IV	9963	3	1						
" " " " " " " " " " " " " "	V	9963	3	1	48-0	11-965	12-76	764 4	850 0	" " " " " " " " " "
" " " " " " " " " " " " " "	VI	30187	4	1	48-0	11-965	12-76	764 4	850 0	
" " " " " " " " " " " " " "	VII	11234			Same as Mark V.	9-95	10-145	461 5	500 0	" " " " " " " " " "
" " " " " " " " " " " " " "	III	6771	2	2		36-5	9-95	10-145	461 5	
10-inch common	I	8105	3	2	37-85	9-95	10-145	460 3	500 0	" " " " " " " " " "
" " " " " " " " " " " " " "	II	9963	3	2	37-85	9-95	10-4	460 3	500 0	
" " " " " " " " " " " " " "	IV	10508	4	2	38-32	9-965	10-4	460 3	500 0	" " " " " " " " " "
" " " " " " " " " " " " " "	V	11234								
" " " " " " " " " " " " " "	VI	11399								" " " " " " " " " "

TABLE No. 16—continued.

SHELLS, B.L., B.L.C., Q.F., OR Q.F.C., COMMON AND COMMON POINTED—continued.

Calibre.	Mark.	Changes in War Stores.	Driving Band.		Length in Inches.	Diameter.		Weight, empty.	Weight, filled.	Material and Remarks.
			Type No. See Plate.	No. of Cannelures.		Bands or Body.	Driving Band.			
2-inch common ...	I	4474	1	—	32.9	ins.	ins.	lb. oz.	lb. oz.	Cast iron.
	II	4895	2	3	32.3	9.15	9.305	262 10	380 0	
	III	5011	2	3	32.6	9.15	9.32	359 3	380 0	
	IV	5556	2	3	33.58	9.15	9.32	346 8	380 0	
	V	5656				9.15	9.32	238 12	380 0	
	VI	8957	3	2	32.3	Same as	Mark IV.			
	I	8105	2	3	34.98	9.15	9.11	359 3	380 0	
	II	8695	3	2	35.41	9.15	9.32	337 14	380 0	
	IV	9963				Same as	9.71	347 8	380 0	
	V	10508	4	2	35.4	9.165	9.7			
8-inch common ...	VI	11234				Same as	Mark V.			Steel bush.
	I	4523	1	—	25.9	7.95	8.11	197 3	210 0	
	II	4895	2	3	26.1	7.95	8.12	194 7	210 0	
	III	5011	2	3	29.0	7.95	8.12	180 8	210 0	
	IV	6086	2	3	25.65	7.96	8.12	190 9	210 0	
	I	9279	3	2	27.33	7.965	8.41	169 3	210 0	
	III	9963				Same as	Mark I			
	IV	9963	3	2	27.13	7.965	8.41	189 8	210 0	
	V	10720				7.965	8.4	180 8	210 0	
	VI	11234	4	2	27.13	7.965	8.4	180 8	210 0	
special, VII and VIIA guns ...	II	6464	2	3	22.45	7.95	8.1	161 8	180 0	Cast steel.
	III	8698	3	2	22.59	7.965	8.41	163 12	180 0	
	I	9963				7.965	8.1	162 1	180 0	
	I	10239	2	3	23.84	7.965	8.1	162 1	180 0	
	I	12387	6	—	27.88	7.465	7.99	181 4	200 0	
	I	4226	Segtl.	—	21.56	5.96	6.12	92 11	100 0	
	II	4226	Segtl.	—	21.55	5.96	6.12	92 11	100 0	
	II	4439	1	—	—	5.96	6.12	92 11	100 0	
	III	4886	2	2	21.05	5.96	6.115	90 14	100 0	

(6139)

211

TABLE NO. 16—continued.

SHELLS, B.L., B.L.C., Q.F., OR Q.F.C., COMMON AND COMMON POINTED—continued.

Calibre.	Mark.	Changes in War Stores.	Driving band.		Length in Inches.	Diameter.		Weight, empty.	Weight, filled.	Material and Remarks.	
			Type No. See plate.	No. or Can-nelures.		Bands, or Body.	Driving band.				
6-inch, common ... ..	IV	5011	2	2	21	ins.	ins.	88 10	100 0	Cast steel.	
" " " " " " " "	V	5083				Only a few issued.	5·96				6·115
" " " " " " " "	VI	5581				Same as Mark V					
" " " " " " " "	VII	5951									
" " " " " " " "	VIII	8891									
" " " " " " " "	IX	9957			Cast iron for practice.						
6-inch common pointed... ..	I	8142	2	2	22·5	5·96	6·115	88 0	100 0	Cast steel.	
" " " " " " " "	II	9272	3	1	22·78	5·97	6·33	88 4	100 0	" " " " D.B. groove undercut.	
" " " " " " " "	III	9957	Same as Mark II							" " " " " " " "	
" " " " " " " "	IV	9958	3	1	22·53	5·97	6·33	88 10	100 0	" " " " " " " "	
" " " " " " " "	V	11234	Same as Mark IV							" " " " " " " "	
" " " " " " " "	VI	12267	6	—	22·53	5·97	6·33	89 10	100 0	For Marks VII and VIII guns, 29lb charge.	
6-inch howitzer ... ..	I	12553	2	2	27·225	5·97	6·12	106 2	118 13	Cast iron.	
" " " " " " " "	II	9006									
" " " " " " " "	III	9346									
" " " " " " " "	IV	9957									
" " " " " " " "	V	11234	Same as Mark III							" " " " solid base.	
5·1-inch " " " " " " " "	I	4,2,95	2	2	16·2	5·36	5·51	55 0	60 0	" " " " D.B. groove undercut.	
" " " " " " " "	II		Same as Mark I							" " " " " " " "	
5-inch gun ... ..	I		To be used up for practice.							" " " " " " " "	
" " " " " " " "	II	4375	1	—	16·0	4·96	5·12	45 9	50 0	Cast iron.	
" " " " " " " "	III	4826	2	2	16·0	4·96	5·11	46 5	51 8	" " " " " " " "	
" " " " " " " "	IV	5011	2	2	18·25	4·96	5·11	41 8	50 0	Forged steel.	
" " " " " " " "	V	5812	2	2	18·25	4·96	5·11	41 13	50 0	" " " " thicker walls.	
" " " " " " " "	VI	9957	2	2	16·0	4·96	5·11	46 5	50 0	Cast iron D.B. groove undercut.	
" " " " " " " "	I	8142	2	2	17·33	4·96	5·11	43 7	50 0	Cast steel.	
5-inch common pointed ... ..	II	12075	7	—	17·33	4·96	5·11	43 7	50 0	" " " " D.B. groove undercut,	
" " " " " " " "	I	8319	2	2	15·0	4·93	5·11	46 1	50 0	" " " " " " " "	





TABLE No. 18.

SHELLS, B.L., B.L.C., Q.F., OR Q.F.C., LYDDITE, COMMON.

Calibre.	Mark.	Change in War Stores.	Driving bands.		Length in inches.	Diameter in inches.		Weight Empty.	Bursting Charge.	Weight of Exploder.	Total Weight.	Remarks.
			Type No. See Plate	Cannulures.		Bands or Body.	Driving Band.					
10-inch ... ..	I	10501	4	1	36.55	9.965	10.61	453 6	46 0	4½-oz. with primer	500 0	
" " " " " "	II	11234	4	1		Same	as Mark I,	except	waved ribs	for driving band.		
9.2-inch, heavy ... ..	I	9636	3	2	33.58	9.165	9.71	339 6	40 0	4½-oz. with primer	380 0	A 4-oz. exploder was first issued.
" " " " " "	II	10508	4	2	33.58	9.165	9.76	339 6	40 0	" " " "	380 0	
" " " " " "	III	11234	4	2		Same	as above,	except	waved ribs	for driving band.		
" " " " " "	IV	12752	4	2	30.24	9.165	9.71	352 12	25 10	4½-oz. with primer	390 0	
" " " " " " light ... ..	I	12507	4	...	27.83	9.165	9.71	251 16	37 7	" " " "	290 0	No eye bolt hole.
9.4-inch howitzer ... ..	I	12355	1	...	28.043	9.415	9.605	226 4	53 2	" " " "	280 0	
8-inch ... ..	I	11148	4	2	25.25	7.965	8.41	186 5	23 1	" " " "	210 0	
" " " " " " special VII and VIII guns	I	10509	2	3	22.23	7.965	8.105	158 5	21 1	" " " "	180 0	
" " " " " "	II	11234	3	3		Same	as above,	except	waved ribs	for driving band.		
" " " " " "	III	12035	7	...	22.3	7.965	8.126	158 5	21 1	4½-oz. with primer	180 0	
7.5-inch ... ..	I	12387	6	...	25.58	7.465	7.99	179 15	19 7	" " " "	200 0	
6-inch gun ... ..	I	8479	3	2	21.81	5.97	6.33	87 14	13 12	3½-oz. for N.S. 5-oz. with primer	102 4	4-oz. exploder was first issued to N.S. and a 5½-oz. with primer for both services.
" " " " " "	II	9957				Same	as above,	groove	for driving	band undercut.		5½-oz. exploder with primer was first issued.
" " " " " "	III	9960	3	2	20.57	5.97	6.33	90 2	10 6	4½-oz. with primer	101 2	5½-oz. exploder with primer was first issued.
" " " " " "	IV	11234				Same	as above,	except	waved ribs	for driving band.		
" " " " " "	V	12267	6	...	20.57	5.97	6.33	90 2	10 6	4½-oz. with primer	101 2	For 29 lb. charge, Marks VII and VIII guns.
" " " " " " howitzer (heavy) ... ..	I	12252	2	2	27.2	5.97	6.12	103 1	18 14	4-oz. ... ..	122 9	
" " " " " "	II	9957				Driving band	and groove	under	cut.			A 4-oz. exploder was first issued.
" " " " " "	III	11234				Waved ribs	for driving	band.				
" " " " " " light ... ..	I	12298	7	...	27.2	5.97	6.12	85 2	14 4	" " " "	100 0	For Mark I* howitzer.
5.4-inch ... ..	I	...	2	2	19.44	5.36	5.515	46 12	12 10	" " " "	60 0	
" " " " " "	II	...	7	...		Same	as above,	except	waved ribs	for driving band.		
60-pr. gun ... ..	I	...	7	...	15.48	4.97	5.12	...	...	3½-oz. ... ..	60 0	





