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U. S. NAVAL TECHNICAL MISSION TO JAPAN
CARE OF FLEET POST OFFICE
SAN FRANCISCO, CALIFORNIA

29 November 1945

RESTRICTED

From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.

Subject: Target Report - Japanese Propellants.

Reference: (a)"Intelligence Targets Japan" (DNI) of 4 September 1945.

1. Article 2 of the report on Target O-10 (including Target O-28) of Fascicle O-1 of reference (a), covering general aspects of Japanese rocket and gun propellants, is submitted herewith.

2. The investigation of the target and the target report were accomplished by Lt. Comdr. R.A. Cooley, USNR, and Lieut. H.L. Blackwell, USNR.

C. G. GRIMES
Captain, USN

JAPANESE PROPELLANTS - ARTICLE 2
ROCKET AND GUN PROPELLANTS - GENERAL

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945
FASCICLE O-1, TARGET O-10, ARTICLE 2, AND TARGET O-28

NOVEMBER 1945

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

ORDNANCE TARGETS

JAPANESE NAVAL PROPELLANTS - ARTICLE 2
ROCKET AND GUN PROPELLANTS - GENERAL

Aside from the excellent Japanese-developed stabilizer, ortho tolyl urethane (see article 1 of this report), there appears to be little that is unique in Japanese naval rocket and gun propellants or in their manufacture.

In the field of liquid propellants, the manufacture of 80% hydrogen peroxide was well started on a commercial scale.

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LIST OF ENCLOSURES

REFERENCES

A. Sources of Information:

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Captain M. NIIMI, Naval Technical Department, First Division, Third Section.

Commander T. MURATA, Chief Engineer, Hiratsuka Naval Powder Factory.

Mr. S. MIYAIRI, Research Chemist, Hiratsuka Naval Powder Factory.

B. Request for Information:

BuOrd ltr. (R37g) EF 37/A8-3, dated 13 Sept. 1945.

THE REPORT

1. Historical Background of Japanese Naval Propellant Powder

Prior to 1896 the Japanese Navy used brown prismatic powder purchased from England, Holland or Belgium. About the year 1896 it became the Japanese Army's responsibility to supply the powder used by the Navy. Since the Army had been using single-base French "Poudre B", this was introduced into Japanese naval use.

In 1907 the Sir William Armstrong Co., of England, erected a smokeless powder factory at HIRATSUKA for the manufacture of double-base British MD cordite to supply the Japanese Navy. Twelve years later, in 1919, the Japanese Navy purchased the Armstrong factory at HIRATSUKA.

About 1912 K. KUSUOSE introduced a new stabilizer, jara jara (beta naphthol methyl ether) and a new smokeless powder known as composition C_2 was developed using this stabilizer. This powder represents the first powder manufactured purely as the result of independent Japanese research and development. The chemical composition of C_2, which is a nitroglycerine gun cotton powder using acetone as a solvent, is shown in Table I.

In 1920, centralite, as a gelatinizer, was introduced from Germany. By 1924 solventless DC (Deutsche Cordite) powder was adopted as the service powder of the Japanese Navy.

About 1933 ortho tolyl urethane was introduced into powder, and was said to give a composition which could be handled with greater ease and safety during kneading and rolling. These advantages were attributed to the low melting temperature of ortho tolyl urethane.

Fairly satisfactory flashless powder (FD), containing potassium sulfate and hydrocellulose, was developed about 1938.

2. Chemical Compositions and Properties of Japanese Naval Propellants

Table I summarizes the chemical compositions as well as the calorific values, force values and stability values of powders used by the Japanese Navy.

The composition of Japanese Army propellants are shown for comparison in the "C" and "G" smokeless powder charts at the end of this report.

3. Nitrocellulose Used in Naval Propellants

The Japanese Navy has used the following kinds of nitrocellulose:

NC_1 or guncotton, 13.15 ± 0.15% N

NC_2 or collodion cotton, 10.90 ± 0.20% N

NC_3 or pyrocollodion, 12.50 ± 0.20% N

NC_1 and NC2 are blended to make a mixed cotton MC_1 (11.85 ± .05% N) which is used in such solventless powders as DC_1, DC_2, DC_3 and FDT_6. Blending is necessary to obtain a nitrocellulose which is sufficiently soluble in nitroglycerin to mix without solvent. NC_1 is relatively insoluble in nitroglycerin, but NC_2 is relatively soluble, so that a satisfactory mixture is obtained. NC_1 and NC_3 are blended to make another mixed cotton MC_2 (13.00 ± .05% N) which is used in single base powder. NC_3 is the highest nitrogen content nitrocellulose of sufficient solubility in ethereal alcohol.

Normally the Japanese would prefer to use cotton as the source of cellulose, but due to shortages it was necessary to use wood pulp during the war. The purification of nitrocellulose is achieved by a total boiling time of about 50 hours with ten decantations. Selwig or Lange nitration methods are used, and blending is achieved by stirring in the presence of excess water.

4. Explosive Oils Used in Propellants

The Japanese had considered the substitution of diethylene glycol dinitrate for nitro-glycerin, since Germany had found the substitution so profitable. Diglycol was rather scarce in Japan however, and aside from experiments, diethylene glycol dinitrate was not used by the Japanese.

Nitroglycerin was manufactured from glycerin obtained from fish and animal fats. Nitration was carried out in a Nathan nitrator at 17.5°C, followed by treatment with a sodium carbonate solution and at least four washings.

5. Stabilizers and Gelatinizers

The Japanese Navy was responsible for the development of one outstanding stabilizer and gelatinizer, namely orthotolyl urethane. Since this stabilizer represents the only point of possible superiority of a Japanese propellant over those of other countries, a special report (Article 1 of this series - "Use and Manufacture of Ortho Tolyl Urethane for Stabilizing Rocket and Gun Propellants" - Index No. O-10-1) has been prepared on the subject.

Other stabilizers used by the Japanese Navy were: beta naphthal methyl ether, symmetrical diethyldiphenylurea, diphenylamine, mononitronaphthalene, and dimethyl phenyl ortho tolylurea. The last stabilizer, though not yet tested by time, was considered to be a very promising stabilizer, because it is a liquid at room temperature and makes a powder easy to manufacture.

6. Flash Reduction

Flash was said to be fairly reliably eliminated in guns up to 14 cm (5.6 inches), but not in larger guns. The elimination or suppression of flash was attained by use of 8 or 4 per cent of potassium sulfate as shown in Encl. (A) for composition FD and FD_1.

7. Manufacture of Propellant Powder

The manufacture of Japanese solventless powder consists of three steps: mixing, rolling and extrusion. The last two steps are at elevated temperatures. The stabilizer is first added to the nitroglycerin, which is then added to wet nitrocellulose; the resulting paste is agitated mechanically. The water content of the paste is then reduced to 45% by centrifuging. The paste is next rolled at 82°C. for about 6 minutes. The resulting sheets are then carpet-rolled and extruded from a press at 80°C.

8. Liquid Propellants for Rockets

The Japanese had received information on the German hydrogen peroxide-hydrazine hydrate liquid propellant, and were producing 80% hydrogen peroxide on an industrial scale (See NavTechJap Report - "Japanese Fuels and Lubricants, Article 5 - Research on Rocket Fuels of the Hydrogen Peroxide - Hydrazine Type", Index No. X-38(N)-5.). None of the devices using liquid propellant had reached the operational stage, however, and no new ideas could be found in anticipated developments. The well-known nitric acid-alcohol combination had been experimented with, but the hydrogen peroxide-hydrazine system was thought more promising.

