AD NUMBER
AD321596
CLASSIFICATION CHANGES
TO: **unclassified**
FROM: **restricted**
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited.**
FROM: **Controlling Organization: British Embassy, 3100 Massachusetts Avenue, NW, Washington, DC 20008.**
AUTHORITY
DSTL, DEFE 15/1935, 11 Dec 2008; DSTL, DEFE 15/1935, 11 Dec 2008

THE WAR OFFICE

ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT

MATERIALS EXPLOSIVES DIVISION

A.R.D.E. MEMORANDUM (MX) 71/60

The development of a range of non-lethal anti-riot we

C. J. Smith

CONFIDENTIAL

Fort Halstead.
Kent

November
1960

RESTRICTED

This Document was graded
RESTRICTED
at the 136th meeting of the A.R.D.E.
Security Classification Committee.

A.R.D.E.
Printing Section

The War Office

(ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT. G.B.)

A.R.D.E. MEMORANDUM (MX)71/60

AD-321596

The development of a range of non-lethal anti-riot weapons

C. J. Smith (X4)

(Nov. 1960).

Summary

The weapon described was developed to meet an urgent requirement for an aid to Military and Police Authorities when dealing with civil riots. It takes the form of a cartridge which is fired from a pistol and is produced in two calibres. The projectile contains a liquid filling of a staining or lachrymatory nature, which is dispersed on the rioters. It is designed to be used at ranges in excess of stone-throwing distances. The report includes the history of development, details of manufacture and performance.

Approved for issue:

L. Northcott, Principal Superintendent 'MX' Division

CONTENTS

IMPORTANT

This document should be returned to the Reports Officer, Armament Research and Development Establishment, Fort Halstead, Sevenoaks, Kent, when no longer required

INITIAL DISTRIBUTION

Internal

No.		
	1	Director
	2	Deputy Director
	3	PS/MX
	4	PS/B
	5	PS/P
	6	Dr. W. M. Evans
	7	SMO
	8	S/X4
	9-12	X4 (Att. Mr. C. R. Allen, Mr. S. C. Bridges, Mr. J. C. Cackett, Mr. C. J. Smith)
	13	X4 Library

External UK

14	Chief Scientist WO
15	Dep. Chief Scientist (A)
16	DG of A/Admin
17	D of A (R&D)
18	D of A (A3)
19	D/XCP
20	D/CDEE
21	DOF(F)
22	DOF(X)
23	DI Arm.
24	War Office, ME7
25	War Office, DWD
26	WO Agency Factory, Randle (Att. Mr. Toler)
27-28	TIL - for retention

Overseas (through TIL)

29	Defence Research Staff (Att. Director of Munitions)
30	Counsellor Defence Research & Supply, Ottawa, (Att. Mr.C.J.Francis)
31-35	Canada - Dept. Nat. Def.
36	- Nat. Res. Council
37-40	- Def. Res. Liaison
41	- CALE
42-46	Australia - Sen. Rep.
47	- RAAF Overseas Hq., London.
48	- SRLO
49-66	USA - Joint Reading Panel
67	- Assist. Sec. of Def. for Res. & Dev.
68-69	- ONR London

Stock

70-79

RESTRICTED

1. HISTORICAL

Towards the end of 1955, it was decided that A.R.D.E. should attempt to develop a weapon or weapons, to aid the Military and Police authorities when dealing with Civil commotions. The Military requirements were of such urgency that any system chosen had to be based on an existing Service store.

Having selected the principle of a stain or lachrymatory filling distributed by means of a frangible cartridge, a survey was made of Service weapons which might be used, and it was decided to develop cartridges which could be fired from standard Service pistols, the Signal 1" No. 1, Mk. 5, and the Signal 1½" No. 4, Mk. 1.

2. FUNCTIONING AND PERFORMANCE

2.1 Principle of Functioning

The essential feature is the liquid filled plastic capsule, which fits into the standard cartridge case, and is discharged from it by a propellant charge which also ignites a pyrotechnic delay housed in the base of the capsule. After burning for about one second, the delay ignites a burster charge which shatters the capsule and distributes the liquid. The capsule will in any case shatter if it strikes a fairly robust target.

2.2 Accuracy

Ranging accuracy was assessed by firing cartridges with inert delays at fixed elevation. Due to the nature of the round the accuracy is not high, and with the 1" Type 11 the mean range was 63 ± 12 yards. The functioning range is also dependent upon the performance of the pyrotechnic delay. Trials have shown that less than 14% of rounds are likely to function outside the required range of 50 to 70 yards.

3. SAFETY FEATURES

The following trials were carried out to estimate the degree of safety of the round both to the user and to the subject.

3.1 Proof Trials

3.1.1 Cartridge, Cooler 1" Filling B (Stain/smell)

Three Type 7 cartridges, (See Fig.7) having a propellant charge of twice the normal, (2 x 35 grains gunpowder G.12) and fitted with an instantaneous fuze replacing the delay were fired from a 1" Signal Pistol. Measurements made before and after each shot showed that the barrel of the pistol was unaffected. The cartridge case split and fragments of the charged container were distributed in an arc in front of the firing position.

Three Type 2 cartridges Filling B with the normal Service charge of 60 grains of gunpowder G.12 and fitted with an instantaneous fuze replacing the delay were fired from the hand. The recoil was not considered excessive.

3.2 Fragmentation

3.2.1 Cartridge, Cooler 1" Type 7

To determine the degree of fragmentation three Type 7 rounds were fired in a sack and the pieces collected. A typical result is shown in Figure 1. The pieces varied in size from approximately ¼" square to ¾" x 2½" and in weight from 0.1 grammes to 4.25 grammes.

3.2.2 Cartridge, Cooler 1" Type 10

Similar trials with the Type 10 showed that the fragments were smaller and more even than those from Type 7. Fragments were approximately $\frac{1}{4}$" to $\frac{1}{2}$" square and about 0.2 grammes in weight.