TABLE No. 19.

SHELLS, B.L., Q.F., or Q.F.C., SHRAPNEL.

Calibre.	Mark.	Para. In L. of Changcs.	Driving Band.		Length in Inches.	Diameter.		Approximate Nature and Number of Balls.	Weight empty.	Weight of Bursting Charge.	Total Weight filled.	Material and Remarks.
			Type No. see plate.	Number of Cannelures.		Body or Bands.	Driving Bands.					
16.25-inch	I	5738	2	5	55.0	16.19	16.5	2330 4-oz. sand shot.	1792 0	8 0	1800 0	Forged steel.
"	II	11234	...	...	5a	same as	Mark I.					" " groove for D.B. undercut. Waved ribs.
13.5-inch	I	5349 5620	2	5	49.0	13.45	13.65	1348 " " "	1243 15	5 4	1250 0	Cast steel.
"	II	11234	4	2	5a	same as	Mark I.					" " groove for D.B. undercut. Waved ribs.
12-inch light...	I	4475	1	...	34.75	11.95	12.11	340 " " "	711 5	1 14	714 0	Cast iron.
"	II	4895	12	4	34.1	11.95	12.12	328 " " "	711 5	1 14	714 0	" "
"	III	5011	12	4	42.0	11.95	12.13	1120 " " "	710 4	2 0	714 0	Forged steel.
"	IV	6401	2	4	40.5	11.97	12.13	1000 " " "	709 11	3 0	714 0	Cast steel.
"	V	8649	3	2	40.837	11.965	12.71	1000 " " "	709 11	3 0	714 0	" " Waved ribs. deeper groove, diameter of shell in rear of bands reduced.
"	VI	12119	4	2	40.837	11.965	12.66	1000 " " "	709 11	3 0	714 0	Cast steel.
10-inch	I	6171	2	3	35.3	9.95	10.145	458 " " "	497 10	1 9	500 0	" " Waved ribs.
"	II	9271	3	2	36.59	9.965	10.4	466 " " "	497 2	1 9	500 0	" "
"	III	11234	4	2	36.59	9.965	10.4	466 " " "	497 2	1 9	500 0	Cast iron.
9.2-inch	I	4474	1	...	31.5	9.15	9.305	420 2-oz. " " "	384 11	1 6	386 14	" " Waved ribs.
"	II	4895	2	3	30.65	9.15	9.32	416 " " "	377 13	1 6	380 0	Cast iron.
"	III	5011	2	3	33.5	9.15	9.32	900 " " "	377 6	1 8	380 0	Forged steel.
"	IV	5142 5620	2	3	33.7	9.15	9.32	640 " " "	377 0	2 3	380 0	Cast steel.
"	V	8695	3	2	32.7	9.15	9.7	638 " " "	377 13	2 3	380 0	" "
"	VI	9957	3	2	32.97	9.15	9.7	638 " " "	377 0	2 3	380 0	Groove for D.B. undercut, Waved ribs.
"	VII	11234	4	2	32.97	9.165	9.7	638 " " "	377 0	2 3	330 0	" "

TABLE NO. 19—continued.

SHELLS, B.L., Q.F., OR Q.F.C., SHRAPNEL—continued.

Calibre.	Mark.	Para. in List of Changes.	Driving Band.		Length in inches.	Diameter.		Approximate Nature and Number of Balls.	Weight empty.	Weight of Bursting Charge.	Total Weight filled.	Material and Remarks.	
			Type No. Sec. Plate	Number of Channelles.		Body or Bands.	Driving Bands.						
8-inch ...	I	4523	1	...	23·85	7·95	8·11	260 2-oz. sand shot.	208 3	0 15½	210 0	Cast iron.	
" " " " " " " " " " " "	III	4895	2	3	23·65	7·95	8·12	332 " " " "	208 3	0 15½	210 0	" " " "	
" " " " " " " " " " " "	IV	5011	2	3	28·0	7·95	8·12	528 " " " "	207 12	1 2	210 0	Forged steel.	
" " " " " " " " " " " "	V	5889	2	3	24·55	7·95	8·12	412 " " " "	208 4	0 15	210 8	Cast steel.	
" " " " " " " " " " " "	VI	9279	3	2	24·55	7·95	8·4	412 " " " "	208 4	0 15	210 8	" " " "	
" " " " " " " " " " " "	VII	9857						Same as Mark VI.				Groove for D.B. undercut.	
" " " " " " " " " " " "	VIII	10720	4	2	24·55	7·95	8·4	412 2-oz. sand shot	208 4	0 15	210 8	" " " "	
" " " " " " " " " " " "	IX	11234						Same as Mark VIII.				Waved Bibs. " "	
8-inch special for Marks VII and VIII guns ...	II	6464	2	3	21·7	7·95	8·1	320 2-oz. sand shot	177 12	0 15	180 0	Cast steel.	
" " " " " " " " " " " "	III	8698	3	2	22·0	7·965	8·41	320 " " " "	177 12	0 15	180 0	" " " "	
" " " " " " " " " " " "	IV	9957						Same as Mark III.				Groove for D.B. undercut.	
7·5-inch " " " " " " " " " " " "	I	12387	6	...	25·4	7·465	7·99	...	197 11½	0 13	200 0	" " " "	
6-inch " " " " " " " " " " " "	I	4226	Segtl.	...	18·35	5·96	6·12	259 { mixed metal 14 to a lb. }	98 12	0 7	100 0	Cast iron.	
" " " " " " " " " " " "	II	4895		2	2	18·2	5·96	6·115	255 " " " "	98 12	0 7	100 0	" " " "
" " " " " " " " " " " "	III	5011		2	2	19·65	5·96	6·115	700 16 to a lb. ...	98 6	0 8	100 0	Forged steel.
" " " " " " " " " " " "	IV	5621		2	2	18·925	5·96	6·115	536 14 to a lb. ...	98 8	0 10½	100 8	Forged steel; walls thicker.
" " " " " " " " " " " "	V	6465		2	2	18·925	5·96	6·115	518 14 " " " "	88 9	0 10½	100 8	Cast steel.
" " " " " " " " " " " "	VI	9272		3	1	18·925	5·97	6·33	518 14 " " " "	98 9	0 10½	100 8	" " " "
" " " " " " " " " " " "	VII	9957							Same as Mark VI.				" " " " Groove for D.B. undercut.
" " " " " " " " " " " "	VIII	10097	3	1	18·582	5·97	6·33	453 14 to a lb. ...	98 9	0 10½	100 8	" " " "	
" " " " " " " " " " " "	IX	11234	3	1	18·582	5·97	6·33	453 14 to a lb. ...	98 9	0 10½	100 8	Cast steel; waved ribs. " "	
" " " " " " " " " " " "	X	12267	6	...	18·582	5·97	6·33	453 14 " " " "	98 9	0 10½	100 8	" " " " for Marks VII and VIII guns.	
5·4-inch howitzer ...	I	27/1/96	2	2	13·6	5·36	5·51	350 16 " " " "	58 6	0 6	60 0	Cast steel.	
" " " " " " " " " " " "	II	...	2	2	13·6	5·36	5·51	397 16 " " " "	58 6	0 6	60 0	Forged steel.	
" " " " " " " " " " " "	III	...						Same as Mark II.				" " " " Groove for D.B. undercut.	
60-pr. gun ...	I	...	7	...	15·28	4·97	5·12	990 25 " " " "	...	...	60 0	F.S. gauge.	