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ROCKET AND GUN PROPELLANTS USED BY JAPANESE NAVY

Symbol and Name		Composition															Characteristics							
		N/G	G/C	M/C	C/C	C/L	OTU	M/J	J/J	MNN	H/C	GP	M/M	K_2SO_4	Sn	Na/B	Colorific Value (Q) (KCal)	Explosion Temperature (°C)	Specific Volume (cc)	Force of Explosion (kg-dm)	Abel's Heat Test (min)	Silvered Vessel Test (hr)	Volatile Matter (%)	Color
C	Common Cordite	58	37					5									1212.9	(gas)3731	881.5	12450	30.0	200	0.3	Light brown
C_2	Type 2 Cordite	30	65					3	2								1012.7	3250	917.5	11290	20.0	1200	1.65	Light brown
T_2	Type 2 Tubite	30	65					3	2								1012.7	3250	917.5	11290	20.0	1200	1.65	Light brown
DC	Type 13 Cordite	30		64.8		4.5							0.7				931.8	3033	928.7	10660	14.48	800	1.0	Grayish black
DT	Type 13 Tubite	30		64.8		4.5							0.7				931.8	3033	928.7	10660	14.48	800	1.0	Grayish black
DB	Type 13 Lameller	30		64.8		4.5							0.7				931.8	3033	928.7	10660	14.48	800	1.0	Grayish black
C_3	Type 89 Cordite	26.5	68.5						5								1015.4	3305	898.3	2800	6.0	1800	1.5	Light brown
T_3	Type 89 Tubite	26.5	68.5						5								1015.4	3305	898.3	2800	6.0	1800	1.5	Light brown
F_2	Type 90 mk 2 Cordite	15			68		8				8					1	465.8	1680	1071.5	6810	27.4	6006	1.7	Light yellow
C_4	Type 92 Cordite	40	55			3	2										1128.4	3590	972.7	11850	20.0	1200	0.3	Light yellow-brown
T_4	Type 92 Tubite	40	55			3	2										1128.4	3590	972.7	11850	20.0	1200	0.3	Light yellow-brown
DC_1	Type 93 mk 1 Cordite	41		51.8		4.5	2						0.7				964.2	3137	922.5	10950		800	0.6	Greyish black
DC_2	Type 93 mk 1 Cordite	27		64.3		5	3						0.7									900	1.0	Greyish black
DC_3	Type 3 Cordite	33		60.0		6.5						0.1			0.4							1060	0.89	Greyish black
DT	Type 93 mk 1 Tubite	41		51.8		4.5	2						0.7				789.0	2640	978.1	9770		800	0.6	Greyish black
DT_2	Type 93 mk 2 Tubite	27		64.3		5	3						0.7									900	1.0	Greyish black
TO_2	Toku	27		64.3		5	3						0.7	3								1135	3.1	Greyish black
FD	Toku	26.4		53.4		7.2#					6.0	0.09					984.2	3137	922.5	10950		3642	1.0	Greyish black
FD_1	Toku	27.5		55.6		7.6#																3529	1.0	Greyish black
T_6	Toku	30		60		3.0				7.0							652.9	2260	938.8	8288		963	2.88	Yellow-brown
FDT_6	Toku'	27		60		3.0*				7.0												863	2.39	Yellow-brown
FD	Type 2 mk 1	30		61.3		5	3				8		0.7	8										Flameless
FD_1	Type 2 mk 2	30		65.3		5	3				8		0.7	4										Flameless

* Used in rockets.
\# This value denotes total per cent of C/L and OTU combined.
Editor's note: Information in the lower right quarter of above table is possibly in error due to misalignment of original.

N/G Nitroglycerin
G/C Gun Cotton
M/C Mixed Nitrocellulose
C/C Colloidion cotton

C/L Centralite
OTU Orthotolylurethane
M/J Mineral Jelly
J/J Jalajala or jara jara

MNN Mononitronaphthalene
H/C Hydrocellulose
M/M Mineral Matter
Na/B Sodium Bromide

Composition	Type of Powder	Standard Composition: Cord Powder	NG	Stabilizer	Inorganic Material	Volatile Matter	[illegible] (cc)	Thickness of Powder m.m	Per Cent Volatile Matter	Per Cent of Volatile Remaining	Specific Gravity	Type of Gun used in Testing	Number of Charges	Amount of Powder Used	Initial Velocity	Pressure in the [illegible]	Dimensions	Purpose	USE	Remarks	Drying Time (Hours)	Box (kg)
G KO (SOLVENT POWDER)	X No1 Square-shape Powder	53.7	41	5	Small Amount of Graphite and KNO_3 if needed	0.3	206	0.1±0.02			>0.550	98 Infantry Gun		35				Heavy Grenade Discharger	Experimental Heavy Grenade Discharger	Not Manufactured	2	A Box 20
	X No2 Square-shape Powder							0.14±0.03	0.30±0.20	0.1	>0.650	97 Mortar	5-10	41.5 (Powder Parts 4)	182±2	370±50		Mortar	Type 97 Mortar	Not Manufactured	3	A Box 20
	Δ No3 Square-shape Powder							0.29±0.05			>0.680	11th year type Horizontal Angle Infantry Gun	10-15	20	334±4	1350±150		Light Mortar	No 201, No 202, RA Type Infantry Guns Type 99 Light Mortar (Empty Shell of same)		4	A Box 25
	No 5 Square-shape Powder							0.46±0.03	0.35±0.20	0.12	>0.680	11th year type Horizontal Angle Infantry Gun.	10-15	32	405±4	1260±130		Medium Mortar	Experimental "SU" Type Infantry Gun (1 7, Charges) Type 16 Medium Mortar Type 97 Medium Mortar Type 99 10cm Mountain Gun		5	A Box 25
	(KYO) No2 Square-shape Powder Type OTSU	55.0	41.5	Camphor Compound 0.5 Nitro C.0	Small Amount of Graphite	0.3	193.5	0.18±0.03	0.30±0.20	0.1	>0.600	Type 97 Mortar Using Experimental Type 98 Howitzer Shell.	10-15	31.5 (Cylinder Parts 4)	158±2	Less than 300			Type 92 Infantry Gun (Substitution) (Empty Shell of the Type 97 Mortar)	It's composition is the same as the "Standard" powder, but it can't be stored long, and is under further research.		
	X No8 Cylindrical Shape Powder	59.6	35	3	Surface Celluloid Stabilizer Powder, Some Graphite Nitre Powder and Smoke Reducer.	0.4	206	0.80±0.08	0.35±0.20	0.2	>0.600	Type 94 37mm Cannon	10-15	117	700±7	2200±200		94 Type 37mm Cannon	Type 94 37mm (Type 13 Howitzer only), Type 94 37mm Tank Gun (Type 13 Howitzer) adaptable to the following guns as a substitute charge: 41mm Mountain gun, Type 94 Mountain gun, Type 90 5.7cm Tank gun, 31st year Rapid fire mountain gun, Type 38 12cm. Howitzer, Type 38 15 cm. Howitzer.	It was made useless by the adoption of 9 holes (KAN ※) in the 37mm gun charge to unify the manufacturing method, though it had been planned as the charge for that gun.	7	A Box 25
G OTSU (SOLVENTLESS POWDER) — MARK ONE COMPOSITION	No16 Cylindrical Shape Powder	63.5				Water content 0.8		1.58±0.07	0.75±0.25	0.5	(9K) mm <120	KOKU Type 38 10cm Cannon	5-10	2K	529±5	2030±160		Med. Cal. Gun Large Cal. Howitzer	Type 99 8cm AA gun "AN" type 12cm. gun adaptable as a substitution for the following: 26 cal. 24cm. cannon, Type 45 24 cm Howitzer, "Koku" Type 35 cal. 15cm gun. "Koku" Type 35 Cal. 12cm. cannon, 7th year Type 10cm cannon, Type 14 10cm Cannon, Type 92 10cm cannon 14 year, Type 10cm. AA., 11year Type 7cm Cannon, 88? AA, 88? Special 7.5cm Rapid-fire gun.	Corresponds to 3 strips of C powder.	30-45	B Box 33
	No20 Cylindrical Shape Powder							1.95±0.08	0.80±0.25	0.6	(29) mm <105	KOKU 35 Cal. 15cm Cannon	3-10	9K	612±7	2270±130		Med. Cal. Gun Large Cal. Howitzer	Experimental Type 96 24 cm Howitzer, 7th year type 30cm. long or short Howitzer (Experimental powder chamber), "AN" Type 6 inch cannon.	Corresponds to 4 strips of C powder.	40-55	B Box 35
	No26 Cylindrical Shape Powder	63.4				0.9		2.65±0.12	0.80±0.25	0.7	(9K) mm <180	26 Calibre 24cm Cannon	3-10	18K	410±4	1.400±?		Large Calibre Gun & Howitzer	Type 96 15 cm. cannon.		70-85	B Box 35
	No30 Cylindrical Shape Powder							3.00±0.12	0.85±0.25	0.7	(40K) mm <200	KOKU 30 Cal. 24cm Cannon	3-10	30K	492±5	1780±150		Med. Cal. Gun Large Cal. Howitzer	As a substitute charge for: 7th year type 30cm Howitzer (long) Type 45, 7th year, Type 90 15cm Howitzers	Corresponds to 5 strips of C powder.	75-90	B Box 36
	No 42 Cylindrical Shape Powder		27.0	8.0	0.7 Heavy Sodium Carbonate; Sodium Ammonium Oxalate		189	4.25±0.15		0.9									41 cm. Howitzer, type 100 heavy howitzer.			
	(KYO) No220 Cylindrical Shape Powder																					
	(KYO) No10 Cord-Shape Powder																	TG Charge				
	(SHU) No 40 Cord-Shape Powder							4.0±0.2		To be determined later								KE Charge			10-20	B Box 24 Boxes (35 K)
	(SHU) No400 Fan-Shape Powder									To be determined later											50	B Box 24 Boxes (22.6 K)
	Δ No700 Cord-Shape Powder																	Rocket Powder				
	▲ No1000 Cord-Shape Powder																	Rocket Powder				
	Δ No1300 Cord-Shape Powder																	Rocket Powder				
	Δ No1500 Cord-Shape Powder																	Rocket Powder				
	Δ No1800 Cord-Shape Powder																	Rocket Powder				
MARK TWO COMPOSITION	No9 Cylindrical-Shape Powder					Water content			0.6±0.2	(0.5)	>0.700							Small Calibre Gun	Type 94 37mm cannon (excluding type 13 Howitzer), "RA" Type 37mm AT gun, Experimental 37mm, self-propelled gun, Experimental 37mm Automatic cannon, Experimental Type "SU" Infantry Gun (I charge), Type "BO" mountain Gun, Type 99 10 cm Mountain gun (Propellant Bags B,C), Type 100 37mm Tank Gun.		4-7	A Box 25
	No10 Cylindrical-Shape Powder																					
	Δ No11 Cylindrical-Shape Powder																	Type 1 37mm cannon	Experimental Type1 37mm AA Machine Gun (Under Research).			
	No12 Cylindrical-Shape Powder																					
	No13 Cylindrical-Shape Powder																	Type1 47mm Cannon	Experimental Type1 37mm gun, Type1 47mm Tank gun, Experimental Type1 37mm Tank Gun, Experimental Type1 37mm AA Machine Gun (under research), Type1 Mobile 47mm gun, U.S.S.R. 76cm. Field Cannon.			
	No 90 Cord-Shape Powder (long)	59.0	35.0	5.0		0.6	204		0.60±0.25			Turret 45 Calibre 30cm Cannon (Except the 3rd (4th Turret))		113.44 (K)	810	2,600		Turret, 45 Cal. 30cm Cannon	Turret, 45 Cal. 30 cm. cannon.	These figures show the situation when the length of the short powder is made the same as the length of the long powder.		
	No 90 Cord-Shape Powder (short)																	Turret, 45 Cal. 25 Cannon	Type 10 24 cm Line Gun (REKKA) Turret 45 Cal. 25 cm gun.			
	No 110 Cord-Shape Powder (long)							1.12±0.3	0.60±0.25	0.5	<270 mm	Turret 45 Calibre 40mm Cannon	3-10	208.4	760	2620±180		Turret, 50 Cal. 30mm Cannon	Turret, 50 Cal. 30 cm gun.	These figures show the situation when the length of the long powder is made the same as the length of the short powder	45-55	B Box 27
	No 110 Cord-Shape Powder (short)										<365 mm							Turret, 45 Cal. 40mm Cannon	Turret, 50 Cal. 40 cm gun.			
	No40 Cord-Shape Powder																	KE Charge				B Box 27
	No400 Fan-Shape Powder																				10-15	B Box 24 Boxes 35
	Second Year Type No20 Cord-shape Powder																		Turret, 25 Cal. 20 cm. gun			
	Second Year Type No80 Cord-shape Powder-long																		Turret, 45,50 Cal. 30cm gun, 45 Cal. 40 cm gun			
	Second Year Type No110 Cord Shape Powder																		Turret, 45,50 Cal. 30cm gun, 45 Cal. 40 cm gun.			
MISC	Powder Plate for Mortar	59.7	35	5	Camphor if needed	0.3	192		0.30±0.20											Adoption of the water-proof sack made this useless.	50	B Box 24 Boxes (22.6 K)
	Cloth of Powder Sack																					