3.2.3 Cartridge, Cooler, $1\frac{1}{2}$" Type 2

Three rounds of this Type gave the typical result shown in Figure 2. The pieces varied in size from approximately $\frac{1}{4}$" x $\frac{1}{8}$" to 1" x $\frac{3}{4}$" and in weight from 0.05 grammes to 2.75 grammes.

3.3 Fragment Penetration

In this trial rounds of different types were burst at the centre of a box frame 3 feet square and 6 feet high which was covered with cloth khaki drill. The results were as follows:-

3.3.1 Cartridge, Cooler 1" Types 7 and 10

The size of the fragments produced by the Type 7 round varied from 1" x $\frac{1}{2}$" to $1\frac{3}{4}$" x $\frac{3}{4}$" and in weight from 0.5 grammes to 8.2 grammes. The fragments struck the cloth frame in numerous places but no penetration was observed although the cloth was liberally sprayed with stain.

3.3.2 Cartridge, Cooler $1\frac{1}{2}$" Type 2

In this round the charge container only was in phenolic material, the base and delay holder being in perspex. The sizes and weights of fragments refer only to the charge container. Fragments struck the cloth frame in numerous places but there was no penetration of the cloth although the cloth was liberally sprayed with stain. The fragments produced varied in size from $\frac{3}{4}$" x $\frac{1}{4}$" to $1\frac{1}{4}$" x $\frac{1}{2}$" and in weight from 0.35 grammes to 2.6 grammes.

3.4 Clothing Contact effect

In order to determine the effect of a round bursting when actually in contact with a clothed body the tests outlined in 3.3 above were repeated with the charged container in contact with the cloth on one side of the frame.

3.4.1 Cartridge, 1" Cooler Types 7 and 10

One Type 7 and one Type 10 round were fired: no penetration was observed.

3.4.2 Cartridge, $1\frac{1}{2}$" Cooler Type 2

One round of Type 2 was fired: no penetration was observed.

3.5 Flesh Contact effect

To study this effect the skinned carcass of a rabbit was used. The containers were placed in contact with flesh and the delay ignited. The results were as follows:-

3.5.1 Cartridge, Cooler 1" Types 7 (Figures 3 and 4) and 10 (Figure 6)

One Type 7 round was fired in contact with the hind leg of the rabbit: no laceration was observed on the flesh.

One round Type 10 was fired in contact with the rabbit. There was a slight laceration of the skin.

3.5.2 Cartridge, Cooler $1\frac{1}{2}$" Type 2

One Type 2 round was fired in contact with the side of the rabbit. There was a slight tearing of the flesh, in the area of a wire securing the rabbit and

it is thought that the damage was caused by movement of the carcass against the wire under the effect of blast and not by fragments.

There may have been some slight laceration of the skin, but if so this was obscured by the effect mentioned above.

4. TECHNICAL DESCRIPTION OF 1" AND 1½" CARTRIDGES

4.1 Cartridge Cooler 1" Type 7 (Figure 7)

This design of cartridge was the first to go into production, the charge container being a moulded phenolic cylinder having two chambers separated by a diaphragm. The larger chamber contains the liquid filling of 15 c.c's, and is closed at the upper end by a plug which houses an "O" seal. The plug is retained in position by a circlip of circular cross section which expands into a groove formed in the top of the chamber. The top edge of the plug is chamfered and the groove so formed is filled with cement CD6 when a lachrymatory filling is used. The smaller of the two chambers carried a small burster charge, 20 grains of gunpowder G.40 which is enclosed by a moulded plug containing a pyrotechnic delay. The delay (2-3 secs) is retained in the chamber by a circlip of circular cross section which expands into a groove as the delay plug is inserted. An "O" seal for obturation in the cartridge case is held between the base of the cylinder and the delay unit. This sub-assembly comprising the charge container, burster charge and delay is inserted into a standard 1" Signal Cartridge Case containing 35 grains of gunpowder G.12. The normal cartridge case closure of cardboard packing piece, glazed paper cup with a turn-over, as shown in the diagram is used.

A number of this design reached the Services for trial, but even before this stage was reached it was evident that certain features required modification, the principle points of criticism being as follows:-

(a) The occasional fracture of the charge container at the gun muzzle.

(b) Leakage of the filling during storage.

(c) Minor difficulties during production.

The premature bursting of the container at the gun muzzle was attributed to the frailty of the moulding. It was established that during the assembly of the end plug minute cracks occurred and passed detection during inspection. It appeared however, that the strength of this section which was required to disrupt the turnover of the cartridge case was marginal, and this feature was eliminated in subsequent designs.

Leakage of the liquid filling was almost certainly due to discrepancies in dimensions of plastic components and to the fact that the "O" seal was not employed in a fully static application. Although precautions were taken during filling to prevent the build-up of internal pressure some pumping action was unavoidable. The application of cement to the groove formed between the plug chamfer and the container wall succeeded to a certain extent in reducing the number of leaking stores, but this did not remedy the real cause.

Production difficulties arose in the assembly of the delay plug which required an acquired skill in the manipulation of special pliers with the application of controlled loading of a press and was obtained at the expense of a fairly high rejection rate (in the early days of production at least) due to cracked components.

Endeavours were made to remedy the above faults and this led to the inception of the 1" Type 10.

4.2 Cartridge, Cooler, 1" Type 10 (Figure 7)

In this design the liquid charge container formed a cylinder with one end closed. The open end incorporated a sealing surface and a screw thread into which was screwed a moulded base having a nipple which held the burster charge of 33 grains gunpowder G.40. This projected into the liquid with the object of obtaining a more thorough dispersion of the filling, the volume of which was 12.3 c.c's. A Butyl rubber "O" seal was fitted on the base, the flange of which trapped the seal which was thus employed in a fully static condition. The burster charge was retained by a pyrotechnic delay holder which screwed into the base which also carried a second "O" seal for obturation in the cartridge case. This sub-assembly was loaded into the 1" Signal Cartridge Case in a similar manner to the Type 7.

