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REGULATIONS FOR ARMY ORDNANCE SERVICES

Volume 4—Ammunition

Pamphlet 10

PRIMERS, IGNITERS AND TUBES

Part 3—Tubes

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PART 3—TUBES

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PART 3—TUBES

SECTION 1—INTRODUCTION

General

1. Tubes are employed in certain gun and howitzer equipments to ignite separate loading bagged propelling charges.
2. The function of the tube is to produce a flash which is regular and of sufficient strength to pass through the vent axial to ensure complete ignition of the cartridge igniter. As the distance between the rear end of the cartridge and the front end of the vent varies with the type of equipment and the charge in use, the strength of the flash must be sufficient to travel along the maximum distance that may be encountered.
3. There are two types of tubes, percussion and electric. The percussion tube is simpler and stronger in construction than the electric tube. The latter, however, is safer than the percussion tube, greater rapidity of fire can be obtained and it can be tested before use.
4. Tubes of the following nomenclatures may be found in current use:—
 - (a) Tube, Percussion, S.A. Cartridge.
 - (b) Tube, Vent, Percussion, .4-in.
 - (c) Tube, Vent, Electric, .4-in.
 - (d) Tube, Vent, Electric, .625-in.

The latest mark or model of the tubes is described in the ensuing sections and the characteristics of all marks or models are given in Tables 1A *et seq.*

Method of gas sealing

5. All tubes are of the vent sealing type i.e. they are designed to seal the escape of gas rearwards through the vent in which they are fired. Such escape, if permitted, causes erosion of the vent.
6. External gas escape is prevented as follows:—
 - (a) The tapered body of the tube is a close but sliding fit in the vent. On firing, the thin wall of the tube expands against the wall of the vent and so prevents the escape of gas between the tube and the chamber.
 - (b) The head of the tube is supported during firing by the striker lock, which prevents any movement of the tube to the rear.
7. Internal gas escape through the tube is prevented by the following methods:—
 - (a) *Tube, Percussion, S.A. Cartridge.* By a small copper ball which is driven back into a cone seating.
 - (b) *Tube, Vent, Percussion.* By a cap holder and striker assembly which are forced back on to their seatings.
 - (c) *Tube, Vent, Electric, .4-in.* By a copper bridge plug, which is forced back on its seating, assisted by the expansion of a gascheck formed by a splayed lip on the forward end of the bridge plug.
 - (d) *Tube, Vent, Electric, .625-in.* By a pole unit with its moulded sleeve being forced back on to the tapered portion of the cap chamber in the tube body.

Identification

8. Tubes, Vent, Percussion, .4-in. have four equi-spaced notches cut in the periphery of the flange so that they may be readily distinguished from .4-in. electric tubes.

Packages

9. Details of packages are given in Table 2.

Ammunition and package markings

10. See Joint Services Ammunition and Ammunition Package Markings Handbook (W.O. Code No. 1803) and R.A.O.S. Volume 4—Ammunition, Pamphlet 1, Part 8 (W.O. Code No. 11990).

Limitations and restrictions

11. Reference must be made to R.A.O.S. Volume 4—Ammunition, Pamphlet 26 (W.O. Code No. 11987) for details of limitations and restrictions which may be imposed on the issue or use of tubes.

12-15. Reserved.

SECTION 2—TUBE, PERCUSSION, S.A. CARTRIDGE

Tube, Percussion, S.A. Cartridge, Mk. 5
(Pt. No. QA7599)

16. The tube is illustrated in Plate 1 and details are given in Table 1A.

17. Empty design. The empty tube comprises a .303-in. cartridge case, gas seal and closing disc.

18. The case, which is manufactured from brass, is tapered towards the forward end and slightly bell mouthed. The rear end is formed externally with a flange to prevent the tube being pushed too far into the vent and also to facilitate extraction. A cap chamber is formed in the base of the case leaving a diaphragm through which two holes are drilled to form fire holes. The rear surface of the diaphragm is shaped with a projection to act as an anvil.

19. The gas seal consists of a body, plug and ball.

(a) The body is of metal and is shaped externally to fit in the bottom of the magazine recess of the case. It is recessed internally, the top portion of the recess forming a chamber to contain a priming charge and the lower portion being screwthreaded to take the plug. Below the recess for the plug the body is bored with a coned channel to receive a soft copper ball.

(b) The plug is of metal and is screwthreaded externally to suit the thread in the body, three fire holes being bored through from front to rear. The base of the plug is formed with a recess.

(c) The ball is seated in the coned recess in the body and retained in the body by the plug being screwed into the body.

After assembly of the gas seal a fine white paper disc is secured over the top surface of the plug.

20. Filled design. A percussion cap, filled with 0.5 to 0.7 gr. of detonating composition, is pressed into the cap chamber of the case and secured by ringing. The chamber of the gas seal body is filled with about 5 gr. of Gunpowder, G.20. A perforated gunpowder pellet with a paper disc secured to its base is inserted on top of the gas seal followed by the main filling of about 20 gr. of gunpowder pellets (or alternatively Gunpowder, G.7) with the interstices being filled with about 3 gr. of Gunpowder, G.20. After filling, the tube is closed with a disc of cork or cork substitute, the disc being secured in the case by approved adhesive and, after insertion, the exposed face of the disc is waterproofed with approved varnish.