Manufacturing Process

- (No1–No3 Square-shape Powder): HIGH & LOW NITRATION NITROCELLULOSE — DEHYDRATING — MORE DEHYDRATING (ALCOHOL) — MIXING (NITROGLYCERIN)
- (No5 Square-shape Powder): KNEADING TO UNIFORMITY (STABILIZER & SOLVENT) — FILTER — EXTRUSION — PRE-DRY — CUT
- (No2 Square-shape Powder Type OTSU): GLAZING — DRY — EXPOSE TO AIR — BLENDING — PACKING
- (No8 Cylindrical Shape Powder): SAME AS ABOVE — KNEAD TO UNIFORMITY — PRESS — PREDRY — CUT; FIRST DRY — SURFACE COLLOID STABILIZER & GLAZE — DRY — SAME AS ABOVE
- (No16 Cylindrical Shape Powder): HIGH & LOW NITRATION NITROCELLULOSE — DEHYDRATING — FIRST MIXING (NITROGLYCERIN) — DEHYDRATING — SECOND MIXING (STABILIZER, ETC.)
- (No26 Cylindrical Shape Powder): BLENDING — ROLLING 85°C — EXTRUSION 70-75°C — CUT — DRY — EXPOSE TO AIR
- (No30 Cylindrical Shape Powder): BLENDING — PACK IN BOX
- (Powder Plate for Mortar): PRESS — ? — HEAT……? — P — PACKING(?)

LEGEND

(KYO)—IS BEING MANUFACTURED BY CONTRACT.

Δ—IS IN EXPERIMENTAL MANUFACTURE

X—IS NOT BEING MANUFACTURED AT PRESENT.

