COPY No. 102

RESTRICTED

The information given in this document is not to be communicated, either directly or indirectly, to the Press or to any person not authorized to receive it.

AUSTRALIAN MILITARY FORCES

TECHNICAL INTELLIGENCE SUMMARY

No. 24

Compiled April, 1945

Prepared by the General Staff and issued under the Direction of the Commander-in-Chief, Headquarters, Australian Military Forces.

C.11209/45 J. J. GOURLEY, Government Printer, Melbourne.

AUSTRALIAN MILITARY FORCES
TECHNICAL INTELLIGENCE SUMMARY
NO. 24
TABLE OF CONTENTS

JAPANESE EQUIPMENT

7.7 MM TYPE 99
PARATROOPER'S RIFLE

1. GENERAL

This weapon is the same as the 7.7mm Type 99 rifle, described in AMF Tech Int Sum No 11, except that it is designed to be broken down into two pieces for use by paratroopers. This factor is the only change.

2. DESCRIPTION (Figs 1 - 2)

It is a manually operated, clip fed, air-cooled shoulder weapon which weighs 8 lbs 12 ozs and has an overall length of 44 ins. It is, like the 7.7mm Arisaka rifle, equipped with a monopod, and the same type of folding leaf sight, with a peep and battle sight, and the arms on the side of the slide which are used in anti-aircraft firing.
Breakdown is accomplished by pulling the barrel lock, located on the bottom of the receiver in front of the floor plate, to the rear. The barrel can then be turned either clockwise or counter-clockwise a quarter turn, as the barrel and receiver have interrupted screw threads, and the barrel pulled out of the receiver.

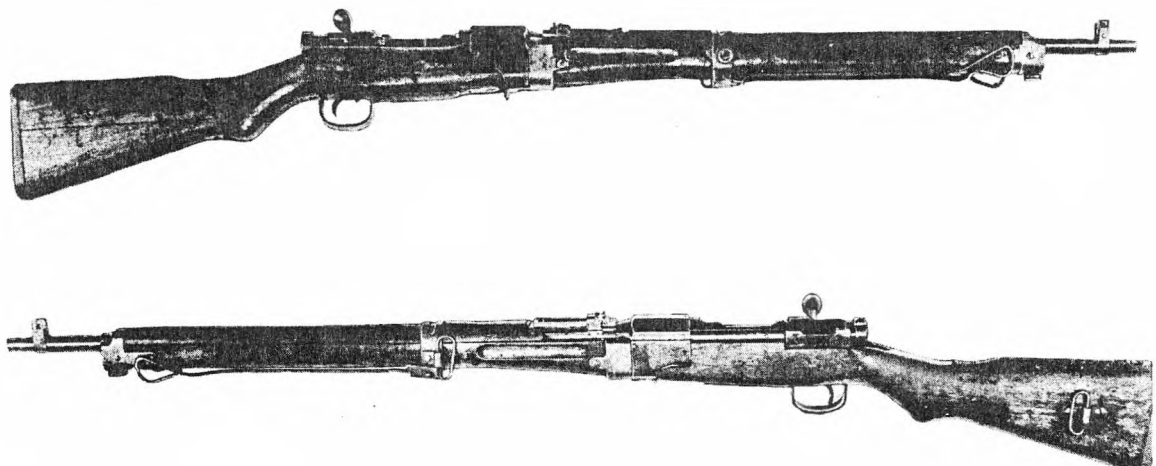
3. CONCLUSIONS

The design, although a good idea, is not considered satisfactory as there is entirely too much play between barrel and receiver. Workmanship is poor, which is one of the reasons for the amount of play between barrel and receiver. If closer tolerances were observed the value of the weapon would be increased.

(SOURCE: ABERDEEN PROVING GROUND, MD)