After initial trials with the Type 10 it was evident that the quantity of filling was insufficient, whether the filling was stain or lachrymatory. A high capacity version in the same calibre was therefore designed and is described below.

4.3 Cartridge, Cooler 1" Type 11 (Figure 7)

This design was identical in general detail with the Type 10, but the charge container in the cartridge case approximately 1.75 inches longer. The capacity of the charge container was 24.2 c.c's and allowing 10% ullage the volume of filling was 22.75 c.c's. With the introduction of the Type 11 round the range of all Cooler Cartridges was reduced to 50 to 70 yards, which necessitated a change in the pyrotechnic delay to 1-2 secs and to the expelling charges.

The performance of Types 10 and 11 rounds was considerably better than with Type 7. A number of difficulties did arise however, which in the main were successfully overcome: they were:-

(a) Leakage of liquid filling from the container. At first sight this appeared to come from the seal and in a small number of cases did so. This was traced to excessive ovality of the sealing surface in some of the containers which under certain circumstances gave no interference between the "O" seal and the mating component. Without 100% inspection of all components this difficulty seemed inevitable, and it was considered advisable to change the type of seal which led to the inception of Type 15 described below. The majority of the 'leakers' however, were due to porosity of the plastic mouldings and a test rig was constructed to examine components at the time of inspection. The Manufacturers attributed the porosity to incorrect curing cycles and rapidly corrected their technique.

(b) Bursts at the muzzle occasionally occurred. This was investigated by the War Office Factory, Randle, who reported that the cause could be due to any one or a combination of three things, viz. (1) Defective mouldings which were outside drawing tolerance but got through inspection. (2) Mouldings subsequently damaged in production which caused minute cracks which were not detected. (3) An unfilled delay which allowed the propellant charge to flash directly on to the burster charge.

In addition to these possible factors, it is also considered that an incorrect turnover of the cartridge case could cause the premature break-up of the charge container.

It was established during proof that when components, correct to drawing and specification are used and when the pyrotechnic delay and the cartridge case turnover are correct the rounds function satisfactorily.

4.4 Cartridge, Cooler, 1" Type 15 (Figure 7)

This Type superseded Type 11 with which it was identical except that it incorporated a rectangular section seal instead of the "O" seal on the charge container. The material, Butyl rubber, remained unchanged.

4.5 Cartridge, Cooler 1" Type 16 (Figure 7)

This Type superseded Type 10 and is identical with Type 15 except that the charge container and cartridge case is shorter, being the same dimensions as the Type 10.

4.6 Cartridge, Cooler 1½" Type 2 (Figure 8)

The general design of this cartridge is similar to the 1" Types 10 and 11. Charge container, base and delay holder are moulded in a phenolic plastic material. The capacity of the charge container is 36 c.c's and the burster charge is 47 grains of gunpowder G.40, which is retained by the delay holder. The charge container assembly is loaded into the standard service cartridge case used for the 1½" double star signal cartridges. An expelling charge of 35 grains of gunpowder G.12 is used to give a range of 50 to 70 yards. The delay burns for 1 - 2 seconds.

4.7 Cooler Cartridge 1½" Type 6 (Figure 8)

The Type 2 gave satisfactory results during trials and appeared to be free from the leakage troubles, which were experienced on the 1" calibre. However, in view of the difficulties experienced on the smaller types it was considered advisable to alter the type of seal and consequently a seal of rectangular cross section replaced the "O" seal. The closed end of the charge container was subsequently amended to improve its strength, as failures had occurred when the thickness of the end was towards the lower tolerance limit.

5. PYROTECHNIC DELAYS

In order to standardise the delay unit and make it common to the complete range, a base unit was designed to accommodate the 1" delay holder. A quantity of this type designated Type 7 was manufactured and proved satisfactory in trials. It is proposed that this modification be introduced on the completion of the current order of stores.

All cartridges have been fitted with delays of the gasless variety. The dimensions and quantities of composition vary slightly from type to type, to give the desired delay, but the method of filling is common to all. Details of the composition and the method of filling are given in Appendix I.

6. MANUFACTURE OF CARTRIDGES

6.1 Production of Moulded Components

Containers and bases are injection moulded. Manufacture to date has been in phenolic material, Bakelite X20/5 being equivalent to Grade Z10/5 in Specification CS.1790E. Future manufacture will demand a material which is wholly compatible with explosives and material of Grade "A" of Phenolic Specification CS.1790E would be suitable.

Delay Holders were originally produced in the same material as the base and container, but since the outer dimensions could not be controlled sufficiently accurately during moulding the clearance between the holder and the filling tool became excessive and cracking of the holder occurred during pressing of the delay composition. As a result delays were subsequently produced in a material of higher impact strength.

6.2 Liquid Charging

The charging of production quantities is carried out by the War Office Agency Factory.

Details of the charging liquids are given in Appendix II.

7. CONCLUSIONS AND PROPOSALS FOR IMPROVING THE STORES

7.1 Conclusions

7.1.1 It is considered that a device can be produced which will aid the Military or Police Authorities when dealing with riots.

7.1.2 Accuracy has had to be sacrificed for non-lethality but this would only be serious when the rioters were few in number.

7.1.3 The effectiveness of 1" High Capacity version is much superior to the 1" normal type but due to the length of the container and the disposition of the burster charge the fragmentation is not so uniform.

7.1.4 Proof trials indicate that the round is safe and that even if a premature occurred the operator would not sustain injury: he would however, be subjected to the effects of the filling.

7.1.5 Fragment penetration trials showed that any material equivalent to khaki drill cloth in weight and texture would provide adequate protection against fragments even if the capsule burst in close proximity to the body.

7.1.6 As a result of trials in which the container was burst in contact with rabbit flesh it is considered that unless a burst occurred in close proximity to the eyes, humans would not sustain serious injury, although the experience would be extremely unpleasant and would not doubt cause a certain amount of shock.