Translated & Redrawn in Tokyo, Japan. Nov. 1945

CLASSIFICATION NAMES	FORM	STANDARD INGREDIENT: PRINCIPAL INGREDIENT NITROCELLULOSE	STANDARD INGREDIENT: STABILIZER (D)	STANDARD INGREDIENT: VOLATILE MATTER	STANDARD INGREDIENT: THE OTHERS	DEGREE OF NITRATION OF NITROCELLULOSE C.C.	THICKNESS OF THE POWDER M.M.	VOLATILE MATTER %	REMAINING VOLATILE MATTER %	APPARENT DENSITY GM/LITER	CHARACTERISTICS OF POWDER: RIFLE OF TEST GUN	CHARACTERISTICS OF POWDER: WEIGHT OF POWDER CHARGE	CHARACTERISTICS OF POWDER: MUZZLE VELOCITY	CHARACTERISTICS OF POWDER: PRESSURE IN BORE	US…: MAIN USE	US…: GENERAL
SMOKELESS RIFLE POWDER	SQUARE	96.2	1.5	2.3	—	206	0.27±.05	2.30±.25	1.2		38 TYPE INFANTRY RIFLE	2.15±.05 GM	762±8	3,400±400	VARIOUS KINDS OF 6.5 MM RIFLE & MACHINE GUN	30 NEW TYPE RIFLE, 38 TYPE … 91 TYPE LIGHT M.G. LOADED ON … GUN (I, II, III), 14 NEW TYPE … TYPE PISTOL (SM.), SMITH-WATSON …
X SMOKELESS RIFLE POWDER B	SQUARE						0.30									NONE
NO. 4 RIFLE POWDER	SQUARE	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.40	1.00±.35	0.5		99 TYPE RIFLE	2.75±.10 GM	740±8	2,800±150	VARIOUS KINDS OF 99 TYPE RIFLE & MACHINE GUN	99 TYPE RIFLE & …
POWDER TYPE "RA" FOR MACH. GUN	SQUARE	97.5	1.5	1.0	SURFACE GELATINIZER (CAMPHOR) 3.5%	208	0.35	1.00±.35	0.5		"RA" TYPE REVOLVING MACH. GUN & PRESSURE TEST GUN	2.70–2.80 GM	IN COMPARISON WITH THE STANDARD POWDER ±8	IN COMPARISON WITH THE STANDARD POWDER ±200	RHEIN METAL TYPE MACHINE GUN	7.92 MM MACH. GUN (E…
0.5 MM. SQUARE POWDER	SQUARE	96.5	1.5	2.0		206	0.07±.03	2.00±.25	1.0		92 TYPE INFANTRY CANNON	43 GM.	184±2.5	1,320±120	GRENADE DISCHARGER TYPE	89 TYPE HEAVY GRENADE … 10 NEW TYPE GRENADE …
0.6 MM. SQUARE POWDER	SQUARE	96.5	1.5	2.0	—	206	0.13±.03	2.00±.25	1.0		92 TYPE INFANTRY CANNON	50 GM	197±2.5	1200±120	92 TYPE INFANTRY GUN, 11-NEW TYPE INFANTRY MORTAR	92 TYPE INFANTRY GUN (…
5 MM. SQUARE POWDER	SQUARE	96.1 97.2	1.5 1.5	2.4 1.3	SURFACE GELATINIZER 5%	206	0.33±.05	2.40±0.35 1.30±0.35	0.1		11 TYPE INFANTRY GUN	50±1 GM	450±45	1,530±170	SMALL CALIBRE CANNON 41 TYPE A/T GUN	11 NEW TYPE INFANTRY GU…
NO. 1 SQUARE POWDER	SQUARE	96.0	1.5	2.5	—	204	0.41±.04	2.50±.25	1.5		41 MT. GUN	2.65 GM.	335±35	1,770±140	VARIOUS KINDS OF MED. OR SMALL CALIBRE HOWITZER	94 TYPE 39 MM. A-T, SHARPSHOOT, … 11 YEAR 7 CM. CANNON (LIGHTENING), … STEEL MADE 9 CM. MORTAR, … 15 CM. MORTAR (I, II), STEEL MADE … HOWITZER & MORTAR, TEST "38" …
NO. 2 SQUARE POWDER	SQUARE	95.7	1.5	2.8	—	204	0.66±.06	2.85±.35	1.7		38 FIELD GUN	600 GM.	494±5	MAX. 2300 STD. 2150 MIN. 2000	VARIOUS KINDS OF LARGE OR MEDIUM CALIBRE HOWITZER	90 TYPE 10 CM. HOWITZER, … 45 TYPE 24 CM. HOWITZER (II CHARGE) … HOWITZER LONG, SHORT, (II–III)
NO. 3 TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.26±.05	1.00±0.35	0.5		FOR VELOCITY MEASUREMENT 92 TYPE HVY. M.G. FOR PRES. MEASURE 7.7 MM. PRESSURE TEST GUN	2.85±0.1 GM.	740±8	3150±250		99 LIGHT MACHINE GUN, "C… 97 AUTOMATIC CANNON (… 99 SHARPSHOOT GUN, 94 … [illegible]
NO. 4 TUBULAR POWDER	TUBULAR															
NO. 5 TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.52±.05	1.00±.35	0.5		92 TYPE 13 MM. M.G. LOADED ON VEHICLE	19.50 GM.	800±8	FIGURE TO BE OBTAINED IN FUTURE TESTS		97 AUTOMATIC GUN, 92 LOA… TEST 20 MM. REVOLVING … (BLANK CARTRIDGE OF 98…
NO. 6 TUBULAR POWDER	TUBULAR															
NO. 7 TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 2% FLAME EXTINGUISHER 0.5%	206	0.70±.05	1.00±.35	0.5		TYPE 98 A-A MACHINE GUN	FIGURE TO BE OBTAINED IN FUTURE TESTS	950±8	STANDARD VALUE 2,800±150		98 TYPE A-A MACHINE … TEST "KEKI", "HOKI", …
NO. 1 BELT-TYPED POWDER	STRIP LIKE FORM	95.7	1.5	2.8	—	204	0.58±.06	2.85±.35	2.4		38 TYPE FIELD CANNON	600 GM.	500±5	2,150±150	7.5 CM CLASS CANNON	38 FIELD, 41 CAVALRY, … RAPID FIELD, … 7.5 CM. A-… 11 YEAR 7 CM. CANNON (EXCEPT … STEEL MADE 12 CM. RAPID … [illegible]
X BELT-TYPED POWDER B	STRIP LIKE FORM						0.75									NO US…
NO. 2 BELT-TYPED POWDER	STRIP LIKE FORM	95.1	1.5	3.4	—	204	0.86±.06	3.40±.40	2.6		"KOKU"-TYPE AND 38 TYPE 10 CM CANNON	1.74 KG.	535±5	2,460±200	CANNON (MEDIUM OR SMALL CALIBRE)	REBUILT 38 FIELD, 87 STEEL-T… (SPECIAL 90 SPIRE), 7.7 CM FIELD … 12 CM. RAPID FIRING CANNON, 26 C… GUN ON RAIL (SHARP-TOPPED …
NO. 3 BELT-TYPED POWDER	STRIP LIKE FORM	94.9	1.5	3.6	—	204	1.17±.06	3.60±.50	2.8		KOKU-TYPE AND 38 TYPE 10 CM CANNON	2 KG.	529±5	1940±150	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	88 TYPE 7 CM A-A (EXCEPT …), … 7.5 CM. RAPID FIRING CANNON, 7 YEAR … 10 CM. CANNON, "KOKU" 36 CALIBRE … 26 CALIBRE 24 CM. CANNON.
NO. 4 BELT-TYPED POWDER	STRIP LIKE FORM	94.6	1.5	3.9	—	204	1.44±.09	3.90±.50	3.0		"KOKU"-TYPE 35 CAL. 15 CM CANNON	9 KG.	612±7	2130±120	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	30 CALIBRE … [illegible] 89 TYPE 15 CM. CANNON "SHIKA" … SUBSTITUTION OF II CHARGE), …
NO. 5 BELT-TYPED POWDER	STRIP LIKE FORM	94.2	1.5	4.3	—	204	2.30±.15	4.30±.50	3.4		"KOKU"-TYPE 30 CALIBRE 24 CM. CANNON	30 KG.	452±5	1,670±140	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	7 NEW TYPE 30 CM. HOWITZER … SPECIAL 24 CM HOWITZER (…
NO. 6 BELT-TYPED POWDER	STRIP LIKE FORM		2.0	FIGURE TO BE OBTAINED IN FUTURE TESTS		204	FIGURE TO BE OBTAINED IN FUTURE TESTS	FIGURE TO BE OBTAINED IN FUTURE TESTS	FIGURE TO BE OBTAINED IN FUTURE TESTS		"KOKU"-TYPE 30 CALIBRE 24 CM. CANNON	36 KG.	520±5	MAXIMUM 1,800 STANDARD TO BE DETERMINED LATER		"KOKU" TURRET "SHIKA" 4… (AS A SUBSTITUTION OF II … (CHARGE A)
SMOKELESS POWDER FOR PISTOL	GRAINY (EMPTY)		1.5	—		208	0.40	2.00±.50	—		14-NEW TYPE PISTOL	0.3±.02 GM	334±15	1,700	VARIOUS KINDS OF PISTOLS	14 NEW TYPE PISTOL, … 89 TYPE HEAVY GRENADE … (FOR FIRING TRAINING) MAUSE…
SMOKELESS PRIMING POWDER	GRAINY	94.0	3.0	1.8	NITRE BICARBONATE OF SODA 3% CHARCOAL, [illegible]	210	1.10±.20	1.80±.50	0.5		LESS THAN 12 SECONDS WITH A COMBUSTION EXAMINER	/	/	/	IGNITION CHARGE OF VARIOUS POWDER CHARGES	
SMOKELESS DUMMY CANNON POWDER	GRAINY (EMPTY)		0.5	2.0				2.00±1.00	—		—	20 GM	IT IS NEEDED FOR RAPID COMBUSTION IN PROPER CONDITIONS	—	VARIOUS DUMMY GUNS	
NO. 1 BLANK CARTRIDGE POWDER	SAME AS POWDER FOR PISTOL	97.5	0.5	2.0		7201	/	2.00±.50	/		38 TYPE INFANTRY RIFLE PRESSURE TEST GUN	0.7 GM.		MAXIMUM 2,000 MINIMUM TO BE DETERMINED LATER	VARIOUS RIFLES & SMALL CALIBRE BLANK CARTRIDGES	38-TYPE RIFLE, 30 NEW TYPE … 94 TYPE 37 MM. CANNON, 94 T… 44 CAVALRY GUN, CAPTURED …
NO. 2 BLANK CARTRIDGE POWDER	SAME AS THE 0.6 MM. SQUARE POWDER	96.5	1.5	2.0		7206	/	2.00±.40	/		92 TYPE HEAVY MACHINE GUN & BLANK BARREL	2.85 GM.		WOODEN SHELL BREAKS W. … 10 M FROM MUZZLE	VARIOUS BLANK CARTRIDGES FOR MACHINE GUNS	38 TYPE RIFLE, 3 NEW TYPE A… LIGHT MACHINE GUN LOADED … LOADED ON VEHICLE, "CHI" T… LOADED ON VEHICLE, "HO" TY…
NO. 3 BLANK CARTRIDGE POWDER	OBLONG (EMPTY)	97.2	0.5	2.3		7201	/	2.30±.50	/		41 TYPE MOUNTAIN GUN	100 GM.	COMPRESSED SHELL BREAKS WITHIN 50 M FROM MUZZLE	1300 MINIMUM TO BE DETERMINED LATER	VARIOUS BLANK CARTRIDGES FOR MEDIUM CALIBRE HOWITZERS	11 NEW TYPE INFANTRY GUN … 91 TYPE 10 CM. HOWITZER, 4… HOWITZER, 96 TYPE 15 CM. …
NO. 4 BLANK CARTRIDGE POWDER	OBLONG (EMPTY)	97.2	0.5	2.3		7201	/	2.30±.50	/		41 TYPE MOUNTAIN GUN	120 GM.	COMPRESSED SHELL BREAKS WITHIN 50 M FROM MUZZLE	700 MINIMUM TO BE DETERMINED LATER	FIELD GUN CLASS & 10 CM. CANNON CLASS BLANK CARTRIDGES	38 TYPE FIELD, 41 TYPE CAVALRY … 31 TYPE RAPID MT., 41 MT., 98 … 11 YEAR TYPE 7.5 CM. ENCAMPMENT … 38 TYPE 10 CM. CANNON, 92 TYPE …