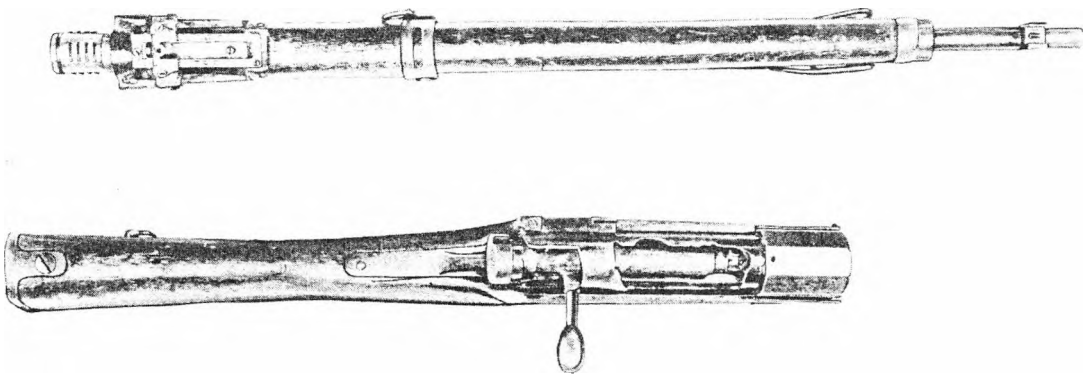
7.7 MM TYPE 99 PARATROOPER'S RIFLE

FIG 1 Side views.



7.7 MM TYPE 99 PARATROOPER'S RIFLE

FIG 2 View showing Break-down.



PARATROOPER'S 7.7 M.M. L.M.G. TYPE 99

1. GENERAL

This parachutists' weapon is a modification of the standard 7.7mm LMG, Type 99. It is the standard gun with a new form of butt and trigger group. The butt can be removed by the simple operation of pulling out a locking pin, and the pistol grip can be folded forward.

2. DESCRIPTION (Fig 1)

With the bipod and magazine packed separately, this gun becomes a compact and convenient load for descent by parachute. It weighs 24 lbs and has an overall length of 47 ins.
The weapon is a gas-operated, magazine fed, air cooled LMG. The only changes, as compared with the Type 99 LMG, are a removable shoulder stock, folding pistol grip and an inter-changeable gas piston.
General characteristics are:

Number of weapon	6635
Date of manufacture	Jul 43
Weight of barrel	5 lbs 14 ozs
Length of barrel	21⅝ ins
Rate of fire (cyclic)	750-800 rpm
Type of fire	Automatic only
Type of feed	30 round box magazine
Type of ammunition	7.7mm rimless
Maximum range	3800 yds

3. DISASSEMBLY

The detachable shoulder stock is attached to the receiver by a pin through the shoulder stock. This stock is cone shaped so as to fit into a conical piece of metal welded to the bottom rear of the receiver. The shoulder stock retaining bolt runs through a hole drilled into the front part of the cone, and a spring-loaded plunger is forced against the cone. On the left side of the cone is a stud which fits into a notch milled into the cone. This prevents forward or lateral play in the stock.
The pistol grip is constructed of heavy steel and is designed to fold up and fit around the trigger guard. It could, under combat conditions, act as a guard against damage to the trigger guard, trigger and trigger mechanism. In order to swing this grip up so that it will cover the trigger guard, the pistol grip retaining pin must be depressed. It is suggested that a

paratrooper could load the weapon, put it on "safe", remove the shoulder stock and pivot the pistol grip up so as to guard the trigger. In case of an emergency it is possible to fire this weapon without the shoulder stock by grasping the pistol grip and the handle on the barrel.
The gas piston is so designed that it can be readily changed in case of excessive carbonisation on the piston face (climatic conditions may cause a considerable amount of rust to accumulate). The gas piston is removed from the operating slide by pulling back the piston lock, located on the operating slide, and at the same time turning the gas piston a quarter turn clockwise or counter-clockwise. A locked fit is guaranteed in this assembly by a stud on the piston lock which fits into a rectangular recess on the rear of the gas piston.