7.2 Proposals for improving the stores

7.2.1 It is considered that improved fillings are needed which should be more persistent and cause more severe discomfort or give more effective staining.

7.2.2 The accuracy of all types might be improved by providing a detachable extension to the barrel of the projector and thus make it possible to identify particular subjects.

7.2.3 Improved methods of sealing the liquid filled container could be adopted, e.g. by the use of induction welding.

7.2.4 The general design could be improved by the avoidance of hygroscopic material which when considered with paragraph 7.2.3 would go a considerable way to meeting O.B. climatic and rough usage trials.

APPENDIX I

PYROTECHNIC DELAY AND PRIMING COMPOSITIONS

INGREDIENTS AND METHOD OF FILLING

1. Ingredients

1.1 S.R.53

Amorphous Boron	4 parts
Silicon (passing 240 B.S. mesh)	4 parts
Potassium Dichromate (passing 240 B.S. mesh)	92 parts

S.R.92

Amorphous Boron	12 parts
Bismuth Oxide (passing 240 B.S. mesh)	66 parts
Chromic Oxide (passing 240 B.S. mesh)	22 parts

1.2 Method of Filling

Cartridge, Cooler 1" Types 7, 10, 11, 15 and 16

This delay is pressed in a column .200 diameter. A hole of .10 diameter allows the flash from the propellant charge to impinge on the priming composition, which is the first increment of the delay. This increment is 2 grains of SR.92 and is pressed with the second increment of 1.1 grains SR.53 under a dead load of half a ton, which is maintained for five seconds. The third increment of 1.1 grains of SR.53 is pressed with the final increment of 2 grains SR.92 under a dead load of half a ton which is again maintained for five seconds. The delay time of types 7 and 10 lie within the range of 2.3 seconds and types 11, 15 and 16 within the range 1-2 seconds.

Cartridge, Cooler 1½" Types 2 and 6

A delay of .200 diameter is used. The flash from the propellant charge passes through a .10 diameter hole to the first increment of priming composition. This contains 0.5 grains of SR.92 which is pressed with the second increment of 1.4 grains of SR.53 under a dead load of half a ton, which is maintained for five seconds. The third increment of 1.4 grains of SR.53 is pressed with the fourth increment of 2 grains SR.92 under a dead load of half a ton and maintained for five seconds. The delay time lies within the range of 1-2 seconds.

APPENDIX II

LIQUID CHARGE CONSTITUENTS

Lachrymatory (BBC)

Brombenzylchloride to Specification CS.1243A (1940, amended 1953).

Stain

This filling has the following composition:-

	Parts by weight
Eosin Y 125 (Ex I.C.I. Limited)	4
Teepol (Ex Shell Chemicals)	1
Water	10

Stain/Smell

This filling has the following composition:-

	Parts by weight
Eosin Y 125 (Ex I.C.I. Limited)	4
Teepol (Ex Shell Chemicals)	1
Water	10
Aniseed	2

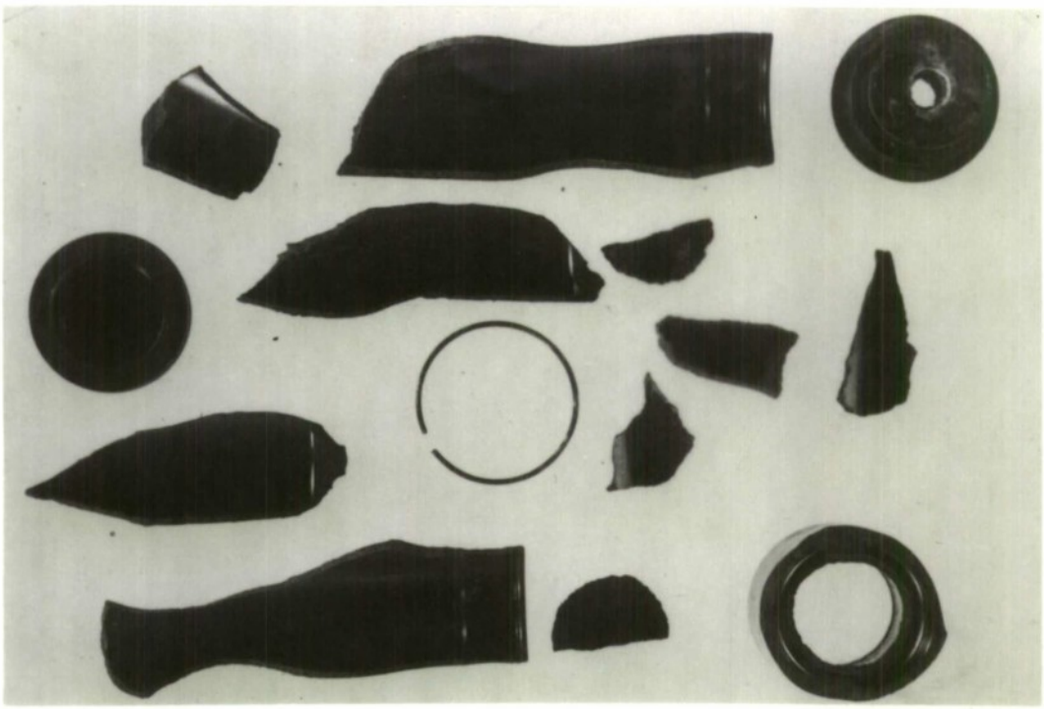

FIG. 1 FRAGMENTATION FROM CARTRIDGE, COOLER, 1 INCH, TYPE 7
(APPROX. FULL SIZE)