LASSIFICATION	FORM	STANDARD INGREDIENT: PRINCIPAL INGREDIENT NITROCELLULOSE	STABILIZER (D)	VOLATILE MATTER	THE OTHERS	DEGREE OF NITRATION OF NITROCELLULOSE C.C.	THICKNESS OF THE POWDER M.M.	VOLATILE MATTER %	REMAINING VOLATILE MATTER %	APPARENT DENSITY Gm/LITER	CHARACTERISTICS OF POWDER: RIFLE OF TEST GUN	WEIGHT OF POWDER CHARGE	MUZZLE VELOCITY	PRESSURE IN BORE	USES: MAIN USE	GENERAL USE
LESS RIFLE POWDER	SQUARE	96.2	1.5	2.3	—	206	0.27±.05	2.30±.25	1.2		38 TYPE INFANTRY RIFLE	2.15±.05 GM	762±8	3,400±400	VARIOUS KINDS OF 6.5 MM RIFLE & MACHINE GUN	30 NEW TYPE RIFLE, 38 TYPE & NEW A.F MG., 44 TYPE CALVARY RIFLE, 11 NEW TYPE LIGHT M.G., 91-TYPE LIGHT M.G. LOADED ON VEHICLE, STEEL [illegible] MORTAR, [illegible] TYPE 12 CM HOWITZER, "RA" TYPE INFANTRY GUN (I, II, III), 14 NEW TYPE MED MORTAR, 30 NEW TYPE PISTOL, 38 TYPE INFANTRY GUN, [illegible] TYPE LT. MORTAR, 26 NEW TYPE PISTOL (SAL), SMITH-WATTSON PISTOL, [illegible] 96-TYPE 24 CM. HOWITZER, 7-NEW TYPE 30 CM HOWITZER IGNITING CHARGE, [illegible]
ESS RIFLE POWDER B	SQUARE						0.30									NONE
IFLE POWDER	SQUARE	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.40	1.00±.35	0.5		99 TYPE RIFLE	2.75±.10 Gm.	740±8	2,800±160	VARIOUS KINDS OF 99 TYPE RIFLE & MACHINE GUN	99 TYPE RIFLE & MACHINE GUN
TYPE "RA" FOR MACH. GUN	SQUARE	97.5	1.5	1.0	SURFACE GELATINIZER (CAMPHOR) 3.5%	208	0.35	1.00±.35	0.5		"RA" TYPE REVOLVING MACH. GUN & PRESSURE TEST GUN	2.70-2.80 Gm.	IN COMPARISON WITH THE STANDARD POWDER ±8	IN COMPARISON WITH THE STANDARD POWDER ±200	RHEIN METAL TYPE MACHINE GUN	7.92 MM MACH GUN (EXCEPT "MO" TYPE RIFLE & "[illegible]" TYPE MACH. GUN)
SQUARE POWDER	SQUARE	96.5	1.5	2.0		206	0.07±.03	2.00±.25	1.0		92 TYPE INFANTRY CANNON	43 Gm.	184±2.5	1,320±120	GRENADE DISCHARGER TYPE	89 TYPE HEAVY GRENADE DISCHARGER (EXCEPT 94 TRAINING SHELL) 10 NEW TYPE GRENADE DISCHARGER (EXCEPT SIGNAL CARTRIDGE)
. SQUARE POWDER	SQUARE	96.5	1.5	2.0	—	206	0.13±.03	2.00±.25	1.0		92 TYPE INFANTRY CANNON	50 GM	197±2.5	1200±120	92 TYPE INFANTRY GUN, 11 NEW TYPE INFANTRY MORTAR	92 TYPE INFANTRY GUN (I, II, III), 11 NEW TYPE INFANTRY MORTAR
SQUARE POWDER	SQUARE	96.1 97.2	1.5 1.5	2.4 1.3	SURFACE GELATINIZER 5%	206	0.33±.05	2.90±0.35 1.30±0.35	0.1		11 TYPE INFANTRY GUN	50±1 GM.	450±45	1,530±170	SMALL CALIBRE CANNON 41 TYPE MT GUN	11 NEW TYPE INFANTRY GUN "HD" 203, 94 TYPE 7cm A.-T. GUN
SQUARE POWDER	SQUARE	96.0	1.5	2.5	—	204	0.41±.04	2.50±.25	1.5		41 MT. GUN	265 GM.	395±35	1,770±140	VARIOUS KINDS OF MED. OR SMALL CALIBRE HOWITZER	94 TYPE 39 mm. A-T, SHARPSHOOT, 90, 97 TYPE 5.7 cm. A-T, 41 MT. 94 MT 31 YEAR RAPID FIRING MT. GUN, 11 YEAR 7 cm. CANNON (LIGHTENING), 11 YEAR 7.5 CM. A.-A. IN ENCAMPMENT (AIM), 88 TYPE 7 cm. AA (AIM), 9 cm. CANNON, STEEL MADE 9 CM. MORTAR, 14 YEAR 10 cm AA (AIM), 14 YEAR 10 cm HOWITZER, 38 TYPE 12 cm HOWITZER, 38 TYPE 15 cm. MORTAR (I, II), STEEL MADE 15 cm MOTAR, 45 TYPE 7 YEAR, 38 TYPE 15 cm. CANNON (LIGHTENING), REDUCED RANGE HOWITZER & MOTAR, TEST "SU" INFANTRY GUN (II SUBSTITUTION), KOKU MT. REBUILDED
SQUARE POWDER	SQUARE	95.7	1.5	2.8	—	204	0.66±.06	2.85±.35	1.7		38 FIELD GUN	600 Gm.	494±5	MAX. 2300 STD. 2150 MIN. 2000	VARIOUS KINDS OF LARGE OR MEDIUM CALIBRE HOWITZER	90 TYPE 10 cm. HOWITZER, REBUILT 14 YEAR 10 cm HOWITZER, 4 YEAR 15 cm HOWITZER, 96 TYPE 15 cm. HOWITZER, 46 TYPE 24 cm. HOWITZER (II CHARGE) 28 HOWITZER, 28 cm MOTAR, "KOKU" 28 cm HOWITZER, 7 YEAR 30 cm. HOWITZER LONG, SHORT, (III II)
TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.26±.05	1.00±0.35	0.5		FOR VELOCITY MEASUREMENT 92 TYPE Hvy. MG. FOR PRES. MEASUREMENT 7.7mm PRESSURE TEST GUN.	2.85±0.1 Gm.	740±8	3150±250		99 LIGHT MACHINE GUN, "CHI" TYPE 7.9 mm LIGHT MACHINE GUN, "MO" TYPE RIFLE, 97 AUTOMATIC CANNON (BLANK CARTRIDGE), 99 RIFLE, 99 SHORT RIFLE, 89 SHARPSHOOT GUN, 94 REVOLVING MACHINE GUN, 89 REVOLVING MACHINE GUN (EXCEPT 98), 12.7mm MACHINE GUN ON "AEROPLANE", 2 TYPE 20mm MACH. GUN, [illegible] 20mm MACH GUN ON "AEROPLANE", 97 AUTOMATIC GUN [illegible]
TUBULAR POWDER	TUBULAR															
TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 5%	206	0.52±.05	1.00±.35	0.5		92 TYPE 13mm. M.G. LOADED ON VEHICLE	14.50 GM.	800±8	FIGURE TO BE OBTAINED IN FUTURE TESTS		97 AUTOMATIC GUN, 92 LOADED 13mm. MACHINE GUN, "HO" TYPE 13mm A-A MACHINE GUN TEST 20mm. REVOLVING SETTLED MACHINE GUN, 99 TYPE 10mt (FOR CHARGE A) (BLANK CARTRIDGE OF 98 A-A MACHINE GUN)
TUBULAR POWDER	TUBULAR															
TUBULAR POWDER	TUBULAR	97.5	1.5	1.0	SURFACE GELATINIZER 2% FLAME EXTINGUISHER 0.5%	206	0.70±.05	1.00±.35	0.5		TYPE 98 A-A MACHINE GUN	FIGURE TO BE OBTAINED IN FUTURE TESTS	950±8	STANDARD VALUE 2,800±150		98 TYPE A-A MACHINE GUN, TEST 94 TYPE 20 mm MACHINE GUN TEST "KEKI", "HOKI", "SOKI" GUNS
BELT-TYPED POWDER	STRIP LIKE FORM	95.7	1.5	2.8	—	204	0.58±.06	2.85±.35	2.4		38 TYPE FIELD CANNON	600 Gm.	500±5	2,150±150	7.5 cm CLASS CANNON	38 FIELD, 41 CAVALRY, REBUILT 38 FIELD, 95 FIELD, 90 FIELD (EXCEPT 90 SPIRE-SHAPED), 31 YEAR RAPID FIELD, 11 YEAR 7.5 cm. A.-A. INCAMPMENT, 88 TYPE 7 cm. A-A (SPECIAL) (EXCEPT SPIRE & SHARP), 11 YEAR 7 cm. CANNON (EXCEPT 90 A-A. SPIRE), 47 mm RAPID, "BA"-TYPE 57 mm. RAPID, 12 cm CANNON, STEEL MADE 12 cm. RAPID CANNON, 9 cm. RAPID CANNON, "KOKU" 35 CALIBRE 10 cm CANNON, "KOKU" 12 cm. CANNON ASSAULTING THE FORTRESS, "SHIKA" 12 cm RAPID CANNON, "KA" 12 RAPID CANNON, "BA" 12 cm RAPID CANNON, [illegible]
T-TYPED POWDER B	STRIP LIKE FORM						0.75									NO USE