TABLE No. 19—continued.

SHELLS, B.L., Q.F., OR Q.F.C., STRAPNEL—continued.

Calibre.	Mark.	Para. in L. of Changes.	Driving Band.		Length in inches.	Diameter.		Approximate Nature and Number of Balls.	Weight empty.	Weight of Bursting Charge.	Total Weight filled.	Material and Remarks.
			Type No. See Plate	Number of Cannelures.		Body or Bands.	Driving Bands.					
5-inch gun	III	4827	2	2	14-1	4-96	5-11	236 14 to a lb.	1b. oz. 49 9	0 4 $\frac{1}{2}$	50 0	Forged steel. Groove for D.B. undercut.
" "	IV	9957	2	2	14-1	4-96	5-11	236 14 "	49 9	0 4 $\frac{1}{2}$	50 0	" "
" "	VI	12075	7	2	13-1	4-96	Same as Mark IV.	Same as Mark IV.	48 15	0 4	50 0	Gunmetal head.
5-inch howitzer, heavy	I	8281	2	2	13-1	4-96	5-11	{ 84 50 to a lb. 288 16 "	48 15	0 4	50 0	Mild steel head.
" "	II	8812	2	2	13-1	4-97	5-115	623 35 to a lb.	48 15	0 4	50 0	Waved ribs, first issue for gun and howitzer.
" "	V	11319	2	2	13-1	4-97	5-115	623 35 to a lb.	48 15	0 4	50 0	Waved ribs, first issue for gun and howitzer.
" "	I	12075	7	2	10-7 $\frac{1}{2}$	4-37	5-115	577 35 "	48 15	0 4	50 0	F.S. gauge.
" "	VII	12076	7	2	13-1	4-97	5-115	623 35 "	48 15	0 4	50 0	Waved ribs.
4-7-inch	I	6575	2	2	13-0	4-7	4-809	242 14 "	45 14	0 5	45 0	Forged steel.
" "	II	9957	2	2	13-0	4-7	4-809	242 14 "	45 14	0 5	45 0	Forged steel.
" "	III	10546	2	2	13-6	4-7	4-814	205 14 to a lb.	43 14	0 5	45 0	" "
" "	IV	12087	7	2	12-96	4-7	4-814	580 25 "	43 6 $\frac{1}{2}$	0 4 $\frac{1}{2}$	45 0	Waved ribs. No shrapnel primer.
30-pr. ...	I	21/11/95	2	2	12-45	3-97	4-115	313 27 "	29 0	0 3	30 0	Forged steel. Bullets in wire cage.
" "	II	...	2	2	12-45	3-97	4-115	313 27 "	29 0	0 3	30 0	Forged steel. Bullets in tin cage.
" "	III	...	2	2	12-553	3-97	4-115	Same as Mark II.	29 0	0 3	30 0	Forged steel. Waved ribs.
" "	IV	...	2	2	11-0	3-95	4-115	313 27 to a lb.	24 13	0 3	25 0	" "
4-inch...	I	4265	R.L.	3	11-0	3-95	4-115	105 20 "	24 13	0 3	25 0	Cast-iron.
" "	II	4394	1	...	11-2	3-97	4-105	{ 40 34 " 105 20 "	24 13	0 3	25 0	" "
" "	III	4965	2	2	10-85	3-97	4-11	{ 49 34 " 94 20 "	24 0	0 3	25 0	" "
" "	IV	5011	2	2	10-3	3-97	4-11	230 22 $\frac{1}{2}$ "	21 12 $\frac{1}{2}$	0 1 $\frac{1}{2}$	25 0	Forged steel. R.C. in shallow bag.
" "	V	5705	2	2	10-3	3-97	4-11	230 22 $\frac{1}{2}$ "	21 12 $\frac{1}{2}$	0 1 $\frac{1}{2}$	25 0	Forged steel B.C. loose in tin cup.
" "	VI	5515	2	2	10-3	3-97	4-11	230 22 $\frac{1}{2}$ "	21 12 $\frac{1}{2}$	0 1 $\frac{1}{2}$	25 0	Forged steel. Groove for D.B. undercut.
" "	VII	9957	2	2	10-3	3-97	4-11	230 22 $\frac{1}{2}$ "	21 12 $\frac{1}{2}$	0 1 $\frac{1}{2}$	25 0	Forged steel. Groove for D.B. undercut.



TABLE No. 20.

SHOT, ARMOUR PIERCING.

Calibre.	Mark.	Change in War Stores.	Length inches.	Driving Band.		Diameter,		Weight.	Remarks.
				Type No.	Cannelures.	Body of Bands.	Driving Bands.		
16-25 inch	I	5993	59-31	2	5	16-19	16-5	lb. oz. 1800 0	
	II	11234			Same as	Mark I.			Waved ribs.
13-5-inch	I	6289	49-27	2	4	13-45	13-65	1250 0	
	II	11244	49-27	4	1	13-45	14-0	1250 0	Waved ribs.
12-inch heavy	I	8437	37-8	2	4	11-965	12-51	850 0	
	II	10187	37-6	5	1	11-965	12-76	850 0	
	III	11234			Same as	Mark II.			Waved ribs.
" " light	I	8423	31-55	2	4	11-95	12-13	714 0	
	II	8771	31-55	3	2	11-95	12-61	714 0	
	III	11234	31-55	4	1	11-95	12-61	714 0	Waved ribs.
10-inch	I	6289	36-5	2	3	9-95	10-145	500 0	
	II	9271	36-5	3	1	9-96	10-4	500 0	
	III	11234	36-5	4	1	9-96	10-4	500 0	Waved ribs.
9-2-inch	I	6289	29-14	2	3	9-15	9-32	380 0	
	II	8424	29-14	3	2	9-15	9-71	380 0	
	III	11234	29-14	4	2	9-15	9-71	380 0	Waved ribs.
8-inch	I	6289	20-93	2	2	7-95	8-12	210 0	
	II	9279	20-93	3	2	7-965	8-4	210 0	
	III	11234	20-93	4	2	7-965	8-41	210 0	Waved ribs.
6-inch	I	6289	17-45	2	2	5-96	6-115	100 0	
	II	9631	17-45	3	2	5-96	6-33	100 0	
	III	9957			Same as	Mark II.			Driving band groove undercut.
	IV	11234			"	"			Waved ribs.
	V	12267	17-45	6		5-96	6-33	100 0	Mks. VII and VIII gun 29-lb. charge.
5-inch	I	11234	4-96					50 0	Waved ribs.

TABLE No. 21.

SHOT B.L., B.L.C., Q.F., OR Q.F.C., SOLID.

Calibre.	Mark.	Change in War Stores.	Length in inches.	Driving Bands.		Diameter in inches.		Weight.	Remarks.
				Type No. See plate.	No. of Can-nelures.	Shot.	Driving Band.		
16 25-inch	I	11194	44.46	2	4	16.205	16.505	lb. oz. 1800 0	} Marks VII and VIII guns 29lb charge.
13.5-inch	I	11194	43.43	4	1	13.465	14.0	1250 0	
12-inch heavy	I	11194	37.29	5	1	11.965	12.76	850 0	
" light	I	11194	32.47	4	2	11.965	12.66	714 0	
"    "	II	12119		Deeper	groove for	driving band	Diameter of	body in rear	
10-inch...	I	11194	31.50	4	1	9.965	10.4	600 0	
9.2-inch ...	I	11194	28.562	4	2	9.165	9.71	380 0	
8-inch ...	I	11194	21.31	4	2	7.965	8.41	210 0	
7.6-inch ...	I	12387		6		7.465	7.99	200 0	
6-inch gun	I	11194	17.57	3	1	5.97	6.33	100 0	
"    "	II	12267	17.57	6	—	5.97	6.33	100 0	
5-inch gun	I	11194	13.04	2	2	4.97	5.115	50 0	
"    "	II	12075	13.04	7	—	4.97	5.143	50 0	
4.7-inch ...	I	11194	13.26	2	2	4.7	4.819	45 0	
"    "	II	12036	13.26	7	—	4.7	4.815	45 0	
4-inch ...	I	11194	10.27	7	—	3.97	4.105	25 0	
12-pr. 12 and 8 cwt.	I	11028	8.94	7	—	2.98	3.095	12 8	
"    "	II	12033	8.94	8	—	2.98	3.09	12 8	
12-pr. 18 cwt. ...	I	12748		8	—	2.98	3.095	12 8	

TABLE NO. 22.