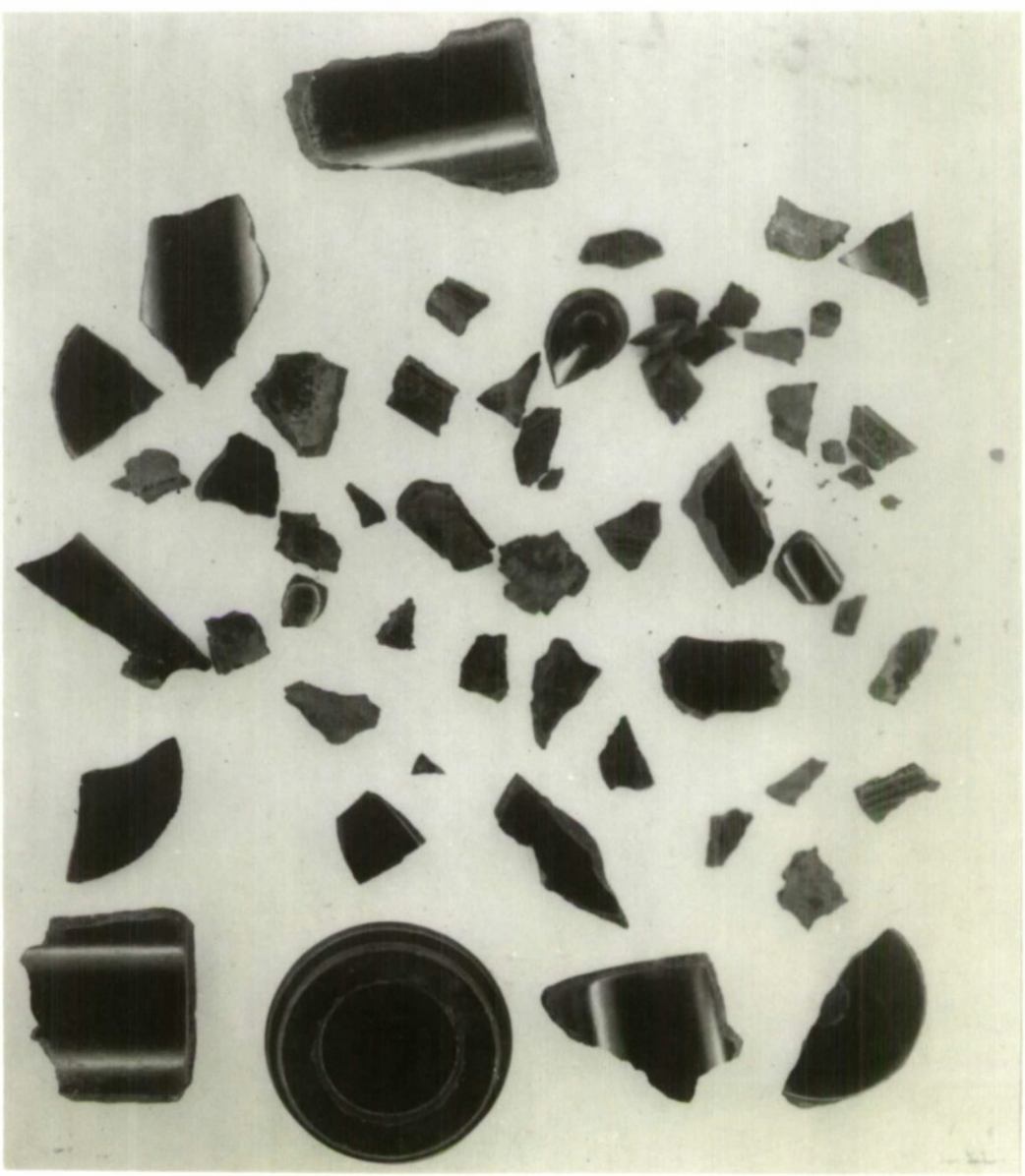

FIG. 2 FRAGMENTATION FROM CARTRIDGE, COOLER, 1.5 INCH, TYPE 2
(APPROX. FULL SIZE)