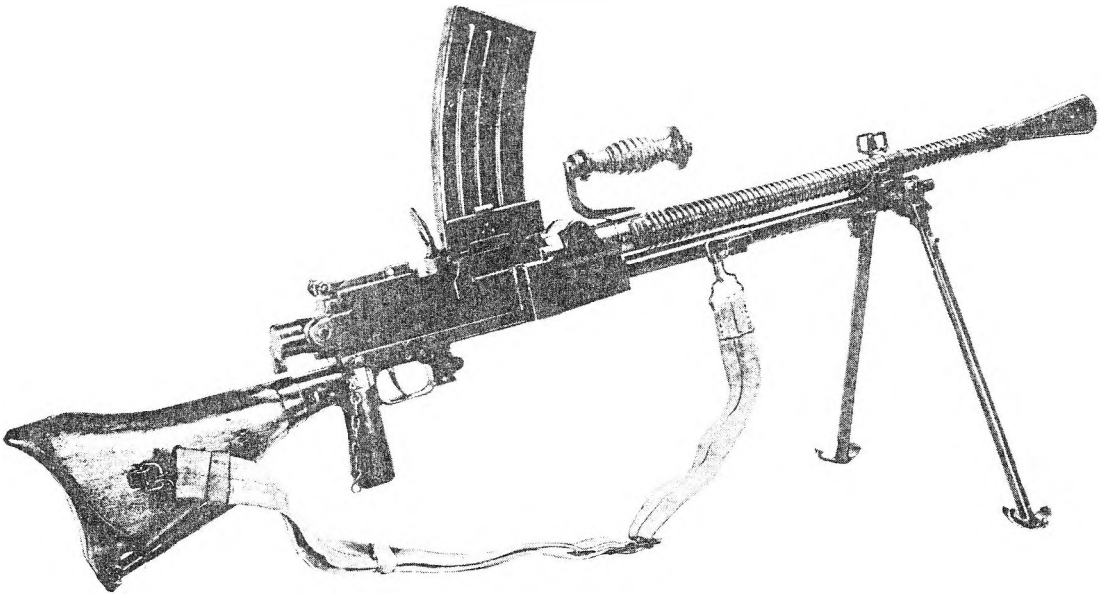
4. REMARKS

Final workmanship is superior to that found on Japanese army weapons in the past.

(SOURCE: ABERDEEN PROVING GROUND, MD)

PARATROOPER'S 7.7 M.M. L.M.G. TYPE 99

FIG 1



LARGE SPIGOT TYPE GRENADE DISCHARGER

1. GENERAL

This new spigot-type rifle grenade discharger was recovered on Luzon, Philippine Islands. Measurements indicate that both the Type 3, Modification I impact rifle grenade and the incendiary rifle grenade will fit this launcher. It can be used on both the Type 38 and Type 99 rifles. Neither the date of manufacture nor the arsenal in which it was made is known.

2. DESCRIPTION (Fig 1)

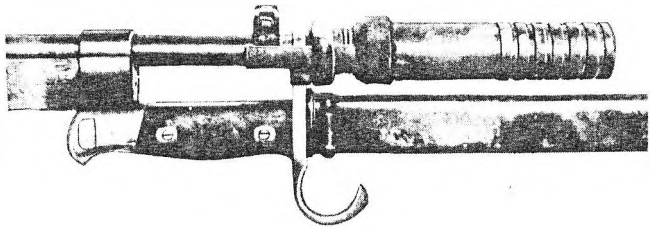
The discharger has an overall length of 107mm and weighs 15.5 ozs.
It is composed of two main components - a launching barrel and an adapter.
The launching barrel is threaded to the adapter and locked in place by a set screw. The launcher is attached to the rifle by means of two locking arms on the adapter, which clamp in place at the rear of the front sight mount. These locking arms are pivoted on the adapter. When the lower ends of the arms are out the discharger can be placed on the rifle. A sleeve is screwed down in order to cam out the upper ends of the arms, thereby locking the lower ends in position behind the sight mount. For additional stability, a two-pronged lug on the adapter fits on the bayonet guard when a bayonet is fixed to the rifle.
Additional dimensions are:

Outside diameter of barrel	27mm
Inside diameter of barrel	21mm
Length of barrel	105mm
Inside diameter of adapter	14mm

(SOURCE: USASOS - SWPA)

LARGE SPIGOT TYPE GRENADE DISCHARGER

FIG 1 Discharger on rifle, with bayonet.



12 CM DUAL PURPOSE GUN TYPE 10

1. GENERAL

This weapon has been captured frequently, particularly on Biak Island and in the Philippine Islands. Those captured on Biak were manufactured by the Kure Arsenal in 1943. There are usually two to four guns in a battery, emplaced along coast lines as a coast defence weapon, or on high ground in a position to fire AA and field missions. The guns are mounted on standard navy pedestal mounts set upon a base plate buried in the floor of the gun pit to furnish stability.
Type 2 (1942) Revision 1 AA Directors are often found with the guns, but each weapon is equipped with simple speed ring sights for direct AA fire.

2. DESCRIPTION (Figs 1 - 2)

For the purpose of this report the equipments may be divided into:- (a) Gun, (b) Firing Mechanism, and (c) Speed Ring Sights.