SHOT, B.L. AND Q.F., CASE.

Calibre.	Mark.	Changes in War Stores.	Diameter, Body.	Length over Handles.	Contents.			No. of Handles.	No. of Metal Studs at Base.	Approximate Weight of Balls.	Weight.			Remarks.		
					Balls.		No. of Segments.				lb. oz.	lb. oz.	lb. oz.			
					No.	Nature.										
12-inch, light	...	...	...	...	I	4574	11'88	35'2	828	8-oz. sand shot	6	6	414 0	714 0	21 0	Staybolt up the centre, and fitted with hole for eyebolt.
10 "	...	...	...	...	I	7980	9'93	34'5	528	8-oz. ditto	6	6	254 8	500 0	15 0	
9'2 "	...	...	...	...	I	4653	9'08	33'15	414	8-oz. ditto	6	6	207 0	380 0	11 0	No hole for eyebolt. Fitted with hole for eye-bolt.
8 "	...	...	...	...	I	4523	7'89	23'5	468	4-oz. ditto	6	2	117 0	210 0	6	
6 "	...	...	...	...	II	4792	7'89		20'1	207	4-oz. ditto	6	1	51 9	100 0	3
5'4 " howitzer	...	...	...	...	I	59798	—	—	245	2-oz. ditto	—	1	30 10	60 0	—	Copper ring at base.
5- "	...	...	...	...	I	4376	4'95	12'3	450	Mixed metal balls, 14 per lb.	4	1	32 3/4	50 0	1 8	
5 " howitzer	...	...	...	...	I	8234	4'95	13'91	433	Ditto, 14 per lb...	4	1	30 15	50 0	1 8	Copper ring at base.
5 " "	...	...	...	...	II	9515	4'97	14'9	185	2 oz. sand shot	3	—	23 2	50 0	—	
30-pr.	...	...	...	...	I	...	3'95	11'45	300	Mixed metal balls, 14 per lb.	3	1	1 9	30 0	3 p.c.	" "
4-inch	...	...	...	...	I	4265	3'95	9'45	245	Ditto, 16 1/2 per lb.	3	1	15 5	25 0	0 12	" " fitted with handle becomes Mark 1 <sup>st</sup> . Copper ring at base, fitted with handle. Corrugated in three places. For use with cordite. Base screwed to body.
12-pr.	...	...	...	...	I	5146 8108	2'96	8'5	314	Ditto, 34 " ...	3	1	9 4	12 15	0 6	
12-pr.	...	...	...	...	II	7570		8'5	Same as Mark I							
15-pr. or 12-pr.	...	...	...	...	III	8235	2'9	8'9	300	Ditto, 34 per lb...	3	1	8 13	12 8	0 6	
" "	...	...	...	...	IV	8736	2'97	9	290	Ditto, " ...	2	1	—	12 14	—	
" "	...	...	...	...	IV*	10283	This is Mark IV with two partial perforations in base for N.S.									
" "	...	...	...	...	V	9456 9815 11027	2'96	8'9	290	Ditto, 34 per lb.	2	1	8 9	13 4	—	Base pressed into recess in body.
10-pr.	...	...	...	...	I	11027 11021		8'3	211	Ditto, " ...	2	1	6 3	10 0	—	



TABLE No. 23.

## 6-PR. Q.F. AMMUNITION (CORDITE).

Nature.	Mark of Cartridge.	§Changes/ in War Matériel.	Charge, Cordite, Size 5.	Bursting Charge.	Mark of—					Remarks.
					Shell.	Fuze.	Igniter.	Cylinder.	Cap.	
Steel shell ... ..	VIII	12295	7½ ozs.	Q.F. shell, F.G. 4 ozs.	IV or V	Hotehkiss. IV	IV	III	II	
	VII*	12031	"	"	IV	IV	IV	III	II	
	VII	9957	"	"	IV	IV	III	III	I	
	VI	9450	"	"	II	IV	III	III	I	
	V	9299	"	"	III	III	III	III	I	
	IV	9299	"	"	III	III	III	wood wad	I	
	III	7302	"	"	III	III	III	II paper cylinder and a disc of millboard and one of felt.	I	
Common shell ... ..	VI	12295	7½ ozs.	3 ozs.	IV	IV	IV	III	II	
	V*	12031	"	"	III	IV	IV	III	II	
	V	10325	"	"	III	IV	III	III	I	
	IV	10325	"	"	II	IV	III	III	I	
	III	10325	"	"	II	III	III	III	I	
	II	7302	"	"	II	III	III	II (see above)	I	

All 6-pr. ammunition made up between the dates, 1st June, 1899, and 29th Nov., 1901, will be recapped, and at the same time reprimed with guncotton.

TABLE NO. 24.

3-pr. Q.F. AMMUNITION (CORDITE).

Nature.	Mark of Cartridge.	Changes in War Materiel.	Charge Cordite, Size 5.	Bursting Charge of Shell.	Mark of—					Remarks.
					Shell.	Fuze.	Igniter.	Cylinder.	Cap.	
Steel shell ... ..	VII	{ 12295 }	6½ ozs.	1 oz. 12 drs.	{ III, IV, V, or VI.† }	IV	IV	III	II	
	VI*	{ 12595 } 12031	"	" "		III	IV	III	II	
	VI	8957	"	" "	III	IV	III	III	I	
	V	9450	"	" "	II	IV	III	III	I	
	IV	9299	"	" "	II	III	III	III	I	
	III	9299	"	" "	II	III	III	wood wad	I	
	II	{ 7348 } { 7000 }	"	" "	II	II	II	II	I	
Common shell ... ..	VI	12295	6½ ozs.	1 oz. 6 drs.	III or IV	IV	IV	III	II	
	V*	12031	"	" "	III	IV	IV	III	II	
	V	10325	"	" "	III	IV	III	III	I	
	IV	10325	"	" "	II	IV	III	III	I	
	III	10325	"	" "	II	III	III	III	I	
	II	10325	"	" "	II	III	III	II	I	

All 3-pr. ammunition made up between the dates, 1st June, 1899, and 29th November, 1901, will be recapped with Mark II cap, and at the same time reprimed with gun-cotton.

† Mark VI shell bursting charge about 2 oz.



TABLE No. 26.

## PACKAGES OF CARTRIDGES, S.A., AND M.G. (BLANK).

Nature.	Charge.	Bundle.		Box.		Remarks.	
		No.	Weight.	No.	Mark.		Gross Weight.
<i>Aiming Rifle.</i>	grs.		lb. oz.			lb. oz.	
M.G., G.G., chamber powder, Mark I, solid case ... ..	65	10	0 8 <sup>3</sup> / <sub>4</sub>	1670 2000	Half barrel ... .. Half-metal lined case ... ..	95 12 134	
.302-inch cordite, Mark V, solid case ... ..	10 Size <sup>20</sup> / <sub>S.C.</sub>	10	0 4 <sup>1</sup> / <sub>4</sub>	1400 <del>2000</del> 500 3200 1900 7400 3400 1450	XI, XII, XIV ... .. XIII ... .. Enfield, N.S. ... .. Half barrel ... .. Quarter barrel ... .. Whole M.L. case ... .. Half " " ... .. Quarter " " ... ..	48 0 81 0 18 12 103 8 59 6 237 0 124 4 58 4	
" " " VI, with mock bullet ... ..	10 Size <sup>20</sup> / <sub>S.C.</sub>	10	—	1400 2400 2000 1100	Quarter barrel ... .. Half barrel ... .. Mark XIII ... .. " XIV ... ..	54 0 90 0 79 0 46 0	} L.S. only.
M.H., or Snider rifle or carbine, Mark IV ... ..	68 Blank F.G.	10	0 4	960 <del>1600</del> 2000 1300 2400 1020	XI, XII, XIV ... .. XIII ... .. Half barrel ... .. Quarter barrel ... .. Half M.L. case ... .. Quarter " " ... ..	36 4 62 4 62 2 40 4 90 0 43 8	
Wesley pistol ... ..	10	6	0 2 <sup>1</sup> / <sub>2</sub>	420	Enfield pistol ... ..	8 8	

