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U. S. NAVAL TECHNICAL MISSION TO JAPAN
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From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.

Subject: Target Report - Japanese Naval Guns and Mounts, Article 1
- Mounts Under 18".

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

1. Subject report, dealing with Targets O-46(N) and O-47(N) of Fascicle O-1 of reference (a), is submitted herewith.

2. The investigation of the target and the target report were accomplished by Comdr. (E) A. J. Stewart, RN.



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O-47(N)-1

JAPANESE NAVAL GUNS AND MOUNTS
ARTICLE 1
MOUNTS UNDER 18"

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945
FASCICLE O-1, TARGET O-46(N) AND O-47(N)

FEBRUARY 1946

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

ORDNANCE TARGETS

JAPANESE NAVAL GUNS AND MOUNTS ARTICLE 1 - MOUNTS UNDER 18"

As a generalization it may be said that all Japanese naval turrets and mounts are of sound and practical design and construction, but have no really outstanding features. With perhaps the exception of the 10cm/65 caliber and 8cm/60 caliber twin Type 98 high angle turret mounts, they are all old-fashioned when compared with U.S. and British standards.

Remote power contact has been used on only one type of mount - for triple 25mm machine guns where a Ward Leonard system is used. No thought whatever appears to have been given to its use on any others. The triple machine gun mount with its Ward Leonard system of remote power contact has also been adapted for use as a 28-barrel 12cm rocket launcher.

It was thought at one time that the Japanese were developing a 6 or 8-inch rapid firing gun. This is not so. The maximum rate of fire of guns above 5-inch caliber was about five rounds per minute, and no projects were in hand to improve on this. It was hoped to design a 12-inch twin turret to be fitted in an oversized cruiser, but designs were never started.

There is no evidence of any of the following features being used, or even being considered for use, by the Japanese:

1. One-stroke ramming into guns using semi-fixed ammunition.
2. Turntable structure fabricated by welding. (Some minor mounts were built with partially welded carriages.)
3. Unequally spaced training rollers.
4. Upward opening breeches (the nearest approach to this is in the center gun of the triple 6-inch turrets, where the breech, which is of the normal swing type, is opened at an angle of about 45° above the horizontal).
5. Cone-type ("hour glass") worms in elevating and training gears.
6. Screw-elevating gears.
7. Triaxial or stabilized mounts.
8. Automatic loading and feeding guns (except 40mm Bofors and below).
9. Local control by joystick. The only approach to a joystick is the control used on the triple 25mm machine gun director. (See NavTechJap Report "Japanese Fire Control" Index No. G-29.)

There are no methods of rapidly changing the type of shell in use, other than loading one gun in a turret with one kind of shell and the other(s) with another type. The method of fire control when using barrage fire is separately reported on in NavTechJap Report Index No. O-29. No guns larger than 5-inch caliber use fixed ammunition.

In the 14 and 16-inch turrets, all angle loading (up to 20° elevation) is used, the method adopted being identical with that on the British 15-inch turrets. In these 14 and 16-inch turrets, and also in the 18-inch turrets, the ring bulkhead is divorced from the ship's structure at armour deck level and above. Although consideration had been given to the design of a similar construction for 6 and 8-inch barbettes, to avoid deformation due to working of

the ship, these turrets were not actually so fitted.

In the 18-inch turrets of YAMATO and MUSASHI, the training gears were "all spur gears". This is described in NavTechJap Report, entitled "Japanese 18" Guns and Mounts", Index No. O-45(N).

Japanese major caliber turrets (14 and 16-inch) are all of old design and were copied from the British-built turrets for the BB KONGO. In general arrangement and in most details, they are similar to the British 15-inch turrets, but some improvements have been made by the Japanese; namely:

1. They have greater elevation. It is not definitely known what was the maximum elevation of these guns. When originally built, it is thought to have been about 25° and to have later been increased to 30 or 33° . Beginning in 1937, all battleship turrets were given a large reconstruction, and the elevation of the guns increased to 43° .
2. Better flash tightness in gunhouses and working chambers. All battleships were fitted with longitudinal flashtight bulkheads between the guns, and between the gun loading hoists in the working chambers.
3. In the 16-inch turrets, the gunloading cages are designed to hold four one-quarter charges end to end, thus enabling a full charge to be rammed with a single stroke of the rammer.

Eight inch turrets were designed after inspection of German cruiser turrets just after World War I. Pusher type shell hoists were copied from these ships. The Japanese 8-inch twin and 6-inch triple turrets are almost identical in arrangement, and are remarkably similar to the early British 6-inch MK XXI and XXII turrets.

Generally speaking, the smaller Japanese mounts appear to be unduly heavy and to have somewhat high trunnions. The practice of fitting the trunnions near the breech of the gun and using an extra weight to balance the gun on elevation is not much used. A number of the simpler mounts are fitted with a spring under compression, attached to the front of the cradle and to the base plate of the mount, for this purpose; and the more modern, high angle guns, rely on the weight of loading trays, rammers, and run-out springs. Features of some interest in modern high angle mounts are:

1. The platforms for the loading tray operators move with the gun on elevation, thus simplifying the loading operation at low angles of elevation.
2. Apparently successful, but heavy, automatic recoil operated spring rammers.
3. Automatic fuze-setting machines which set the fuze when the round is in the loading tray as it is being swung to the loading position. (See NavTechJap Report, "Japanese Fuze-Setting Machines", Index No. O-48(N).)

By far the most outstanding gun and mount used by the Japanese is their 10cm (4-inch)/65 caliber Type 98 twin high angle gun mount, which has a maximum range of 21,320 yards surface, and 14,220 yards vertical, with a rate of fire of 19 to 20 rounds per minute.

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The following is a copy of a Japanese report on an electric gun given to members of the Scientific Intelligence Survey of Japan in September and October 1945. The report is included here for convenience only.

"Work on this projector was started in 1942 with the aim of using it as a kind of artillery piece. The principle was that of the induction motor; the projector being the stator and the projectile, the rotor. Power was supplied by a 2000 KVA 1500 cycle, 3-phase generator. Theoretically, a velocity of 500 meters/sec for a 10 kg projectile is possible, but the best results obtained were 350 meters/sec for a two kg projectile. This was not considered a practical field weapon, but was used as a projector for models of winged rockets."

Reference to electric guns has also been seen in several old popular science magazines.

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INTRODUCTION

The objects of this investigation were to obtain general details of turret mounts built since 1927, and of any transferable mounts of interest, and to obtain particulars of any novel features in these mounts. The work of obtaining information was done concurrently with, and in the same manner as that for NavTechJap Report, "Japanese 18" Guns and Mounts", Index No. O-45(N).

A questionnaire of some 50 questions on the salient features of guns and mounts in use by the Japanese Navy was given to Captain IWASHIMA on 23 November 1945. The complete table of answers has been included at the beginning of this report. Certain of the answers given, particularly those giving numerical values are not fully reliable. A few answers were later corrected from the drawings (mentioned later in this introduction), and from information received at KURE.

A large number of documents or handbooks on many types of mounts, and a number of drawings, including a complete set of drawings of the 10cm Type 98 HA gun and mount, were sent to the United States from Sasebo Naval Gun Factory before the writer started investigation on these targets. Another complete library of drawings was found towards the end of December at YOKOSUKA. This library is thought to contain complete sets of drawings of all types of mounts from 16-inch downwards, (as far as it is known, it does not contain any drawings of the 18-inch mount). In addition, it includes a large number of handbooks and pamphlets. As the library contained in the region of 40,000 drawings, it was not practicable to inspect them all. A number were, however, removed for investigation and a few of the more interesting have been enclosed with this report. The titles of a number of the documents were translated, and those of interest forwarded to ATIS for complete translation and filing at Washington Document Center. The titles of these documents, together with their identifying numbers have been given in the section of this report to which they are appropriate. The remainder of the library has been shipped to the Washington Document Center "en bloc".

On arrival at KURE in November 1945, the writer found that the Arsenal in the Navy Yard had been very badly damaged by bombing. The Arsenal contained a vast number of different types of mounts which were too badly damaged to be of value for technical investigation. The latest experimental 5-inch gun and mount (for land use) was fortunately untouched and it was shipped to the United States. A list of other mounts of interest which were inspected, and the ships in which they were seen, is given below:

1. 16-inch turrets: In NAGATO. No. 2 turret was inspected throughout, and found to be in an excellent state of maintenance.
2. 14-inch turrets: In ISE and HARUNA. Both ships were sunk, and flooded up to the level of the gunwells. All parts of the gunhouse machinery and guns in No. 2 turret in HARUNA were still in perfect condition.
3. 8-inch turrets: In cruiser AOBA. Flooded up to the level of the gunwell, but in a reasonably good state of maintenance.
4. 6-inch turrets: One spare trial gunhouse and working chamber was seen on the proving ground at KAMEGAKUBI and a number of almost complete turrets removed from MOGAMI were found stored in a warehouse on ETA JIMA.
5. 5-inch (12.7cm) Type 89/40 cal twin HA mounts: Were seen on board the aircraft carrier KATSURAGI. (Three of these have been sent to the United States.)

6. 4-inch (10cm) Type 98/65 cal twin mounts: In destroyers NATSUZUKI and HANAZUKI. It was hoped to see these mounts run under power, but, although the ships were less than a year old, the mounts had been so neglected since the end of the war that there was not time to put them in working condition before the ships sailed to repatriate Japanese nationals. Two mounts were, therefore, removed from NATSUZUKI and have been shipped to the United States.

In view of the large numbers of handbooks and drawings sent to the United States, no attempt has been made in this report to give a comprehensive and detailed description of any mount. The report is intended only to act as a guide and to draw attention to the more interesting features of the mounts, which can be studied in detail from the drawings and handbooks and in some cases from the mounts themselves if required.

REFERENCES

Location of Target:

Kure Navy Yard, Ordnance Department.

Kamegakubi Proving Ground.

ETA-JIMA, and other islands around KURE.

Battleships NAGATO, ISE, and HARUNA; aircraft carriers KATSURAGI and RYUKU; cruiser AOBA; destroyers NATSUZUKI and HANAZUKI.

Japanese Personnel Who Assisted in Gathering Documents:

Technical Captain DATE, late head of Mount Section in Navy Technical Department, TOKYO.

Technical Comdr. ICHINOI, Fire Control Section in Navy Technical Department, TOKYO.

Japanese Personnel Interviewed:

Captain IWASHIMA - TOKYO

Captain DATE - TOKYO

Captain YASUNAMI - KURE

T. OTANI (Engineer) - KURE

R. SUGIYAWA (Engineer) - KURE

Constructor Captain MAKIRO - TOKYO

Lt. Comdr. MATSAMURA - KURE

Comdr. ICHINOI

Fuller information on the above personnel is given in NavTechJap Report, "Japanese 18" Guns and Mounts", Index No. O-45(N) and NavTechJap Report, "Japanese Fire Control", Index No. O-29.

Mr. KOGA - Engineer, Kure Ordnance Department. Designer of the 12.7 cm/50 cal Type 5 single mount, and various other small caliber mounts.

Mr. ASAKAWA, Kure Ordnance Department, mainly concerned with design of medium caliber mounts.

Gunnery officers of the aircraft carriers and destroyers inspected.

THE REPORT

Section I GENERAL DETAILS OF TURRETS AND MOUNTS

The data which follows in this section of the report were compiled by Japanese personnel at the Navy Technical Department in TOKYO, from memory and from personal notes. The data on mounts has been checked as far as possible by the author from information received from Japanese officers at Kure Naval Arsenal; from inspection of certain of the mounts; and, in some instances, from drawings. Where it has not been possible to decide conclusively on a correct answer, that which is considered to be the more reliable has been asterisked. Where two answers appear to be equally reliable both have been given. No alterations have been made to the data on guns or ammunition, since separate reports (NavTechJap Report "Japanese Naval Guns", Index No. O-54(N) and NavTechJap Report "Japanese Projectiles - General Types", Index No. O-19) have been made on these subjects. The data in those reports on guns and ammunition therefore, differ slightly from that given here, which has been included in this report simply for convenience in giving the reader a general idea of the type and performance of the guns and ammunition for which the mounts have been built. A separate report is also being made on machine guns and their mounts.

It is hoped that the information contained in the following data will suffice to give a general picture of types and performances of the mounts in use by the Japanese Navy. A certain amount of additional data have been gathered since the data in this section were compiled, and is included in Section II of the report. No reliable information could be obtained on the recoil forces in any of the mounts.

DATA ON JAPANESE NAVAL GUNS

Guns	Name (Work or Type No.)	Bore		Length (cal)	Weight (tons)	Max. Range (yd)	
		Nominal	Actual			Surface	Vertical
94th yr 40cm(46cm)	Model of 94th year, 40cm gun	40cm	18.1" (46cm)	45	160-165*	46,000 (42,050 meters)	13,200
40cm	Model 3rd year, 40cm gun	40cm	16.14" (41cm)	45	102	42,000	12,100
36cm	Model 11st year, and model Vickers 36cm gun	36cm	14" (35.56cm)	45	85-86*	38,800	10,670
20cm	Model 3rd year, 20cm gun, Type 2	20cm	8" (20.32cm)	50	18-19*	31,600	11,000
Short 20cm	Short 20cm gun Types I, I ₂ and I ₃	20cm	8" (20.32cm)	12	1390 lbs (630 kg)	6900 (6300 meters)	3600 (3300 meters)
15.5cm	15.5cm gun Types I, I ₂ and I ₃	15.5cm	6.1" (15.5cm)	60	28,000 lbs (12,700 kg)	Armor Piercer 30,000 (27,400 meters) common shell 29,000 (26,500 meters)	Common shell 13,750 (12,600 meters)
14cm/40cal	40 cal model of 11th year 14cm guns Types I, I ₂ and I ₃	14cm	5.5" (14cm)	40	8580 lbs (3900 kg)	17,400 (16,000 meters)	Surface Only
15cm Twin	50 cal model of 11st year 15cm gun	15cm	6" (15.24cm)	50	8.6	23,000 (21,000 meters)	10,940 (1000 meters)
14cm/50 cal Twin	50 cal model of 3rd year 14cm gun	14cm	5.5" (14cm)	50	5.6	22,400 (20,500 meters)	Used as Sur- face Gun Only
12.7cm/50 cal	50 cal model 3rd year 12.7 cm AA gun	12.7cm	5" (12.7cm)	50	4.3	20,100 (18,400 meters)	12,550 (11,500 meters)
12.7cm/40 cal	40 cal model 89th year 12.7cm AA gun	12.7cm	5" (12.7cm)	40	3.15	16,200 (14,800 meters)	10,200 (9400 meters)

DATA ON JAPANESE NAVAL GUNS (Continued)

Guns	Name (Work or Type No.)	Boys		Length (cal)	Weight (tons)	Max. Range (yd)	
		Nominal	Actual			Surface	Vertical
12cm/45 cal	45 cal model 11th year 12cm gun Type X, X ₂ , X ₃	12cm	4.7" (12cm)	45	3.24	17,500 (16,000 meters)	Surface use only
12cm/45 cal AA	45 cal model 16th year 12cm AA gun Type IX, IX ₂ , IX ₅	12cm	4.7" (12cm)	45	2.98	17,500 (16,000 meters)	10,900 (10,000 meters)
Short 12cm	Short 21cm gun	12cm	4.7" (12cm)	12	?	5800 (5300 meters)	2620 (2400 meters)
10cm/50 cal	50 cal Model of 88th year 10cm gun Type I	10cm	3.95" (10cm)	50		17,700 (16,200 meters)	12,250 (11,200 meters)
98th yr 10cm AA	Model of 98th yr 10cm AA gun Type I, I ₂	10cm	3.95" (10cm)	65	3.08	21,320 (19,500 meters)	14,200 (13,000 meters)
98th yr 8cm AA	Model of 98th year 8cm AA gun Type I, I ₂	8cm	3" (7.62cm)	60	1.2 1.6	14,750 (13,500 meters)	9300 (8500 meters)
8cm/40 cal AA	40 cal Model of 3rd year 8cm AA gun	8cm	3" (7.62cm)	40	0.6	11,800 (10,800 meters)	7870 (7200 meters)
	40 cal Model of 88th year 8cm AA gun						
Short 8cm	Model of 5th year Short 8cm AA gun	8cm	3" (7.62cm)	25		8400 (7700 meters)	5100 (4700 meters)
Vickers 40mm MG	Vickers Type 40mm Machine gun	40mm	40mm	62	620 lbs (280 kg)	6340 (5800 meters)	4370 (4000 meters)
25mm MG	25mm Machine Gun	25mm	25mm	60	253 lbs (115 kg)	7400 (6800 meters)	5500 (5000 meters)

DATA ON JAPANESE NAVAL GUNS (Continued)

Guns	Muzzle Velocity	Life of Gun #	Const. of Barrel	Rifling Twist	Maximum Chamber Pressure
94th yr 40cm (46cm)	2558 ft/sec (780 m/sec)	Not determined yet, 200* approximate	Wire wound Radially expanded	Uniform 28 cal one turn	30-32" * 30 kg/mm ² 19.4 tons/sq. in.
40cm	2558 ft/sec (780 m/sec)	250	Wire wound	Uniform 28 cal one turn	30 kg/mm ² 19.4 tons/sq. in.
36cm	2524 ft/sec (770 m/sec)	250	Wire wound Radially expanded	Uniform 28 cal one turn	30 kg/mm ² 19.4 tons/sq. in.
20cm	2738 ft/sec (835 m/sec)	280-320*	Wire wound Radially expanded	Uniform 28 cal one turn	19.4 tons/sq. in. 31-30* kg/mm ²
Short 20cm	1000 ft/sec (305 m/sec)	Probably over 2000	Monobloc	Increasing twist, at beginning 30 cals. At muzzle 13 cal one turn	9250 lbs/sq. in. 6.5 kg/mm ²
15.5cm	3000 ft/sec (980 m/sec)	250	Monobloc Radially expanded	Uniform 28 cal one turn	48,600 lbs/sq. in. 34 kg/mm ²
14cm/40 cal	2300 ft/sec (700 m/sec)	800	Type I, I ₂ , Built up guns, Type I ₃ Monobloc guns all radially expanded	Uniform 28 cal one turn	36,100 lbs/sq. in. 25 kg/mm ²
15cm Twin	2790 ft/sec (850 m/sec)	500	Built up Radially expanded	30 cal one turn	41,240 lbs/sq. in. 29 kg/mm ²
14cm/50 cal Twin	2790 ft/sec (850 m/sec)	500	Wire wound	28 cal one turn	41,240 lbs/sq. in. 29 kg/mm ²
12.7cm/50 cal	2960 ft/sec (910 m/sec)	550	Built up Radially expanded	28 cal one turn	40,000 lbs/sq. in. 28 kg/mm ²
12.7cm/40 cal	2860 ft/sec (720 m/sec)	800	Monobloc Radially expanded	28 cal one turn	36,000 lbs/sq. in. 25.3 kg/mm ²

DATA ON JAPANESE NAVAL GUNS (Continued)

Guns	Muzzle Velocity	Life of Gun #	Const. of Barrel	Rifling Twist	Maximum Chamber Pressure
12cm/45 cal	2700 ft/sec (825 m/sec)	700	Built up Radially expanded	Uniform 28 cal one turn	39,100 lbs/sq. in. 2715 kg/mm ²
12cm/45 cal AA	2700 ft/sec (825 m/sec)	700	Type IX, IX ₂ Built up Type IX ₅ monobloc Radially expanded	Uniform 28 cal one turn	37,700 lbs/sq. in. 26.5 kg/mm ²
Short 12cm	950 ft/sec (290 m/sec)	Not determined yet	Monobloc	Increasing twist, at beginning 30 cal. At muzzle 13 cal one turn	10,000 lbs/sq. in. 7 kg/mm ²
10cm/50 cal	2850 ft/sec (870 m/sec)	700	Monobloc Radially expanded	28 cal one turn	40,100 lbs/sq. in. 28.2 kg/mm ²
98th yr 10cm AA	3280 ft/sec (1000 m/sec)	350	Type I Removable liner. Radially expanded. Type I ₂ Monobloc Radially expanded	28 cal one turn	43,400 lbs/sq. in. 30.5 kg/mm ²
98th yr 8cm AA	2950 ft/sec (900 m/sec)	Not determined yet	Type I Removable liner. Radially expanded. Type I ₂ Monobloc Radially expanded	28 cal one turn	39,800 lbs/sq. in. 28 kg/mm ²
8cm/40 cal AA	2230 ft/sec (680 m/sec)	1200	Monobloc Radially expanded	28 cal one turn	31,600 lbs/sq. in. 22.2 kg/mm ²
Short 8cm	1480 ft/sec (450 m/sec)	1600	Monobloc Radially expanded	28 cal one turn	23,700 lbs/sq. in. 16.6 kg/mm ²
Vickers 40mm MG	1970 ft/sec (600 m/sec)	More than 20,000			
25mm MG	2950 ft/sec (900 m/sec)	15,000			

In equivalent full charge.

DATA ON JAPANESE NAVAL MOUNTS

Guns	Name	Type	Number Per Mount	Total Weight	Ships Fitted	Target	Operation			
							Type	Pressure Medium	Normal Pressure	Pump
94th yr 40cm (46cm)	94th yr 40cm triple turret	Turret	3	2200 tons 2510*	YAMATO class		Steam hydraulic (turbo)	Water + Congelene oil	1100 lbs/sq. in. 1000*	3700 RPM Shaft hp of turbine 3600 normal 3000 overload*
40cm	40cm twin turret mount	Turret	2	1117 tons 1024*	MAGATO class	Against ships of same class and smaller ships which guns are fitted	Steam hydraulic (reciprocating)	Water	1100 lbs/sq. in.	About 120 RPM 110*
36cm	36cm twin turret mount	Turret	2	(ISE Type) 695-787* (HARUNA Type) 664-721*	ISE FUSO HARUNA	Same as above	Steam hydraulic (reciprocating)	Water	1100 lbs/sq. in.	About 120 RPM 110*
20cm	20cm twin turret mount	Turret	2	(MAGI Type) 168 tons (FUSAO Type) 171 tons (MAGI Type) 173 tons	MAGI AOB MCKI TAKO	Same as above and aircraft	Electro hydraulic #	Oil	500 lbs/sq. in.	500 RPM 650*
Short 20cm	Short 20cm 8 in.	Pedestal	1	3.5 tons 4.1 tons	Merchant ships	Submarine and aircraft				
15.5cm	15.5cm triple turret mount	Turret	3	160 tons 180 tons	YAMATO class (secondary battery) originally TONE class (main battery)	Cruisers and smaller ships and aircraft	Electro hydraulic	Oil	1000 lbs/sq. in.	650 RPM 500 hp Input of Electric motor
14cm/40 cal	40 cal model of 11th year 14cm twin gun mount	Pedestal	1	8.6 tons	Submarine I-1 class I-34 class	Destroyers				
	40 cal model of 11th year 14cm twin gun mount	Pedestal	2	18.3 tons	Submarine I-7 class	Destroyers				
15cm Twin	50 cal 15cm twin mount	Turret	2	73 tons	AGANO class	Cruisers and smaller ships	Electro hydraulic (universal transmission gears used)			
11cm/50 cal Twin	50 cal model of 3rd year 11cm twin mount Type A	Pedestal	2	37.5 tons	OKINOSHIMA class	Cruisers and smaller ships	Same as above			
	50 cal model of 3rd year 11cm twin mount Type A Model 2	Pedestal	2	49 tons	KATON class	Cruisers and smaller ships	Same as above			
12.7cm/50 cal	50 cal model of 3rd year 12.7cm single turret m. Type A, B, C, D	Turret	1	18.7 tons	A HATSUBARU class Type A Mod. 1 ARIAKE class Type B SHIGOME class	Destroyers	Same as above			
	50 cal model of 3rd year 12.7cm twin turret m. Type A, B, C, D	Turret	2	32.5 tons	A FURUKI class B AIZUMI class C HATSUBARU class D Mod. 3 YUACHI class C ARIAKE class D SHIMANAMI class	Destroyers	Same as above			

DATA ON JAPANESE NAVAL MOUNTS (Continued)

Guns	Name	Type	Number Per Mount	Total Weight	Ships Fitted	Target	Type of Operation
12.7cm/40 cal	40 cal model 88th yr 12.7cm AA gun mount Type A, A mod 1	Pedestal	1	8.8 tons	Submarine Type A I-5 Type A mod 1-I-6	Aircraft	
	40 cal model 89th yr 12.7cm twin AA gun m. Type A1, A1 mod 1 A1mod 2, 21 mod 3	Pedestal	2	29 tons 24.5 tons	A NAGATO class Type A1 Mod1 ASHIGARA class Type A1 Mod 2 KAGA, SORYU Type A1 Mod3 YAMATO class	Aircraft	Electro hy- draulic (Uni- versal trans- mission gears used)
12cm/45 cal	45 cal model 11th yr 12cm gun mount Types J,L,M	Pedestal	1	8.9 tons	J Submarine I-53 class L Submarine I-71 class M Torpedo Boat OTORI class	Small ships	
12cm/45 cal AA	45 cal model 10th year 12cm AA single gun mount Type B	Pedestal	1	10 tons	TAKAO class	Aircraft	Electro hy- draulic (Uni- versal trans- mission gears)
	The same twin g.m. Type A	Pedestal	2	20.3 tons	AKAGI class	Submarine etc.	
Short 12cm	Short 12cm gun mount	Pedestal	1	1.89 tons	Merchant ships		
10cm/50 cal	50 cal model 88th year 10cm AA gun mount Type B	Pedestal	1		Submarine I-65 class	Destroyers and air- craft	
98th yr 10cm AA	Model of 98th year 10cm AA gun mount	Turret		34.5 tons	AKITSUSHIMA class	Aircraft	Electro hy- draulic (Uni- versal trans- mission gears used)
98th yr 8cm A1	Model of 98th year 8cm AA gun mount	Turret		12.5 tons	AGANO class IBUKI class	Aircraft	Same as above
8cm/40 cal AA	40 cal model 88th year 8cm AA gun mount	Pedestal	1	3 tons	HIRA class etc.	Aircraft	
	40 cal model 88th year 8cm AA gun mount	Pedestal	1	3 tons	Submarine RO-33 class	Aircraft	
Short 8cm	Short 8cm AA gun mount	Pedestal	1		ATAMI class	Small boats and aircraft	
Vickers 40mm MG	Vickers Single Type 40mm MG Twin mount	Pedestal	1	2.1 tons	MAYA class WAKABA class	Aircraft	
		Pedestal	2	3.4 tons	TAIGEI class	Aircraft	
25mm MG	Model 95th year 25mm MG Twin mount	Pedestal	2	2 tons	NATSUSHIO class	Aircraft	
	Model Single	Pedestal	1	300 tons	HOSHO class	Aircraft	
	96th 25mm Twin MG	Pedestal	2	1350 tons	MUTSU class etc.	Aircraft	All electric
	mount Triple	Pedestal	3	2200 tons	HIRYU class	Aircraft	All electric

The "A" end of the universal transmission gears is used as the pumps.