21. Action. On firing, the cap in the base of the tube is struck by the point of the firing pin causing the cap composition to be nipped between the anvil and interior base of the cap. The resultant flash passes through the holes in the diaphragm of the case and gas seal to ignite the gunpowder filling which, in turn, blows out the closing plug and ignites the propelling charge. The gases formed by the gunpowder drives the copper ball into its seating in the gas seal and expands the front portion of the gas seal body to prevent any escape of gas past the gas seal. At the same time, the walls of the tube are expanded radially thus forming a gas seal between the tube and tube vent.

Tube, Percussion, S.A. Cartridge, Drill, Mk. 1
(Pt. No. QB7599)

22. The tube consists of a .303-in. cartridge case with the anvil removed from the cap chamber and the body filled with a wooden plug which is secured by the neck of the case being indented into it in three places. Three equi-spaced longitudinal flutes are formed on the outer surface of the case and filled with red paint. The outer surface of early production drill tubes was lacquered black.

23-26. Reserved.

SECTION 3—TUBE, VENT, PERCUSSION, 4-in.

Tube, Vent, Percussion, 4-in., Mk. 11

27. The tube is illustrated in Plate 2 and details are given in Table 1B.

28. Empty design. The empty tube comprises a body, cap holder, striker holder, sleeve, striker, shearing wire and closing plug.

29. The body, which is manufactured from solid drawn brass, tapers slightly towards the forward end and is manufactured to fit the vent with great accuracy. The rear end is flanged to prevent the tube being pushed too far into the vent, the front of the flange being bevelled to facilitate extraction. The rear end is bored and screwthreaded to take the cap and striker holders; the centre of the body is left solid and shaped to form an anvil and has two fire holes drilled through it. A paper disc is placed over the fire holes in the bottom of the magazine.

30. The cap holder is of manganese bronze and is a small screwed plug having a central hole through it for the striker to pass through. The front end of the plug is recessed to form a chamber to receive a percussion cap.

31. The striker holder is of metal and is threaded to screw into the head of the tube and bored to receive the striker. A shoulder is formed inside it which bears against a corresponding flange on the striker and a hole is bored diametrically to receive the shearing wire. At the rear end a recess is formed to take the sleeve and to accommodate the shoulder on the latter when forced in on firing. Two slots are cut in the rear face to facilitate insertion into the body. It is prevented from unscrewing by stabbing.

32. The sleeve is of metal and is cylindrical and prepared to receive the rear end of the striker. It allows for eccentricity of the firing pin of the breech mechanism, as a blow on either the striker or striker sleeve will function the tube.

33. The striker is of metal and is cylindrical. Its front end enters the cap holder and its rear end projects into the sleeve, which is secured by riveting over the end of the striker, the latter being faced flush with the sleeve and striker holder. A flange formed on the striker limits its movement by engaging a recess formed by the shoulder on the striker holder and the rear face of the cap holder. The flange, which is bored diametrically to receive the shearing wire, also bears against the front end of the sleeve.

34. The shearing wire is of brass and secures the striker in the striker holder until struck by the firing pin. It passes through the flange of the striker and walls of the holder.

35. Filled design. A percussion cap, with a filling of detonating composition, is fitted in the cap holder which is screwed into the base of the tube, followed by the insertion of the striker assembly. The magazine of the tube is filled with about 20 gr. of small gunpowder pellets (or alternatively Gunpowder, G.7). After filling, the mouth of the tube is closed with a cork or cork substitute plug which has a paper disc attached to each side. The plug is retained by the mouth of the case being burred over.

36. Action. On firing, the striker is forced inward by the firing pin of the breech mechanism, shears the wire, and fires the cap. The flash from the cap passes through the two fire holes in the diaphragm to ignite the main filling which blows out the cork plug and ignites the propelling charge. The gases formed by the gunpowder expand the walls of the tube radially to form a gas seal between the tube and vent. Any escape of gas through the flanged head of the tube is prevented by the setting back of the striker.

37-40. Reserved.

SECTION 4—TUBE, VENT, ELECTRIC, #4-in.