BELT-TYPED POWDER	STRIP LIKE FORM	95.1	1.5	3.4	—	204	0.86±.06	3.40±.40	2.6		"KOKU"-TYPE AND 38 TYPE 10 cm CANNON	1.74 Kg.	535±5	2,460±200	CANNON (MEDIUM OR SMALL CALIBRE)	REBUILT 38 FIELD, 87 STEEL-TOPPED BULLET, 90 FIELD (90 SPIRE), 38 TYPE 10 cm CANNON, 88 TYPE 7 cm. A-A (SPECIAL 90 SPIRE), 7.7 cm FIELD, "KOKU" 12 cm. CANNON (25 CALIBRE), "SHIKA" 12 cm. RAPID FIRING CANNON, [illegible] 12 cm. RAPID FIRING CANNON, 26 CALIBRE 24 cm. CANNON, "BA", "KA" 12 cm RAPID FIRING CANNON, 90 FIELD GUN ON RAIL (SHARP-TOPPED ARMOR PIERCING SHELL)
BELT-TYPED POWDER	STRIP LIKE FORM	94.9	1.5	3.6	—	204	1.17±.06	3.60±.50	2.8		KOKU-TYPE AND 38 TYPE 10 cm CANNON	2 Kg.	529±5	1,940±150	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	88 TYPE 7 cm A-A (EXCEPT AIM), 88 TYPE 7 cm. A-A SPECIAL (90 A-A SPIRE), 11 YEAR 7 cm. CANNON (90 A-A SPIRE), 7.5 cm RAPID FIRING CANNON, 7 YEAR 10 cm. CANNON, 14 YEAR 10 cm A A (EXCEPT AIM), 92 TYPE 10 cm. CANNON, [illegible] 10 cm CANNON, "KOKU" 30 CALIBRE 12 cm CANNON, "KOKU" 35 CALIBRE 15 cm CANNON, 45 TYPE 24 cm HOWITZER [illegible] 26 CALIBRE 24 cm. CANNON.
BELT-TYPED POWDER	STRIP LIKE FORM	94.6	1.5	3.9	—	204	1.44±.09	3.90±.50	3.0		"KOKU"-TYPE 35 CAL. 15 cm CANNON	9 Kg.	612±7	2130±120	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	30 CALIBRE, 36 CALIBRE, "KA" TYPE 28 CALIBRE, "KA" TYPE 30 CALIBRE, "KA" TYPE STEEL 26 CALIBRE, "SHI" TYPE 30 CALIBRE, "SHIKA" TYPE 36 CALIBRE } 27 cm CANNON, "AM" 35 CALIBRE 24 cm CANNON, "KOKU" 35 CALIBRE 24 cm CANNON, "SHI" 36 CALIBRE 24 cm CANNON, 7 YEAR 30 HOWITZER (SHORT) (I, II), "KOKU" 25 CALIBRE 24 cm CANNON, "KOKU" 25 CALIBRE 27 cm. CANNON, 89 TYPE 15 cm. CANNON "SHIKA" 15 cm. RAPID FIRING CANNON, "KO" 5 TYPE, 7 YEAR 30 TYPE 15 cm CANNON (AS A SUBSTITUTION OF II CHARGE), "SANKOKU" TURRETS 15 cm CANNON "KOKU" 40 CALIBRE 12 cm RAPID FIRING CANNON
BELT-TYPED POWDER	STRIP LIKE FORM	94.2	1.5	4.3	—	204	2.30±.15	4.30±.50	3.4		"KOKU"-TYPE 30 CALIBRE 24 cm. CANNON	30 Kg.	452±5	1,670±140	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	7 NEW TYPE 30 cm. HOWITZER (LONG) (I, II CHARGE), 96 TYPE 15 cm CANNON, SPECIAL 24 cm. HOWITZER (I, II CHARGE)
BELT-TYPED POWDER	STRIP LIKE FORM		2.0	FIGURE TO BE OBTAINED IN FUTURE TESTS	—	204	FIGURE TO BE OBTAINED IN FUTURE TESTS	FIGURE TO BE OBTAINED IN FUTURE TESTS	FIGURE TO BE OBTAINED IN FUTURE TESTS		"KOKU"-TYPE 20 CALIBRE 24 cm. CANNON	36 Kg.	520±5	MAXIMUM 1,800 STANDARD TO BE DETERMINED LATER		"KOKU" TURRET "SHIKA" 40 CALIBRE 27 cm CANNON, TURRET 45 CALIBRE 25 cm. CANNON (AS A SUBSTITUTION OF II CHARGE), 25 cm CANNON, TURRET 45 CALIBRE 20 cm CANNON (CHARGE A)
SS POWDER FOR PISTOL	GRAINY (EMPTY)		1.5	—		208	0.40	2.00±.50	—		14-NEW TYPE PISTOL	0.3±.02 Gm	334±15	1,700	VARIOUS KINDS OF PISTOLS	14 NEW TYPE PISTOL, 6 NEW TYPE PISTOL, 99 TYPE RIFLE (TRAINING MINIATURE CARTRIDGE) 89 TYPE HEAVY GRENADE THROWER (TRAINING USE), 10 NEW TYPE GRENADE THROWER (FOR FIRING TRAINING) MAUSER PISTOL, 100 TYPE MACHINE GUN
SS PRIMING POWDER	GRAINY	94.0	3.0	1.8	NITRE, BICARBONATE OF SODA } 3%, CHARCOAL, FEW	210	1.10±.20	1.80±.50	0.5		LESS THAN 12 SECONDS WITH A COMBUSTION EXAMINER	/	/	/	IGNITION CHARGE OF VARIOUS POWDER CHARGES	
SS DUMMY CANNON POWDER	GRAINY (EMPTY)		0.5	2.0				2.00±1.00	—		—	20 Gm	IF IS NEEDED FOR RAPID COMBUSTION IN PROPER CONDITIONS	—	VARIOUS DUMMY GUNS	
BLANK CARTRIDGE POWDER	SAME AS POWDER FOR PISTOL	97.5	0.5	2.0		7201	/	2.00±.50	/		38 TYPE INFANTRY RIFLE PRESSURE TEST GUN	0.7 Gm.		MAXIMUM 2,000 MINIMUM TO BE DETERMINED LATER	VARIOUS RIFLES & SMALL CALIBRE BLANK CARTRIDGES	38-TYPE RIFLE, 30 NEW TYPE RIFLE, 99 TYPE RIFLE, "MO" TYPE RIFLE, 3[illegible] INFANTRY, 94 TYPE 37mm CANNON, 94 TYPE 37mm A.-T., 90 TYPE, 97 TYPE 5, 7 A.-T., [illegible] TYPE 7cm A.-T. 44 CAVALRY GUN, CAPTURED 7.9mm SMALL GUN
BLANK CARTRIDGE POWDER	SAME AS THE 0.6 MM. SQUARE POWDER	96.5	1.5	2.0		7206	/	2.00±.40	/		92 TYPE HEAVY MACHINE GUN & BLANK BARREL	2.85 Gm.		WOODEN SHELL BREAKS WITHIN 10m. FROM MUZZLE	VARIOUS BLANK CARTRIDGES FOR MACHINE GUNS	38 TYPE RIFLE, 3 NEW TYPE A.-A. MACHINE GUN, 11 NEW TYPE [illegible] MACHINE GUN, 91 TYPE LIGHT MACHINE GUN LOADED ON VEHICLE, 92 TYPE HEAVY MACHINE GUN, 97 TYPE HEAVY MACHINE GUN LOADED ON VEHICLE, "CHI" TYPE 7.9mm. LIGHT MACHINE GUN, 92 [illegible] 13mm MACHINE GUN LOADED ON VEHICLE, "HO" TYPE 13mm A-A MACHINE GUN
BLANK CARTRIDGE POWDER	OBLONG (EMPTY)	97.2	0.5	2.3		7201	/	2.30±.50	/		41 TYPE MOUNTAIN GUN	100 GM.	COMPRESSED SHELL BREAKS WITHIN 50 m FROM MUZZLE	1300 MINIMUM TO BE DETERMINED LATER	VARIOUS BLANK CARTRIDGES FOR MEDIUM CALIBRE HOWITZERS	11 NEW TYPE INFANTRY GUN, REFORMED 14 NEW TYPE 10 cm HOWITZER, 38 TYPE 12 cm HOWITZER, 91 TYPE 10 cm HOWITZER, 4 NEW TYPE 15 cm HOWITZER, 89 TYPE 15 cm CANNON, 38 TYPE 15 cm HOWITZER, 96 TYPE 15 cm HOWITZER
BLANK CARTRIDGE POWDER	OBLONG (EMPTY)	97.2	0.5	2.3		7201	/	2.30±.50	/		41 TYPE MOUNTAIN GUN	120 GM.	COMPRESSED SHELL BREAKS WITHIN 50 m FROM MUZZLE	700 MINIMUM TO BE DETERMINED LATER	FIELD GUN CLASS & 10 cm. CANNON CLASS BLANK CARTRIDGES	38 TYPE FIELD, 41 TYPE CAVALRY, REFORMED 38 TYPE FIELD, 35 TYPE FIELD, 90 TYPE FIELD, 94 TYPE MT., 31 TYPE NEW MT, 41 MT, 88 TYPE 7 cm A-A, 88 TYPE 7 cm A-A (SPECIAL), 31 YEAR TYPE RAPID FIELD, 11 YEAR TYPE 7.5 cm ENCAMPMENT A.A, NEW TYPE 7 cm CANNON, 1 NEW TYPE 10 cm CANNON, 10 cm CANNON, 38 TYPE 10 cm CANNON, 92 TYPE 10 cm CANNON, 45 TYPE 24 cm HOWITZER