DATA ON JAPANESE NAVAL MOUNTS (Continued)

Guns	Power Supply	Fire Control System	Training and Elevating Method	Automatic Stabilization	Operated By One Man?	Manual Operation Possible?	Maximum Elevation and Depression (degrees)		Elevating and Depressing Speed (deg/sec)	Training Speed (deg/sec)	Safety Arrangements	Use of Worm and Worm Wheel	
							Elevation	Depression				Elevating Gears	Training Type
94th yr 40cm (46cm)	Ring main	All guns are fired in a salvo by director. Firing data is computed by the data computer in the fire control room. Range finders and radar are used for decision of firing data.	"Follow the Pointer"	No	No	No	45	-5	10 8*	2	When the angles of elevation and training of any gun coincide with the angles transmitted from the director, the electric circuit of the firing electric current is made in Type E receivers i.e. only the guns which are laid and trained correctly by director can be fired.	No	No
40cm	Ring main		"Follow the Pointer"	No	No	No	43	-3	8 5*	1.58* 3		No	Yes
36cm	Ring main	All firing data is transmitted by 3-phase selsyn motors. Two directors and data computers are fitted, i.e., the main and secondary	"Follow the Pointer"	No	No	No	43	-5	8 5*	1*-1.58 3 (Varies in class of BB)		No	Yes
20cm	Self-contained in each mount		"Follow the Pointer"	No	No	No	Some 50 Others 55	-5	6-12	4		No	Yes
Short 20cm		None		No	No		75	-15	(Trial record) 8 (by hand)	(Trial record) 8.6 (by hand)	None	Yes	Yes
15.5cm	Power supply is self-contained in each mount. Pump later fitted out side mount in YAMATO	Same principle as the major caliber guns	"Follow the Pointer"	No	No	No?	55	-7 -10	10* 15	6	Same as the major caliber guns	No	Yes
14cm/10 cal		None		No	No		30	-5			None	Yes	Cylindrical
		None		No	No		40	-7			None	Yes	Cylindrical
15cm Twin	Entirely self-contained	Same system as the 20cm etc.	"Follow the Pointer"	No	Two men	Alternative hand operating apparatus fitted	55	-5	10	6	Same as the 20cm gun etc.	Yes	Yes
14cm/50 cal Twin	Entirely self-contained	Same system as the 20cm etc.	"Follow the Pointer"	No	Two men	Alternative hand operating apparatus fitted	30	-7	6	4	Same as the 20cm gun etc.	Yes	Yes
	Entirely self-contained	Same system as the 20cm etc.	"Follow the Pointer"	No	Two men	Alternative hand operating apparatus fitted	35	-5	6	4	Same as the 20cm gun etc.	Yes	Yes

DATA ON JAPANESE NAVAL MOUNTS (Continued)

Guns	Power Supply	Fire Control System	Training and Elevating Method	Automatic Stabilization	Operated By One Man?	Manual Operation Possible?	Maximum Elevation and Depression (degrees)		Elevating and Depressing Speed (deg/sec)	Training Speed (deg/sec)	Safety Arrangements	Use of Worm and Worm Wheel	
							Elevation	Depression				Elevating Gears	Training Gears
12.7cm/50 cal		Same system as the 20cm etc.	"Follow the Pointer"	No	No	Yes	A 75 A mod 55 B 55	-7 -7 -7	23-54	4-6	None	Yes	Yes
		Same system as the 20cm etc.	"Follow the Pointer"	No	No	Yes	A 40 B 75 B Mod 2 75 B Mod 3 55 C 55 D 75	-7 -7 -7 -7 -7 -8	27-12	4-6	None	Yes	Yes
12.7cm/40 cal				No	No	No	75	-7	About 4	About 4	None	Yes	Yes
12cm/45 cal		Same as the major caliber guns	"Follow the Pointer"	No	No	Yes	90	-8	Type A1 12 Type B2 16	Type A1 6 Type B2 16	None	Yes	Yes
		None		No	No	No	J 33 L 33 M 55	-7 -10 -10	About 5	About 4	None	Yes	Yes
12cm/45 cal AA		Same as the 12.7cm AA	"Follow the Pointer"	No	No	Yes	75	-10			None	Yes	Yes
Short 12cm		None		No	No	No	75	-5 -15	13 ?	12.5	None	Yes	Yes
10cm/50 cal		None		No	No	No	90	-7			None	Yes	Yes
98th yr 10cm AA	Entirely contained in each mount	Same as the 12.7cm/40 cal AA	"Follow the Pointer"	No	No	Yes	90	-10	16	12-16	None	Yes	Yes
98th yr 8cm AA	Entirely contained in each mount	Same as the 12.7cm/40 cal AA	"Follow the Pointer"	No	No	Yes	90	-10	16	12-16	None	Yes	Yes
8cm/40 cal AA		None		No	No	No	75	-5	About 10	About 10	None	Yes	Yes
Short 8cm				No	Yes	No	80	-10	About 10	About 10		Yes	Yes
Vickers 40mm M5				No	Yes	No	85	-5				Yes	Yes
25mm M5		For power driven mount, remote control system fitted	For power driven mount, remote control system was used	No	Yes	Yes	80	-10				Yes	Yes
				No	Yes	Yes	80	-10				Yes	Yes

DATA ON AMMUNITION, AMMUNITION SUPPLY, LOADING, ETC.

Guns	Weight of Shell	Weight of Charge	Fixed or Separate	Rate of Fire	Case Disposal	Type of Hoists	Rate Supply	Loading Angles (degrees)	Raming	
									Method	Strokes
94th yr 40cm (46cm)	Armor piercing 3200 lbs. Common 3000 lbs. Incendiary 3000 lbs. High explosive target practice 3200 lbs	728 lbs	Separate	1.5 rds/min at max. angle of elevation		(Shell hoist) 3 pusher hoists per mount. (Cordite hoist) Hydraulic winch and cage, direct from handling room to gun house	(Shell) about 3 rds/min. (Cordite) about 1.5 rds/min at angle of elevation zero	3	Power	One stroke for loading shell and one stroke for loading Cordite
40cm	A.P. 2660 lbs C.S. 2070 lbs I.S. 2070 lbs T.P.S. 2260 lbs	483 lbs	Separate	1.5-2 rds/min Same as above		Ammunition hoists of this turret are of British type; 2 sets of hoists per turret. (Lower hoist) Ammunition hoist cage thru central trunk actuated by hydraulic power raises complete round from ammunition handling room to working room. (Upper hoist) Actuated by hydraulic winches. Gun loading hoist cage brings ammunition to breach from working room	(Shell and Cordite) 1.5 rds/min	Any angle -3° to plus 20	Power	One stroke for loading shell and followed by one stroke for loading cordite
36cm	A.P. 1490 lbs C.S. 1380 lbs I.S. 1380 lbs T.P.S. 1490 lbs	315 lbs	Separate	Same as above			(Shell and Cordite) 1.5 rds/min	(FUSO type) Fixed angle loading at 5° of elevation (ISE and HARUNA type) -3° plus 20	Power	One stroke for shell followed by two for Cordite
20cm	A.P. 278 lbs C.S. 278 lbs I.S. 278 lbs T.P.S. 278 lbs	79 lbs	Separate	2.4 rds/min 4* Same as above		(Shell hoist)(Cordite hoist) The mechanism of hoists is almost same as that of 94th yr 40cm gun turret, and motive power is oil pressure generated by pump contained in turret; 2 sets per mount	(Shell) 5 rds/min (Cordite) 4 rds/min	Fixed angle loading at 5* 7° degrees elevation	(Shell) Power (Cordite) Hand	One stroke for loading shell. Cordite is loaded by hand
Short 20cm	103 lbs (47 kg)	4.4 lbs (2 kg)	Separate cart-ridge cases used. The material formerly brass lately steel	4 to 5 rds/min		Simple derricks fitted; cargo hoists of ships employed		About 10	Hand	
15.5cm	122.9 lbs (55.87 kg) Common 122.9 lbs (55.9 kg)	42.9 lbs (19.5 kg)	Separate powder bag is used	5 rds/min		Same principle as the 20cm gun mount; 3 sets of hoists per mount	(Shell) 6 rds/min (Cordite) 5 rds/min	7	(Shell) Power (Cordite) Hand	One stroke for loading the shell
14cm/40 cal	Common and Illum. 93.7 lbs (38 kg) A/S 92 lbs (42 kg)	15.2 lbs (6.86 kg)	Separate cart-ridge cases used material was brass	5 rds/min		Pneumatic hoist; one set per ship	Almost 5 rds/min	Almost 10	Hand	
15cm Twdn	Common 100 lbs (45.36 kg)	28 lbs (12.76 kg)	Separate powder bag is used	4 to 6 rds/min		Shell hoist same principle as 20cm turret, motive power being electric motor, hydraulic piston rack and winch. Powder lifted down hand to hand; 2 sets of hoists per mount	(Shell) 7 rds/min	7	Hand	
14cm/50 cal Twin	Common and Illum. 93.6 lbs (38 kg) A/S 92 lbs (42 kg)	24.2 lbs (11 kg)	Separate powder bag used	About 6 rds/min		Bucket chain hoists fitted on board independent from gun mount	About 10 rds/min	Any angle	Hand	

DATA ON AMMUNITION, AMMUNITION SUPPLY, LOADING, ETC. (Continued)

Guns	Height of Shell	Height of Charge	Fixed or Separate	Rate of Fire	Case Disposal	Type of Hoists	Rate Supply	Loading Angle (degrees)	Method	Strokes
12.7cm/50 cal	Common, incendiary shell, 50.6 lbs (23 kg) A/S 46.2 lbs (21 kg)	16.94 lbs (7.7 kg)	Separate	5 rds/min		Same as 15cm Twin T.M.	(Shell) 10 rds/min (Cordite) 10 rds/min	About 5-10	Hand	
12.7cm/40 cal	Common, incendiary shell, 50.6 lbs (23 kg) A/S 46.2 lbs (21 kg)	8.8 lbs (4 kg)	Fixed ammo brass (regular) mild steel as (substitute)	8 rds/min		Pneumatic hoist one set per ship	About 10 rds/min	At any angle	Hand	
	A/S 46.2 lbs (21 kg)	8.8 lbs (4 kg)	Same as above	14 rds/min		Bucket chain hoist one to two sets per mounts	About 10 rds/min	At any angle	By semi-automatic mechanical reamer actuated by recoil force of gun	
12cm/45 cal	Common, incendiary shell, 42.9 lbs (20.4 kg) A/S 36.2 lbs (16.4 kg)	11.6 lbs (5.27 kg)	Separate material of cartridge case brass (regular) mild steel as (substitute)	About 5 rds/min		Submarine Pneumatic hoist one set per ship. Torpedo boat one set of bucket chain hoist per 1 or 2 mount	About 107 rds/min	Almost 10-15	Hand	
12cm/45 cal AA	Common, incendiary shell, 42.9 lbs (20.4 kg) A/S 36.2 lbs (16.4 kg)	12.2 lbs (5.55 kg)	Fixed material of cartridge case brass (regular) mild steel as (substitute)	10 rds/min		Bucket chain hoist one set per 1-2 mount	About 10 rds/min	At any angle	Hand	
Short 12cm	28.6 lbs (13 kg)	1.08 lbs	Separate material of cartridge case brass (regular) mild steel as (substitute)	8 rds/min		No hoist		At any angle	Hand	
10cm/50 cal	Common 28.6 lbs (13 kg)	9.1 lbs (4.15 kg)	Fixed Brass	12 rds/min		Pneumatic ammunition hoist one set per ship	6 rds/min	At any angle	Hand	
98th yr 10cm AA	Common 28.6 lbs (13 kg)	13.2 lbs (6 kg)	Fixed Brass	19-21 rds/min	Empty cartridge into fixed aperture	Same as the 12.7cm/50 cal gun mount	About 20 rds/min	At any angle	Same as 12.7cm/40 cal AA gun by semi-automatic runner	Same as 12.7cm/40 cal AA gun (i.e., by semi-automatic runner)
98th yr 8cm AA	Common 13.2 lbs (5.99 kg)	8.55 lbs (3.91 kg)	Fixed Brass	25-28 rds/min	Outside working chamber	Same as the 12.7cm/50 cal gun mount	25 rds/min	At any angle	Same as 12.7cm/40 cal AA gun by semi-automatic runner	Same as 12.7cm/40 cal AA gun (i.e., by semi-automatic runner)
8cm/40 cal AA	Common Armour Piercing 13.2 lbs (5.99 kg)	2.05 lbs (0.93 kg)	Fixed Brass	20 rds/min				At any angle	Hand	
Short 8cm	12.7 lbs (5.79 kg)	0.88 lbs (0.4 kg)	Fixed Brass	About 30 rds/min				At any angle	Hand	
Vickers (Om M)	2.0 lbs (907 gr)		Fixed Brass	200 rds/min				At any angle		
2-inch M	0.55 lbs (250 gr)		Normal material of cartridge case brass (as substitute mild steel)	220 rds/min				At any angle		

DATA ON BREECH MECHANISM, ROLLER PATH AND TURN TABLE STRUCTURE, FUZE SETTING AND ARMOR

Guns	BREECH MECHANISM	ROLLER PATH AND TURN TABLE STRUCTURE		FUZE SETTING		ARMOR
	Type of Breech Mechanism	Are Rollers Equally Spaced?	Turntable Structure	Type of Fuze Setter	When is Fuze Set?	Thickness
94th yr 40cm (46cm)	Normal swinging	All same distance apart, except part at which roller holders are joined	Fabricated	Hand	On waiting tray in gun house, usually in shell handling room	(front) 25.6* (roof) 10"
40cm	Withdrawn directly to rear before swinging	Same as above	Fabricated	Hand	On waiting tray in working room usually	(front) 18-19" (roof) 8-9½"
36cm	Normal swinging	Same as above	Fabricated	Same as above	Same as above	(front) 10" (roof) 6"
20cm	Normal swinging	Same as above	Fabricated	Hand	On loading tray usually	(front) 1" (side) 1" (roof) 1"
Short 20cm	Normal swinging	Equidistant	Fabricated	Hand	Just before loading	None
15.5cm	Normal swinging	Equidistant	Fabricated	Hand	Same as the 20cm gun	1" (front) 3/4" (side) 3/4" (roof) 3/4"
14cm/40 cal	Horizontal sliding	Equidistant	Cast			None
15cm Twin	Normal swinging	Equidistant	Fabricated	Hand. Fuze time receiver and special fuze setting apparatus fitted near loading trays	Before loading on loading tray	3/4" all around
14cm/50 cal Twin	Normal swinging	Equidistant	Fabricated	Not used as AA gun, therefore no fuze setting mechanism		(front) 0.4" (10mm)
	Normal swinging	Equidistant	Fabricated	Not used as AA gun, therefore no fuze setting mechanism		(front) 2"

DATA ON BREACH MECHANISM, ROLLER PATH AND TURN TABLE
STRUCTURE, FUZE SETTING AND ARMOR (Continued)

Guns	BREACH MECHANISM		ROLLER PATH AND TURN TABLE STRUCTURE		FUZE SETTING		ARMOR
	Type of Breech Mechanism	Are Rollers Equally Spaced?	Turntable Structure	Type of Fuze Setter	When is Fuze Set?	Thickness	
12.7cm/50 cal	Normal swinging	Equidistant	Fabricated	Hand	On loading tray, before loading	1/8" (front, side and roof)	
12.7cm/40 cal	Horizontal sliding	Equidistant	Cast	Hand		None	
	Horizontal sliding	Equidistant	Cast	Automatic apparatus attached at breech end of gun	Directly just before the ammunition is rammed	2mm spray shield	
12cm/45 cal	Type J, L, horizontal sliding Type M, normal swinging	Equidistant	Cast			Type J, L, none Type M, 1/8" (3.2mm)	
12cm/45 cal AA	Horizontal sliding	Equidistant	Cast	Hand	Directly just before loading	According to condition of fitting on board, steel plate of 1.6-3.2mm thick was fitted for protection from spray	
Short 12cm	Normal swinging	Equidistant	Fabricated	Hand	Directly just before loading	None	
10cm/50 cal	Horizontal sliding	Equidistant	Cast	Hand	Just before loading	None	
98th yr 10cm AA	Horizontal sliding	Equidistant	Fabricated	Automatic same as the 12.7cm 40 cal AA gun	Just before loading	About 3mm	
98th yr 8cm AA	Horizontal sliding	Equidistant	Fabricated	Automatic same as 12.7cm/40 cal AA gun	Just before loading	About 3mm	
8cm/40 cal AA	Vertical sliding	Equidistant	Cast	Hand	Just before loading	None	
Short 8cm	Horizontal sliding	Equidistant	Cast	Hand	Just before loading	None	
Vickers 40mm MG		Equidistant	Cast				
25mm MG		Equidistant	Cast				

GENERAL DATA

Guns	Manufacture		Design		Production to Date		Performance	Problems
	Guns	Mounts	Guns	Mounts	Guns	Mounts		
94th yr 40cm (46cm)	At KURE Engineer M. OYAMADA#	At KURE Adm. T. ITO	Engineer C. HADA# 1939	Engineer C. HADA# 1940	At least 27	??	The result of performance was considered almost satisfactory The muzzle blast was the great- est difficulty at firing	1. Leakage of water from the pipe arrangement 2. Great consumption of lubricant
40cm	At KURE and MIKORAN Engineer A. SATO	At KURE and MIRO BAN Adm. T. GODO	Adm. I. MIRO 1918	Adm. I. MIRO 1919	40?	16?	1. Higher rate of training for AA 2. Convenient apparatus for time size setting for AA firing 3. Difficulty of handling of work valve for training was complaint	1. Wearing of tooth face of worm wheel of training apparatus 2. The corrosion of interior of elevating of cylinders
36cm	At KURE and MIKORAN Adm. A. NAKAJIMA	At KURE and YOKOSUKA Adm. T. GODO	Vickers Co. Ltd., England completed the design About 1912	Vickers Co. Ltd., Eng- completed the design About 1912	100?	36?	Same as above	Almost same as 40cm gun
20cm	At KURE and MIKORAN Capt. I. FUKUDA#	At KURE and YOKOSUKA Adm. K HIDAKA	Engineer C. HADA# 1924	Engineer C. HADA# Single tur- ret 1925 Twin turret 1926	300?	120?	1. Higher rate of training was requested for AA 2. Dispersion of a salvo, the pattern of which was almost above 400 meters, was considered too large, and improvement was requested	1. The largest embarrassment was the noise generated from the pump in the working room 2. Damage of the rubber-coated electric cable by oil
Short 20cm	At KURE Comdr. A. OTAMADA#	At KURE Comdr. T. TANAKA	Engineer C. HADA# 1923	Engineer C. HADA# 1923	250	250	Heavy and slow	None
15.5cm	At KURE Comdr. A. OTAMADA#	At KURE and HIROSHIMA Comdr. T. TANAKA	Engineer C. HADA# 1933	Engineer C. HADA# 1934	80	20	Almost same as the 20cm turret mount	Almost same as the 20cm turret mount
14cm/40 cal	At KURE Capt. T. FUKUDA#	At KURE Engineer N. SAWAMURA	Engineer C. HADA# 1925	Engineer C. HADA# 1925	80	80	No serious opinion about per- formance	Erosion of several parts by sea water was the greatest difficulty in maintenance
17cm Twin	Guns in stock were used	At SASEBO Capt. S. YAHIRO	Engineer C. HADA# About 1905	Engineer C. HADA# 1911	Guns in stock were used	12	Considered almost satisfactory	Same as above
14cm/50 cal	At KURE and MIKORAN Capt. T. FUKUDA#	At KURE Adm. T. ITO	Engineer C. HADA# About 1915	Engineer C. HADA# 1935	5	2	Considered almost satisfactory	There was no serious complaint
	At KURE Comdr. H OTAMADA#	At KURE Capt. H. AKEMOTO	Engineer C. HADA# About 1915	Engineer C. HADA# 1938	10	4	Considered almost satisfactory	There was no serious complaint
12.7cm/50 cal	At KURE and HIROSHIMA Capt. T. FUKUDA#	At KURE and YOKOSUKA Engineer N. SAWAMURA	Engineer C. HADA# About 1926	Engineer C. HADA# 1927	700	300	Considered excellent although dispersion of salvo was consid- ered too wide and improvement was requested	As a whole, the strength of the structure of the turret was not enough

GENERAL DATA (Continued)

Guns	Manufacture		Design		Production to 1945		Performance	Problems
	Guns	Mounts	Guns	Mounts	Guns	Mounts		
12.7cm/40 cal	At KURE and HIROSHIMA Capt. T. FUKUDA#	At KURE and HIROSHIMA Engineer N. SAWAMURA	Engineer C. HADA# 1930	Engineer C. HADA# 1930	1500	750	Considered almost satisfactory	No serious problems
			1931	1931			Considered excellent. The shortness of firing range was main draw back of this gun	Condition of maintenance was good
12cm/45 cal	At KURE and MIORAN Engineer A. SAITO	At KURE, YOKOSUKA, SASEBO K. HIDAKA	Engineer C. HADA# About 1927	Engineer C. HADA# About 1927	70	70	Almost satisfactory	Erosion of all parts by sea water was greatest difficulty in maintenance
12cm/45 cal AA	At KURE and MIORAN Coedr. M. OYAMADA#	At KURE, YOKOSUKA, SASEBO Engineer H. SAWAMURA	Engineer C. HADA# 1927	Engineer C. HADA# 1927	3000	2600	More rapid rate of firing was requested	No serious defects
Short 12cm	At YOKOSUKA Coedr. K. MUTO	At YOKOSUKA Coedr. K. MUTO	Engineer C. HADA# 1941	Engineer C. HADA# 1941	550	550	No special opinion	No special problem
10cm/50 cal	At KURE Capt. T. FUKUDA#	At SASEBO	Engineer C. HADA# 1930	Engineer C. HADA# 1931	10	10		
98th yr 10cm AA	At KURE and HIHARI Coedr. M. OYAMADA#	At SASEBO Capt. S. YAHIRO	Engineer C. HADA# 1940	Engineer C. HADA# 1940	120	50	Considered excellent. Short life of gun only complaint	No serious problem existed
98th yr 8cm AA	At KURE Coedr. M. OYAMADA#	At SASEBO Capt. S. YAHIRO	Engineer C. HADA# 1941	Engineer C. HADA# 1941	50	20	Opinion was not determined but considered satisfactory	No serious problem existed
8cm/40 cal AA	At KURE and HIROSHIMA Coedr. M. OYAMADA#	At MATZURU Coedr. HESASUE	Engineer C. HADA# About 1915	Engineer C. HADA# About 1915	1400	20	No opinion	No serious problem existed
Short 8cm			1930	1930	50	50	No opinion	No special problem
Vickers 40mm MG	At KURE and YOKOSUKA Adm. F. SHIMIZU	At KURE and YOKOSUKA Adm. F. SHIMIZU	Adm. F. SHIMIZU	Adm. F. SHIMIZU	500	200	No opinion	
25mm MG	At TOYOKAWA and YOKOSUKA Adm. M. HIRI	At TOYOKAWA and YOKOSUKA Adm. M. HIRI	French design 1933	Adm. K. KATSUTA Single 1943 II 1933 III 1941	33,000	20,000	Considered excellent	No serious problem

T. FUKUDA, C. HADA, and M. OYAMADA are now dead

Section II
BRIEF DESCRIPTION OF THE MORE IMPORTANT MOUNTS

A. Major Caliber Turrets

1. General

Excluding the 18-inch mounts fitted in YAMATO and MUSASHI, and the single 19-inch gun and slide, built for trial purposes only which have already been described in NavTechJap Report "Japanese 18" Guns and Mounts", Index No. O-45(N), the only major caliber turrets built by the Japanese, were for 14 and 16-inch guns. The former were fitted in battleships of KONGO, ISE, and FUSO classes and the latter in NAGATO and MUTSU. All of these turrets were built either before, during, or just after the first World War. They are similar in principle, and in most details to the British turrets built for KONGO; which in turn, are, with the exceptions mentioned later, similar to the 15-inch turrets of QUEEN ELIZABETH and ROYAL SOVEREIGN classes.