Tube, Vent, Electric, #4-in., Mk. 12

41. The tube is illustrated in Plate 3 and details are given in Table 1C.
42. **Empty design.** The empty tube consists of a body with ebonite cup, bridge plug (with pole, bridge and insulated wire), washer, contact piece and closing plug.
43. The body is of solid drawn brass and tapers slightly towards the forward end and is manufactured to fit the vent with great accuracy. The head is flanged to prevent it being pushed too far into the vent, and the front of the flange is bevelled to facilitate extraction. The interior is bored and shaped from the front to take a bridge plug and to form a magazine. A small central channel is bored through the rear part of the body leading into a recess in the head. The recess is screw-threaded and fitted with an ebonite cup, having an undercut recess. The forward end of the channel is bell-mouthed to form a seating for the conical portion of the bridge plug.
44. The bridge plug is of copper and is shaped to fit in the body and has a splayed lip to act as a gascheck. Through the centre of the plug is passed a copper wire which is tinned, enamelled and covered with a double layer of silk, the plug being pressed on to it. The plug is inserted through the mouth of the tube and pressed into the body. The end of the copper wire projects slightly to the front of the plug and is bared of its insulation to enable one end of an iridio-platinum wire bridge to be soldered to it. The other end of the bridge is soldered to a tinned copper pole attached to the copper plug. The bridge has a resistance of 0.9 to 1.1 ohm. The rear end of the insulated wire is passed through the central channel in the body through a small copper washer in a recess in the ebonite cup and is bared of its insulation and coiled down in the recess.
45. The contact piece is of tin and antimony and is pressed into the recess in the ebonite cup to form a contact with the copper wire. It fits slightly below the rear face of the tube, and the inner edge of the ebonite cup is bevelled off all round.
46. **Filled design.** About 2 gr. of guncotton dust is packed around the bridge as a priming composition above which is a perforated gunpowder pellet with a paper disc coated with approved composition attached to the base, the edges being turned up around the side. The remainder of the magazine is filled with about 10.5 gr. of gunpowder pellets (or alternatively Gunpowder, G.7) with the interstices filled with about 4 gr. of Gunpowder, G.20. After filling, the mouth of the tube is closed by a cork or cork substitute plug which has a paper disc attached to each side of it. The plug is retained by the mouth of the tube being burred over.
47. **Action.** On firing, an electric current causes the iridio-platinum bridge to become incandescent. This fires the guncotton dust which, in turn, ignites the gunpowder filling, blowing out the closing plug and igniting the propelling charge. The gases formed by the gunpowder expand the walls of the tube radially to form a gas seal between the tube and vent. Any escape of gas through the flanged head of the tube is prevented by the copper bridge plug setting back into the coned seating in the body. The gascheck portion of the bridge plug also expands and assists in the sealing action.

48-50. Reserved.

SECTION 5—TUBE, VENT, ELECTRIC, .625-in.

**Tube, Vent, Electric, .625-in., L1A3
(Pt. No. QX388GF)**

51. The tube is illustrated in Plate 4 and details of the tube and earlier models are given in Table 1D.
52. **Empty design.** The empty tube comprises a body and insulated pole piece assembly.
53. The body, which is manufactured from solid drawn brass, tapers slightly towards the forward end which is coned and necked. The rear end is machined to form a flange at the base to facilitate extraction. Internally, the body is bored and shaped to provide a chamber for the propellant filling and a housing to take the insulated pole piece assembly and a quantity of cap conducting composition.
54. The insulated pole piece assembly comprises a funnel shaped brass unit with a nylon insulator moulded to it, a short length of tinned copper wire, a nylon insulating sleeve, a tin/antimony contact plug and a rubber ebonite insulating plug. The wire is secured to the base of the spigot on the brass unit and passes through the sleeve into the contact plug which has a copper washer fitted to it. The contact plug is held in the insulating plug which is screwed into the base of the body.
55. **Filled design.** The cap conducting composition is pressed in two pressings on top of the brass unit of the pole piece and retained by a celluloid cup. The body is filled with the propellant charge and the mouth closed by a celluloid cup, the periphery of the cup being coated with approved composition to seal it in position.
56. **Action.** On firing, the electric current flows through the contact plug and pole unit to the cap conducting composition, the graphite filling of which acts as a conductor, and then back through the body to complete the circuit. When the potential difference across the conducting composition is about 15 volts, heating occurs and ignites the composition which, in turn, ignites the propellant charge and the igniter fitted to the cartridge. The gases formed by the propellant expand the walls of the tube radially to form a gas seal between the tube and vent. Any escape of gas through the tube is prevented by the pole unit being forced back on to the tapered portion of the pole unit housing.

TABLE IA--CHARACTERISTICS OF MARKS; TUBES, PERCUSSION, S.A. CARTRIDGE

Item	Filled			Filling				Associated equipments	Remarks
	Mark	Design No.	Part No.	Cap		Main			
				Nature	Approx. weight (grains)	Nature	Approx. weight (grains)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
1	5	D.D.(L)10849	QA7599	Cap composition	0.6	Gunpowder, G.20	5	5.5-in. Gun	(1) Tubes, Mks. 1, 2, 3, 3A, 4 and 4A are obsolete.
						Pellet, Gunpowder, Perforated	—	7.2-in. How.	
						Pellets, Gunpowder, Solid	20	155-mm. How.	
						Gunpowder, G.7.	3		
						Gunpowder, G.20 in the interstices			

TABLE 1B—CHARACTERISTICS OF MARKS; TUBES, VENT, PERCUSSION, 4-in.

Item	Filled		Filling				Associated equipments	Remarks
	Mark	Design No.	Cap		Main			
			Nature	Approx. weight (grains)	Nature	Approx. weight (grains)		
(a)	(b)	(c)	(e)	(f)	(g)	(h)	(i)	(j)
1	II	D.D.(L)621(1)	Detonating composition	—	Pellets, Gunpowder Solid or Gunpowder, G.7	20	9.2-in. Gun	(i) Tubes, Vent, Percussion, 4-in., Mks. 1 to 8 are obsolete. (ii) Tubes, Mks. 5, 9 and 10 are Naval Design.

TABLE 1C—CHARACTERISTICS OF MARKS; TUBES, VENT, ELECTRIC, 4-in.