(a) Gun: The barrel is a monoblock type with uniform right hand rifling. The gun is mounted in a cylindrical cradle that surrounds the barrel, the bearing surface for recoil being the machined barrel surface. A long, narrow rectangular projection on the bottom of the barrel slides in a groove in the cylindrical cradle, and prevents the barrel from rotating. The gun is mounted on a naval pedestal type mount, allowing 360 degrees traverse. There is only one elevating arc on the gun, located on the right hand side of the cradle. The elevating hand wheel is on the right of the gun, while the traversing handwheel is on the left. In addition, an auxiliary hand wheel located on the left side permits one man to both elevate and traverse the gun, if desired. Although it has been reported that a counterweight is used as an equilibrator, closer observation has shown that a push type equilibrator is used. This may be pneumatic, but it is believed more probable that a large coil spring encased within two concentric cylindrical covers is used. This equilibrator operates on a pivot attached to the gun forward of the trunnions. The gun is well balanced, and is exceptionally easy to move in elevation.
The weapon uses what appears to be a hydro-pneumatic recoil system. The three cylinders of the recoil mechanism located on top of the gun probably consist of a central hydraulic recoil tube and two hydro-pneumatic recuperators. A semi-automatic, horizontal.

sliding breech block is used. The cams for semi-automatic breech operation are located beneath the breech where they are not easily seen. Part of the cam mechanism can be seen beneath the breech in Figure 1. The breech ring is machined with five grooves at the top and bottom of the forward section which mate with corresponding projections on the breech block, thus transmitting the pressure of the breech block on the breech ring over a wider bearing surface. Further data is as follows:-

Calibre	12cm (4.7 ins)
Length of barrel	45 calibres
Weight (overall)	6,416 lbs
Overall length, gun and mount	19 ft 6½ ins
Overall width, gun and mount	7 ft 1 in
Overall height, gun and mount	7 ft 8⅛ ins
Length of tube	17 ft 1⅛ ins
Length of rifling	14 ft 0½ ins
Length of chamber	27½ ins
Diameter of tube, land to land	4.722 ins
Diameter of tube, groove to groove	4.822 ins
Depth of grooves	.050 in
Number of lands	36
Width of lands	⅛ in
Width of grooves	¼ in
Thickness of breech block	6 ins
Height of breech block	10½ ins
Length of breech block	16¼ ins
Length of breech ring	18 ins
Height of breech ring	20⅛ ins
Width of breech ring	23 ins
Elevation limits, actual	-5 to plus 75 degrees
Elevation limits, according to scale	-5 to plus 80 degrees
Muzzle velocity (from director)	2,707 ft/sec
Maximum range	17,000 yds
Rate of fire	10/12 rds/min
Length of recoil	19 ins
Weight of projectile	42.7 lbs

(b) Firing Mechanism: Two Type 4 Firing Mechanisms (Computing Sights) Model 2 captured on Luzon were found to be used with the Type 10, 12cm dual purpose gun. It is assumed that this computor is used alone or as a stand-by computor for the Type 2 AA Director Model 2 Series. The instruments examined weighed 275 kgs and both were made in August 1944.
The instrument is an off-carriage course-speed computing device somewhat similar to the American Computing Sight M 7. The computor is operated by a crew of two or three men, their duties being: one, tracker; two, fuse drum matcher; third, course-speed-range setter. The tracker uses either a ring-peep sight or a telescopic sight for following the target as he traverses the computor by pressure with his body against a curved bracket, mounted on the main frame, and elevates the tracking assembly with the elevating handwheel. The course-speed-range setter is on the left of the tracker and the fuse drum matcher is on the left of the course-speed man. The selsyn transmitters for azimuth, elevation and fuse are located in the main

frame and are zeroed to it. From the position of the tracker, the sighting assembly is on his right, the course-speed-range assemblies on his left.
The limits of operation of the firing mechanism are as follows:

Azimuth	No limit
Elevation	-15 to 80 degrees
Slant range	2000 to 10000 metres
Altitude	1000 to 8000 metres
Fuse time	40 secs
Speed	400 knots/hr
Diving Angle	90 degrees
Climbing Angle	30 degrees
Azimuth Course	180 degrees in either direction
Azimuth Spot	-160 units (probably mils)
Elevation Spot	-160 units (probably mils)