2. Improvements

There are two features in the Japanese 15-inch turrets which are improvements over the British:

a. Greater elevation:

When first built, the Japanese 14 and 16-inch guns were given at least 25° elevation. It has not been possible to ascertain definitely, what was the original maximum elevation, but it was probably above 33°.

This was not considered sufficient, and about 1937 the Japanese began modifying the main armament of all battleships to give 43° elevation. This work was completed in all ships (except in the aftermost turrets in ISE and HYUGA), before the beginning of the war. The extra elevation was obtained, not by increasing the trunnion height, but by increasing the depth of the gunwell, and lowering the remainder of the revolving structure a corresponding amount, bodily on the ship.

The reconstruction of these turrets involved a great deal of work but it undoubtedly increased the range of the old guns considerably, and was well-worth while. In ISE and HYUGA it was not possible to lower the revolving structure of the aftermost turrets, and they were left with the original elevation, much to the disgust and annoyance of the ship's gunnery officers. These turrets have now been removed, and a flight deck fitted on the quarterdeck instead.

b. Better subdivision of compartments in the gunhouses and working chambers:

Main armament gunhouses on all battleships are fitted with two longitudinal flashtight bulkheads, about 20 inches apart between the guns. The only passage between one side of the gunhouse and the other, is via a flashtight door through these bulkheads. The right and left sides of the working chambers are similarly separated. The trainer's position in the working chamber is totally enclosed and comparatively soundproof.

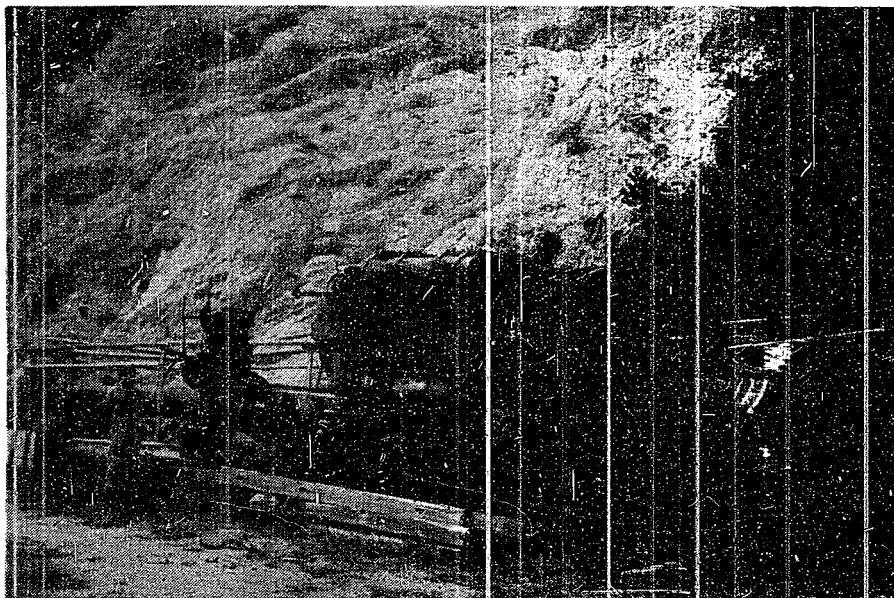


Figure 1
CRADLE AND SLIDE FOR 40cm (16-INCH) GUN

3. Gunloading cages

Four different types of gunloading cages were used. They are:

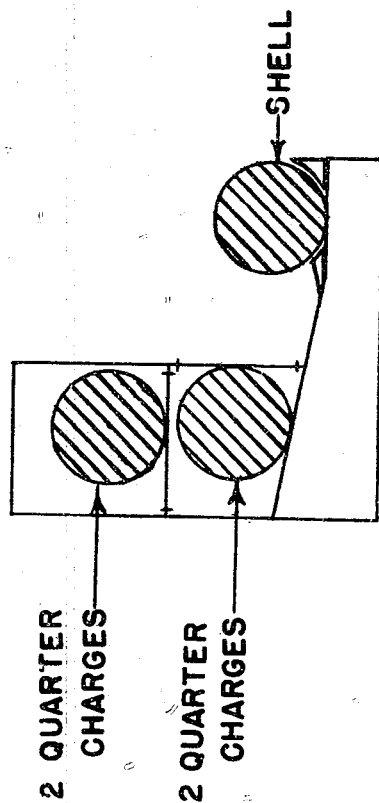
- a. KONGO Type, in which the shell is carried on an extension to the main cage, and the four quarter charges are carried in the cage proper. They are rolled down, and into line with the breech, and rammed two at a time.
- b. ISE Type, a conventional cage similar to British 15-inch guns..
- c. HARUNA Type. In the HARUNA type, the cordite is carried in two rows of one-quarter charges above the shell, in a flashtight container housed in the cage, which is not in line with the bore. The container is able to pivot about the shaft "A" to bring the shell and charges successively into the ramming position.
- d. NAGATO and 16-inch Type. The 16-inch gunloading cage is similar to the 14-inch HARUNA type, except that all four of the one-quarter charges are carried end to end, and rammed by a single rammer stroke.

The fluid used in all hydraulic systems of the major caliber mounts is the normal anglene oil mixture or, as the Japanese call it - water and lathe oil.

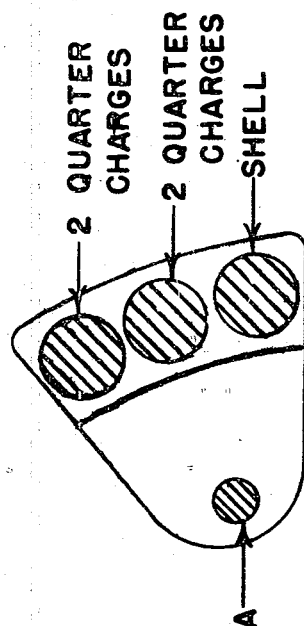
4. Loading angle

Although the 14 and 16-inch turrets are known as "any angle loading turrets", the guns are never loaded at elevations above 20° and the breech

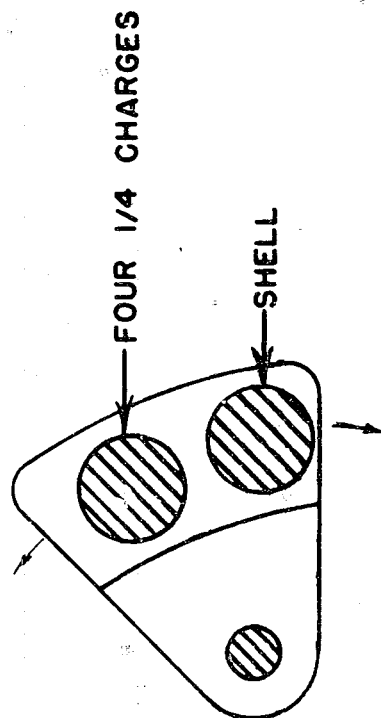
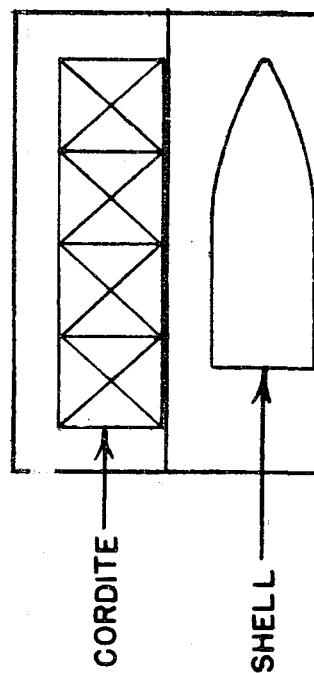
KONGO TYPE



HARUNA TYPE



NAGATO OR 16 INCH TYPE



G.L. CAGES
(See page 25.)

cannot be opened above 25°. It was stated that to prevent shells slipping back after being rammed at high angles of elevation, small circumferential serrations were made on the gun to grip the driving bank of the shell. Attempts were made to verify this point in NAGATO, but with the lighting facilities available, the serrations could not be seen.

5. Additional data

Diagram of training roller path (16-inch)	29½ ft
Diagram of training roller path (16-inch)	25.3 ft
Distance between guns (16-inch)	8 ft
Distance between guns (14-inch)	7½ ft
Trunnion height above roller path (16-inch)	10 ft

B. Medium Caliber Mounts

1. General

All modern Japanese cruisers, except a few light cruisers, carried either triple 6-inch (15.5cm) turrets, or twin 8-inch (20cm) turrets. The older light cruisers carried simple twin 15cm turrets built to use up some very old 15cm guns. Around 1941, the 6-inch cruisers TONE, MOGAMI, SUZUYA, MIKUMA, KUMANO, and CHIKUMA had their turrets removed and 8-inch turrets were fitted in their place. The photos in Figures 4 to 7, 10, 19, and 20 to 22 are of the turrets removed from MOGAMI and now stored in a warehouse on ETA JIMA. Since the 6 and 8-inch turrets are almost identical in size, weight, and design, this was not a very difficult change. The majority of turrets removed from these cruisers were used for land defense purposes. Similar turrets were fitted in YAMATO and MUSASHI as secondary armament.

2. Shell handling

Both the 8-inch twins and the 6-inch triples are very similar to the British 6-inch Mark XXI turrets, and their general layout can be seen in Figures 2 and 3. There were two different arrangements for handling shells in the shell handling rooms, one using a shell bogie, and the other using a circular roller track around the base of the revolving structure. Shell hoists were the conventional pusher type. Two cordite cages connected to an endless wire rope were fitted in each trunk, and were operated by hydraulic pistons, racks, and wire winches, as can be seen in Figures 5, 6, and 7.

The arrangements for shell handling in gunhouses can be seen in Figures 8, 9, and 10. In the 8-inch the shell tilting buckets were worked by a handwheel and quadrant, but a simple handle and lever connected directly to the tilting bucket was used for the 6-inch shell rammers (Figure 7) were normal piston and rack type, and shell and cordite were rammed separately.

3. Breech mechanisms

Normal swinging screw breech mechanisms were fitted and could be worked either by power (piston and racks) or by hand. There is one interesting feature in the center gun of the 6-inch turrets. As the distance between the guns of 5 feet 1 inch was insufficient to allow the breech of the center gun and breech mechanism was twisted through 45° as shown in Figures 8 and 9. To balance the weight of this upward opening breech, the top of the carrier axis pin is fitted with a crank whose pin works in a slotted lever ("A", Figures 8 and 9) connected to a spring running through the top of the breech ring.

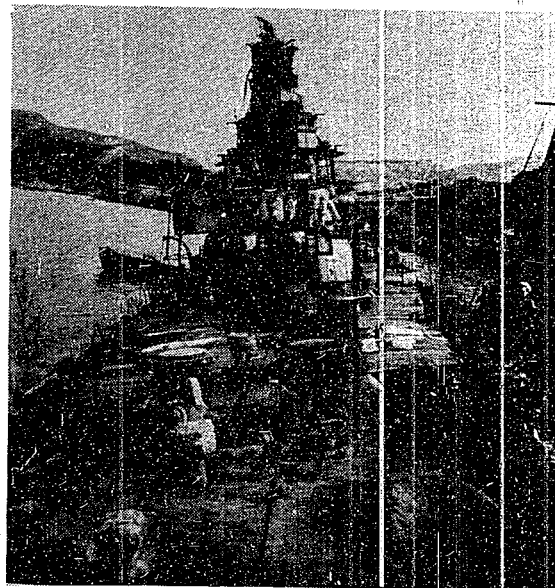


Figure 2
CRUISER AOBA
VIEW FROM FORWARD SHOWING 20cm (8-INCH) TWIN MOUNTS



Figure 3
20cm (8-INCH) MOUNTS, SHOWING LAGGING OUTSIDE TURRETS

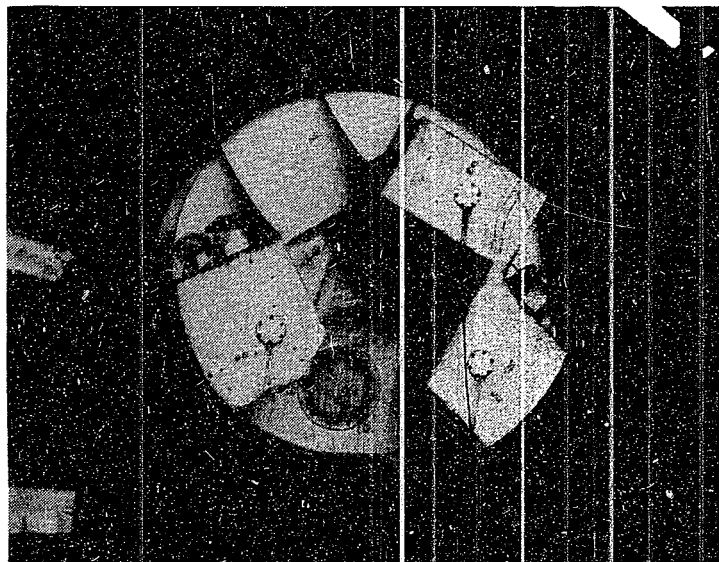


Figure 4
15.5cm (6-INCH) TRIPLE MOUNT
UNDERSIDE OF CORDITE HANDLING ROOM SHOWING BOTTOM OF THREE MOUNTS

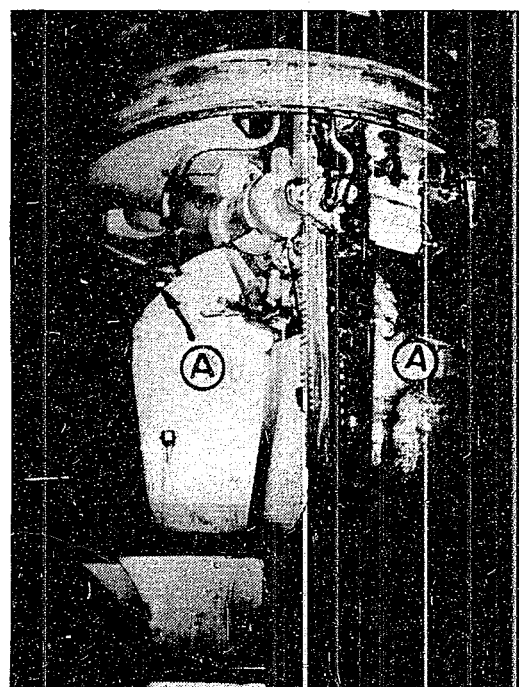


Figure 5
15.5cm (6-INCH) TRIPLE MOUNT CORDITE HANDLING ROOM
(A) Flashtight Entrances to Cordite Hoists

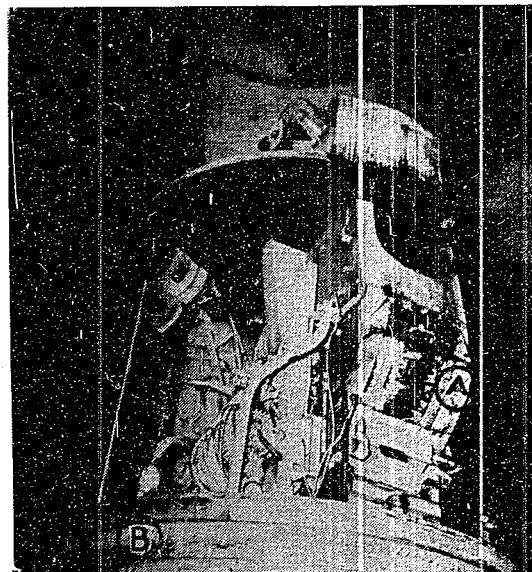


Figure 6

15.5cm (6-INCH) TRIPLE MOUNT CORDITE HANDLING ROOM
(A) Flashtight Entrance to Hoist
(B) Roller Path for Vertical Guide Rollers

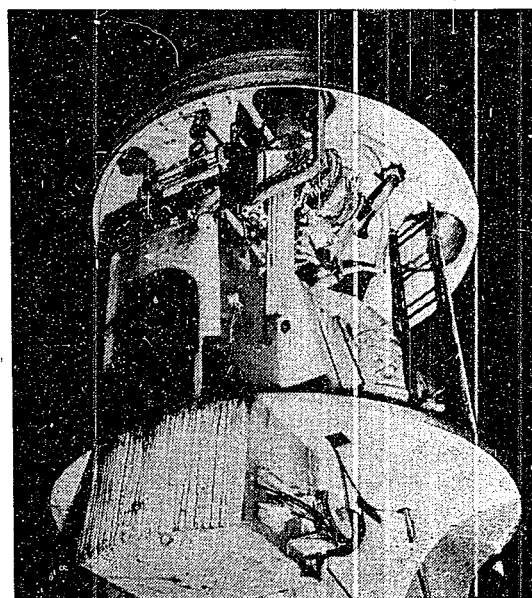


Figure 7

15.5cm (6-INCH) TRIPLE MOUNT CORDITE HANDLING ROOM

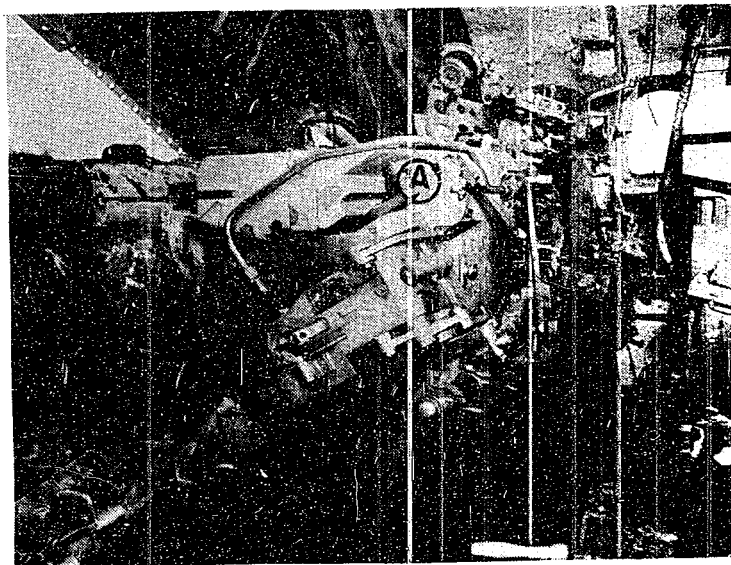


Figure 8
15.5cm (6-INCH) TRIPLE MOUNT
SHOWING ARRANGEMENT OF CENTER GUN BREECH MECHANISMS
(A) Crank to Breech Balance

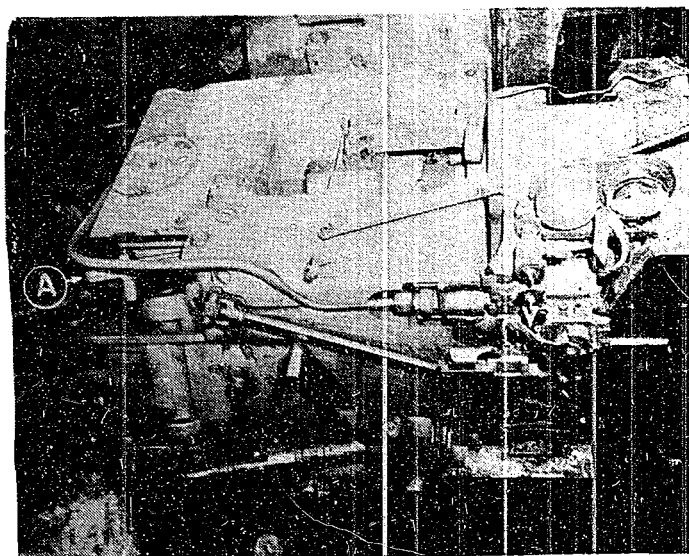


Figure 9
15.5cm (6-INCH) TRIPLE MOUNT BREECH MECHANISM OF CENTER GUN
(A) Crank to Breech Balance

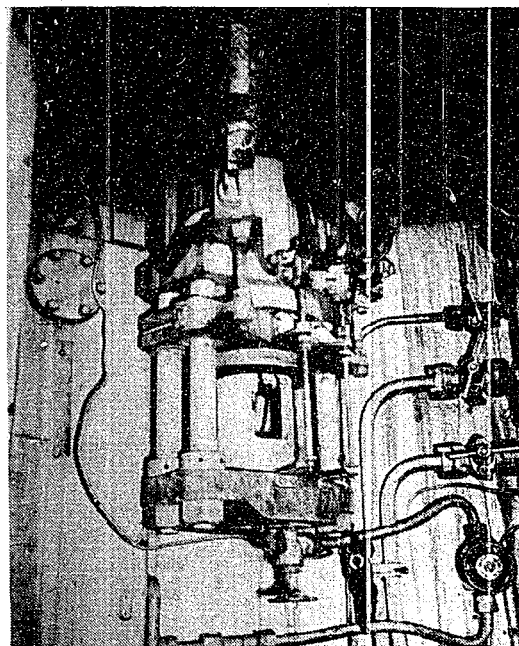


Figure 10
15.5cm (6-INCH) TRIPLE MOUNT HYDRAULIC ACCUMULATOR

4. Power supply

Two 100 hp electric motors driving two standard swashplate "A" ends are fitted below the gunwell to supply hydraulic pressure to a common ring main via hydraulic accumulators (Figure 10). Only one pump is normally used, the other being the standby.