Item	Filled		Filling		Associated equipments	Remarks	
	Mark	Design No.	Part No.	Nature			Approx. weight (grains)
(a) 1	(b) 12	(c) D.D.(L)7616	(d) QA2268	(e) Guncotton Dust Pellet, Gun-powder, Perforated Pellets, Gun-powder, Solid Gunpowder, G.20 in the interstices	(f) 2 — 10-5 4	(g) 9.2-in. Gun	(h) (i) Tubes, Vent, Electric, 4-in., Mks. 1 to 6, 6C, 6R, 7, 7R, 10 and 10** are obsolete. (ii) Tubes, Mks. 8, 8C, 9, 9C, 10C and 11 are Naval design.

TABLE 10—CHARACTERISTICS OF MODELS; TUBES, VENT, ELECTRIC, .25-in.

Item	Filled			Filling				Associated equipments	Remarks
	Model No.	Design No.	Part No.	Conducting cap		Magazine			
				Nature	Approx. weight (grains)	Nature	Approx. weight (grains)		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
1	L1A1	S1/13467/GF/1391	QX340GF	Composition, R.D.1303/Graphite (92/8 parts by weight) Composition, R.D.1652	1.5	Propellant, NRN 110	99	120-mm. Tk. Gun, L1A1	(i) Not introduced into Land Service.
2	L1A2	P8(c)3254/GF/235	QX366GF	Composition, R.D.1303/Graphite (92/8 parts by weight) Composition, R.D.1652	1.5	Propellant, NRN 141AH	99	120-mm. Tk. Gun, L1A1	(i) Differs from L1A1 in nature of propellant used. (ii) Obsolete.
3	L1A3	P8(c)4614/GF/235	QX388GF	Composition, R.D.1303/Graphite (95.5/4.5 parts by weight) Composition, R.D.1652	1.5	Propellant, NRN 141AH	99	120-mm. Tk. Gun, L1A1	(i) Differs from L1A2 in filling of conducting cap.

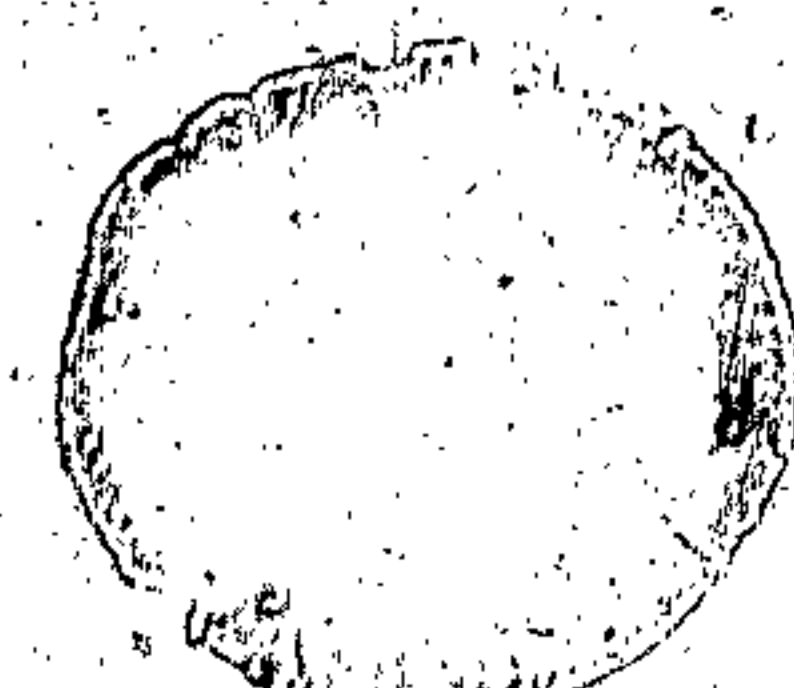
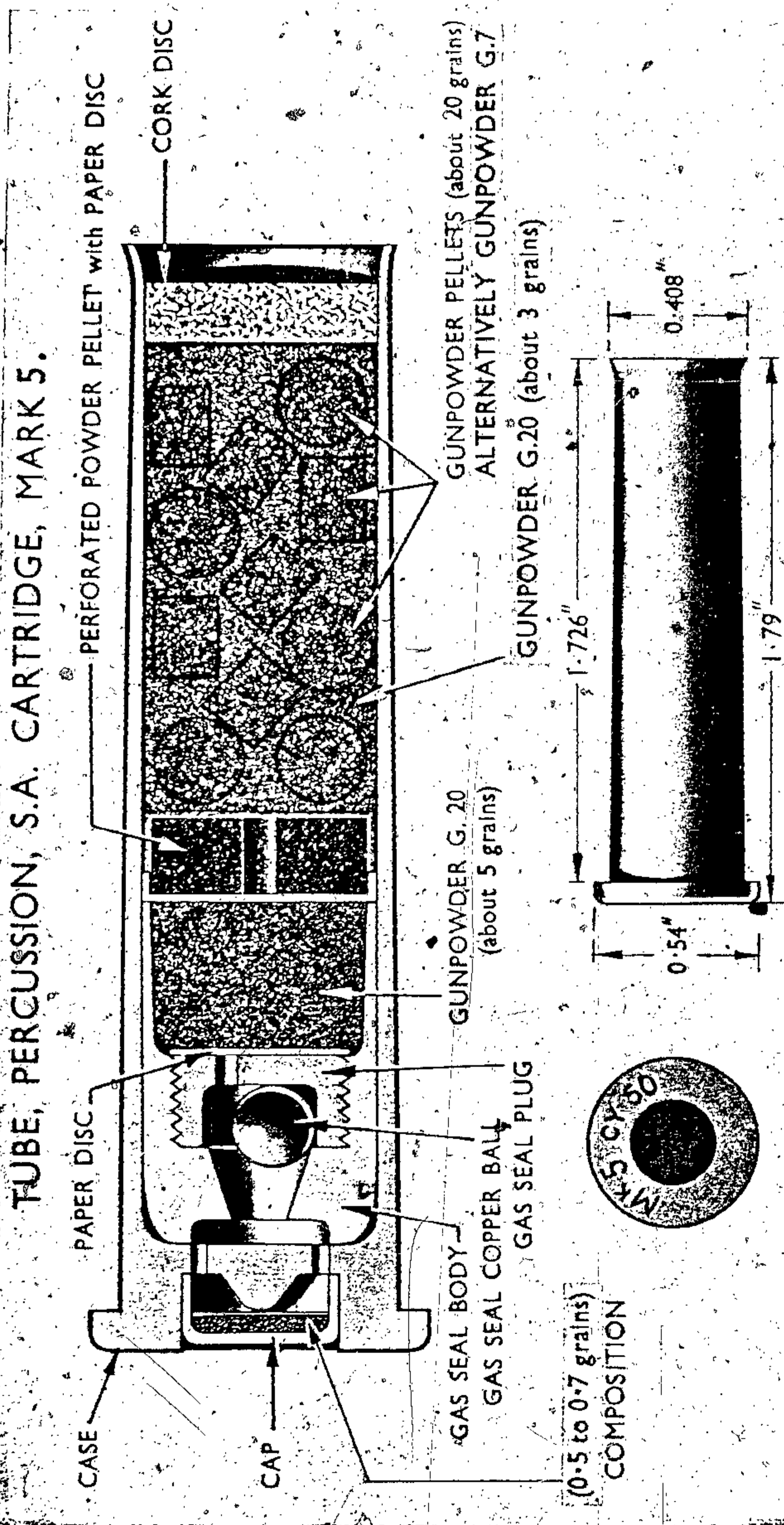