(i) FUNCTIONING: The target paralleling unit is set parallel to the course of the target.
The range-speed adjusting unit is set for the corresponding speed and slant range of the target.
The range adjusting unit is set for the proper slant range (for high angle or AA targets use the left hand scale, and for low angle or land targets use the right hand scale).
The above three operations, by means of the motion imparted to and multiplied by the parallelogram lead computing linkage unit through the pulley train, position the sight bracket and positioning unit behind the position the main frame assembly is pointing.
The ring and peep or telescopic sight is then brought to bear on the target by turning the elevation handwheel and by traversing the main frame assembly by pressure of the tracker's body against the curve bracket attached for that purpose.
The main frame assembly should now be pointing in azimuth to the future position of the target and the elevation scale should now be reading the future angle of elevation of the target. Since the azimuth transmitters are rotated as the main frame is rotated, they transmit the firing azimuth, and since the elevation transmitters are rotated as the elevation handwheel is turned they transmit the quadrant elevation.
In the meantime, the fuse drum has been rotated to the quadrant elevation and the fuse handwheel has been rotated so that the indicator will be translated so as to follow the appropriate slant range curve. As the indicator was translated, the fuse transmitter was also positioned to the correct fuse time.

(ii) ACCURACY: The principle involved will give accurate firing data, but there are too many places where personnel errors may affect the accuracy of this data, as follows:-
The speed of the plane is approximately found, possibly by guessing or reports from outposts, unless a friendly plane flying parallel to the target radios the speed to the computor. An army type 90 speed and course angle indicator could also be used.

The course of the target paralleling unit is set as close to parallel to the course of the target as possible. The course may be determined in the same manner as the speed.
Tracking in azimuth will not be smooth as the main frame is traversed by pushing.
A target whose slant range is changing constantly will give the fuse matcher and the course-speed-range setter some difficulty in constantly and accurately changing the three adjustments.
In conclusion, it is believed that this device would be more effective if it were used with a shorter range and smaller calibre weapon such as a 40mm gun, but as used it will still give accurate firing data as long as accurate course and speed data are obtained.

(c) Speed Ring Sights: Elliptical speed ring sights provided for this gun incorporate provisions for altering the angle of elevation and the angular lead to compensate for the range of the target. There is apparently no separate Japanese designation for this fire control item. These sights are apparently used as emergency forward area sights, in the event of director failure. There is also evidence that fire has been conducted with these sights in those instances in which the guns have been found emplaced, but with the director not yet installed.
The sight is a range compensating elliptical ring type sight. Three rings are provided, calibrated for speeds of 200, 300 and 400 knots. Two sights are provided, one for elevation and one for azimuth. The two sights are identical, except for provision of a range adjusting handwheel on the azimuth sight only. The sight mounts move in azimuth with the gun carriage and in elevation through a linkage with the tube. No study has been made of the point, as the sight studied had been removed from the gun, but it seems possible that this linkage may provide compensation for the angle of elevation of the gun.
A range drum is provided which is calibrated for ranges of from 2000 to 12,400 metres. This drum is moved by a handwheel located on the azimuth side, and mounted on a shaft which extends across the gun to the elevation sight, thus moving both sights simultaneously. The ring sight is so mounted that with rotation of the range drum the sight is moved backward and forward by a worm gear. The ring sight moves to the rear approximately one inch for each 1000 metre increase in range. This causes greater angular leads to be provided when firing at increased range, and thus compensates for the gradually decreasing velocity of the projectile. The rear eye piece is mounted on an arm which terminates at the range drum. A lug on this arm rides in a spiral groove in the range drum, and causes the eye piece to move down approximately 0.15 inch for a range increase of 1000 yds, thus providing increased elevation for increased ranges.

(SOURCE: USASOS - SWPA)