The fluid used in the pressure system of all turrets and mounts other than 14, 16, and 18-inch is mineral oil. It was stated that no coolers were fitted on pressure systems and that the highest oil temperature reached in the 6 and 8-inch turrets when used in the tropics was about 40°C. In YAMATO and MUSASHI the main turret pump for the 6-inch turrets was fitted outside the turret to reduce noise.

5. Elevating and training gear

In the earlier 8-inch turrets, the elevating gear was the arc and pinion type, but in the later 6 and 8-inch turrets, piston type gear was used. In both 6 and 8-inch turrets, only one set of training gear is fitted, and is of normal worm and wormwheel design.

6. Gunhouse cogging

For use in tropical climates gunhouses are lagged with thin steel sheeting on the roof, sides, and front (Figure 3). An air space of approximately four inches is allowed between the lagging and the armour. No internal lagging has been tried.

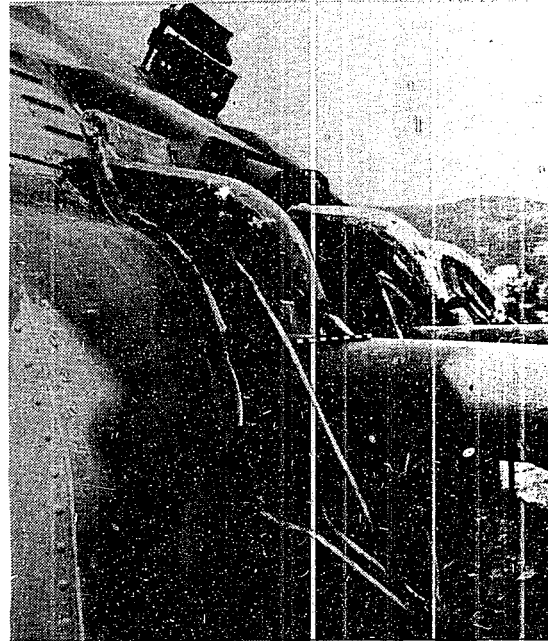


Figure 11
15.5cm (6-INCH) TRIPLE MOUNT BLAST BAG ARRANGEMENT

7. Blast bags

Normal canvas blast bags are fitted to the guns over protection plates and pivoting rods arranged to keep the canvas clear of the gun ports at high angles of elevation. This gear can be seen in Figure 11.

8. Dangerous bearing warning gear (See Enclosure (A).)

A simple type of audible warning gear is fitted to ships carrying aircraft, to prevent turrets being trained onto a dangerous bearing when aircraft are actually on board. When aircraft are flown off, the gear is inoperative and the arcs of training may be increased to the full limits. A lever in the gunhouse is connected to a vertical rod, at the end of which is a crank and roller. When aircraft are on board, the lever is put in the position which brings the roller into line with a cam rail fitted around the inside of the barbette. The cam is suitably cut to cause the roller to rotate the lever on dangerous bearings and so make the necessary contacts in the electrical circuit of buzzers fitted in the gunhouse.

9. Run-out control gear (See Enclosure (B))

The speed of run-out is controlled at different angles of elevation by gears similar to that shown in Enclosure (B). The method of operation of this gear is self-evident from the drawing, and no further description is necessary. The type shown is typical of that used in both 6 and 8-inch turrets.

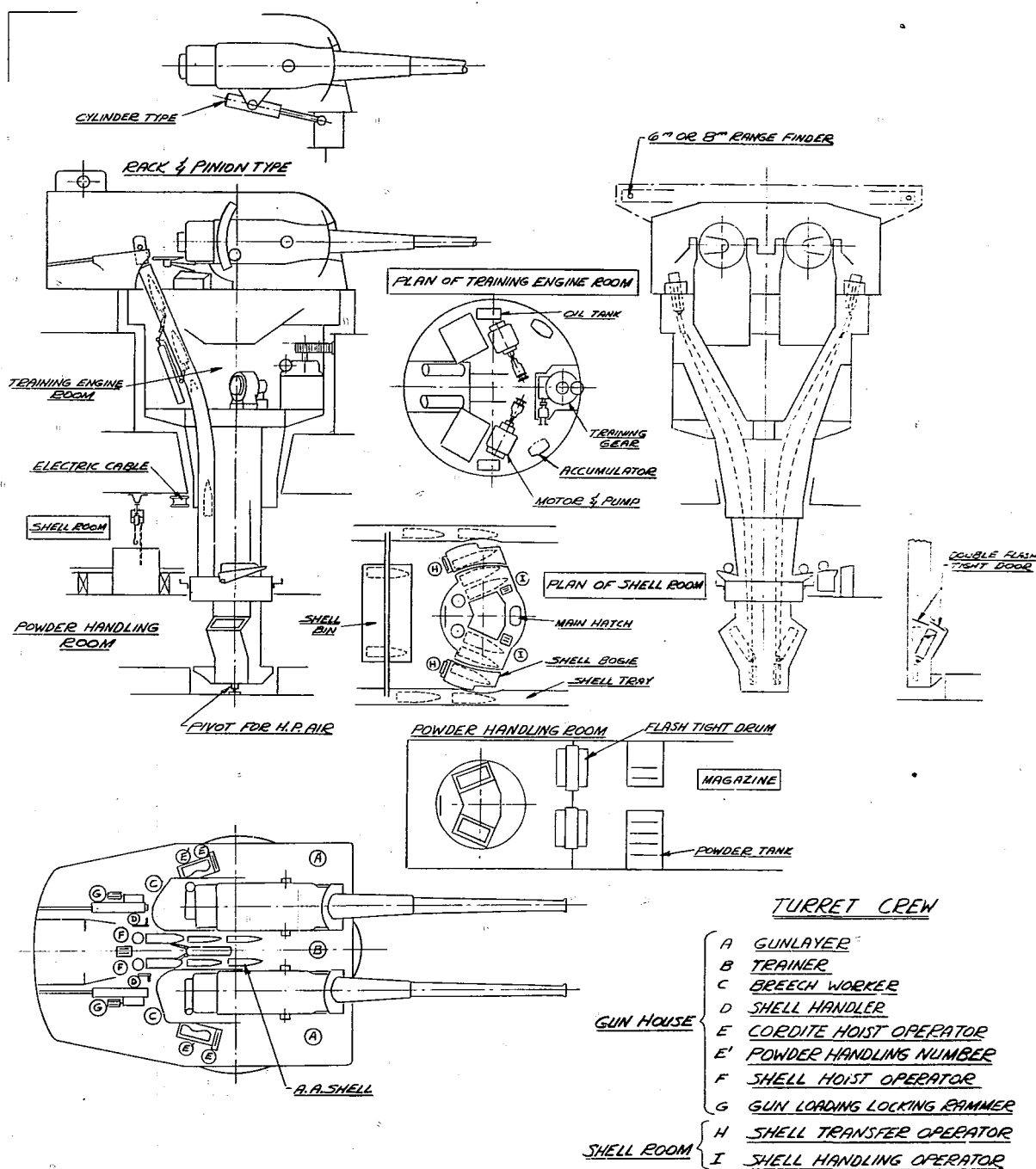


Figure 12
20cm 50 CALIBER TURN GUN TURRET



Figure 13

AOBA 20cm (8-INCH) MOUNTS
TOP OF CORDITE HOIST AND GUN LAYERS POSITION AT RIGHT GUN

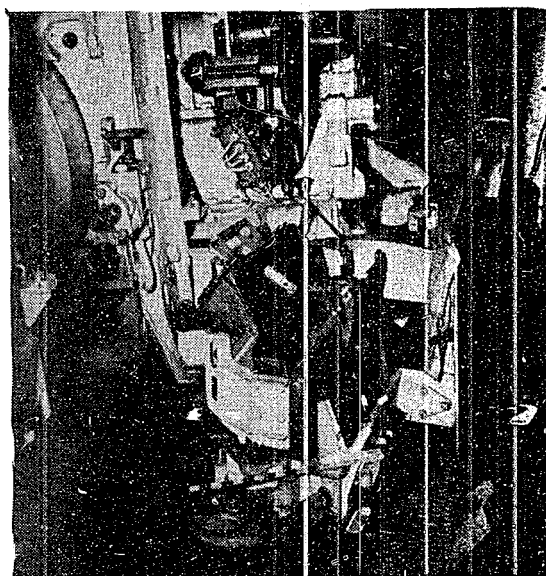


Figure 14

AOBA 20cm (8-INCH) MOUNTS SHOWING TOP OF CORDITE HOIST

10. Method of changing type of shell in use

No quick method has been devised for changing the type of shell in use. In a triple 6-inch turret seen on the proving ground at KAMEGAKUBI, one additional hoist was fitted for HA shell. Its rate of supply was stated to be only five rounds per minute. It was, therefore, only able to supply ammunition for one of the three guns. This was a trial turret and the additional hoist was not fitted to future turrets.

11. Additional data

Diameter of training roller path for 8-inch	16½ ft
Diameter of training roller path for 6-inch	18 ¾ ft
Distance between guns 8-inch	6 ft - 3 in
Distance between guns 6-inch	5 ft - 1 in
Total height of revolving structure 6 and 8-inch .	42 ft - 8 in

A typical trunnion design for medium caliber mounts is illustrated in Enclosure (I). The shock of firing is taken as usual on a plain bearing, but the method of reducing the friction for ease of elevating is unusual. No further description is necessary here since the arrangement is clearly illustrated.

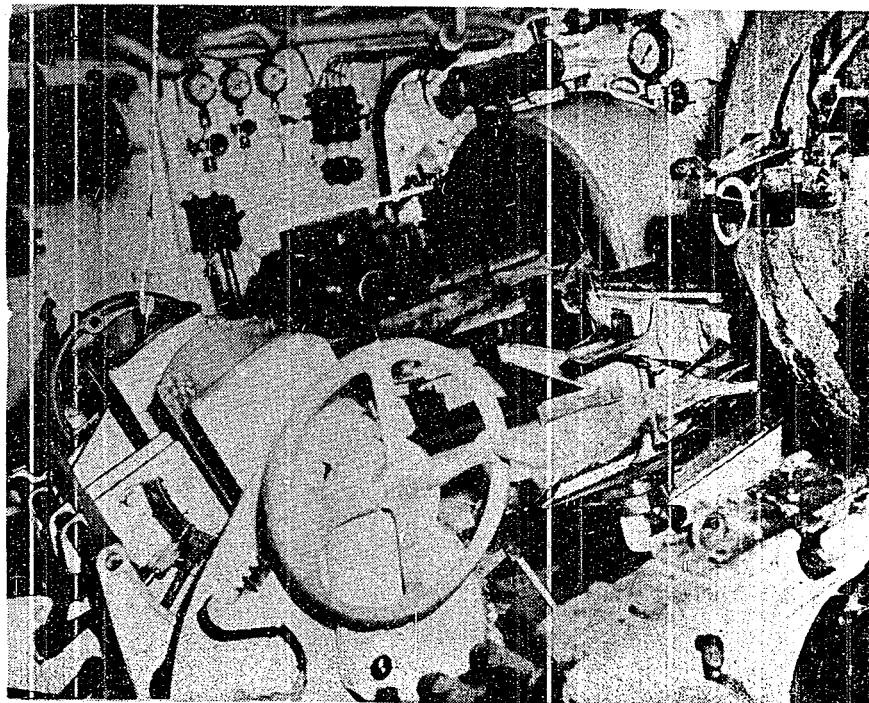


Figure 15
AOBA 20cm (8-INCH) MOUNTS
SHOWING SHELL LIFTING BUCKETS AND LOADING POSITIONS IN GUN HOUSE

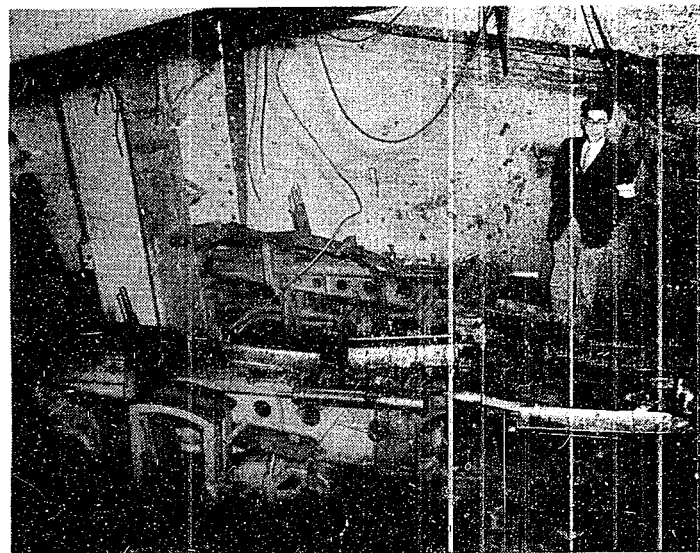


Figure 17
15.5cm (6-INCH) TRIPLE MOUNT
GUN HOUSE MOUNT REMOVED FROM CARRIER AND USED FOR COAST AND AA. DEFENSE

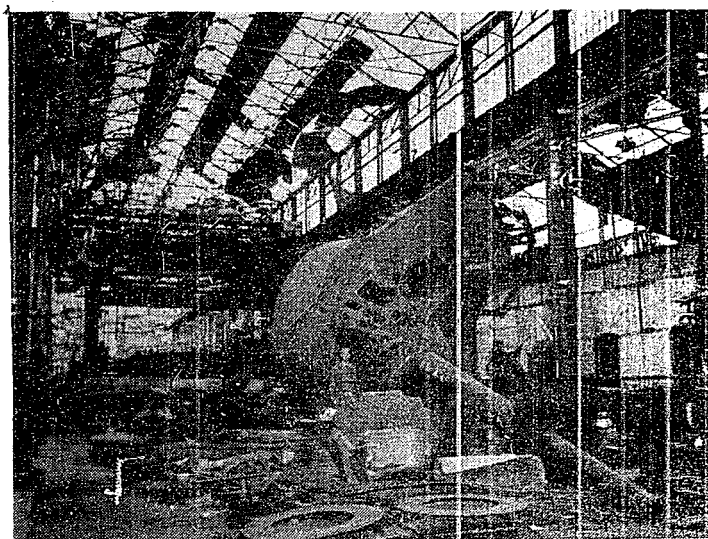


Figure 18
GENERAL VIEW OF ONE BAY OF KURE ARSENAL GUN MOUNT FACTORY
(DECEMBER 1945) SHOWING 15.5cm (6-INCH)
SINGLE LAND MOUNT CAPSIZED BY BOMBING

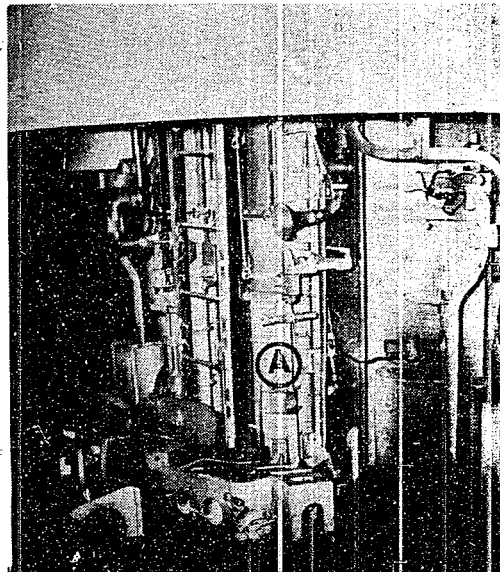


Figure 19

15.5cm (6-INCH) TRIPLE MOUNT SHELL HANDLING ROOM
(A) Tilting Bucket at Entrance to Hoist

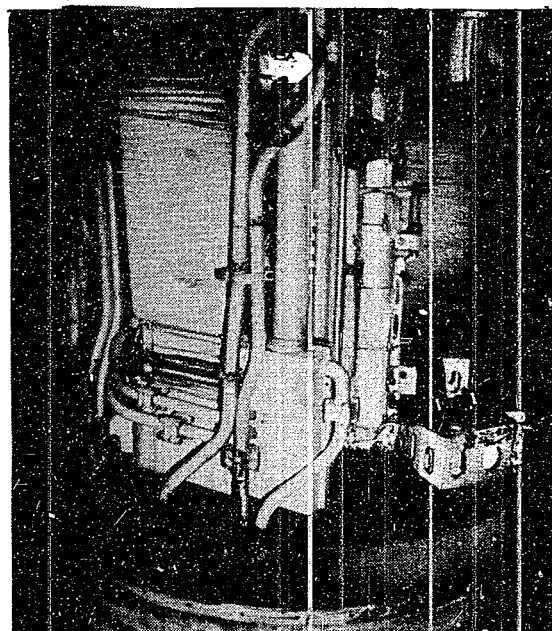


Figure 20

15.5cm (6-INCH) TRIPLE MOUNT SHELL HANDLING ROOM

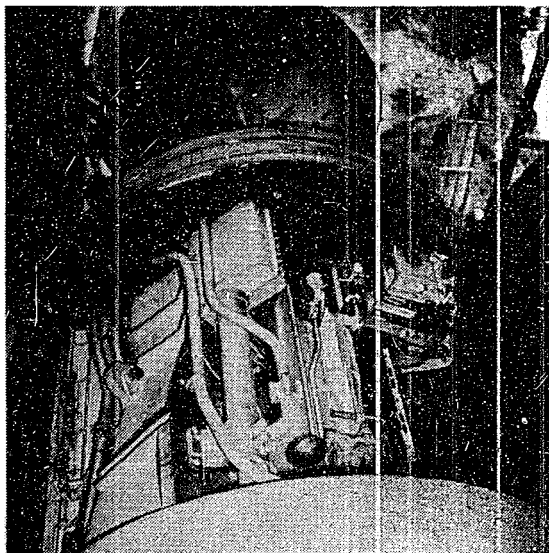


Figure 21

15.5cm (6-INCH) TRIPLE MOUNT SHELL HANDLING ROOM



Figure 22

15.5cm (6-INCH) TRIPLE MOUNT
PLAN VIEW CONE TRUNKING BELOW WORKING CHAMBER

C. Small Caliber Mounts (12.7cm (5-inch) and below)

1. General

The most interesting Japanese mounts for the smaller caliber guns are, in order of age:

- 12.7cm/50 cal twin and single. (Enclosures (B), (C), (D), and (E).)
- 12.7cm/40 cal twin Type 89 mounts.
- 10cm/65 cal and 8cm/60 cal Type 98 twin mounts.

2. 12.7cm/50 cal twin and single powered mounts

These mounts were designed in 1927 as the main armament of first-class destroyers. They were designed mainly for low angle firing and used separate ammunition. Their rate of fire was consequently low, about five rounds per gun per minute. Because of this, they were not very popular mounts and were soon replaced. In the twin mounts, the guns were fitted in separate cradles and were elevated independently of each other. As separate ammunition and hand ramming was used, it was necessary to load the gun between 5 and 10° of elevation. In order to keep up a reasonable rate of fire, it was therefore essential to have a very high elevating speed. In the single mounts, this was nearly 24°/sec, and in the twins, a little over 27°/sec. The elevating gear is shown diagrammatically in Enclosures (D) and (E). Both twin and single mounts were fitted with pusher type shell hoists (Enclosure (F)) but no cordite hoists were fitted in the revolving structure. The trunnion height above the roller path is 6 feet 1 inch. The low training speed (6°/sec) and the low rate of fire made these guns almost useless against aircraft.

3. 12.7cm/40 cal Type 89 twin HA gun mounts (Enclosure (G) and (H) and Figures 23 to 29)

These mounts were designed in 1929 to replace the old 8cm/40 cal hand-worked HA mount as the standard mount in battleships and cruisers for long range defense against aircraft. It appears in all respects to be a good, sound, dual-purpose mount of about average performance. Its maximum speeds of training and elevation, 16°/sec, are adequate for this type of mount using fixed ammunition. The main points of interest in these mounts are:

a. Loader's platforms (Figure 26 and 27)

These are suspended from the rear end of the cradle, and are raised and lowered with the elevation of the gun to keep the loader always in the most convenient position for placing the shell on the loading tray and moving the loading tray to and from the breech. The Japanese have never used power for working loading trays.

b. Power rammer (Enclosure (H))

Ammunition is rammed by a spring rammer, which is cocked by the gun during recoil. The stroke of the rammer is increased to twice the recoil length by use of a double rack and pinion gear. Details of this gear can be seen in Enclosure (I). Before loading the first round, the rammer is cocked by a simple wire whip secured to the base plate of the mounting and passed round a special removable pulley at the rear end of the rammer casing and then hooked to an eye-bolt on the gun. By depressing the gun, it is hauled back by the wire, thus cocking the rammer. The rammer is automatically released by mechanical trip gear as the loading tray reaches the ramming position. If a misfire occurs, the next round to be loaded must be rammed by hand, unless there is sufficient time to recock the rammer as al-

ready described. Control of ramming speed is obtained by means of adjustable oil buffer in the front of the rammer spring casing. The setting of this buffer is varied with the elevation of the gun.

3. Fuze-setting machines

The fuze setters cabinet is situated on the right side of the mount (Figure 28). By rod gearing passing through the trunnions, the fuze-setting machine is adjusted continuously to the fuze time to be set. The machines are fitted to the breech faces of the guns. (Figures 30 and 31.) A full description of this type of fuze-setting machine, fitted to all modern Japanese HA guns, may be found in NavTechJap Report, "Japanese Fuze-Setting Equipment," Index No. O-48.

d. Empty cartridge case deflector

Small empty cartridge case deflectors are fitted at the rear end of the rammer casing. These are interesting in that they are adjusted

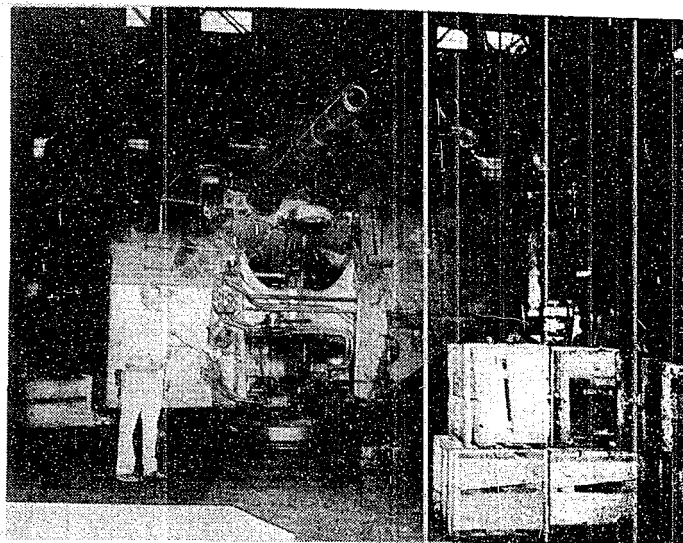


Figure 23

12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN MOUNT, FRONT VIEW

automatically by rod gearing during elevation of the gun to deflect the case in the most convenient way. At low elevations the case strikes the deflector and is downwards, while at very high elevation the deflector protects the base of the mount and deflects the case clear of the carriage.

In the aircraft carrier KATSURAGI where these guns were inspected, the ammunition supply arrangements were poor. One electrically operated dredger type hoist per mount was fitted. It supplied ammunition from the magazine to a point some 30 or 40 yards away from the mount, and the ammunition was carried through at least two bulkheads from this point to the mount. The rate of supply by the hoist was insufficient to keep up with the rate of fire of two guns. The trunnion height of the guns is 8.16 feet above the roller path, and the recoil length is 17.75 inches.