## TABLE NO. 27.

## COMBUSTIBLE COMPOSITIONS FOR LABORATORY STORES.

PORTFIBRES.				Long, Short, and Coast Guard Lights, and Lights for Wrecks :—			
Common Portfires :—				lb. oz.			
Saltpetre, ground	..	..	6 0	Saltpetre, ground	..	..	17 8
Sulphur, ground	..	..	2 0	Sulphur, ground	..	..	4 6
Powder, mealed	..	..	1 4	Orpiment, red	..	..	1 4
Magnesium Light for $\frac{1}{2}$ lb. Light Rocket :—				lb. oz.			
Magnesium powder	..	..	1 8	Nitrate of Baryta	..	..	1 11
Chlorate of Potash	..	..	1 2	Nitrate of Potash	..	..	1 2
Nitrate of Baryta	..	..	1 9 $\frac{1}{2}$	Magnesium Powder coated with Paraffin*	..	..	1 8
Oil, Linseed, boiled	..	..	0 3	Add 3 per cent. boiled Linseed Oil.			
ROCKETS.				Composition for Stars of Signal Rocket :—			
War Rocket :—	24-PR.	9-PR.		lb. oz.			
	lb.	lb.		Saltpetre, ground	..	..	8 0
Saltpetre, ground	..	6 1 75	8 75	Sulphur, ground	..	..	2 0
Sulphur, ground	..	14 75	2 0	Antimony, Sulphide of	..	..	2 0
Charcoal, Alder, ground	..	20 5	2 5	Isinglass	..	..	0 3 $\frac{1}{2}$
				Spirits, methylated	..	..	pint 1
				Vinegar	..	..	qrt. 1
				Powder, L.G., mealed for priming	..	..	lb. oz. 1 0
Signal Rockets.				Stars, Incendiary, for Shells :—			
			Parts.	lb. oz.			
Saltpetre	..	..	13	India-rubber solution	..	..	0 2
Charcoal, fine	..	..	3 5	Powder, mealed	..	..	0 5
.. medium	..	..	3 75	Saltpetre, ground	..	..	0 1
Sulphur	..	..	2	Paraffin wax	..	..	0 0 $\frac{1}{2}$
				Naphthalene	..	..	0 0 $\frac{1}{2}$
				Coal tar	..	..	0 1
For Quick Pellet for Rocket, Life- Saving :—				MATCH.			
			lb. oz.	Slow Match :—			
Saltpetre, ground	..	..	8 9 $\frac{1}{2}$	Hemp, Yarn, pure, Russian			
Charcoal, Alder, ground	..	..	2 1	lb. 100			
Sulphur, ground	..	..	1 13 $\frac{1}{2}$	Ashes, Wood..			
				.. bushel 1			
				Water			
				.. gals. 50			
Quick Match :—							
		2 threads.	3 threads.	4 threads.	6 threads.	10 threads.	
		lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	
Cotton Wick	..	2 0	3 0	1 10	2 2	2 7	
Gum Arabic	..	0 10 $\frac{1}{2}$	1 0	0 11	0 12	0 13	
Powder, mealed, L.G.	..	18 0	26 0	20 0	20 0	24 0	
Water, distilled	..	8 pints	12 pints	8 pints	9 pints	10 pints	

\* The Magnesium Powder is immersed in melted paraffin so as to coat each grain of the powder. The paraffin so taken up amounts to about  $\frac{1}{2}$  of the weight of the unprepared powder. The weights given above are the weights of the prepared powder.

TABLE NO. 27—*continued.*COMBUSTIBLE COMPOSITIONS FOR LABORATORY STORES—*continued.*

TUBES.			
Detonating Composition for Copper Friction Tube:—		lb.	oz.
Potash, Chlorate of ..	..	0	6
Antimony, Sulphide of ..	..	0	6
Sulphur, ground ..	..	0	0½
Damped with spirits, methylated, 1 quart, shellac 448 grains, in the proportion of 200 minims to 1,000 grains of composition. For T friction tubes the composition differs in having—			
		lb.	oz.
Powder, mealed ..	..	0	0½
Glass, ground..	..	0	0½
<hr/>			
Composition for Percussion Caps 3, 6, 13, and 18-pr. Q.F.:—		Parts.	
Potash, Chlorate of ..	..	12	
Antimony, Sulphide of ..	..	18	
Mealed powder ..	..	1	
Sulphur ..	..	1	
Ground glass..	..	1	
<hr/>			
Composition for Percussion Caps for S.A., M.G., and aiming rifle powder cartridges, small, Direct Action, D.A. Delay, and Base Percussion, and Time and Percussion Fuzes:—			
		lb.	oz.
Mercury, Fulminate of ..	..	0	6
Potash, Chlorate of ..	..	0	6
Antimony, Sulphide of ..	..	0	4
<hr/>			
Composition for Percussion Caps for Cordite S.A., and M.G. Cartridges:—			
		Parts.	
Chlorate of Potash ..	..	14	
Sulphide of Antimony ..	..	18	
Fulminate of Mercury ..	..	8	
Sulphur ..	..	1	
Mealed powder ..	..	1	
<hr/>			
Composition for Caps and Detonator of Fuze, 1-pr. Q.F.:—			
		Parts.	
Potash, Chlorate of ..	..	18	
Antimony, Sulphide of ..	..	12	
Mealed powder ..	..	1	
Sulphur ..	..	1	
Ground Glass ..	..	1	

TABLE NO. 28.

PAINTS AND OTHER NON-COMBUSTIBLE COMPOSITIONS FOR LABORATORY STORES.

Luting, Mark I:—				Shellac Putty:—			
Tallow	} Equal parts.			Whiting	..	..	lb. oz. 6 0
Beeswax				Shellac, gum	..	..	2 0
				Spirits, methylated	..	..	qrt. 1
Luting, Mark III:—				Paste:—			
Whiting	..	..	Parts. 80	Flour	..	..	lb. oz. 2 0
Mineral jelly	..	..	20	Alum, pounded	..	..	0 1
Castor oil	..	..	1	Water	..	..	gal. 1
Transparent Lacquer for Brass Work:—				Kit Composition No. 1 (for use hot):—			
Seed lac	..	..	lb. oz. 5 0	Pitch, Swedish	..	..	lb. 30
Turmeric	..	..	2 8	Tallow, Russian	..	..	7½
Spirits, methylated	..	..	gals. 5	Beeswax	..	..	30
				Resin	..	..	32½
Lacquer for inside of Shells:—				Varnish for inside of Lyddite and new A.P. Shell:—			
Rosin	..	..	lb. oz. 12 0	Shellac	..	..	lb. oz. 3 0
Brown, Spanish	..	..	2 0	Methylated spirits	..	..	qrts. 5
Plaster of Paris	..	..	1 0	Turpentine	..	..	pints 1½
Turpentine, spirits	..	..	pint 0½				
<i>Velvet Paint for Inside of Shell.</i>				Lubricant for Lids, Q.F. cartridges:—			
			Parts.	Tallow, Russian	} equal parts.		
Zinc oxide	..	..	2½	Beeswax		..	
Ochre, yellow	..	..	3-5				
Red, oxide of iron	..	..	0-5				
Nitroriciniolin	..	..	15-0				
Nitro cellulose (of a very low degree of nitration)..	..	..	7-5				
Acetone oil	..	..	60-0				
Waterproof Varnish for Percussion Caps:—				Pettman cement for waterproofing purposes:—			
Shellac, gum	..	..	lb. oz. 2 2	Shellac gum	..	..	lb. oz. 7 8
Spirits, methylated	..	..	f gal. 1	Methylated spirits (1 gal.)	..	..	8 4
				Tar Stockholm (½ gal.)	..	..	5 0
				Red Venetian	..	..	20 12

*Paint for Lyddite Shell.*

	1st Coat.	2nd Coat.
Paint, zinc oxide, dry (free from lead) .. .. .	9½ lbs.	
Oil, linseed, boiled (free from lead) .. .. .	1¼ pints.	1¼ pints.
Terebenc (free from lead).. .. .	1¼ "	2½ "
Turpentine, spirits of .. .. .	1½ "	1½ "
Paint, ochre, yellow, stone, Oxford, dry.. .. .	..	8½ lb.
Thinned luting, equal parts of Mark III luting and mineral jelly.		

It is very important that the ingredients employed in paints for lyddite shell should be quite free from lead, and supplies obtained at Woolwich for this purpose are chemically analysed to guard against the presence of lead. Paint, or the ingredients for making up paint for lyddite shells, should, therefore, only be obtained from Woolwich.

## INDEX.

		Page
<b>A.</b>		
Adapters, fuze hole, G.S.	.. .. .	92
"    for base of shell	.. .. .	128
"    for Q.F. or Q.F.C. cartridges	.. .. .	151
Adze, coopers', magazine	.. .. .	111-138
Ammunition for Q.F. and Q.F.C. guns	.. .. .	152-167
"    aiming rifle, M.G. and S.A.	.. .. .	22
Apparatus, cutting cordite	.. .. .	11
"    "    wet guncotton	.. .. .	97
"    filling cartridges, with prism powder	.. .. .	102
Armour piercing, shell	.. .. .	89
"    "    shot	.. .. .	
Augmenting strips for B.L. projectiles.	.. .. .	