TABLE 2—PACKING DETAILS

Item	Package, ammunition		Details of outlet package	Details of inner packing	Nature packed	Quantity per package	Remarks
	No.	Mk.					
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
1	—	—	Box, M.92, Mk. 1 (steel)	30 Boxes, Tube, Percussion, S.A. cartridge Mk. 1 or Mk. 2, tinplate, each containing 20 tubes, and packing fitments	Tubes, Percussion, S.A. cartridge, Mk. 5	600	(i) Vocab. Section and Part Nos.:— (a) Box, M.92, Mk. 1—T2/SV112A (b) Box, Tube, Perc., S.A. cartridge:— Mk. 1—Q2/QB0580 (obsolescent) Mk. 2—Q2/QB0584
2	—	—	Case, T.3, Mk. 1 (wood)	10 Boxes, No. 380, Mk. 1, tinplate, each containing 20 tubes	Tubes, Percussion, S.A. cartridge, Mk. 5	200	(i) Vocab. Section and Part Nos.:— (a) Case, T.3, Mk. 1—Q2/QB0830 (b) Box, No. 380, Mk. 1—Q2/QB4695
3	—	—	Box, T.9, Mk. 1 (wood)	20 Boxes, No. 379, Mk. 1, tinplate, each containing 10 tubes	Tubes, Vent, Percussion, 4-in. Mk. 11 or Tubes, Vent, Electric, 4-in. Mk. 12	200	(i) Vocab. Section and Part Nos.:— (a) Box, T.9, Mk. 1—Q2/QB0602 (b) Box, No. 379, Mk. 1—Q2/QB4694
4	25	1	Box, W.138, Mk. 1 (wood)	20 Boxes, No. 379, Mk. 1/1, tinplate, each containing 10 tubes, and packing fitments	Tubes, Vent, Percussion, 4-in. Mk. 11 or Tubes, Vent, Electric, 4-in. Mk. 12	200	(i) Vocab. Section and Part Nos.:— (a) P.A., No. 25, Mk. 1—Q2/SV33GA (b) Box, W.138, Mk. 1—Q2/SV34A (c) Box, No. 379, Mk. 1/1—Q2/SV35A
5	49	11	Box, H.50, Mk. 1 (steel)	12 Cylinders, No. 730, Mk. 1, tinplate, each containing 10 tubes, and packing fitments	Tubes, Vent, Electric, 625-in., L1	120	(i) Vocab. Section and Part Nos.:— (a) P.A., No. 49, Mk. 11—Q2/SV344GA (b) Box, H.50, Mk. 1—Q2/8140-99-960-1578 (c) Cylinder, No. 730, Mk. 1—Q2/SV384A
6	49	17	Box, H.50, Mk. 1 (steel)	12 Cylinders, No. 730, Mk. 1, tinplate, each containing 10 tubes, and packing fitments	Tubes, Vent, Electric, 625-in., L1	120	(i) P. A., No. 49, Mk. 17 differs from item 5 in design of packing fitments. (ii) Vocab. Section and Part Nos.:— (a) P.A., No. 49, Mk. 17—Q2/SV417GA (b) Box, H.50, Mk. 1—Q2/8140-99-960-1578 (c) Cylinder, No. 730, Mk. 1—Q2/SV384A

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PLATE 1



Pam. 10, Part 3.