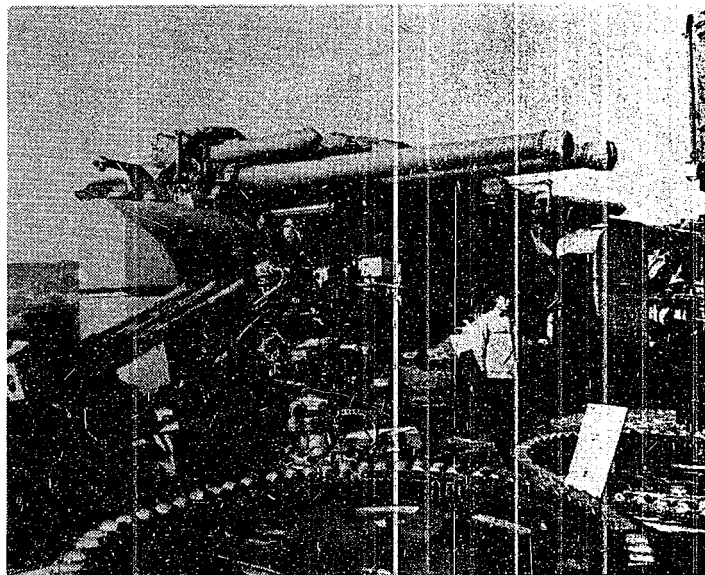


Figure 24

12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN MOUNT, FRONT VIEW
TRAINING RACKS ROLLERS IN FOREGROUND

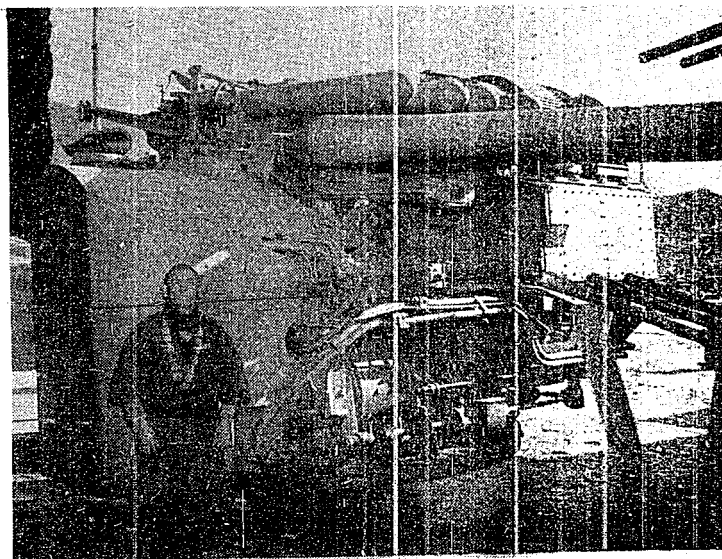


Figure 25

12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN MOUNT, FRONT VIEW

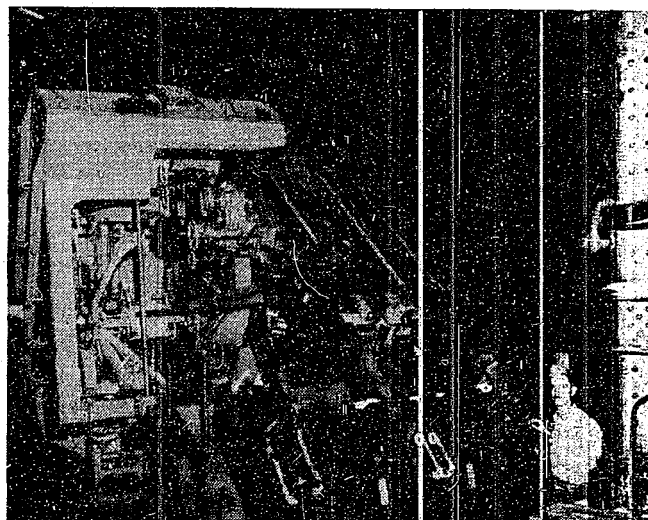


Figure 26
12.7cm (5-INCH) 40 CALIBER TYPE 89 GUN MOUNT, REAR VIEW

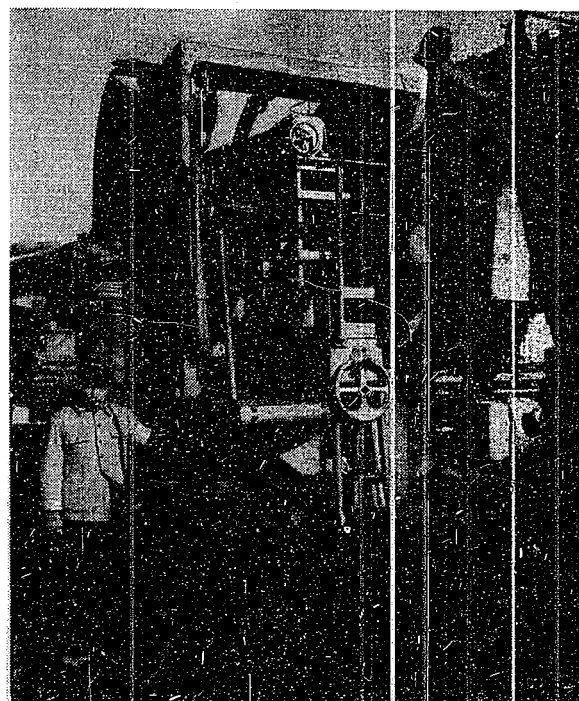


Figure 27
12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN HA MOUNT (LEFT SIDE)

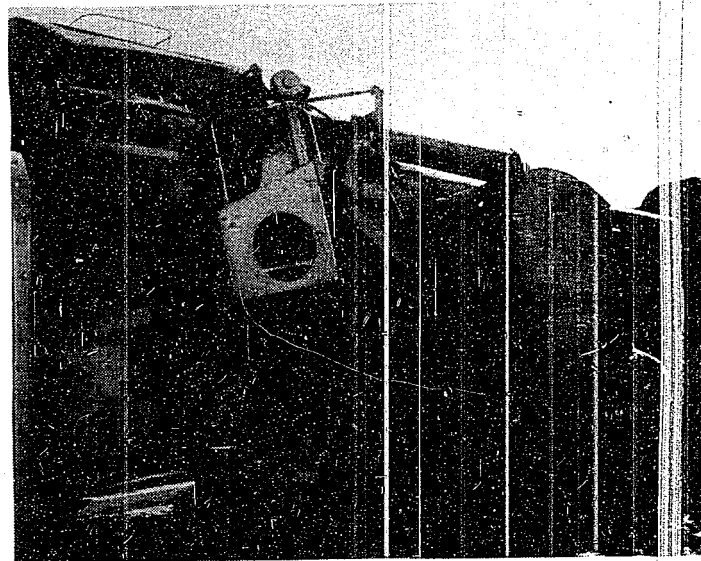


Figure 28
12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN HA MOUNT (RIGHT SIDE)

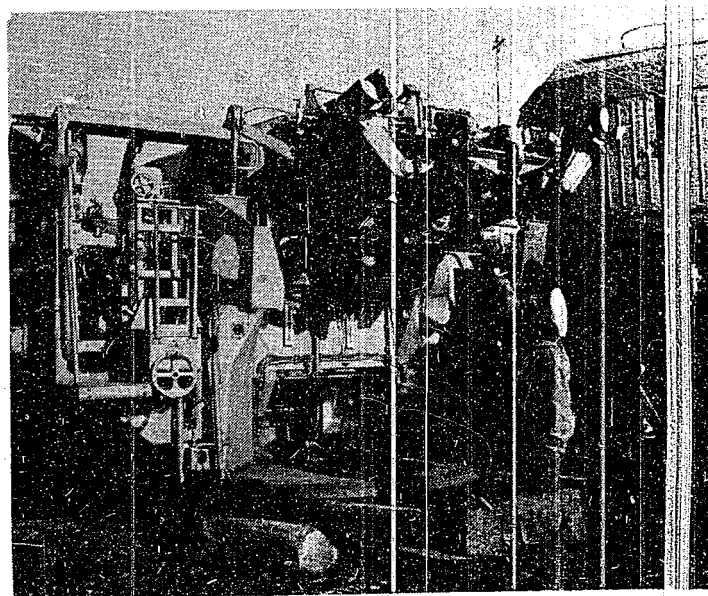


Figure 29
12.7cm (5-INCH) 40 CALIBER TYPE 89 TWIN HA MOUNT (REAR VIEW)

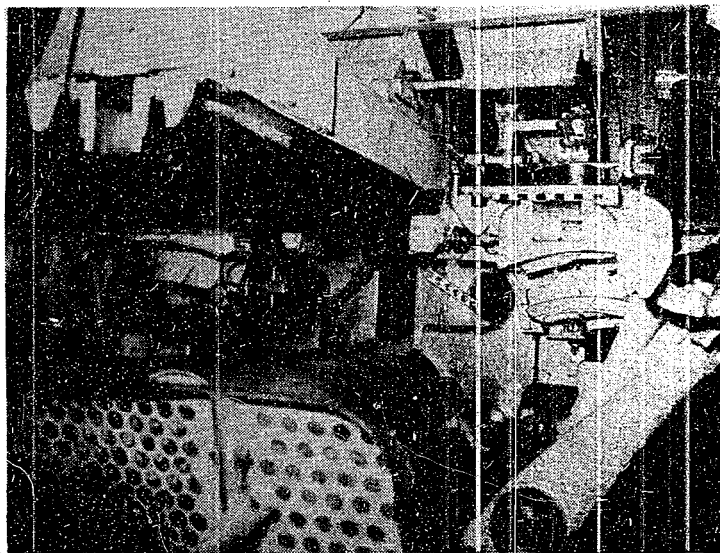


Figure 30
FUZE-SETTING MACHINE (LEFT HAND) FITTED ON 10cm TYPE 98 TWIN MOUNT

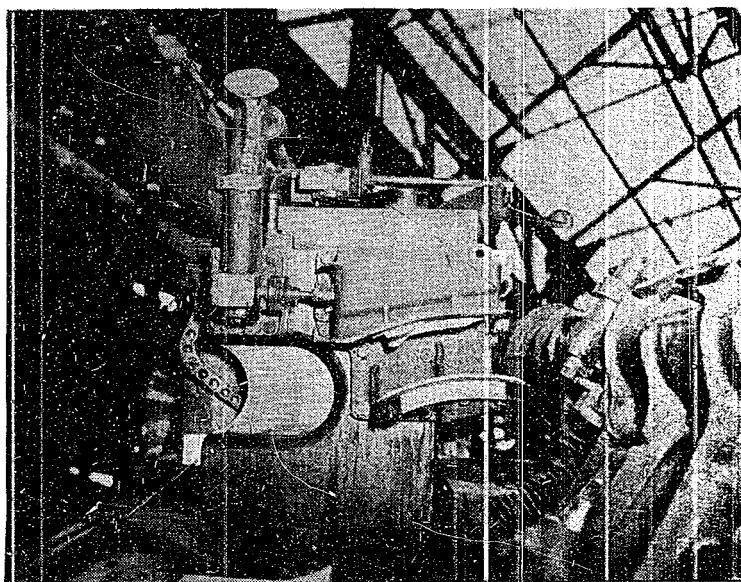


Figure 31
FUZE-SETTING MACHINE (RIGHT HAND) FITTED
ON 12.7cm MARK V EXPERIMENTAL MOUNT

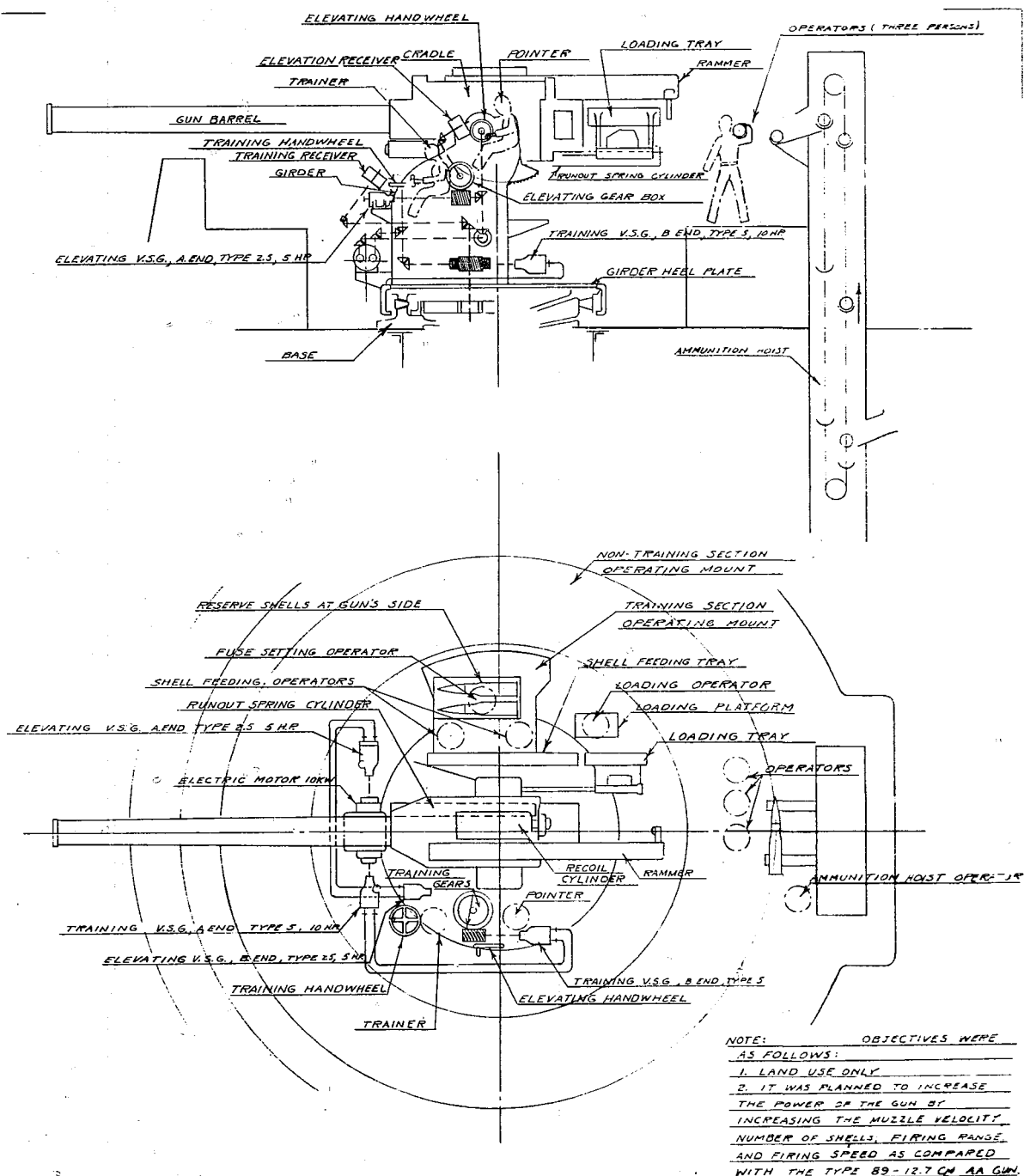


Figure 32
12.7cm 50 CALIBER TYPE 5 AA GUN

4. The 10cm/65 cal and 8cm/60 cal Type 98 twin mounts (Figure 34-35 and Enclosure (I))

The 10cm Type 98 guns and mounts were designed in 1938, in response to a demand for greater fire power in high angle guns. Turrets and ordinary type mounts were built; the former were fitted in the latest AA destroyers, and the latter were used in AA batteries on land. The 8cm mount is similar to the 10cm but on a smaller scale, and was designed mainly as an AA gun for the AGANO class cruisers.

By using a 65 caliber gun, a range of 21,350 yards on the surface and 14,220 yards vertically was obtained with a rate of fire of 19-21 rounds per minute - a very great advance on any previous high angle gun built by the Japanese. Both the guns and the mounts, are undoubtedly the most outstanding of any around this size designed and built in Japan.



Figure 33
AMMUNITION STOWAGE AND BUCKET HOIST (MAGAZINE TO WORKING CHAMBER)

a. Ammunition supply

Fixed ammunition is used and is supplied from the magazines to the working chambers in the fixed structure by two simple bucket type hoists (Figure 33), at the rate of 20-22 rounds per minute per hoist. In the working chamber the ammunition is man-handled from the top of the hoists to awaiting positions at the entrances to the gunloading pusher hoists (Figures 34 and 36).

There are two hoists built as one unit in each turret. The power supply for the hoists is independent of that for the remainder of the turret. The electric motor and "A" ends of the hydraulic system for the hoists can be seen in Figures 34 and 36. Two hoists which



Figure 34

10cm (4-INCH) 65 CALIBER TYPE 98 HA TWIN MOUNT LOWER END OF SHELL HOIST
ENTRANCE FOR SUPPLY TO LEFT GUN

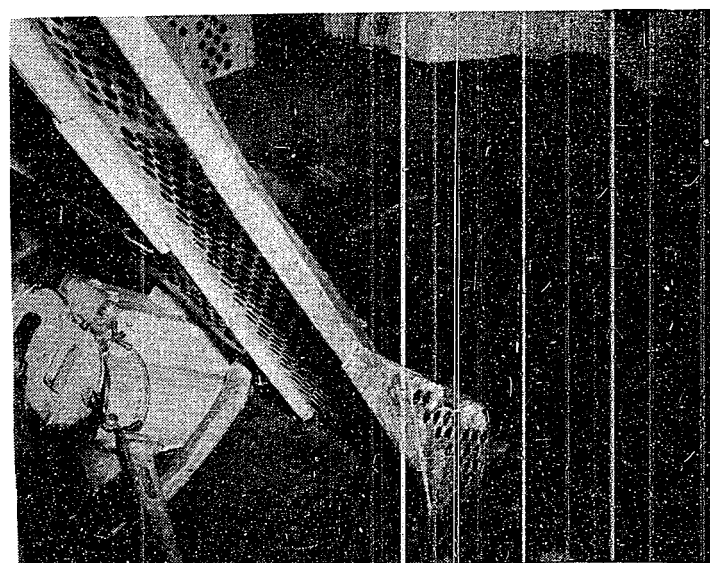


Figure 35

10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNTS
TOP OF SHELL HOIST AND EMPTY CARTRIDGE CASE DISPOSAL CHUTE

are normal pusher type hoists, are interconnected and cannot work independently of each other. The hoists are controlled by a lever in the rear of the turret between the exit from the hoists. The speed of ammunition supply may be varied at will by suitably positioning the control lever. The maximum rate of supply is about 20-22 rounds per hoist per minute. On leaving the top of the hoist, the ammunition rolls automatically into one of the waiting positions shown in Figure 38, from where it is passed to the loaders standing alongside the loading trays on platforms moving in elevation with the guns.

The loading trays, fuze setting machines and rammers are similar in principle to those of the 12.7cm Type 89 mounts. The rammer is mounted above the guns instead of below as in the 12.7cm gun and has embodied certain improvements principally in the tripper gear, which has an improved type of tumbler release mechanism. The general arrangement of this can be clearly seen in Enclosure (I). In the early days of these mounts, frequent failures occurred due to fracturing of the rammer heads, but this trouble has now been overcome and the rammer is stated to be entirely satisfactory.

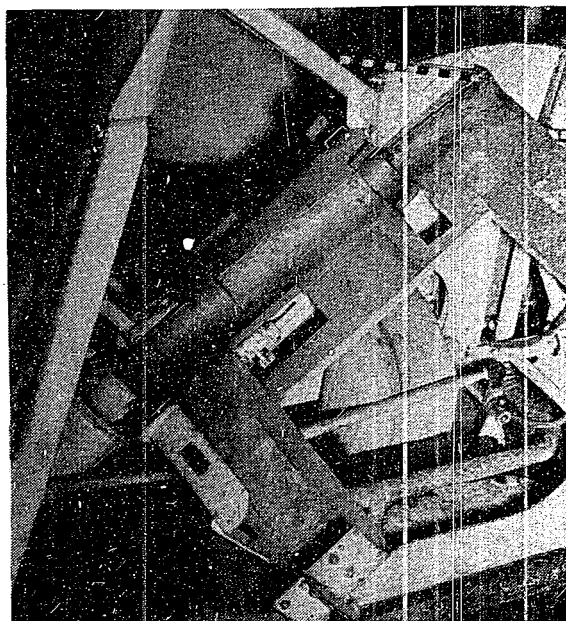


Figure 36

10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNT
TOP OF SHELL HOIST (LEFT GUN)

b. Empty cartridge case disposal

On rejection, the cartridge cases strike a large fixed deflector (Figure 39) and then drop down a chute below the gunwell and through a door into the fixed structure around the bottom of the hoist, whence they are removed clear of the working chamber into spaces along the ship's side.

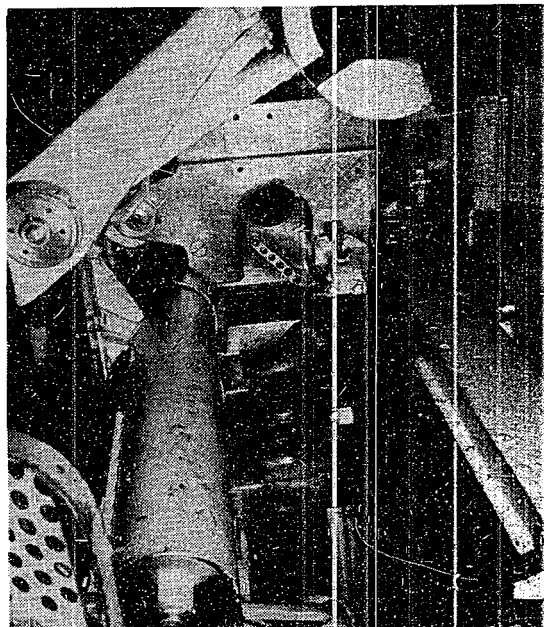


Figure 37

10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNT-RAMMERS

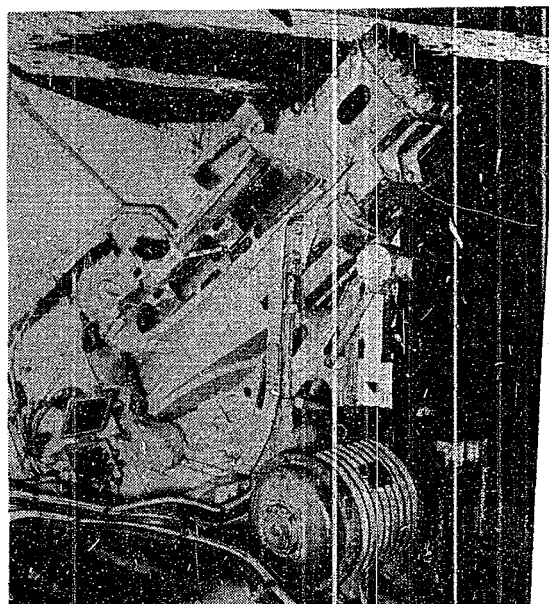


Figure 38

10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNT
LOWER END OF SHELL HOIST ENTRANCE FOR SUPPLY TO RIGHT GUN

c. Recoil and run-out

A normal recoil piston and cylinder is fitted above each gun and a run out spring below. Additional run-out springs (one per gun) are also fitted between and to the rear of the guns. The weight of the run-out springs, loading trays, and rammers is sufficient to balance the guns in elevation without the addition of special balance weights. The normal length of recoil is 19.3 inches and the trunnion height is 8.2 feet above the roller path.

In case of failure of power, the mount (including the hoists) can be left in operation entirely by hand. The main power motor is a 10 hp electric motor, which drives two "A" ends of a separate hydraulic system supplying pressure to a "B" end for training the turret through normal worm and worm wheel.

d. Safety training and depression control gear These are of conventional design and are operated from cam rails fitted below the training racks.

e. Local director sight (Figure 41)

When the 8 and 10cm Type 98 mounts were first produced it was thought very necessary to have a local sight capable of controlling the guns with considerable accuracy, if the main director failed. A combined local director sight and computer (of somewhat complicated design for this type of gun) was therefore produced. The mechanism was developed from the French "L.P.R." sight, and is similar in principle to that used on the 25mm triple machine guns described in the NavTechJap Report "Japanese AA Fire Control", Index No. O-30. It is briefly a simple course and speed sight in which target speed, course, and range are resolved to give time flight and vertical and lateral deflections. These values are transmitted manually to the sights and fuze receivers by matching pointers and following up time of flight curves on a drum. Vertical and lateral spotting corrections can be added differentially to the output drives of the sights. During the latter part of the war, various simplified types of sights were fitted to the mounts, as the original local director sight was complicated and proving a bottle neck in the mass production of the most valuable anti-aircraft weapon in use.