**B.**

Bags, burster	.. .. .	144
"    primer, 7 drams	.. .. .	145
"    powder barrel	.. .. .	34
"    "    10 lb.	.. .. .	36
Ballistite	.. .. .	17
Bands, driving	.. .. .	87-91
"    lifting cartridge (J case)	.. .. .	
Bar, lifting shell	.. .. .	139
Barrels, powder	.. .. .	33, 34
"    transporting cordite	.. .. .	16
"    cartridge	.. .. .	163
Bearers, projectile, B.L., 6-inch	.. .. .	145
Blocks, Nos. 1 and 2	.. .. .	139, 140
"    wood steadying shell	.. .. .	140
Bolts, eye, lifting projectiles, large and small	.. .. .	145
Bearers, cartridge, cylinder	.. .. .	43
Boxes, ammunition, Q.F. 6-pr.	.. .. .	116
"    "    3-pr.	.. .. .	119
"    "    1-pr.	.. .. .	112
"    "    small arm, Marks XI and XV	.. .. .	164
"    "    S.A., Nos. 1 and 2	.. .. .	163, 164
"    "    "    303-inch, half naval	.. .. .	164
"    "    "    780 rounds	.. .. .	164
"    "    "    600 rounds	.. .. .	164
"    "    "    pistol, Enfield, 600 rounds.	.. .. .	164
"    "    "    "    240	.. .. .	164
"    "    "    camel and bullock	.. .. .	165
"    "    "    distinguishing marks	.. .. .	165
"    "    "    cartridge, Q.F. 4.7-inch, naval	.. .. .	125
"    "    "    "    Marks I to IV*, guns, L.S.	.. .. .	124, 125
"    "    "    "    Mark V gun	.. .. .	130
"    "    "    "    12-pr., 8 and 12 cwt.   X	.. .. .	131
"    "    "    "    12 cwt., L.S.	.. .. .	131
"    "    "    "    or Q.F.C. 4-inch	.. .. .	133
"    "    "    "    6-inch	.. .. .	134, 135
"    "    "    cases, Q.F. 6-pr. saluting	.. .. .	118



	Page
Boxes, exploders, lyddite .. .. .	43
" for wet guncotton .. .. .	8, 9
" life-saving fuze, Mark III .. .. .	172
" lights, Mark II .. .. .	172
" portfires .. .. .	172
" tubes, V.S. .. .. .	69
Brushes, fuze hole, Mark I .. .. .	135
" primer hole, Mark I .. .. .	137
Brace, magazine, Mark II, with bit .. .. .	151
Burning of fuzes, causes affecting .. .. .	71

## C.

Cages, projectile, B.L. or Q.F., 6 inch .. .. .	145
Cartridges, for B.L. ordnance .. .. .	18-32
" qualifications, uses, &c. .. .. .	18, 19
" 10, 12 and 15-pr. .. .. .	23
" 4-inch, 5-inch, and 60-pr. .. .. .	23, 24
" 7.5-inch and up .. .. .	24-27
" composite .. .. .	27
" 6-inch .. .. .	27, 28
" howitzers .. .. .	28, 29
" gauges, &c. .. .. .	30, 31
" drill .. .. .	31, 32
" marking .. .. .	20, 29
" powder .. .. .	19-22
" silling .. .. .	21-23
" saluting .. .. .	20
" aiming rifle, M.G. & S.A. .. .. .	152-167
" 1-inch electric .. .. .	152
" " percussion .. .. .	153
" aiming tube .. .. .	154
" M.G., .45-inch, Mark IV .. .. .	155
" " cordite, Mark I .. .. .	156
" S.A., ball, .303-inch, cordite .. .. .	157, 158
" short range practice .. .. .	159
" blank, .303-inch .. .. .	160
" ball, pistol, Webley .. .. .	162
" blank, pistol, Webley .. .. .	162
" ball, M.H. rifle, solid case, Mark II .. .. .	156
" " " cordite, Mark I .. .. .	156
" " M.H. carbine, solid case, cordite, Mark I .. .. .	157
" dummy drill, .303-inch rifles or carbines .. .. .	161
" signal, Very .. .. .	176
" quick-firing .. .. .	111-138
" Q.F. 6-pr. .. .. .	112-118
" " 3-pr. .. .. .	118, 119
" " 1-pr. .. .. .	111, 112
" " 2.95-inch .. .. .	119-121
" " 15-pr. .. .. .	121, 122
" " 13-pr. .. .. .	122
" " 18-pr. .. .. .	122
" " 12 pr. 8 cwt. .. .. .	130
" " 12-pr. 12 cwt. .. .. .	130, 131
" " 12-pr. 18 cwt. .. .. .	131
" " 14-pr. .. .. .	131, 133
" " 4.7-inch .. .. .	123-130
" " or Q.F.C., 4-inch .. .. .	133
" " " 6 " .. .. .	133, 134
Cases, cartridge .. .. .	43
" cordite .. .. .	15
" " drum .. .. .	16
" for wet guncotton .. .. .	7-9
" for dry guncotton .. .. .	9-11
" powder, cylindrical .. .. .	39, 40
" " pentagon .. .. .	36, 37

	Page
Cases, powder, rectangular .. .. .	37-39
"  "  metal lined .. .. .	36
"  "  100 lb. .. .. .	34, 35
"  "  metal lined, field .. .. .	35
"  "  transport, explosive .. .. .	34
"  "  detonators .. .. .	52
Case, shot .. .. .	103-106
Centering B.L. projectiles .. .. .	87
Chargers, .303-inch cartridges .. .. .	158
Clips, cartridge, Q.F., 6 and 3-pr. .. .. .	115, 116
"  "  "  1-pr. and 2-95-inch .. .. .	112, 119
"  "  "  13 and 18-pr. .. .. .	222
Cordite .. .. .	13-16
Covers, cartridge, paper, canvas and silk cloth .. .. .	30, 31
Cylinders, ammunition .. .. .	34
"  "  cartridge .. .. .	40-43
"  "  tin ( <i>see</i> Tables) .. .. .	202-204

## D.

<i>Detonators</i> .. .. .	44-54
"  "  remarks on .. .. .	52
"  "  electric, No. 9 .. .. .	46
"  "  "  12 .. .. .	47
"  "  "  13 .. .. .	48
"  "  "  18 .. .. .	50
"  "  "  20 .. .. .	52
"  "  non-electric, No. 8 .. .. .	44
"  "  "  15 .. .. .	49
"  "  precautions when dealing with .. .. .	53
Discs, base plug .. .. .	96, 97
Drivers, grummet .. .. .	145
Driving bands .. .. .	87-91
Drill shell .. .. .	107-109
"  "  cartridges .. .. .	31, 32
Drum, cordite, transport.. .. .	16

## E.

Electric fuze, No. 14 .. .. .	48
"  "  "  16 .. .. .	49
"  "  "  19 .. .. .	51
Exploders, lyddite shell .. .. .	96
Extractors, drill shell, Nos. 1 to 5 .. .. .	109
"  "  cartridge, "M" powder case .. .. .	136
"  "  tube .. .. .	67, 68

## F.

Fulminate of mercury, note on .. .. .	54
Funnels, cartridge .. .. .	151
Fuze composition .. .. .	4
"  "  instantaneous .. .. .	178
"  "  safety .. .. .	177, 178
Fuzes, combined or T. and P. .. .. .	80-85
"  "  T. and P., No. 54.. .. .	82, 83
"  "  "  No. 55 and 57 .. .. .	83
"  "  "  No. 56.. .. .	82
"  "  "  No. 60.. .. .	80-82
"  "  "  No. 61.. .. .	84
"  "  "  No. 63.. .. .	82
"  "  "  No. 80.. .. .	84, 85
"  "  time, sensitive, No. 24 .. .. .	84
"  "  "  No. 25 .. .. .	85, 86



## K.

	Page
Keys, for powder cases .. .. .	37, 38
" for metal-lined cases .. .. .	36
" inserting and removing primer, cartridge, aiming rifle, 1-inch, electric	152
Knives, magazine .. .. .	151

## L.

Lanyards, friction tubes, &c. .. .. .	69
Lever, extracting eyebolt .. .. .	147
Lights, coastguard .. .. .	176
" long, G.S. .. .. .	177
" short .. .. .	177
" long, blue, green, and red .. .. .	177
Luting .. .. .	227
Lyddite .. .. .	17
" shell .. .. .	96

## M.

Machine gun ammunition .. .. .	155-156
" rocket, war .. .. .	169
" " life-saving .. .. .	171
" " signal .. .. .	175
Marking on B.L. powder cartridges .. .. .	22
" " cordite cartridges .. .. .	29
" stamped on projectiles .. .. .	110
Mealed powder .. .. .	4
Models, points, armour-piercing projectiles .. .. .	98