PLATE 2

TUBE, VENT, PERCUSSION, .4 INCH MARK II.

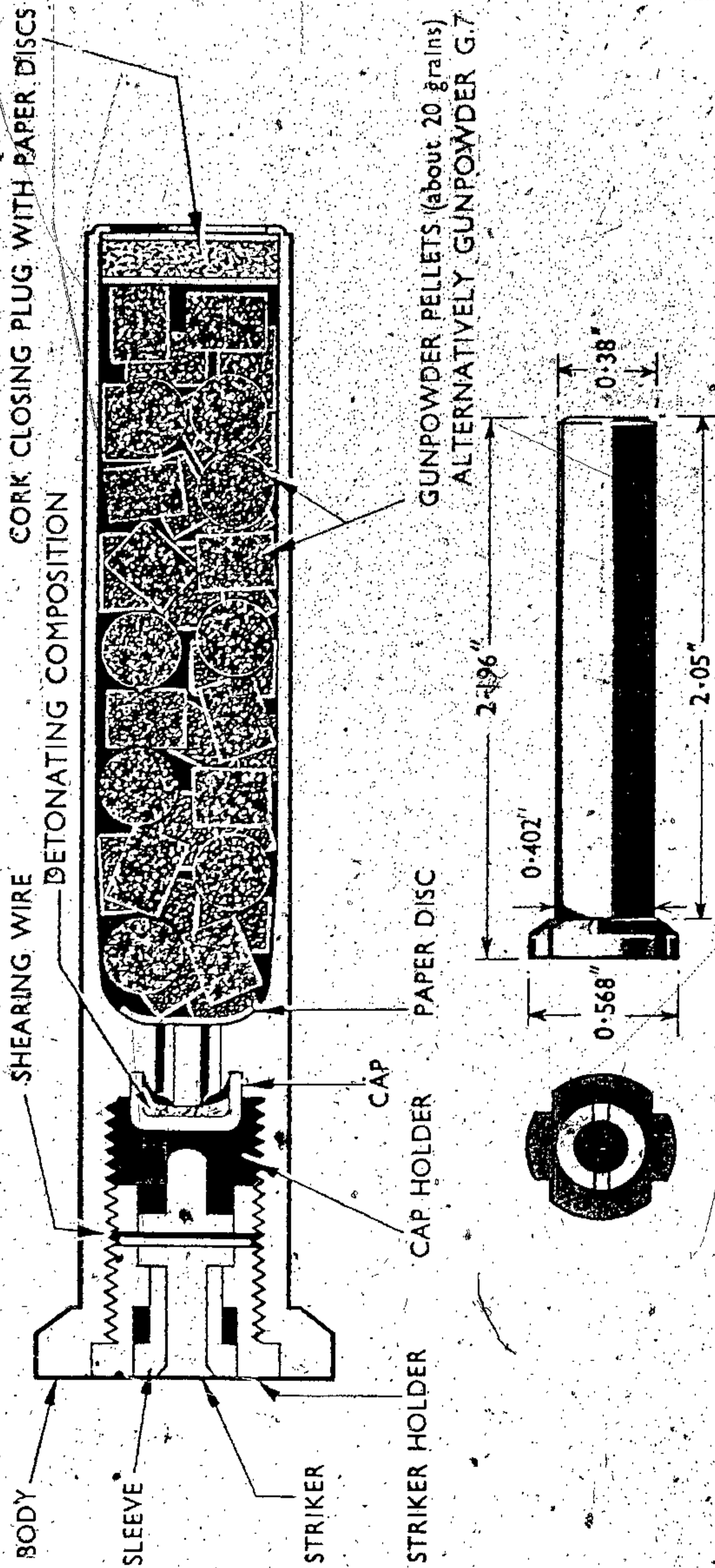