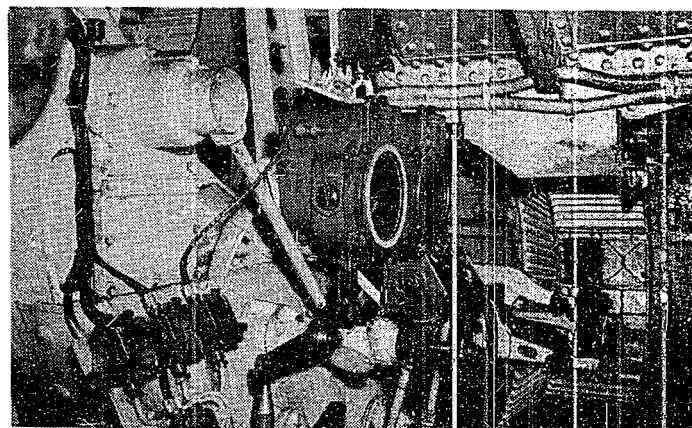


Figure 39

SIGHT SETTER'S AND FUZE SETTER'S POSITIONS
ON 10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA TURRET

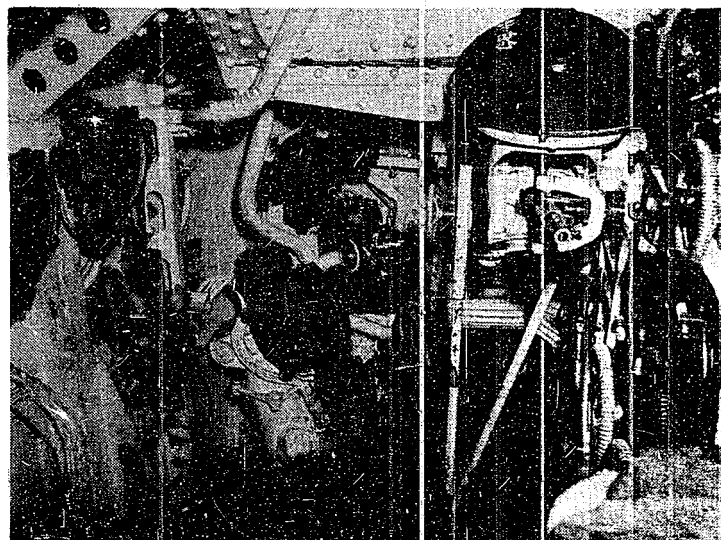


Figure 40
10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNT
GUNLAYER'S CONTROLS



Figure 41
10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNT
LOCAL DIRECTOR

5. The 12.7cm/50 cal Type 5 single HA gun and mount

Toward the end of the war, a requirement arose for a new 12.7cm/50 cal twin HA turret mount with greater fire power than the 12.7cm Type 89. Before this was designed, however, orders were given to change this into a single HA mount for land based AA batteries. This mount was known as the 12.7cm/50 cal Type 5. Only one experimental mount was built; it has just completed proving trials at the end of the war. This gun and mount were found among the debris in the gun mount shop in Kure Navy Yard in December 1945. It is the only mount of this type built, and has not yet been stripped for examination since being proved. No mention was made of this mount in the tables of data prepared in TOKYO, but the following information has been obtained:

Bore (Actual) - 127mm	(5-inch)
Caliber	50
Chamber pressure	28 Kg/mm ² - 17.78 long tons/m ²
M.V.	880 m/sec - 2886 ft/sec
Type of breech	Horizontal sliding; semi-automatic
Weight of gun and breech mechanism	4.59 tons (long)
Weight of recoiling parts	5.10 tons (long)
Weight of elevating parts	9.35 tons (long)
Weight of remainder	9.35 tons
Total weight	18.60 tons (long)
Weight of shell	59.4 lbs
Weight of charge	21.56 lbs
Total weight of round	105.82 lbs
Total length of round	5.35 ft
Length of recoil (Max)	20.5 in
Length of recoil (Normal)	20.0 in
Recoil liquid used	Glycerine and water
Run-out mechanism	Springs
Reaction on firing	38.4 tons (long)
N.B. (This is presumed to be the reaction on the trunnions when firing at zero elevation.)	
Rate of fire	15 to 18 rounds per minute
Maximum surface range	22,506 yd
Maximum vertical range	16,629 yd
Limits of elevation and depression	+85° to -8°
Maximum speed of elevation (power)	18° per sec
One revolution of elevating handwheel	1½° of elevation
Maximum training speed (power)	18° per sec

The carriage is cast and appears to be of very heavy construction as, indeed, does all the remainder of the mount, but as it was designed for land use only, this is not of great importance. The exact trunnion height is not known, but as can be seen from Figures 42, 43, and 44, it is very great (about seven feet) for a gun of this size.

The general arrangement of the mount and the method planned for ammunition supply is shown in Enclosure (C). After delivery from a dredger type hoist, the ammunition is carried around a raised platform and placed on a waiting tray on the right side of the mount ("A", Figure 44). From here it is lifted onto an intermediate loading tray ("B", Figure 43). This tray elevates with the gun, but does not swing to the breech. From "B", the round is slid into the lower loading tray ("C", Figure 43) where it is arrested by a spring and oil operated buffer stop "D". The cushioning effect of this stop is regulated according to the elevation of the gun. Suitable mechanically operated spring stops are fitted to the upper tray to prevent the round falling out when the lower tray is swung over to the breech. The lower tray is fitted with shell grips to prevent the round

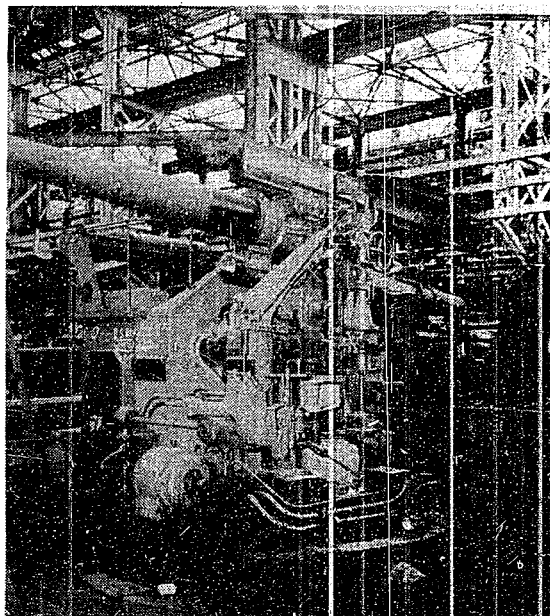


Figure 42

12.7cm (5-INCH) 50 CALIBER TYPE 5 SINGLE HA EXPERIMENTAL LAND MOUNT
(LEFT FRONT VIEW)

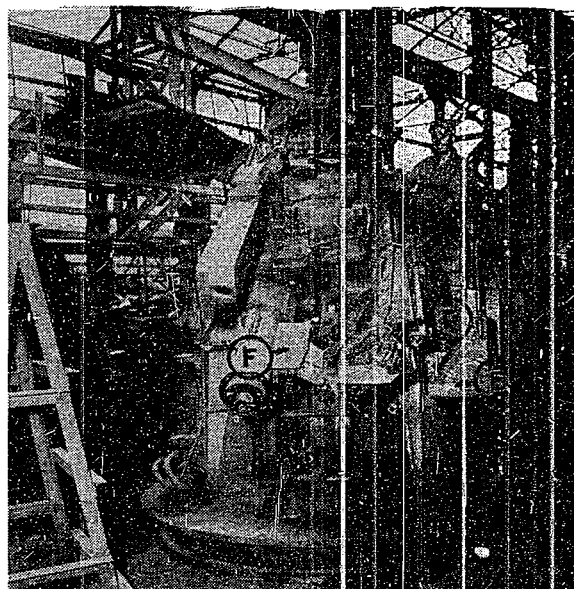


Figure 43

12.7cm (5-INCH) 50 CALIBER
TYPE 5 SINGLE HA EXPERIMENTAL LAND MOUNT (REAR VIEW)
(B) Intermittent Loading Tray
(C) Lower Loading Tray
(D) Buffer Stop
(E) Operation Platform

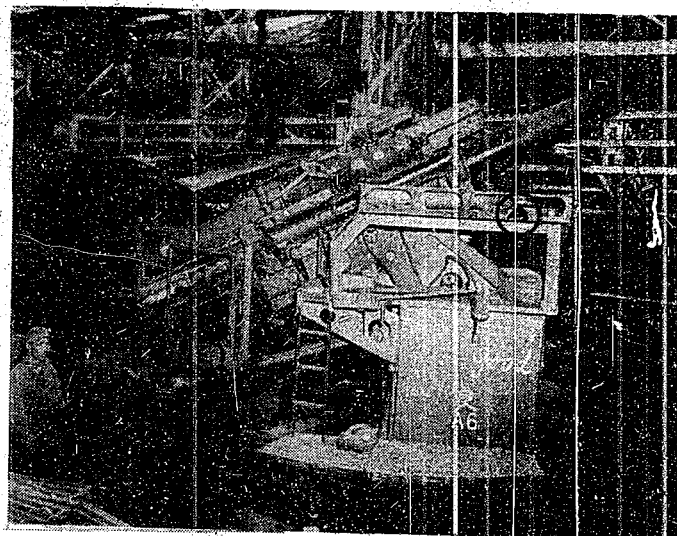


Figure 4a

12.7cm (5-INCH) 50 CALIBER TYPE 5 SINGLE HA EXPERIMENTAL LAND MOUNT
(RIGHT SIDE VIEW)

(A) Ammunition Tray
(E) Operator Platform

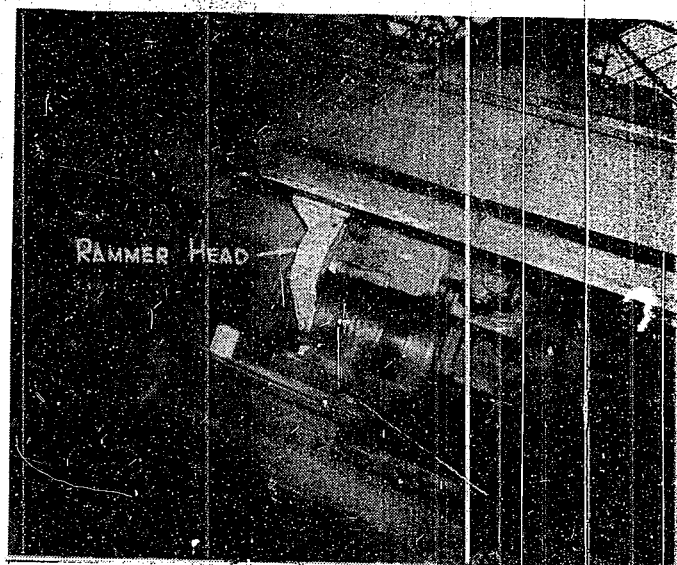


Figure 45

12.7cm (5-INCH) 50 CALIBER TYPE 5 SINGLE HA EXPERIMENTAL LAND MOUNT
RAMMER HEAD

jumping or being turned while the fuze is being set. The loading tray operator stands on a platform ("E", Figure 43) which is raised and lowered as the gun depresses or elevates. The fuze-setting machine, rammer, mechanism, recoil, and run-out arrangements are similar to those on the 8 and 10cm Type 98 mounts.

An empty cartridge case deflector plate ("F", Figures 43 and 46) is automatically angled as necessary at high elevations.

It was intended to use a fuze with a white metal time-setting ring, on the ammunition for this mount. The fuze-setting machine may therefore differ slightly from that fitted to other mounts.

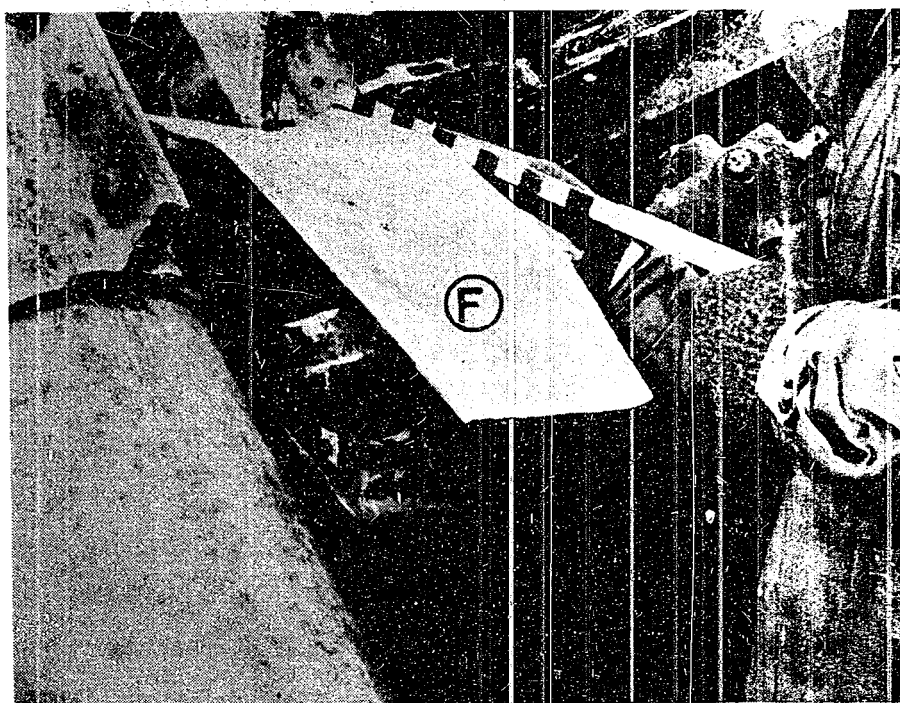


Figure 46

12.7cm (5-INCH) 50 CALIBER TYPE 5 SINGLE HA EXPERIMENTAL LAND MOUNT
(F) Empty Cartridge Case Deflector

a. Submarine pneumatic hoists

It has for some time been the practice in the Japanese Navy to use air operated ammunition hoists. No information on the hoists has been obtained beyond the fact that a good deal of trouble is experienced with air leaks. Two general arrangement drawings of hoists for 12cm ammunition are, however, contained in this report (Enclosures (J) and (K)) and a handbook (NavTechJap Document No. ND50-3631) on the trials of a hoist for the 10cm gun in submarine I-68, has been sent to the Washington Document Center.

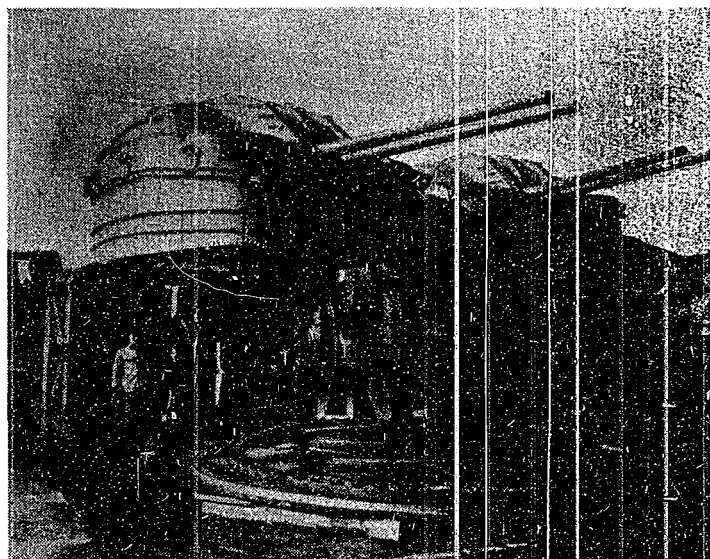


Figure 47
10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNTS

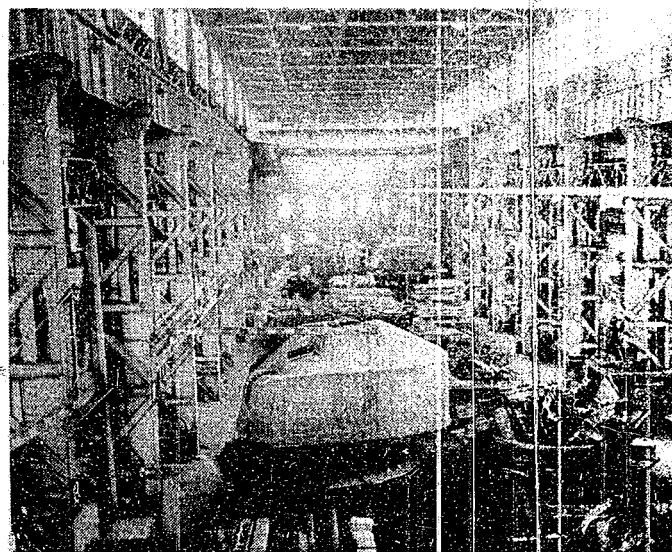
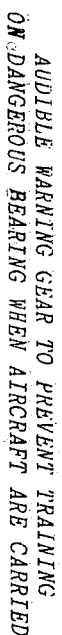
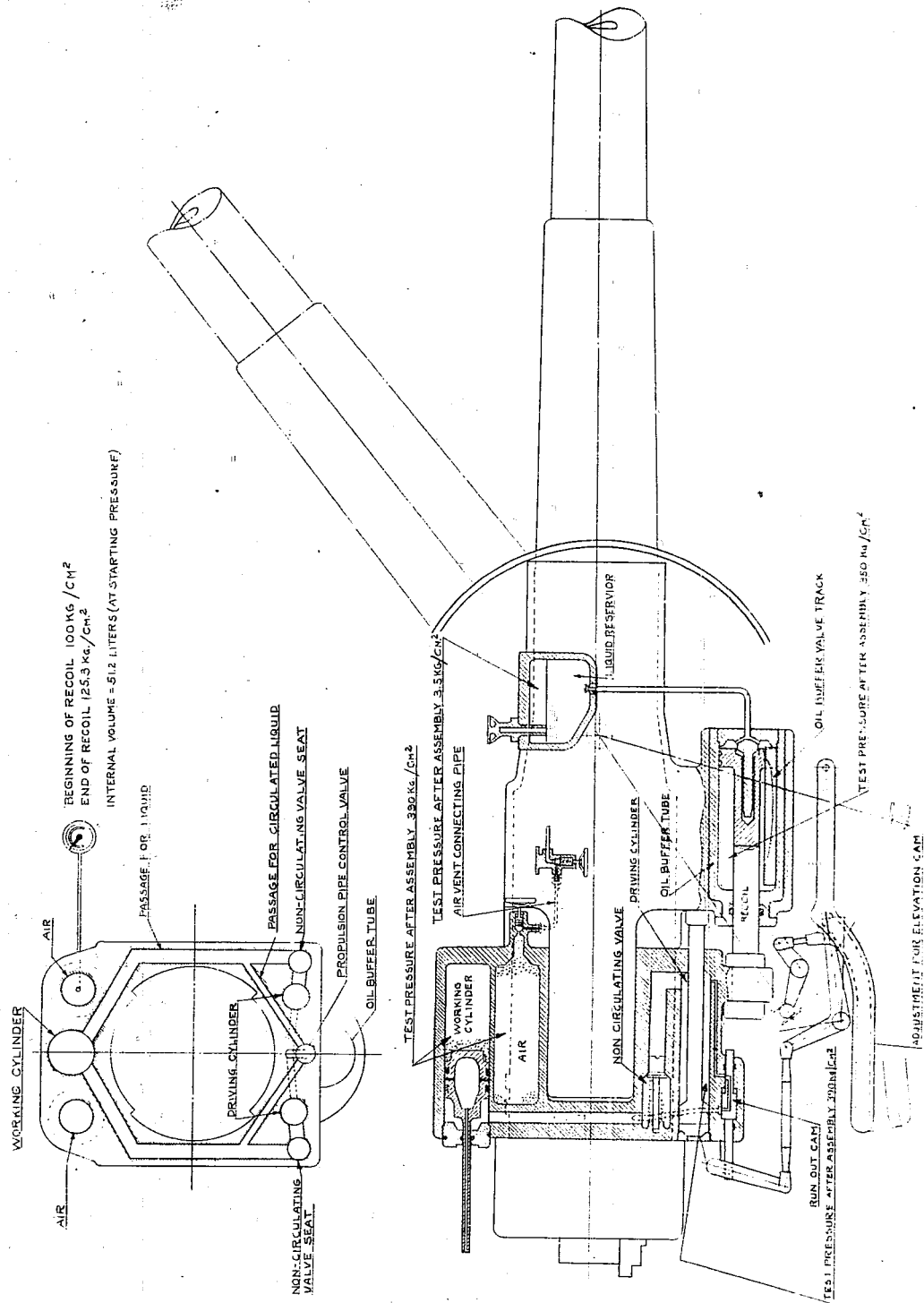


Figure 48
VIEW OF ASSEMBLY SHOP AT SASEBO NAVAL GUN FACTORY
FOR 10cm (4-INCH) 65 CALIBER TYPE 98 TWIN HA MOUNTS

O-47(N);



ENCLOSURE (B)