WDER		USES		N. B.	MANUFACTURING COURSE
	PRESSURE IN BORE	MAIN USE	GENERAL USE		
6ℓ	3,400±400	VARIOUS KINDS OF G… MACHINE RIFLE GUN	30 NEW TYPE RIFLE, 38 TYPE & NEW A.A MG., 44 TYPE CALVARY RIFLE, 11 NEW TYPE LIGHT M.G., 91 TYPE LIGHT M.G. LOADED ON VEHICLE, STEEL 9 CM. MORTAR, 39 TYPE 12 CM HOWITZER, "RA" TYPE INFANTRY GUN (I, II), 14 NEW TYPE MED MORTAR, 30 NEW TYPE PISTOL, 38 TYPE INFANTRY GUN, 90 TYPE LT. MORTAR, 26 NEW TYPE PISTOL (SA…) SMITH-WATTSON PISTOL, …96 TYPE 24 CM. HOWITZER, 7-NEW TYPE 30 CM. HOWITZER IGNITING CHARGE.		GUN-COTTON COLLODION → MIXING → DEHYDRATION → KNEADING ROLLING EXTRUSION CUTTING → RECOVERING OF SOLVENT GLAZING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
			NONE	THOUGH IT WAS ADOPTED FOR 7.7MM. MACH GUN, IT WILL NEVER BE MANUFACTURED IN FUTURE, OWING TO THE APPEARANCE OF No.3 TUBULAR POWDER	
40±8	2,800±160	VARIOUS KINDS OF 99 TYPE RIFLE & MACHINE GUN	99 TYPE RIFLE & MACHINE GUN		UP TO THE "CUTTING" IT IS THE SAME AS POWDER FOR RIFLE RECOVERING OF SOLVENT SURFACE GELATINIZATION GLAZING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
COMPARISON WITH THE STANDARD POWDER ±8	IN COMPARISON WITH THE STANDARD POWDER ±200	RHEIN METAL. TYPE MACHINE GUN	7.92 MM MACH. GUN (EXCEPT "MO" TYPE RIFLE & "CHI" TYPE MACH. GUN)		SAME AS ABOVE
94±2.5	1,320±120	GRENADE DISCHARGER TYPE	89 TYPE HEAVY GRENADE DISCHARGER (EXCEPT 94 TRAINING SHELL) 10 NEW TYPE GRENADE DISCHARGER (EXCEPT SIGNAL CARTRIDGE)		SAME AS RIFLE POWDER
97±2.5	1200±120	92 TYPE INFANTRY GUN, 11 NEW TYPE INFANTRY MORTAR	92 TYPE INFANTRY GUN (I, II, III), 11 NEW TYPE INFANTRY MORTAR		SAME AS RIFLE POWDER
50±4.5	1,530±170	SMALL CALIBRE CANNON 41 TYPE MT. GUN	11 NEW TYPE INFANTRY GUN "HO" 203, 94 TYPE 7CM. A.-T. GUN		SAME AS THE POWDER OF SMALL GUN, BUT WHEN ITS SURFACE IS COATED WITH COLLOID STABILIZER THE MANUFACTURING METHOD IS THE SAME AS FOR No. 4 POWDER OF SMALL GUN.
35±35	1,770±140	VARIOUS KINDS OF MED. OR SMALL CALIBRE HOWITZER	94 TYPE 39MM. A-T, SHARPSHOOT, 90, 97 TYPE 5.7 CM. A-T, 41 MT. 94 MT. 31 YEAR RAPID FIRING MT. GUN 11 YEAR 7CM. CANNON (LIGHTENING), 11 YEAR 7.5 CM. A.-A. IN ENCAMPMENT (AIM), 88 TYPE 7CM. AA (AIM), 9 CM. CANNON, STEEL MADE 9CM. MORTAR, 14 YEAR 10CM. AA. (AIM), 14 YEAR 10 CM HOWITZER, 38 TYPE 12 CM HOWITZER, 38 TYPE 15 HOWITZER, 15CM. MORTAR (I, II), STEEL MADE 15CM. MORTAR, 45 TYPE 7 YEAR, 90 TYPE 15 CM. CANNON (LIGHTNING), REDUCED RANGE. HOWITZER & MOTAR, TEST "SU" INFANTRY GUN (II SUBSTITUTION), KOKU MT. REBUILDED		SAME AS FOR RIFLE POWDER UNTIL ROLLING CUTTING → RECOVERY OF SOLVENT - GLAZING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
94±5	MAX. 2200 STD. 2150 MIN. 2000	VARIOUS KINDS OF LARGE OR MEDIUM CALIBRE HOWITZER	90 TYPE 10CM. HOWITZER, REBUILT 14 YEAR 10 CM. HOWITZER, 4 YEAR 15CM HOWITZER, 96 TYPE 15 CM. HOWITZER, 45 TYPE 24 CM. HOWITZER (I CHARGE) 28 HOWITZER, 28 CM MOTAR, "KOKU" 28 CM. HOWITZER, 7 YEAR 30 CM. HOWITZER LONG, SHORT (II III)		SAME AS No.1 SQUARE POWDER
	=				
40±8	3150±250		99 LIGHT MACHINE GUN, "CHI" TYPE 7.9MM. LIGHT MACHINE GUN. "MO" TYPE RIFLE 97 AUTOMATIC CANNON (BLANK CARTRIDGE), 99 RIFLE, 99 SHORT RIFLE, 99 SHARPSHOOT GUN, 94 REVOLVING MACHINE GUN, 89 REVOLVING MACHINE GUN (EXCEPT 98), 12.7MM. MACHINE GUN ON "AEROPLANE", 2 TYPE 20MM MACH. GUN, LT. 20MM. MACH. GUN ON "AEROPLANE", 97 AUTOMATIC GUN (BLANK)		SAME AS FOR RIFLE POWDER UNTIL KNEADING KNEADING → EXTRUSION → CUTTING → RECOVERING OF SOLVENT SURFACE GELATINIZATION GLAZING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
00±8	FIGURE TO BE OBTAINED IN FUTURE TESTS		97 AUTOMATIC GUN, 92 LOADED 13MM. MACHINE GUN, "HO" TYPE 13MM A-A. MACHINE GUN TEST 20MM. REVOLVING SETTLED MACHINE GUN, 99 TYPE 10MT. (FOR CHARGE A) (BLANK CARTRIDGE OF 98 A-A MACHINE GUN)		
	=				
50±8	STANDARD VALUE 2,800±150		98 TYPE A-A. MACHINE GUN, TEST 94 TYPE 20MM. MACHINE GUN TEST "KEKI", "HOKI", "SOKI" GUNS	IT IS THE ONLY FLAME-EXTINGUISHING POWDER THAT HAS EVER BEEN MADE, BUT IT IS NEEDED TO HAVE SMOKE-EXTINGUISHING EFFECT ELSE.	
00±5	2,150±150	7.5CM CLASS CANNON	38 FIELD, 41 CAVALRY, REBUILT 38 FIELD, 95 FIELD, 90 FIELD (EXCEPT 90 SPIRE-SHAPED), 31 YEAR RAPID FIELD, 11 YEAR 7.5CM. A.-A. INCAMPMENT, 88 TYPE 7CM. A-A. (SPECIAL) (EXCEPT SPIRE & SHARP), 11 YEAR 7CM. CANNON (EXCEPT 90 A-A. SPIRE), 47MM RAPID, "BA"-TYPE 57MM. RAPID, 12 CM CANNON STEEL MADE 12 CM. RAPID CANNON, 9 CM. RAPID CANNON, "KOKU" 35 CALIBRE 10 CM CANNON, "KOKU" 12CM CANNON ASSAULTING THE FORTRESS, "SHIKA" 12 CM RAPID CANNON, "KA" 12 RAPID CANNON, "BA" 12 CM RAPID CANNON, AUTO TYPE 90 FIELD GUN.		SAME AS FOR RIFLE POWDER UNTIL KNEADING KNEADING → ROLLING (KNEADING - - EXTRUSION - - ROLLING: EXTRUSION FOR No.2 BELT POWDER ONLY) → 1ST HYDRAULIC PRESS → PRE-DRYING → 2ND ROLLING → 2ND HYDRAULIC PRESS → CUTTING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