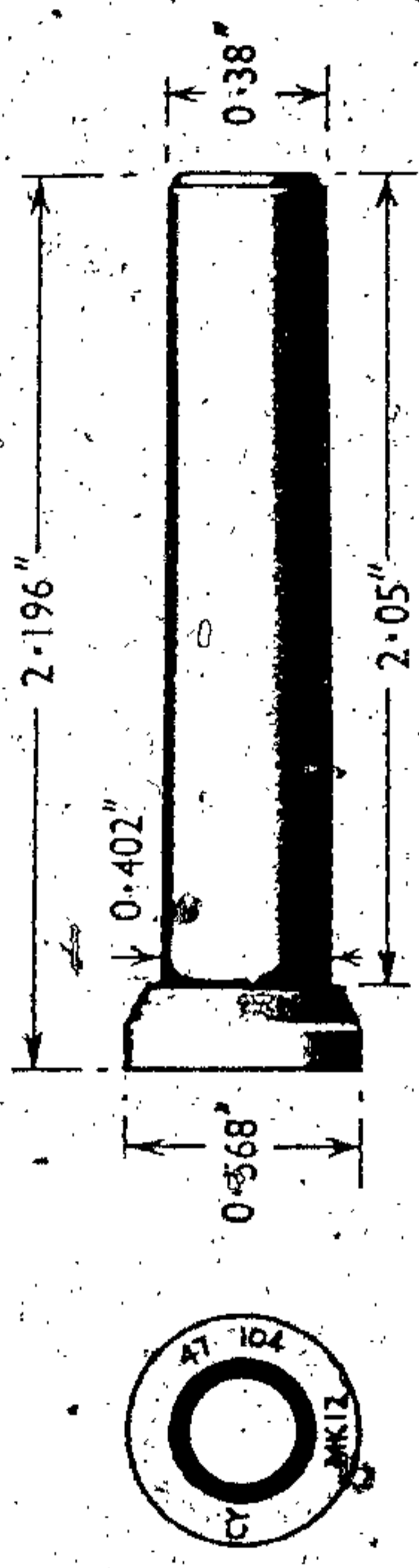
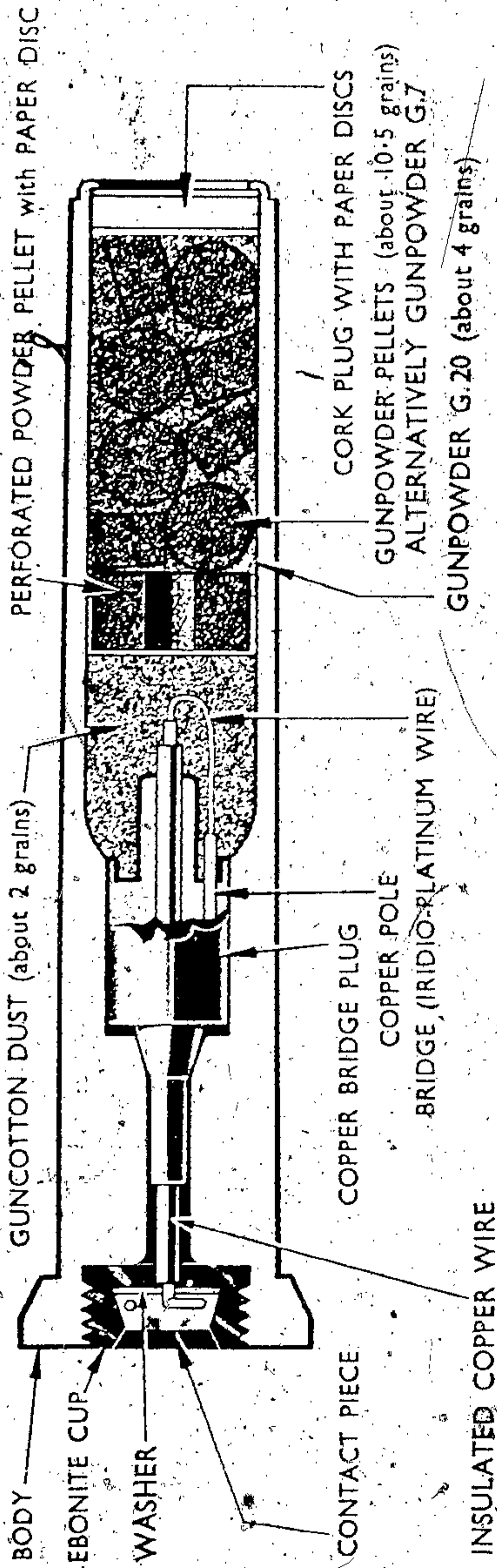
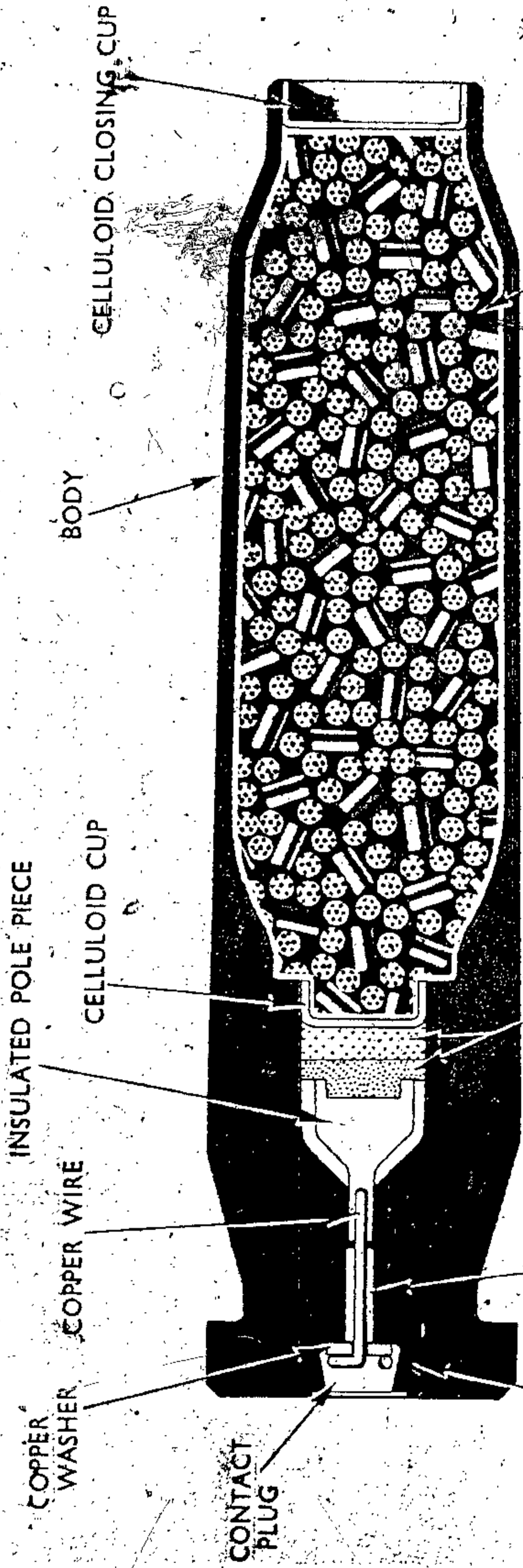