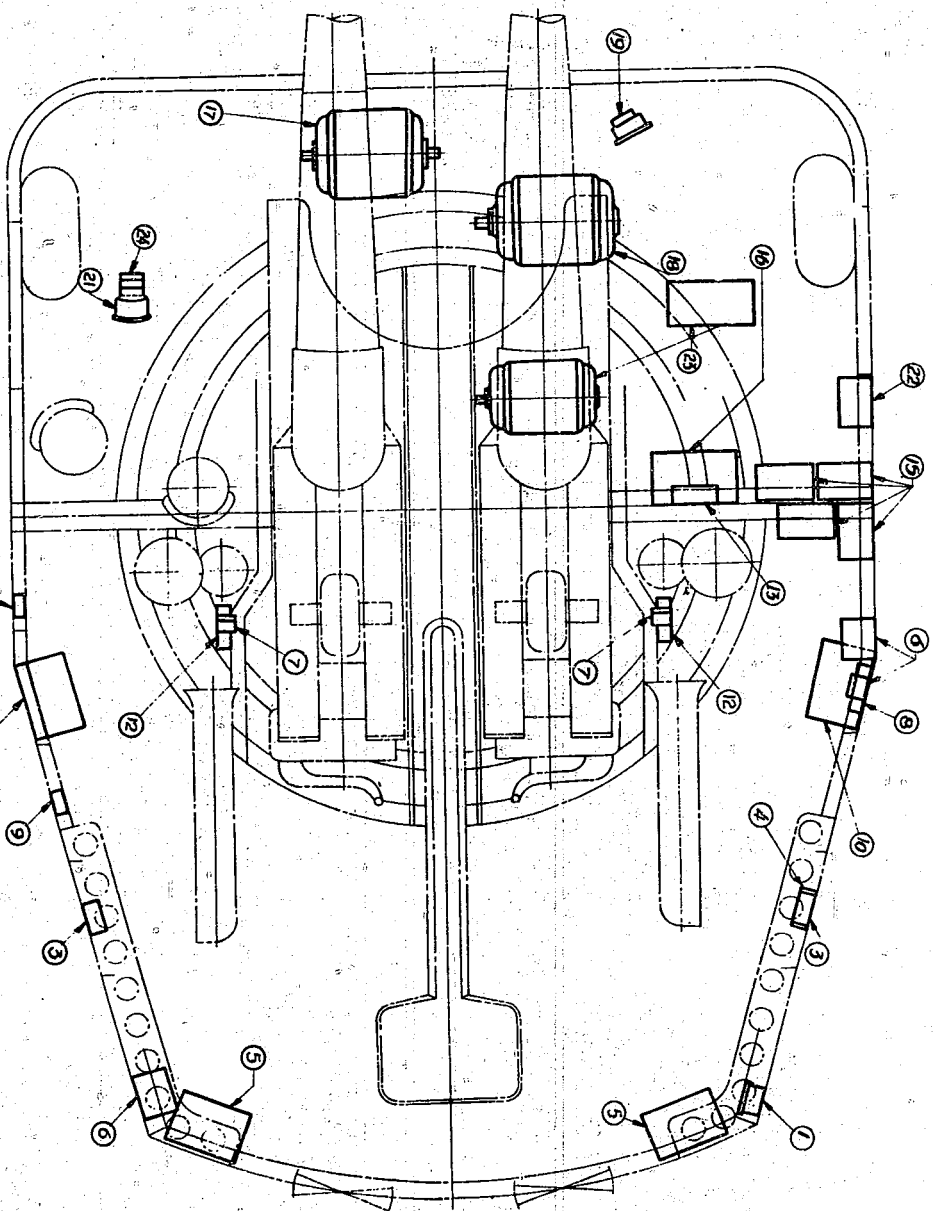
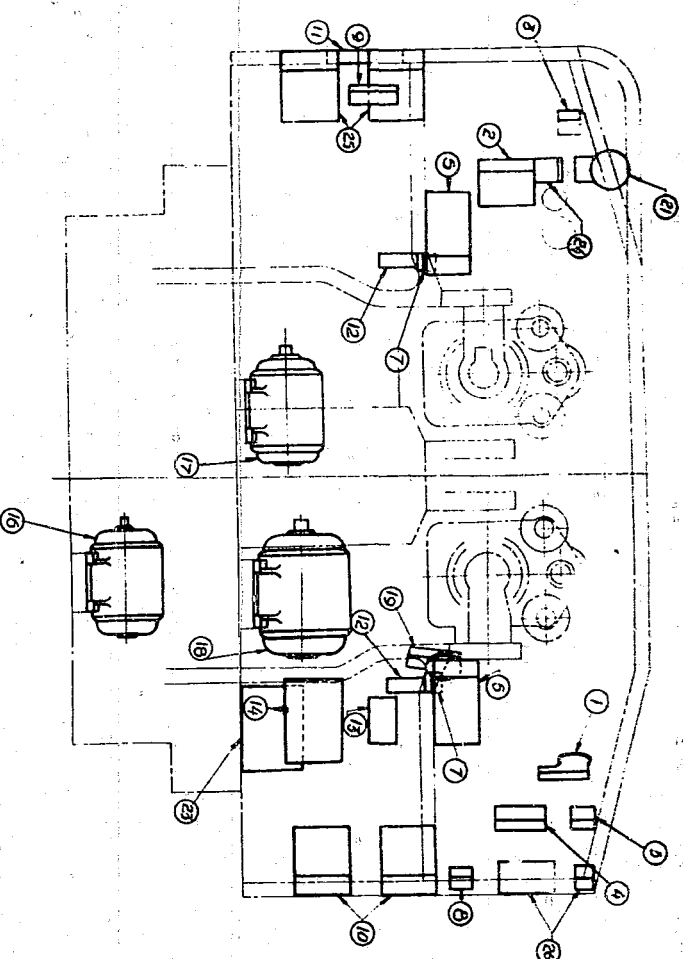
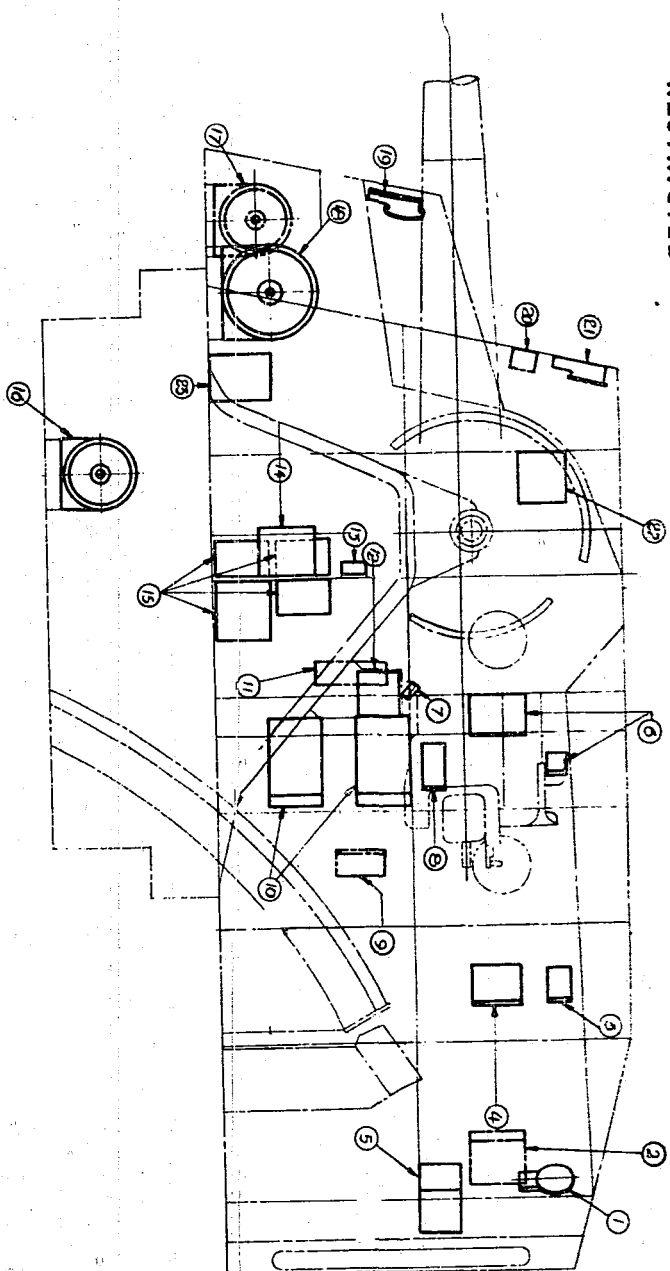


TYPICAL ARRANGEMENT OF RUN-OUT CONTROL GEAR OF 6-INCH AND 8-INCH MOUNTS

RESTRICTED

ENCLOSURE (C)

O-47(N)-1

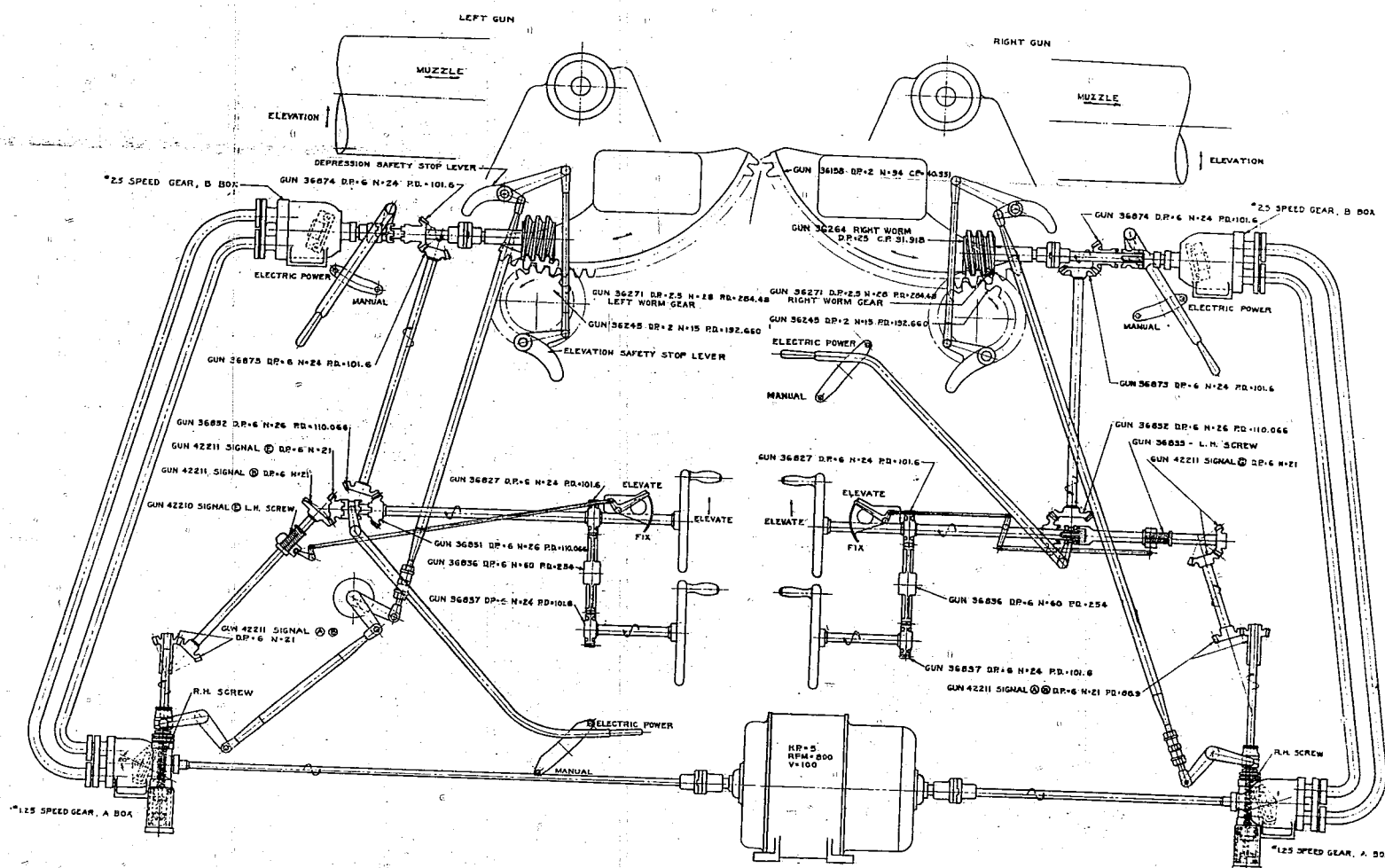


- 1 - DC AMMETER FOR AMMUNITION HOIST.
- 2 - CIRCUIT BREAKER FOR ELEVATOR.
- 3 - CUT-OVER SWITCH.
- 4 - CIRCUIT BOX.
- 5 - STORAGE BOX FOR FIRING ASSEMBLY HOIST.
- 6 - CIRCUIT BREAKER FOR AMMUNITION HOIST.
- 7 - IGNITOR SWITCH.
- 8 - SHUNT FOR AMMUNITION HOIST.
- 9 - SHUNT FOR ELEVATOR FOR AMMUNITION HOIST.
- 10 - AUTOMATIC STARTER FOR AMMUNITION HOIST.
- 11 - BASE FOR ELEVATOR AND TURNABLE.
- 12 - TYPE 92 (BLASTING CIRCUIT) INSPECTOR.
- 13 - SHUNT FOR TURNABLE.
- 14 - AUTOMATIC STARTER FOR TURNABLE.
- 15 - BATTERY BOX.
- 16 - SHIP DC MOTOR FOR AMMUNITION HOIST.
- 17 - SHIP DC MOTOR FOR ELEVATOR.
- 18 - 10HP DC MOTOR FOR TURNABLE.
- 19 - DC AMMETER FOR TURNABLE.
- 20 - PUSH BUTTON SWITCH FOR AMMETER.
- 21 - DC AMMETER FOR ELEVATOR.
- 22 - CIRCUIT BREAKER FOR TURNABLE.
- 23 - STORAGE BOX FOR ELECTRICAL GEAR.
- 24 - PUSH BUTTON SWITCH FOR ELEVATOR.
- 25 - AUTOMATIC STARTER FOR ELEVATOR.
- 26 - SWITCH FOR AMMUNITION HOIST.

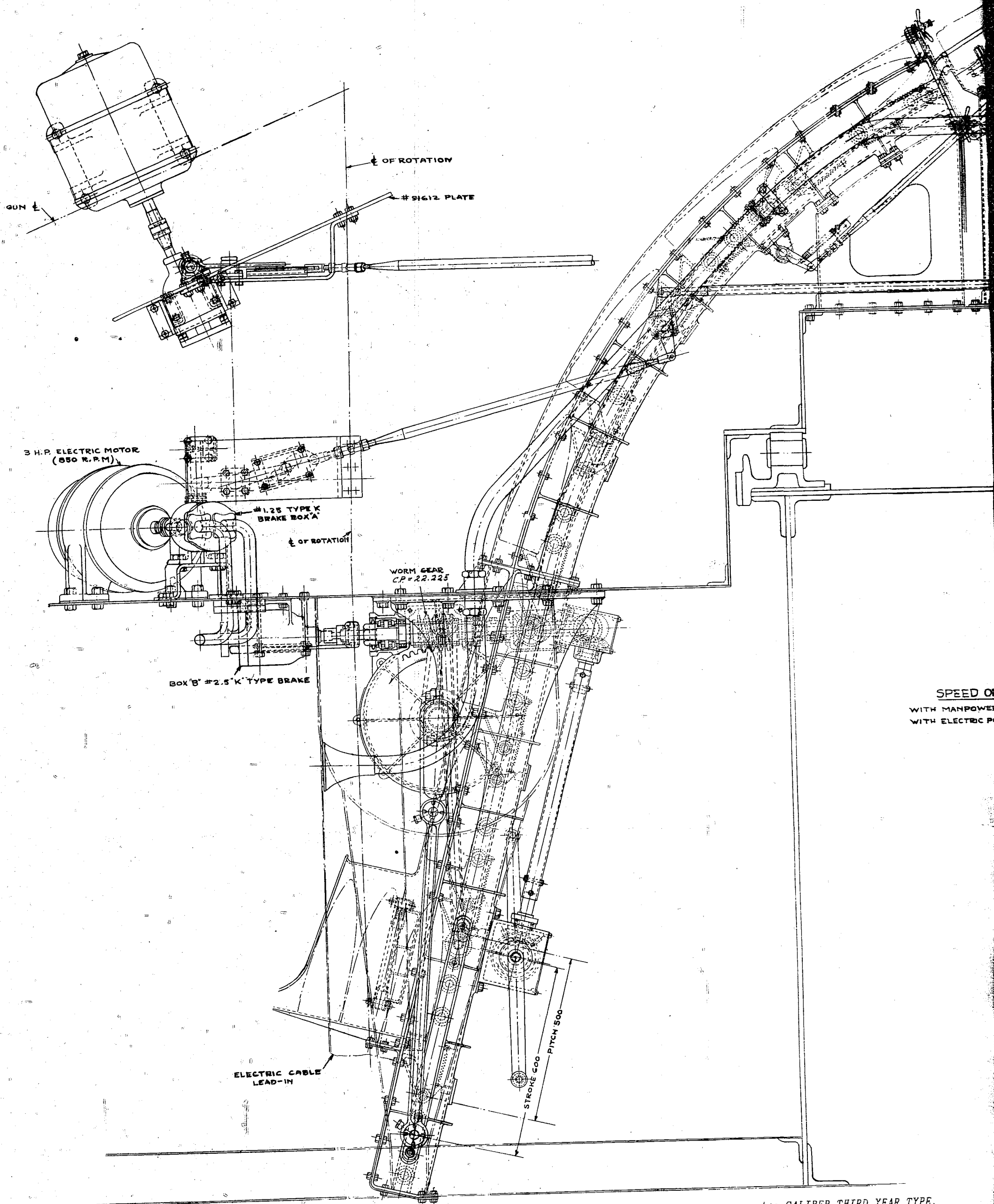
GENERAL ARRANGEMENT OF 12.7cm/50 CALIBER TYPE C TWIN MOUNT -

ENCLOSURE (E)

ELECTRICALLY-POWERED: ELEVATION SPEED 27°-12' PER SECOND
MAN-POWERED ELEVATION SPEED. 2°-3' PER REVOLUTION

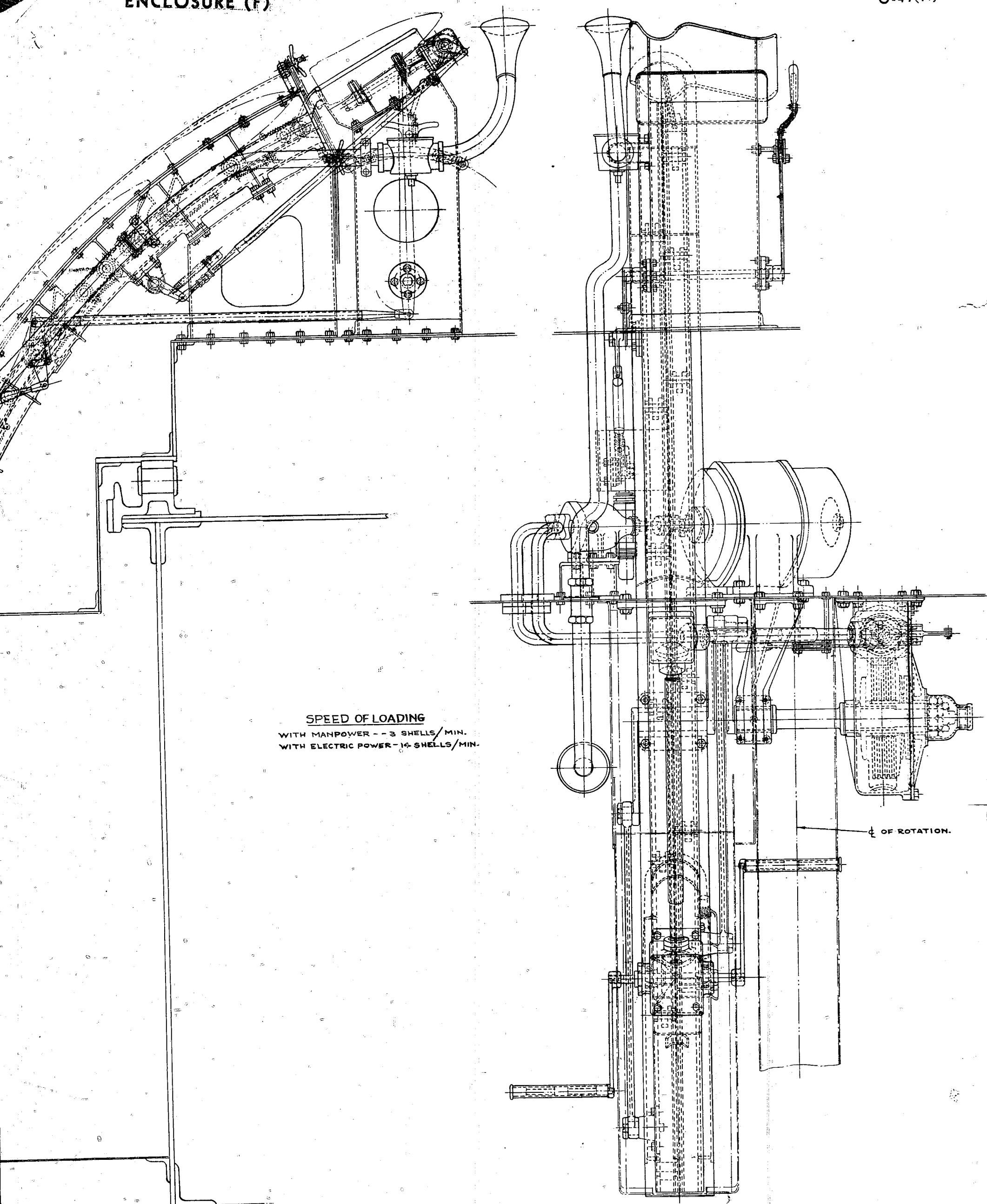


12.7cm/50 CALIBER TYPE C TWIN MOUNT, ELEVATING GEAR



SPEED OF
WITH MANPOWER
WITH ELECTRIC POWER

12.7cm/50 CALIBER THIRD YEAR TYPE,
SINGLE MOUNT PUSHER HOIST

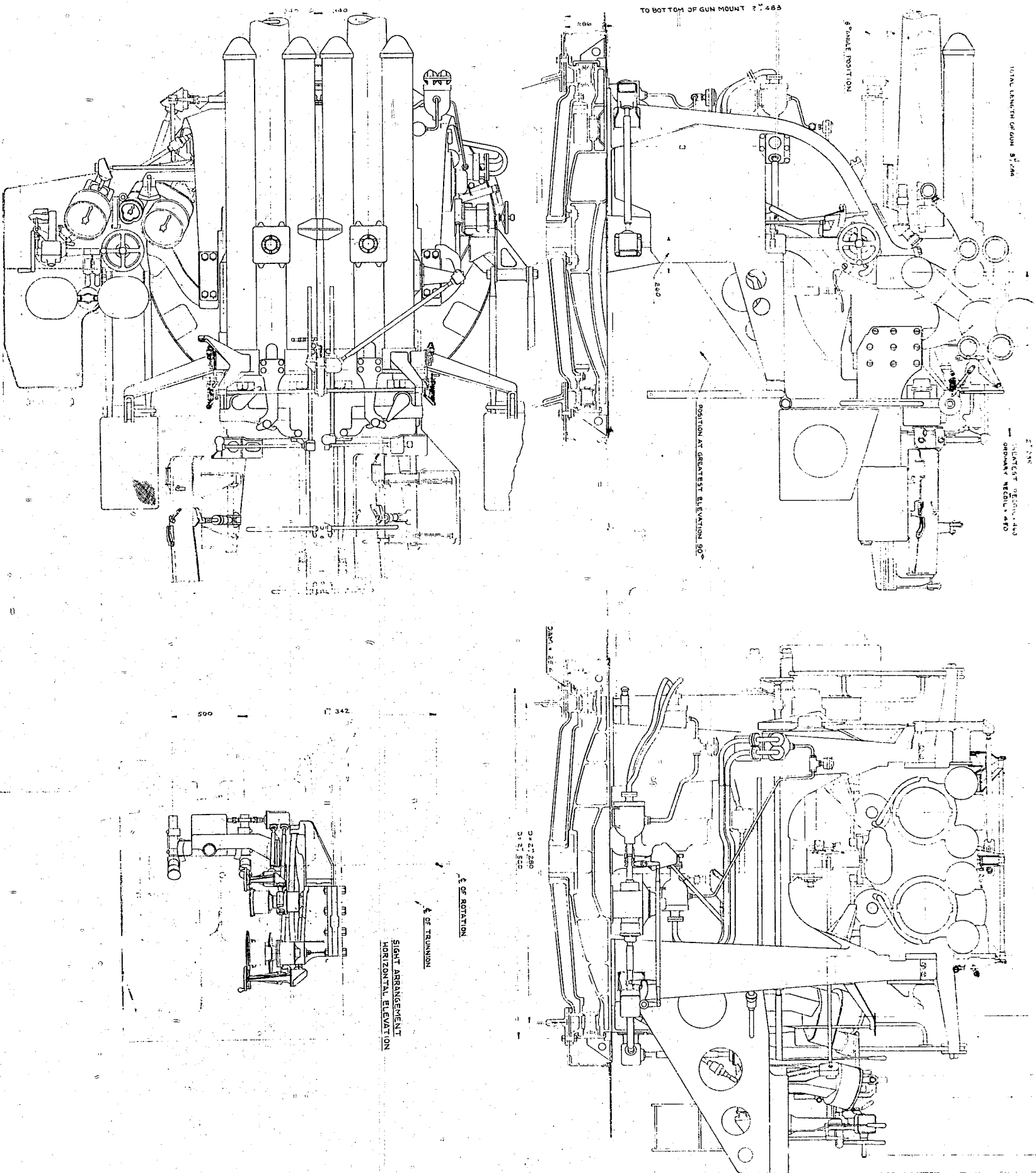


12.7cm/50 CALIBER THIRD YEAR TYPE,
SINGLE MOUNT PUSHER HOIST

RESTRICTED

ENCLOSURE (G)