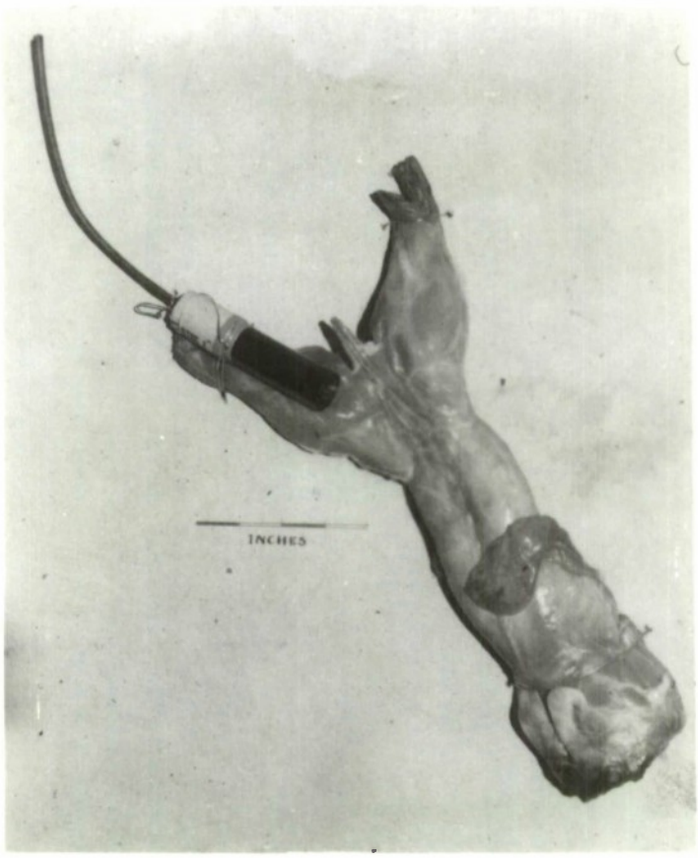

FIG. 3 FLESH CONTACT EFFECT, CARTRIDGE, COOLER, 1 INCH, TYPE 7
SPECIMEN READY FOR FIRING

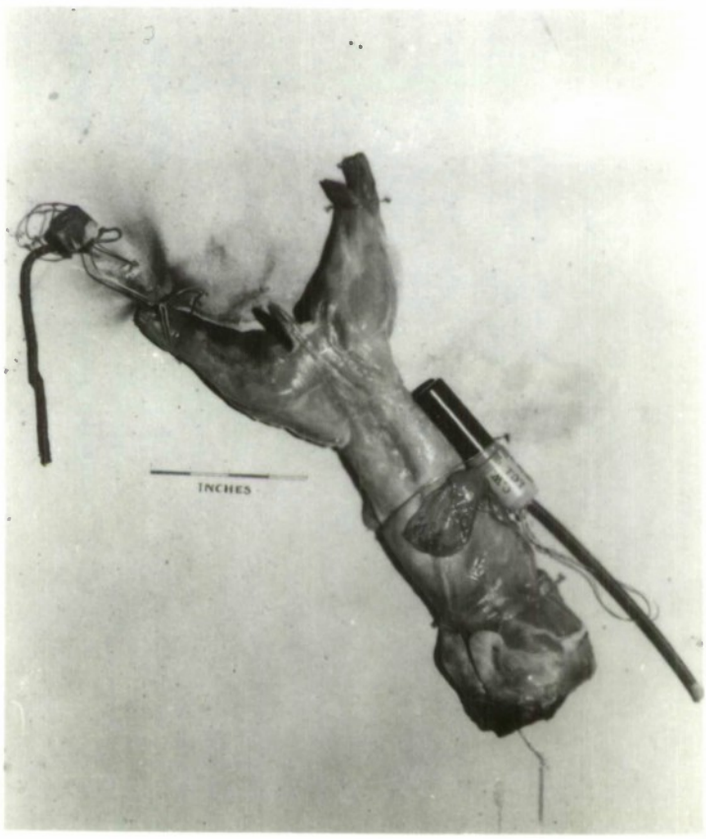

FIG. 4 SPECIMEN AFTER FIRING
(NEW CARTRIDGE IN POSITION)