## N.

Needles, magazine, phosphor bronze, 4-inch and 9-inch .. .. .	151
" " nickel silver, 1 $\frac{1}{4}$ -inch .. .. .	151
" " curved .. .. .	151

## P.

Paints, table of .. .. .	227
Percussion fuzes .. .. .	72-80
Picric acid .. .. .	17
" powder .. .. .	17
Pistol, B.L., safety fuze .. .. .	178
Pincers, magazine .. .. .	151
Planks, stacking projectiles .. .. .	147
Plugs, vent, T. .. .. .	69
" base, shell, Nos. 1 and 5 .. .. .	147
" fuze-hole, G.S., with loop .. .. .	147
" " " without loop .. .. .	147
" " " " Naval .. .. .	147
" " special .. .. .	147
Portfires, common .. .. .	176
" life-saving .. .. .	176
Prickers, cartridge .. .. .	151
Primers, cartridge, Q.F., saluting, 6 and 3-pr. .. .. .	117
" dummy, cartridge, drill, Q.F. or Q.F.C. .. .. .	129
" eight drams .. .. .	96
" electric, large, Q.F. or Q.F.C. .. .. .	126-128
" guncotton, dry .. .. .	10
" torpedo, guncotton, dry .. .. .	10, 11
" shrapnel shell .. .. .	147, 148

	Page
Projectiles, B.L., B.L.C., Q.F., or Q.F.C. .. .. .	87-110
" armour-piercing .. .. .	97, 93, 102, 103
" Palliser .. .. .	103
" marks on .. .. .	110
Protectors, armour-piercing projectiles. . . . .	148
" projectiles .. .. .	148
Protection of driving bands with gas-checks .. .. .	90
Puffs, cordite .. .. .	150
" powder .. .. .	150
Pumps, air, testing powder cases .. .. .	38

## Q.

Quick-firing ammunition. . . . .	111-138
" 1-pr. . . . .	111, 112
" 3-pr. . . . .	118, 119
" 6-pr. . . . .	112-118
" 2.95-inch .. .. .	119-121
" 12-pr., 8 cwt., 12 cwt., and 18 cwt. . . . .	130, 131
" 13-pr. . . . .	122
" 15-pr. . . . .	121, 122
" 18-pr. . . . .	122
" 4-inch .. .. .	133
" 4.7-inch .. .. .	123-130
" 6-inch .. .. .	133, 134
Quickmatch .. .. .	177

## R.

Rectifiers, guncotton primers .. .. .	52
Rimers, rectifying, guncotton primer .. .. .	53
" vent .. .. .	67
Rings, base plug .. .. .	93
Ring gauges for projectiles .. .. .	92, 93
" " cartridges .. .. .	30
Rockets, war, 24-pr. .. .. .	168
" " 9-pr. .. .. .	169
" " machines .. .. .	169
" life saving, Boxer .. .. .	170
" " " stores, &c. . . . .	171
" signal, service, 1 lb. and $\frac{1}{4}$ lb. . . . .	172, 173
" " red, blue, or green .. .. .	173
" " red and white .. .. .	173
" " light .. .. .	173
" " sound .. .. .	174
" " light and sound .. .. .	175
" " machine .. .. .	175
Rods (driving primers, &c., from 6-pr. and 3-pr. cases) .. .. .	138
" filling shell .. .. .	144
R.L. cap .. .. .	76

## S.

Scrapers, shells .. .. .	144
Screws, preserving, eyebolt holes .. .. .	150
Scissors, laboratory .. .. .	151
" magazine .. .. .	151
Selvagees .. .. .	150
Shells, armour-piercing .. .. .	97, 98
" common .. .. .	90-95
" " pointed .. .. .	94
" " lyddite .. .. .	96
" double .. .. .	119
" shrapnel .. .. .	98-101

	Page
Shells, star.. .. .	101, 102
"  Palliser .. .. .	103
"  practico .. .. .	97
"  drill .. .. .	107-109
"  Q.F. drill .. .. .	129
"  marks on .. .. .	110
Shot, armour-piercing .. .. .	102, 103
"  case .. .. .	103-106
"  Palliser .. .. .	103
"  solid .. .. .	103
"  paper .. .. .	106, 107
"  proof .. .. .	106
Slings, lifting projectiles.. .. .	151
Slow-match .. .. .	177
Small arm ammunition ( <i>see</i> Cartridges).	
Stars, incendiary .. .. .	142
Straps, carrying projectiles .. .. .	130
Strips, augmenting .. .. .	89

## T.

Testing powder cases and cylinders .. .. .	35
Thimbles, magazine .. .. .	151
Tools, cartridge, Q.F. saluting .. .. .	137, 138
"  drivers, screw, primer .. .. .	137
"  rods, 12.7-inch .. .. .	137
<i>Tools reforming cartridges, Q.F. or Q.F.C.</i> .. .. .	135-138
"  "  drifts .. .. .	137
"  "  funnels, cartridge .. .. .	137
"  "  gauges .. .. .	137
"  "  hammers, 12-oz. .. .. .	142
"  "  holders .. .. .	138
"  "  machine extracting shell, 6-pr. and 3-pr. .. .. .	138
"  "  "  indenting .. .. .	138
"  "  mandrels .. .. .	138
"  "  plugs .. .. .	138
"  "  presses, hydraulic .. .. .	138
"  "  "  screw .. .. .	138
"  "  pumps, pressure .. .. .	138
"  "  rods, 17-inch .. .. .	138
"  "  sets .. .. .	138
"  opening cartridges, Q.F. .. .. .	137
"  extracting bullets, S.A. .. .. .	166, 167
Tubes, vent sealing, percussion .. .. .	55, 56
"  "  "  drill .. .. .	68
"  "  "  electric, P .. .. .	56, 57
"  "  "  drill .. .. .	64
"  "  "  wireless, P .. .. .	57, 58
"  "  "  "  drill .. .. .	65
"  "  "  "  T, double wired .. .. .	61
"  friction, T.. .. .	59, 60
"  "  drill .. .. .	66
"  "  T, for blank .. .. .	60, 61

## W.

Wads, fuze hole, G.S. .. .. .	151
War rockets .. .. .	168, 169
Waterproof bags for gunpowder barrels .. .. .	34

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

(Wt. 1345 4000 5 | 06—H & S 6139)

*MILITARY BOOKS, published by Authority—continued.*

- LAW. MILITARY. Manual of. 1899. Price 2s.**  
**MEDICAL SERVICES. ARMY. Regulations for. 1900. Price 3d.**  
**MEDICAL SERVICES. ARMY. Advisory Board for. Treatment of Venereal Diseases and Scabies. First Report. Price 1s. 6d. Second Report. 1905. Price 2s.**  
**MEDICAL CORPS. ARMY. Manual. 1904. Price 9d.**  
,, Extract from. Sec. II. Drills and Exercises. 1903. Price 3d.  
,, Regns. for Admission to. May, 1902. Price 1d.  
**MEDICAL CORPS AND QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE. Standing Orders. 1903. Price 1s.**  
**MEKOMETER. Handbook. 1904. Price 6d.**  
**POSITION-FINDER. Handbook. 1904. Price 3d.**  
**RANGE-FINDER. Depression. Land Service. 1904. Price 4d.**  
**RANGE-FINDING. Field. With Watkin's Field Range-finder and Telemeter. Handbook. 1903. Price 6d.**  
**BASHFORTH CHRONOGRAPH. Report on Experiments with. (1870.) Price 1s.**  
**RAILWAYS DURING THE WAR IN SOUTH AFRICA, 1899-1902. Price 4s.**  
**SADDLES AND COLLARS, SORE BACKS AND SORE SHOULDERS. A Manual of. By Veterinary Major Fred. Smith, Army Veterinary Department. Third Edition. 1897. Price 1s.**  
**SCOUTS Training and Use of. Price 2d.**  
**SEWAGE. Practical Treatment of. Price 6d.**  
**SIGNALLING REGULATIONS. 1904. Price 9d.**  
DO. Extract from. SEMAPHORE SIGNALLING. Price 1d.  
**SMALL ARMS. Text Book. 1904. Price 2s. 6d.**  
**TELEGRAPHS IN WAR. Regulations for Working. Price 1d.**  
**TELEGRAPHY. ARMY. Manual of Instruction in Field Telegraphs. Price 3s.**  
**TELESCOPIC SIGHTS. Land Service. Handbook. 1904. Price 4d.**  
**TRACTOR TRIALS AT ALDERSHOT. 1903. Report on. Price 6d.**  
**TRANSPORT MANUAL. (Field Service.) Part I. 1905. (Provisional.) Price 4d.**  
**ROYAL MILITARY ACADEMY. ADMISSION TO. Regns. respecting. 1904. Price 1d.**  
**ROYAL MILITARY COLLEGE. Ditto. Price 1d.**  
**ROYAL MILITARY COLLEGE: Syllabus of the Course of Instruction at. 1900. Price 3d.**  
**STAFF COLLEGE. Regulations respecting the. 1905. Price 2d.**  
**TERRITORIAL REGIMENTS OF THE BRITISH ARMY. Nos. 1 to 67. Short Histories of. Price 1d. each, or the whole bound in one volume, price 5s.**  
**VETERINARY DEPARTMENT. Admission to. Regns. 1905. Price 1d.**  
**MILITARY EXAMINATION PAPERS, viz.:-**  
ENTRANCE. Nov.-Dec. 1904. Price 1s.  
R.M. Academy (Fourth Class) and R.M. College (Fourth Division). Dec., 1904. Price 1s.  
Staff College. Admission August, 1904. Price 1s.  
Militia and Imperial Yeomanry. Competitive and Qualifying. March, 1905. Price 1s.  
Foreign Languages. Modern. Officers of the Army. Oct., 1903. Price 1s.  
Regular Forces, Militia, Yeomanry, and Volunteers. Nov., 1904. Price 1s.  
**SCHOOLS. ARMY:-**  
Regulations. 1903. Price 4d.  
Inspectors of, &c., &c. Standing Orders for. 1900. Price 4d.  
Singing in Regns. for Teaching. 1901. Price 1d.  
Technical Terms and Words of Frequent Occurrence in Army Orders, Lists of 1904. Price 2d.  
Type Exercises from Regimental Orders or use of Candidates for 3rd class certificates. Price 3d.  
**WAR ON LAND. The Laws and Customs of, as defined by the Hague Convention. 1904. Price 6d.**