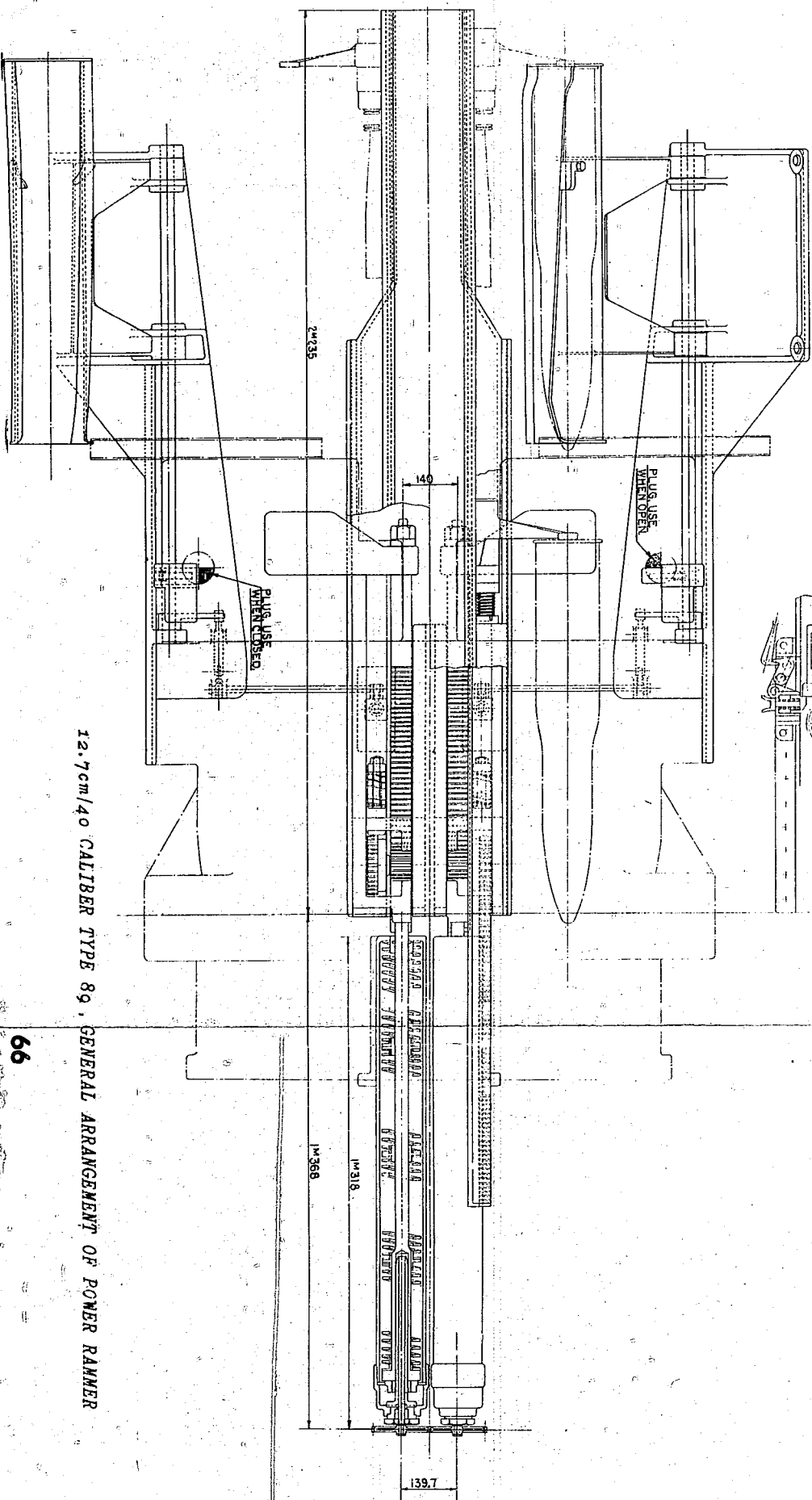
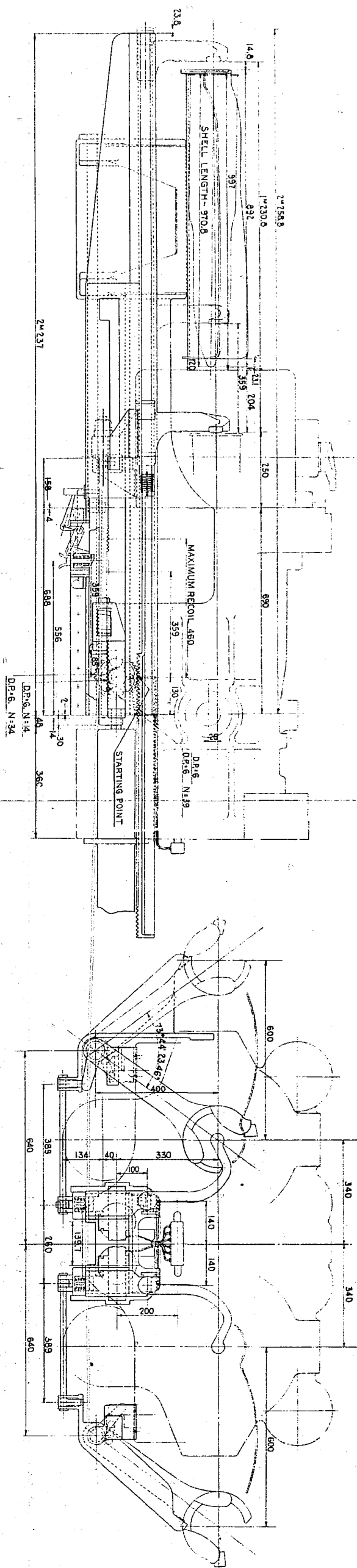
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12.7cm/40 CALIBER TYPE 89 TWIN MOUNT, GENERAL ARRANGEMENT

ENCLOSURE (H)

RESTRICTED

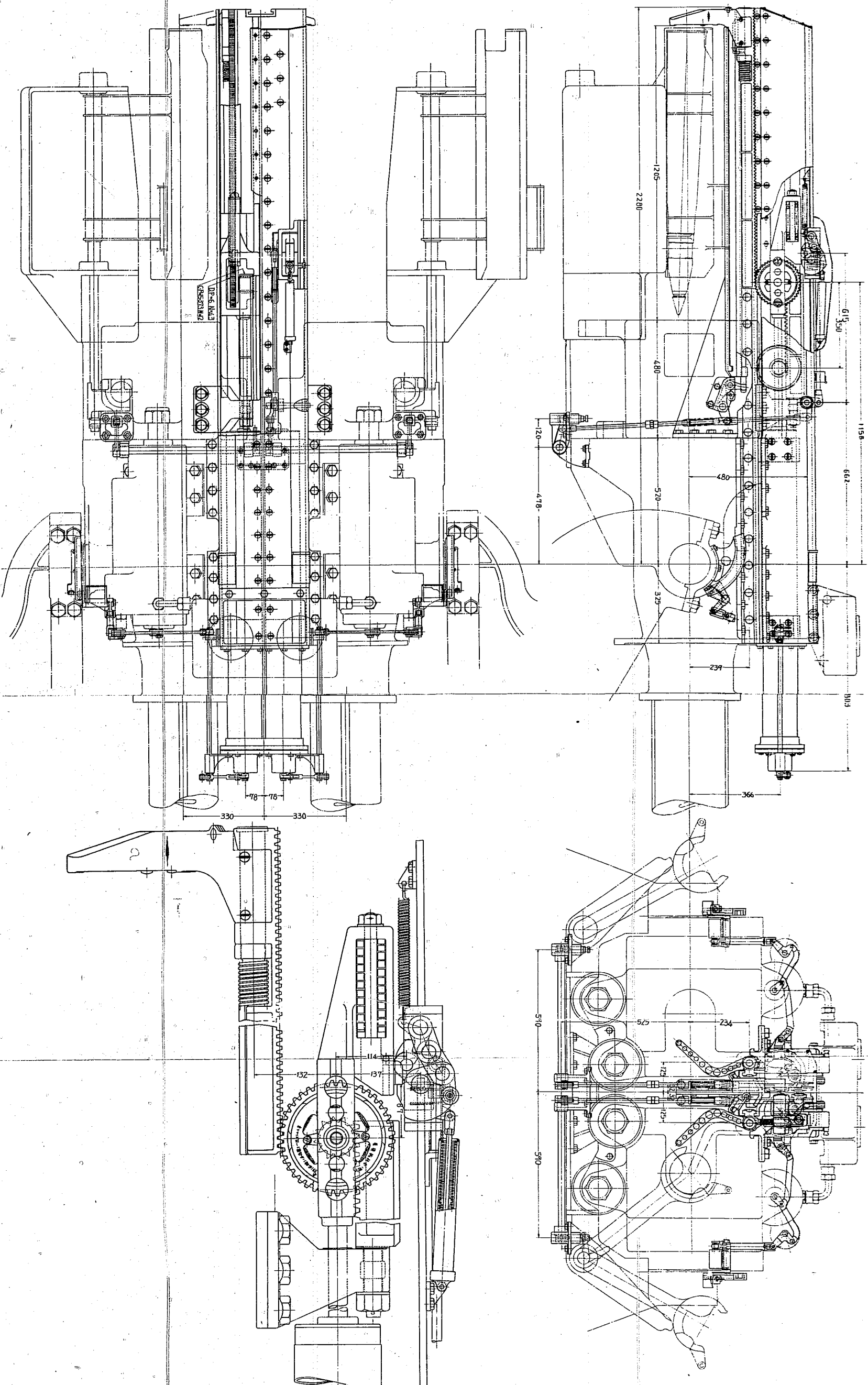


12.7cm/40 CALIBER TYPE 89, GENERAL ARRANGEMENT OF POWER RAMMER

RESTRICTED

ENCLOSURE (I)

O-47(N)-1

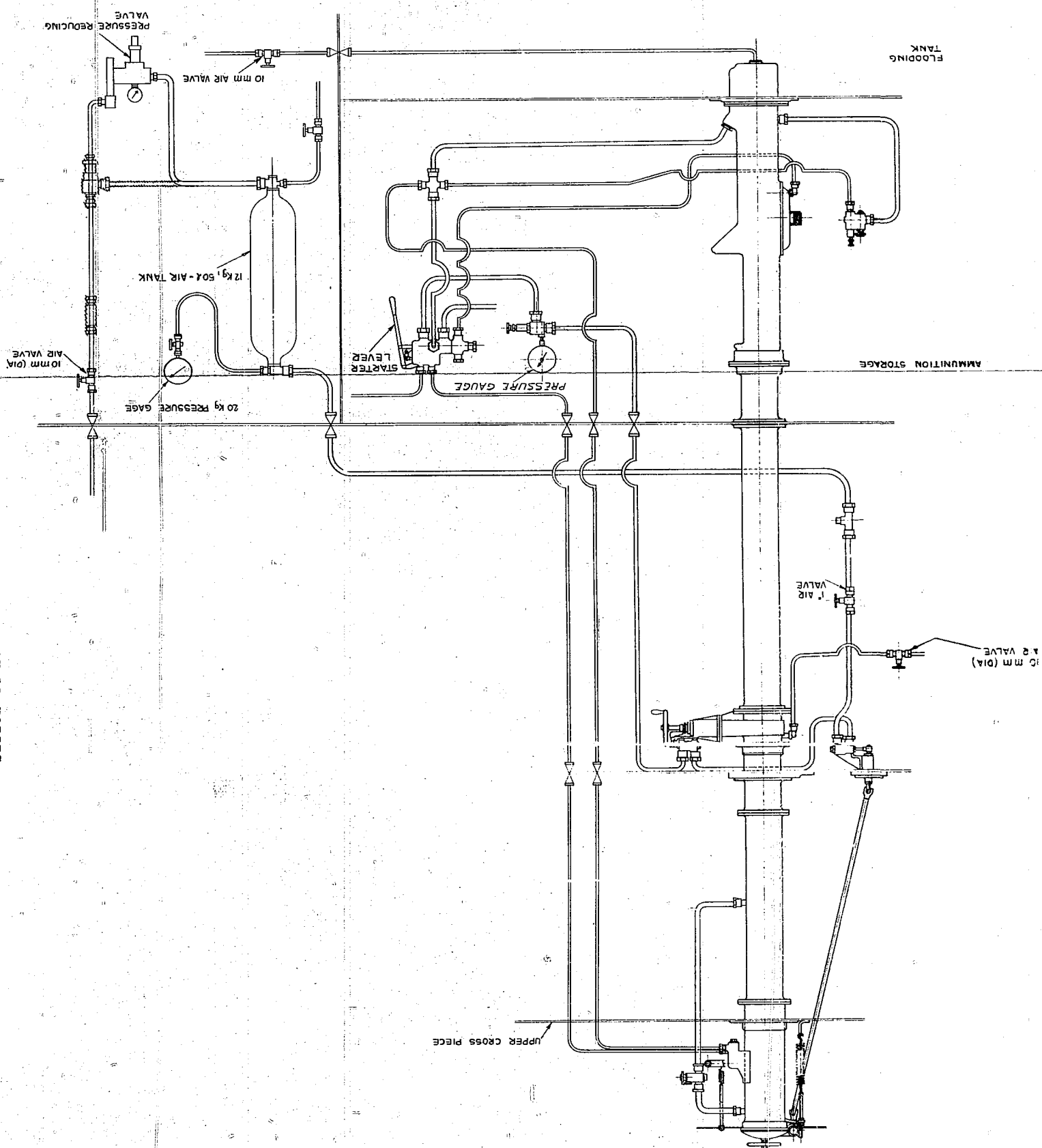


10cm/165 CALIBER TYPE 98 TWIN MOUNT, SPRING RAMMER

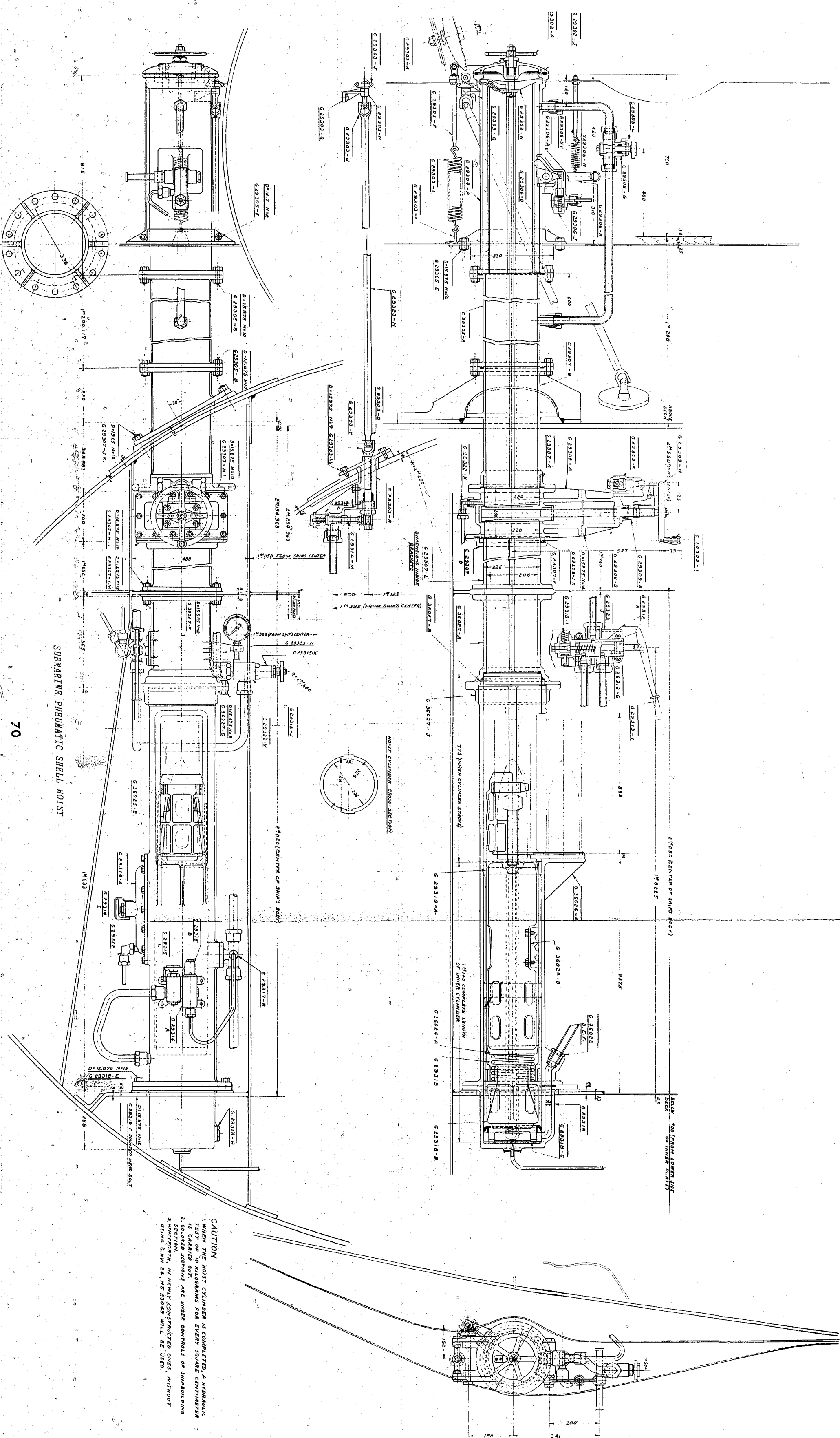
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ENCLOSURE (J)

RESTRICTED



GENERAL ARRANGEMENTS OF PNEUMATIC SHELL HOISTS
FITTED IN SUBMARINE I-71 FOR 12cm/45 CALIBER GUN



ENCLOSURE (M)

LIST OF DOCUMENTS FORWARDED THROUGH ATIS TO
WASHINGTON DOCUMENT CENTER

In addition to the documents listed herewith, a complete library of drawings, giving full details of all types of mounts (except 18-inch) together with other documents on ordnance, is being sent to Washington Document Center.

<u>NavTechJap No.</u>	<u>ATIS No.</u>	<u>Subject</u>
		<u>14 and 16-inch Mounts</u>
ND50-3647	4133	Ordnance instruction material for 40cm gun turret (June 1928) (16-inch Handbook).
ND21-3403	3636	Report on counter-measures against breakdown of hydraulic motors in 16-inch turrets of battleship NAGATO (1940).
ND50-3623	4064	(14-inch) General investigation on pneumatic recuperation of 36cm gun mount of battleship ISE (November 1936).
ND50-3624	4065	(14-inch) Corrosion in 36cm gun mounts of battleship HYUGA.
ND50-3627	4068	(14-inch) Report on ammunition supply for Main Armament of battleship ISE.
ND50-3616	3626	(14-inch) Results of training trials on 36cm turrets in battleship ISE after modification necessary when elevation of guns was increased (December 1937).
ND50-3617	3615	(16-inch) Suggestions for improvements in 40cm turrets of battleship MUTSU (February 1933).
ND50-3603	3614	(14-inch) Report on experiments on the main battery sprinkler systems of battleship ISE (January 1937).
ND50-3644	4130	(14-inch) Report on ammunition handling equipment in magazines of 36cm turrets in battleship FUSO (1932).
ND50-3646	4132	(14-inch) Description of cutting work done in alterations to barbette of 36cm turret in battleship FUSO (1932).
ND50-3648	4134	(14-inch) Handbook ("Ordnance Instruction Materials") (September 1930).
ND50-3650	4136	Report on blast effect of 36cm guns of battleship HYUGA on 12.7cm Type 89 twin mounts (1933).

ENCLOSURE (H), continued

<u>NavTechJap No.</u>	<u>ATIS No.</u>	<u>Subject</u>
		<u>6 and 8-inch Mounts</u> (15.5 and 20cm)
ND50-3625	4066	Notes on cordite hoist interlocks of 20cm Twin Mounts, and on lever mechanism of ATAGO class cruisers (1931).
ND50-3626	4067	(8-inch) Investigation on the effects of the inertia (due to training) of the revolving structure of the 20cm mounts in ATAGO class cruisers (1931).
ND50-3627	4068	(8-inch) Cordite hoists of 20cm turret mounts (1929).
ND50-3602	4069	(8-inch) (a) Ammunition hoists in the cruiser NACHI; (b) New type recoil loading gear; (c) Removal and replacement of main armament director.
ND50-3602	3639	(8-inch) Report on oil cooler trials for 20cm turrets (January 1938).
ND50-3654	4140	(8-inch) Tests on amount of oil pumped by No. 35 hydraulic engines in moving 20cm turrets (1931).
ND50-3620	3628	(8-inch) Outline of 2nd Modification to anti-flash scuttle ("Fire Protection Tube"), between magazine and handling room of 20cm twin mounts in cruisers AOBA and IRYO (May 1939).
ND50-3622	3612	(8-inch) Results of measurement of muzzle vibration of 20cm/50 caliber guns in CA-ATAGO as result of sudden reversal of elevating handwheel.
ND50-3618	3617	(8-inch) Report on investigations of the backlash in the elevating gears of 20cm turrets in cruisers NACHI and MYOKO.
ND50-3638	4124	(8-inch) Report on tooth clearances in worm and worm wheels of training gear of 20cm turrets (1931).
ND50-3640	4126	(8-inch) "Rust resistance" in recoil ring (?) of 20cm guns (1932).
ND50-3642	4128	(8-inch) Results of measurement of muzzle whip and breech kick in adjacent turrets, carried out by means of device, invented in gunnery section of Kure Arsenal and used during trials of 20cm twin turrets (1930).
		<u>14 and 15cm Mounts</u>
ND50-3649	4135	(5.5-inch) Report on gun loading trays of 15cm guns in battleship FUSO.

ENCLOSURE (N), continued

<u>NavTechJap No.</u>	<u>ATIS No.</u>	<u>Subject</u>
		<u>12.7 (5-inch) and 12cm (4.7-inch) Mounts</u>
ND50-3629	4070	(12.7cm Type 89) Results of Power Rammer Trials.
ND50-3630	4771	(12.7cm Type 89) Summary of items and plans for 40 caliber Type 89, 12.7cm Twin Mount.
ND50-3604	3616	Experiments on the reversing effect on the elevating hand wheel due to firing the 12.7cm Type 89 twin guns (1936).
ND50-3650	4136	(12.7cm) Report on blast effect of 36cm guns of the battleship HYUGA on 12.7cm Type 89 twin mounts (February 1933).
		<u>10cm (4-inch) Mounts and below</u>
ND50-3631	4072	Pneumatic Ammunition hoists for 10cm gun in submarine I-68 Trial Report (1935).
		<u>GENERAL</u>
ND50-3656	4142	Accuracy of copper column and pressure indicator gauges and measuring method (July 1935).
ND50-3613	3633	Effect of modern packings on the fire power of battleships and heavy cruisers.
ND50-3600	3630	Report on measurement of recuperator pressures by means of piezo quartz pressure gauge (1933).
ND50-3415	4266	Data collected on Ammunition hoist experiments after final gunnery trials of torpedo boat HATSUKARI.
ND50-3409	3618	Magnetic type remaining rounds counter (for machine guns).
ND50-3610	3624	Report on carbon steel wire used for valve springs.
ND50-3410	4262	Report on air blast trials ("Bore Blowers").
ND50-3608	3622	Report on experiments on friction of Nitrided gears.
ND50-3609	3623	Experiments on pressure gauges and measuring methods.
ND50-3605	3619	Report on spring design and efficiency of "double gears with springs". (NOTE) This may refer to spring split pinions or gears using spring shock absorbers.
ND50-3611	3613	Optics - Shock proofing of Optical Ordnance (1944).

ENCLOSURE (M), continued

<u>NavTechJap No.</u>	<u>ATIS No.</u>	<u>Subject</u>
ND50-3607	3621	Report on corrosive effect of sea water on light metals used in turrets (1935).
ND50-3606	3620	Report on contact corrosion of materials used in turrets.
ND50-3639	4125	Various methods of laying out electric cables for guns (1938).
ND50-3652	4138	Report on prevention of hp air leaks (November 1930).
ND50-3653	4139	Experiments on anti-rusting materials for submarine guns (August 1928).

ENCLOSURE (N)

LIST OF EQUIPMENT BEING SHIPPED TO OIL, INDIANHEAD, MARYLAND

<u>NavTechJap Equipment No.</u>	<u>Quantity</u>	<u>Description</u>
JE22-2072	1	16-inch (40cm) Slide
JE10-3200 3202	3	5-inch (12.7cm) Type 89/40 cal Twin Guns and Mounts
JE0-21,22,23 JE0-66	4	12cm (4.7-inch) Short Naval Gun
JE10-3209	1	12cm (4.7-inch) Twin Gun and Mount
JE10-3210	1	12cm (4-inch) Dual Purpose Gun
JE22-1002(0-6)2 JE22-1003(0-6)	2	10cm (4-inch) Type 98 Twin HA Guns and Mounts
JE10-3206(0-1)	2	8cm (3-inch) Type 98 Twin HA Guns and Mounts
JE10-3205(0-1)	2	8cm (3-inch) Type 98 Twin Accessories
JE0-62,63,64,65	4	8cm Short Naval Guns Type 41
JE0-9,14,15,16	4	8cm (3-inch) Short Naval Guns 9th Year Type
JE0-17,18,19,20	4	8cm (3-inch) Dual Purpose 10 year Type Guns