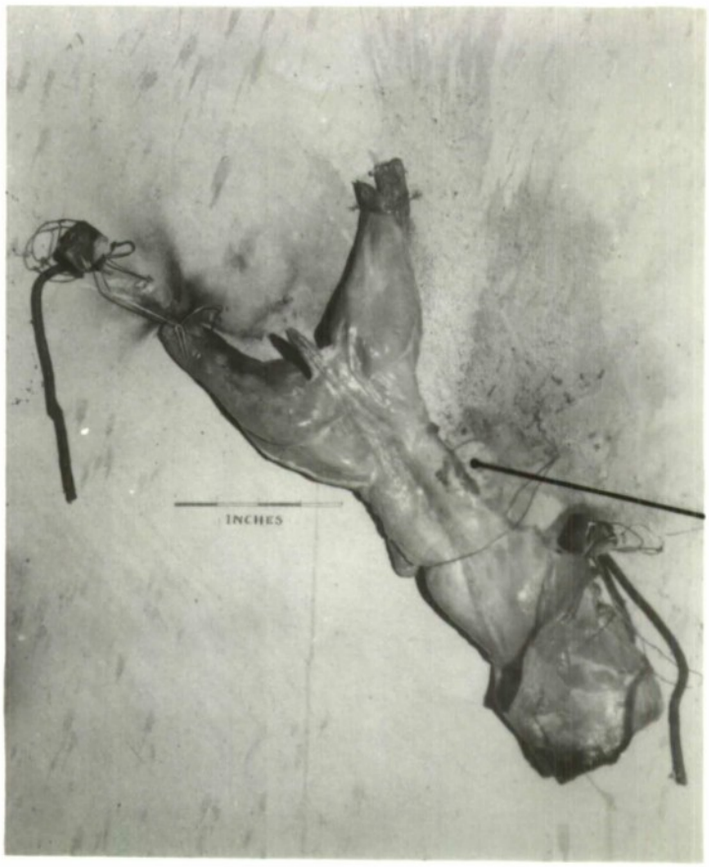

FIG. 5 SPECIMEN AFTER FIRING

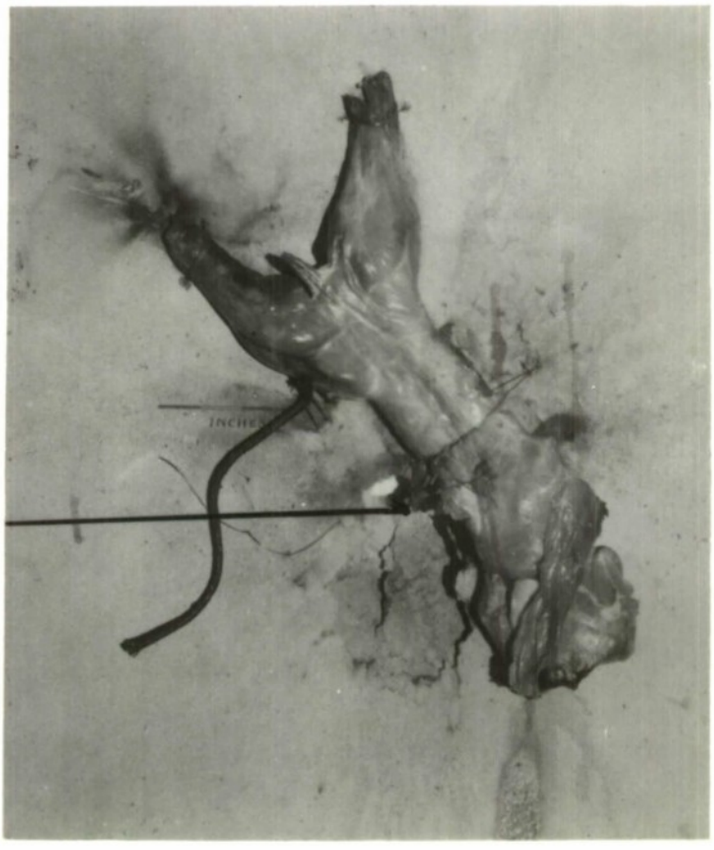

FIG. 6 SPECIMEN AFTER FIRING

LIQUID FILLING – LACHRYMATORY, STAIN, STAIN & SMELL

GUNPOWDER BURSTING CHARGE

GUNPOWDER PROPELLANT CHARGE

PYROTECHNIC DELAY UNIT

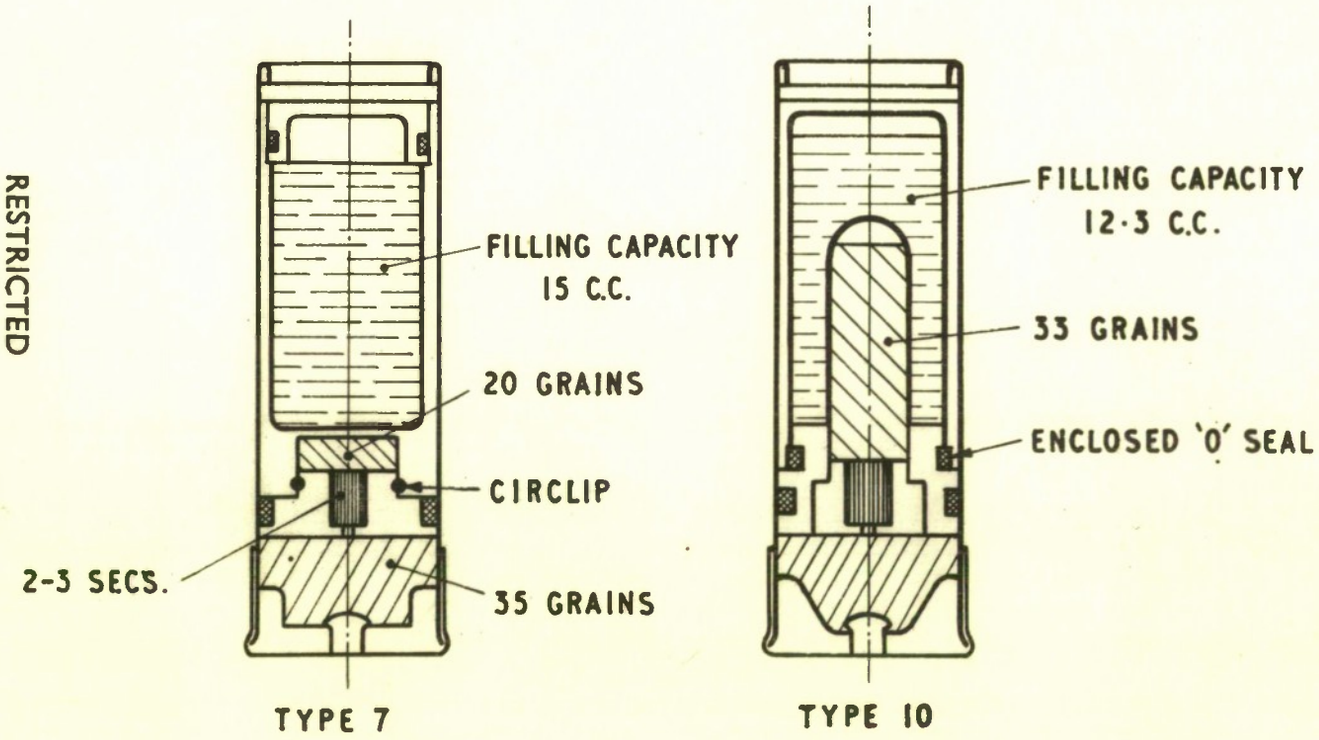

FIG. 7 CARTRIDGE, RIOT, 1 INCH

TYPE 11

SIMILAR TO TYPE 10 EXCEPT AS FOLLOWS:-

(1) LONGER CASE

(2) FILLING CAPACITY 22·75 C.C.

(3) PYROTECHNIC DELAY UNIT 1-2 SECS.

TYPE 15

SIMILAR TO TYPE 11 EXCEPT FOR:-

(1) TRAPPED FLAT SEAL TO REPLACE ENCLOSED 'O' SEAL

TYPE 16

SIMILAR TO TYPE 10 EXCEPT AS FOLLOWS:-

(1) PYROTECHNIC DELAY UNIT 1-2 SECS.