			NO USE	THOUGH IT IS ADOPTED FOR 7.5CM A-A GUNS IT HAS NO VALUE NOW & IT WOULD NEVER BE MANF'D. IN THE FUTURE	
35±5	2,460±200	CANNON (MEDIUM OR SMALL CALIBRE)	REBUILT 38 FIELD, 87 STEEL-TOPPED BULLET, 90 FIELD (90 SPIRE), 38 TYPE 10 CM. CANNON, 88 TYPE 7CM A-A (SPECIAL 90 SPIRE), 7.7 CM FIELD, "KOKU" 12 CM. CANNON (25 CALIBRE), "SHIKA" 12 CM. RAPID FIRING CANNON, "KA" 12 CM. RAPID FIRING CANNON, 26 CALIBRE 24 CM. CANNON, "BA", "KA" 12 CM RAPID FIRING CANNON, 90 FIELD GUN ON RAIL (SHARP-TOPPED ARMOR PIERCING SHELL).		
29±5	1940±150	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	88 TYPE 7CM A-A (EXCEPT AIM), 88 TYPE 7CM. A-A SPECIAL (90 A-A SPIRE), 11 YEAR 7CM. CANNON (90 A-A SPIRE) 7.5CM. RAPID FIRING CANNON, 7 YEAR 10 CM. CANNON, 14 YEAR 10 CM A-A (EXCEPT AIM), 92 TYPE 10 CM. CANNON, 14 YEAR 10 CM CANNON, "KOKU" 30 CALIBRE 12 CM CANNON, "KOKU" 35 CALIBRE 15 CM CANNON, 45 TYPE 24 CM HOWITZER (I CHARGE) 26 CALIBRE 24 CM. CANNON.	THE CORRESPONDING GUN POWDER TO THIS POWDER IS THE No 16 TUBULAR POWDER	
12±7	2130±120	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	30 CALIBRE, 36 CALIBRE, "KA" TYPE 28 CALIBRE, "KA" TYPE 30 CALIBRE, "KA" TYPE STEEL 28 CALIBRE, "SHI" TYPE 30 CALIBRE, "SHIKA" TYPE 36 CALIBRE } 27 CM CANNON, "AN" 35 CALIBRE 24 CM. CANNON, "KOKU" 35 CALIBRE 24 CM. CANNON, "SHI" 36 CALIBRE 24 CM. CANNON, 7 YEAR 30 HOWITZER (SHORT) (I, II), "KOKU" 25 CALIBRE 24 CM. CANNON, "KOKU" 35 CALIBRE 21 CM. CANNON, 89 TYPE 15 CM. CANNON "SHIKA" 15 CM. RAPID FIRING CANNON, "RO" S TYPE, 7 YEAR 90 TYPE 15 CM. CANNON (AS A SUBSTITUTION OF II CHARGE), "SANKOKU" TURRETS 15 CM CANNON "KOKU" 40 CALIBRE 12 CM. RAPID FIRING CANNON	THE CORRESPONDING GUN POWDER TO THIS POWDER IS THE No 20 TUBULAR POWDER	
52±5	1,670±140	MEDIUM CALIBRE CANNON, LARGE CALIBRE HOWITZER	7 NEW TYPE 30 CM. HOWITZER (LONG) (I, II CHARGE), 96 TYPE 15 CM. CANNON, SPECIAL 24 CM. HOWITZER (I, II CHARGE)	THE CORRESPONDING GUN POWDER TO THIS IS No. 30 TUBULAR POWDER.	
20±5	MAXIMUM 1,800 STANDARD TO BE DETERMINED LATER		"KOKU" TURRET "SHIKA" 40 CALIBRE 27 CM. CANNON, TURRET 45 CALIBRE 25 CM. CANNON (AS A SUBSTITUTION OF II CHARGE), 25 CM CANNON, TURRET 45 CALIBRE 20 CM. CANNON (CHARGE A)		
34±15	1,700	VARIOUS KINDS OF PISTOLS	14 NEW TYPE PISTOL, 6 NEW TYPE PISTOL, 99 TYPE RIFLE (TRAINING MINIATURE CARTRIDGE) 89 TYPE HEAVY GRENADE THROWER (TRAINING USE), 10 NEW TYPE GRENADE THROWER (FOR FIRING TRAINING) MAUSER PISTOL, 100 TYPE MACHINE GUN.		SAME AS RIFLE POWDER UNTIL KNEADING KNEADING → ROLLING → CUTTING → WEATHERING → BLENDING → EXAMINATION → PACKING
/	/	IGNITION CHARGE OF VARIOUS POWDER CHARGES			SAME AS RIFLE POWDER UNTIL KNEADING KNEADING → EXTRUSION → CUTTING → NATURAL DRYING → DRYING → WEATHERING → BLENDING → EXAMINATION → PACKING
… IS NEEDED …R RAPID …MBUSTION PROPER …NDITIONS	—	VARIOUS DUMMY GUNS		WASTE POWDERS OF SMOKELESS POWDER ARE APPLIABLE TO PISTOL No. 1, 2, & 3, BLANK CARTRIDGES	SAME AS FOR SMOKLESS POWDER FOR PISTOLS
	MAXIMUM 2,000 MINIMUM TO BE DETERMINED LATER	VARIOUS RIFLES & SMALL CALIBRE BLANK CARTRIDGES	38-TYPE RIFLE, 30 NEW TYPE RIFLE, 99 TYPE RIFLE, "MO" TYPE RIFLE, 92 INFANTRY, 94 TYPE 37MM. CANNON, 94 TYPE 37MM. A.-T., 90 TYPE, 97 TYPE 5, 7 A.-I., 94 TYPE 7CM A.-T., 44 CAVALRY GUN, CAPTURED 7.9MM. SMALL GUN.		SAME AS ABOVE
	WOODEN SHELL BREAKS W… 10M FROM MUZZLE	VARIOUS BLANK CARTRIDGES FOR MACHINE GUNS	38 TYPE RIFLE, 3 NEW TYPE A.-A. MACHINE GUN, 11 NEW TYPE LIGHT MACHINE GUN, 91 TYPE LIGHT MACHINE GUN LOADED ON VEHICLE, 92 TYPE HEAVY MACHINE GUN, 97 TYPE HEAVY MG. LOADED ON VEHICLE, "CHI" TYPE 7.9MM. LIGHT MACHINE GUN, 92 TYPE 13MM. MACHINE GUN LOADED ON VEHICLE, "HO" TYPE 13MM A-A MACHINE GUN.		SAME AS FOR RIFLE POWDER
…MPRESSED …ELL BREAKS …THIN 50 M …ROM MUZZLE	1300 MINIMUM TO BE DETERMINED LATER	VARIOUS BLANK CARTRIDGES FOR MEDIUM CALIBRE HOWITZERS	11 NEW TYPE INFANTRY GUN, REFORMED 14 NEW TYPE 10 CM HOWITZER, 38 TYPE 12 CM. HOWITZER 91 TYPE 10CM HOWITZER, 4 NEW TYPE 15CM HOWITZER, 89 TYPE 15 CM. CANNON, 38 TYPE 15CM HOWITZER, 96 TYPE 15 CM. HOWITZER		SAME AS FOR SMOKELESS POWDER FOR PISTOLS
…MPRESSED …ELL BREAKS …THIN 50M …ROM MUZZLE	700 MINIMUM TO BE DETERMINED LATER	FIELD GUN CLASS & 10 CM. CANNON CLASS BLANK CARTRIDGES	38 TYPE FIELD, 41 TYPE CAVALRY, REFORMED 38 TYPE FIELD, 95 TYPE FIELD, 90 TYPE FIELD, 99 TYPE MT. 31 TYPE RAPID MT, 41 MT., 88 TYPE 7CM. A-A., 88 TYPE 7CM A-A (SPECIAL), 31 YEAR TYPE RAPID FIELD, 11 YEAR TYPE 7.5CM ENCAMPMENT A-A, NEW TYPE 7CM. CANNON, 11 NEW TYPE 10 CM. CANNON, 10 CM. A-A. 38 TYPE 10CM CANNON, 92 TYPE 10 CM. CANNON, 45 TYPE 24 CM. HOWITZER		SAME AS ABOVE