# WORKS

PREPARED BY THE GENERAL STAFF

AT THE

WAR OFFICE.

## **AFRICA, BRITISH EAST PROTECTORATE, AND ZANZIBAR.**

Précis of Information concerning. 1900. Price 3s.

**CYPRUS.** Compiled by Captain A. B. Saville, 18th Foot. 1878.  
Price 2s. 6d.

**DUTCH ARMY (HOME AND COLONIAL).** Handbook of the.  
1896. Price 9d.

**FRANCO-GERMAN WAR, 1870-71.** Authorised Translation from  
the German Official Account by Major F. O. H. CLARKE, C.M.G., R.A.

**FIRST PART:—History of the War to the Downfall of the Empire.**

Vol. I.:—Sections 1 to 5. From the Outbreak of Hostilities to the Battle of  
Gravelotte. With case of Maps and Plans. Price 26s. (*Out of print.*)

Vol. II.:—Sections 6 to 9. From the Battle of Gravelotte to the Downfall  
of the Empire. With case of Maps and Plans. Price 22s. (*Out of print.*)

**SECOND PART:—History of the War against the Republic.**

Vol. I.:—Secs. 10 to 13. From the Investment of Paris to the re-occupation  
of Orleans by the Germans, with case of Maps and Plans. Price 26s.

Vol. II.:—Secs. 14 to 18. Events in Northern France from the end of  
November. In the North-west from the beginning of December. And  
the Siege of Paris from the commencement of December to the Armistice,  
the Operations in the South-east from the Middle of November to the  
Middle of January. (1883.) Price 26s.

Vol. III.:—Secs. 19 and 20. Events in South-east France from the Middle  
of January to the Termination of Hostilities. Rearward Communications.  
The Armistice. Homeward March and Occupation. Retrospect. 1884.  
Price 31s. 6d.

Analytical Index. By Colonel LONSDALE HALE. Price 1s. 6d.

*Also separately, in paper covers:—*

### Section

1. The Events in July. Price 3s.
2. Events to the Eve of the Battles of Worth and Spicheren. Price 3s.
3. The Battles of Wörth and Spicheren. 1882. Price 5s.
4. Advance of the Third Army to the Moselle, &c. Second edition, revised  
and corrected. With 1 Plan and 7 Sketches. Price 4s.
5. Operations near Metz on 15th, 16th, and 17th August. Battle of Vionville  
Mars-la-tour. Price 6s. 6d.
6. The Battle of Gravelotte—St. Privat. 5s. (*Out of print.*)
7. Advance against the Army of Chalons. Price 6s.
8. The Battle of Sedan. Price 3s. (*Out of print.*)
9. Proceedings on German Coast and before Fortresses in Alsace and  
Lorraine. General Review of War up to commencement of September.  
Price 4s. 6d.
10. Investment of Paris. Capture of Toul and Strasburg. Price 6s.
11. Events before Paris and at other Points. Price 5s. 3d.
12. Last Engagements with French Army of Rhine. 1878. Price 4s. 6d.
13. Occurrences on the Theatre of War in Central France up to the re-occupa-  
tion of Orleans by the Germans. (1880.) Price 6s.
14. Measures for the Investment of Paris. Price 4s.

*WORKS prepared by the General Staff—continued.*

**Franco-German War, 1870-71—continued.**

**Section**

15. Measures for protecting Investment of Paris. (1880.) Price 2s. 6d.
  16. Proceedings of the Second Army. Price 3s. 6d.
  17. Proceedings of the First Army. Price 3s.
  18. Occurrences on the South-Eastern Theatre of War up to the Middle of January, 1881. Price 8s.
  19. Occurrences on the South-east Theatre of War. Price 13s. 6d.
  20. General Retrospect of the War. The Results of the War. Price 5s.
- FRENCH ARMY. Handbook.** 1901. Price 1s.
- GERMAN ARMY. Field Service Regulations.** 1900. Price 6d.
- GERMAN ARMY (HOME AND COLONIAL). Handbook.** Second Edition. Price 1s. 6d.
- GERMAN FIELD ARTILLERY. Drill Regns.** By Major J. H. V. CROWE, R.A., Staff Captain. Price 1s. 6d.
- GERMANY: Campaign of 1866 in.** Compiled by the Department of Military History of the Prussian Staff. Price £1 1s.
- HOSTILITIES WITHOUT DECLARATION OF WAR.** By Bt. Lieut.-Col. J. F. MAURICE, R.M. 1883. Price 2s.
- NILE AND COUNTRY BETWEEN DONGOLA, SUAKIN, KASSALA, AND OMDURMAN.** Report on the. 1898. Price 4s. 6d.
- RECONNAISSANCE IN LITTLE-KNOWN COUNTRIES. Hints on.** By Captain C. E. CALLWELL, R.A., Staff Captain. Price 1d.
- RHODESIA, SOUTHERN. Précis of Information concerning.** By Major C. T. DAWKINS, C.M.G. Jan., 1899. Price 2s.
- STAFF DUTIES IN THE FIELD.** 1891. Price 3s.
- SUDAN ALMANAC.** 1905. Price 1s.
- SUDAN CAMPAIGN. History of.** In Two Parts, with Case of Maps. By Colonel H. E. COLVILLE, C.B., Gren. Guards. 1890. Price 15s.
- SUDAN. Handbook of the.** Part I. Geographical. Part II. Historical. By Captain Count GLEICHEN, Grenadier Guards, D.A.A.G. 1898. Price 2s.
- DITTO. SUPPLEMENT.** July, 1899. Price 2s. 6d.
- SUDAN, RED SEA, AND EQUATOR. REPORT ON THE EGYPTIAN PROVINCES OF THE.** July, 1884. Price 3s. 6d.
- SURVEYS (GOVERNMENT) OF THE PRINCIPAL COUNTRIES. NOTES ON.** 1882. Price 6s.
- DITTO. SUPPLEMENT TO.** A Guide to Recent Large Scale Maps, including both Surveys and Compilations, together with a List of Some Large Sheet Atlases. By A. KNOX, M.A. Price 5s. 6d.
- SWEDEN AND NORWAY. Handbook.** 1901. Price 1s. 6d.
- SWISS ARMY. Handbook.** 1898. Price 6d.
- TACTICS, MODERN. Précis of.** Originally Compiled by Colonel R. HOME, C.B., R.E., and revised and re-written by Lt.-Colonel Sisson Pratt. 1892. Price 4s. 6d.
- UGANDA PROTECTORATE. Précis of Information concerning.** 1902. Price 5s. 6d.
- VALPARAISO. THE CAPTURE OF IN 1891.** Report on. Price 1s.
- WAR GAME. On a Map. Conduct of. Rules for the.** 1899. Price 3d.
- WAR ON LAND. LAWS AND CUSTOMS OF.** Price 6d.
- ZULULAND. Précis of Information concerning. With Map.** 1894. Price 4s.