(2) GUNPOWDER PROPELLANT CHARGE 22 GRAINS

(3) TRAPPED FLAT SEAL

RESTRICTED

FIG. 7

LIQUID FILLING – LACHRYMATORY, STAIN, STAIN & SMELL

GUNPOWDER BURSTING CHARGE

GUNPOWDER PROPELLANT CHARGE

PYROTECHNIC DELAY UNIT

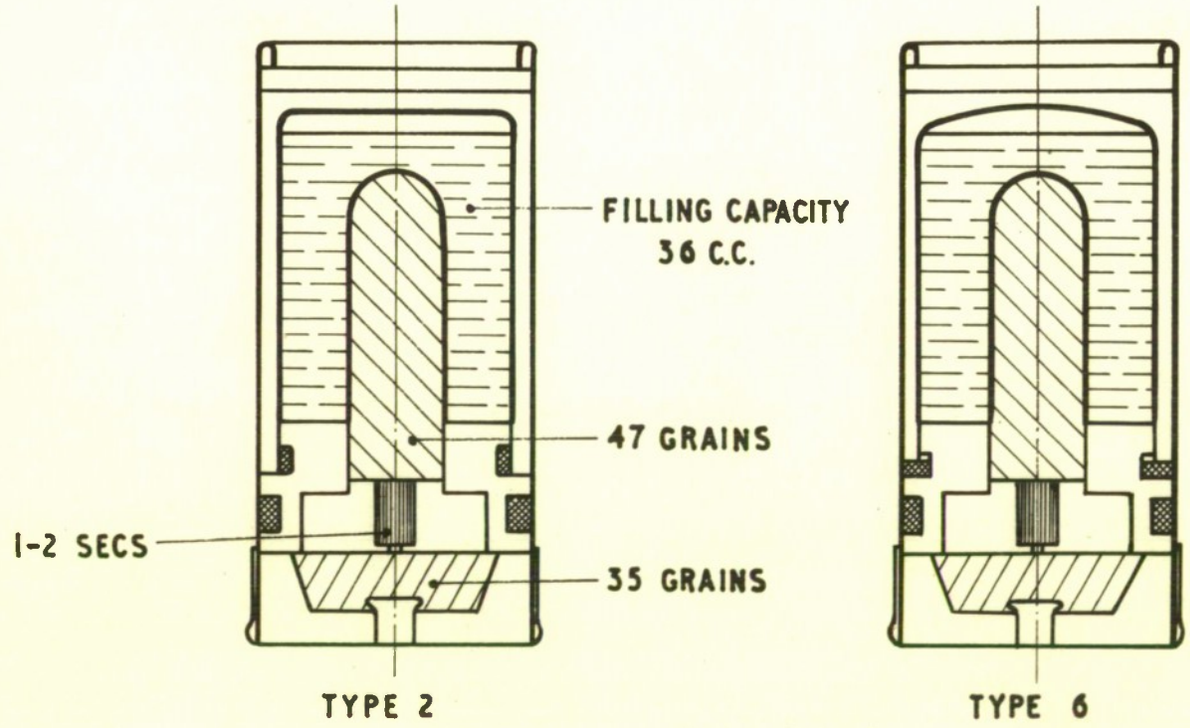

FIG. 8 CARTRIDGE, RIOT, $1\frac{1}{2}$ INCH

TYPE 6

SIMILAR TO TYPE 2 EXCEPT AS FOLLOWS :-

① CLOSED END OF CONTAINER STRENGTHENED

② FLAT TRAPPED SEAL

TYPE 7

SIMILAR TO TYPE 6 EXCEPT AS FOLLOWS :-

① GUNPOWDER BURSTING CHARGE 44 GRAINS

② SMALLER DELAY HOLDER

RESTRICTED

RESTRICTED

FIG. 8

For Indexing

RESTRICTED

Armament Research & Development Establishment
A.R.D.E. Memorandum (MX)71/60

355.426:
667.21:
623.459.432:
623.454.442

The development of a range of non-lethal anti-riot weapons.
C.J.Smith.

November 1960

The weapon described was developed to meet an urgent requirement for an aid to Military and Police Authorities when dealing with civil riots. It takes the form of a cartridge which is fired from a pistol and is produced in two calibres. The projectile contains a liquid filling of a staining or lachrymatory nature, which is dispersed on the rioters. It is designed to be used at ranges in excess of stone-throwing distances. The report includes the history of development, details of manufacture and performance.

8pp. 8 figs.

RESTRICTED

RESTRICTED

Armament Research & Development Establishment
A.R.D.E. Memorandum (MX)71/60

355.426:
667.21:
623.459.432:
623.454.442

The development of a range of non-lethal anti-riot weapons.
C.J.Smith.

November,1960

The weapon described was developed to meet an urgent requirement for an aid to Military and Police Authorities when dealing with civil riots. It takes the form of a cartridge which is fired from a pistol and is produced in two calibres. The projectile contains a liquid filling of a staining or lachrymatory nature, which is dispersed on the rioters. It is designed to be used at ranges in excess of stone-throwing distances. The report includes the history of development, details of manufacture and performance.

8pp. 8 figs.

RESTRICTED

RESTRICTED

Armament Research & Development Establishment
A.R.D.E. Memorandum (MX)71/60

355.426:
667.21:
623.459.432:
623.454.442

The development of a range of non-lethal anti-riot weapons.
C.J.Smith.

November 1960

The weapon described was developed to meet an urgent requirement for an aid to Military and Police Authorities when dealing with civil riots. It takes the form of a cartridge which is fired from a pistol and is produced in two calibres. The projectile contains a liquid filling of a staining or lachrymatory nature, which is dispersed on the rioters. It is designed to be used at ranges in excess of stone-throwing distances. The report includes the history of development, details of manufacture and performance.

8pp. 8 figs.

RESTRICTED

RESTRICTED

Armament Research & Development Establishment
A.R.D.E. Memorandum (MX)71/60

355.426:
667.21:
623.459.432:
623.454.442

The development of a range of non-lethal anti-riot weapons.
C.J.Smith.

November 1960

The weapon described was developed to meet an urgent requirement for an aid to Military and Police Authorities when dealing with civil riots. It takes the form of a cartridge which is fired from a pistol and is produced in two calibres. The projectile contains a liquid filling of a staining or lachrymatory nature, which is dispersed on the rioters. It is designed to be used at ranges in excess of stone-throwing distances. The report includes the history of development, details of manufacture and performance.

8pp. 8 figs.

RESTRICTED

[dstl]

Information Centre
Knowledge Services
[dstl] *Porton Down*
Salisbury
Wilts
SP4 0JQ
22060-6218
Tel: 01980-613753
Fax 01980-613970

Defense Technical Information Center (DTIC)
8725 John J. Kingman Road, Suit 0944
Fort Belvoir, VA 22060-6218
U.S.A.

AD#: AD321596

Date of Search: 11 December 2008

Record Summary: DEFE 15/1935
Title: Development of range of non-lethal anti-riot weapons
Former reference (Department) Memorandum (MX) 71/60
Held by The National Archives, Kew

This document is now available at the National Archives, Kew, Surrey, United Kingdom.

DTIC has checked the National Archives Catalogue website (http://www.nationalarchives.gov.uk) and found the document is available and releasable to the public.

Access to UK public records is governed by statute, namely the Public Records Act, 1958, and the Public Records Act, 1967.
The document has been released under the 30 year rule.
(The vast majority of records selected for permanent preservation are made available to the public when they are 30 years old. This is commonly referred to as the 30 year rule and was established by the Public Records Act of 1967).

This document may be treated as UNLIMITED.