PLATE 3

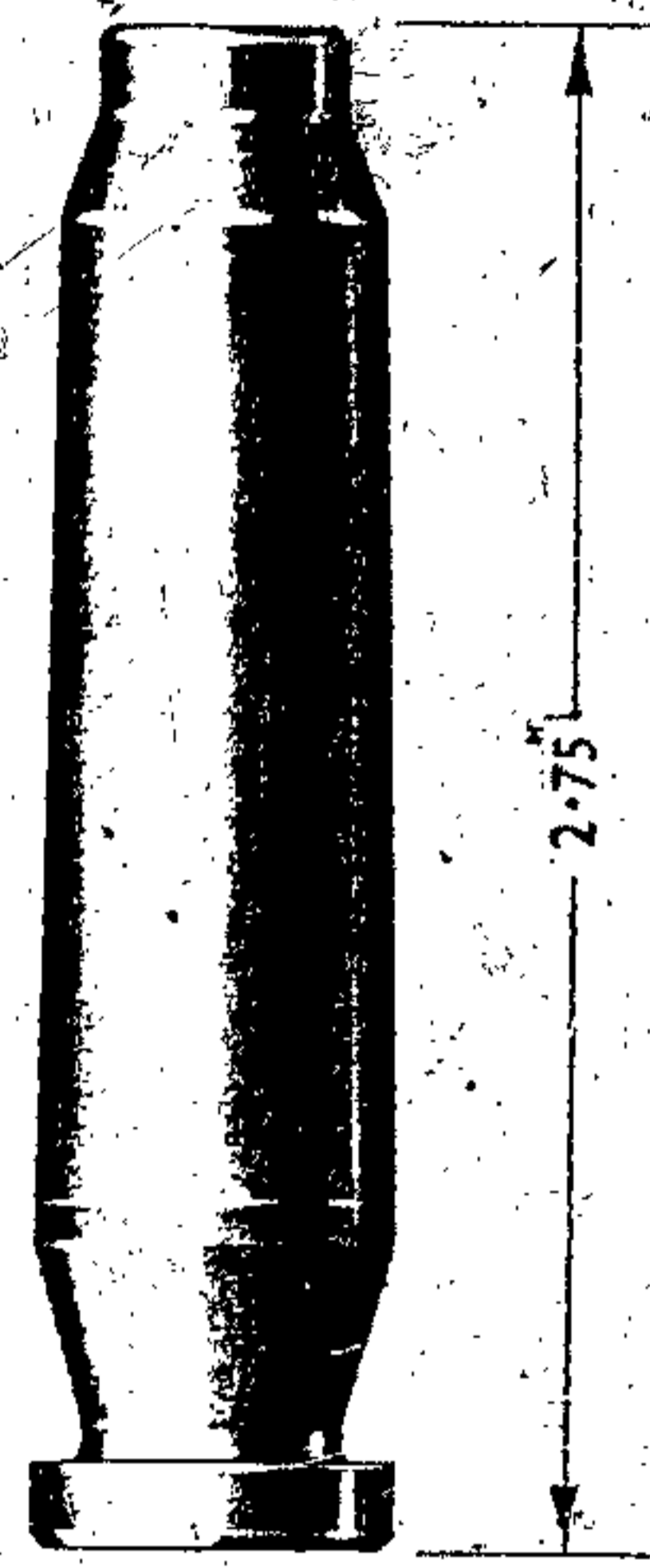
TUBE, VENT, ELECTRIC, .4 INCH, MARK 12.



TUBE, VENT, ELECTRIC, .625 INCH, LIA 3



CONDUCTING COMPOSITION
 1st. PRESSING - COMP. RD 1303 (95.5 PARTS) PROPELLANT NRN 141 AH
 SYNTHETIC GRAPHITE (4.5 PARTS) (1.5 GRAINS) (99 GRAINS)
 2nd. PRESSING - COMP. RD 1652 (1.5 GRAINS)



BASE STAMPINGS