12 CM DUAL PURPOSE GUN TYPE 10

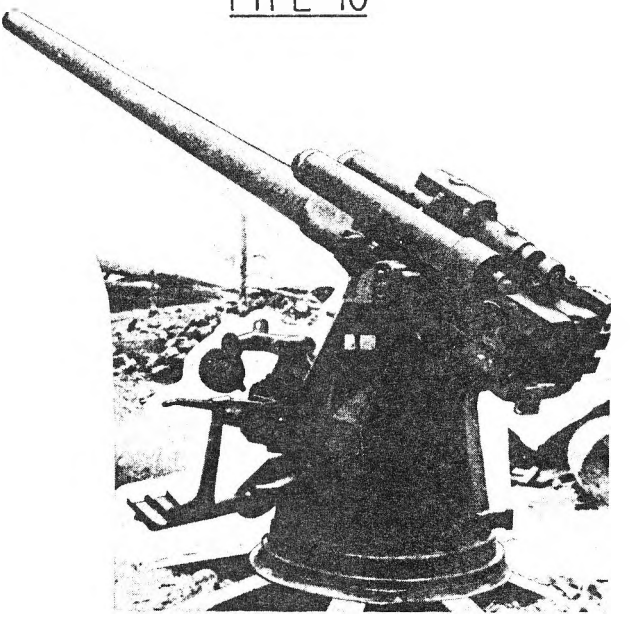


Fig 1

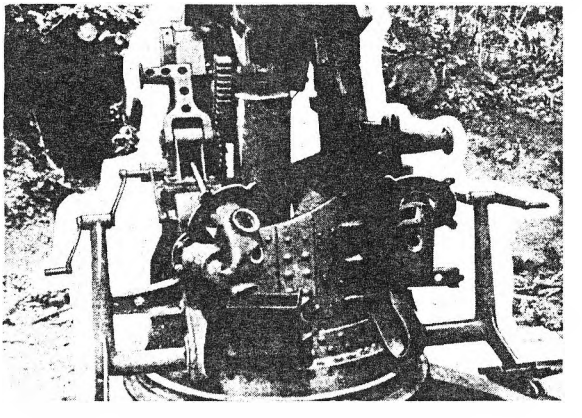


Fig 2 Front view showing push type Equilibrator.

ARMY 20 CM SPIN-STABILISED ROCKET

Addendum to Report in AMF Tech Int Sum No 23

1. GENERAL

Twenty centimetre rockets of Army design and manufacture have been encountered in the Manila area. The round is basically similar to the Navy 20cm spin-stabilised rocket, described in AMF Tech Int Sum No 19, and is reported to be a very effective weapon.
Two slightly different designs exist: in one the motor has two pronounced bourrelets; in the other the sides of the motor are almost straight and the weight is greater. There is also 1-2 Kgs weight variation in both projectiles and motors of the same design. Perhaps owing to this the weight is stencilled on each projectile and motor.

2. DESCRIPTION (Figs 1 - 11)

The complete round is 37 ins long and the weight approximately 180 lbs.
The weapon consists of three main parts:

(a) Projectile, (b) Motor, and (c) Launcher.

(a) Projectile (with bourrelet): This is a thin-walled tube with an ogival nose. It is closed at the base by a male plate which is concave to permit a maximum explosive charge.
The filling is high grade cast TNT. The fuse pocket will take the Type 100 selective instantaneous-short delay mortar fuse and the round has been successfully test-fired with these. An adapter receives the fuse and houses part of the booster. Unlike projectile adapters, this adapter threads into the projectile with right-hand threads.
The projectile is shipped separately from the motor. The threads on the base plate on to which the motor screws are protected by a cardboard ring and a threaded cap.

Projectile Data:

	Bourrelet Round	Straight Round
Overall length	17.6 ins	
Maximum diameter	7.9 ins	
Distance maximum diameter to nose	10.8 ins	
Radius of ogive in calibres	1.2	
Wall thickness	.25 in	
Weight empty without fuse	50.3 lbs	
Weight of filling (cast TNT)	35.7 lbs	
Base plate threads:		
Per inch	10 US Std	8½ US Std
Outside diameter	7.06 ins	7.19 ins
Length of threaded portion	1.75 ins	.7 in

	Bourrelet Round	Straight Round
Adapter pocket threads:		
Per inch	12 US Std	
Outside diameter	1.94 ins	
Length of threaded portion	.62 in	

Differences in Straight Round: The projectile differs only in that the base plate threads are different sizes and do not extend to the rear edge of the plate. The only protection for the threads is waxed paper.
The forward threads of the motor match the changed projectile threads. Because the sides are straighter and the wall thickness approximately the same, the interior diameter is slightly greater. The forward support plate is slightly simplified by the elimination of 2 of the concentric ridges. The after support plate is eliminated and in its place a ring is mounted on the base plate. The ignition plug has larger threads and a slightly different arrangement of the ports leading to the central stick.
These changes could be attributed to simplification of the manufacturing process. The straight round, however, behaves peculiarly on firing. A delay of ½ to 1 second elapses between the firing of the primer and the rocket take-off. The same primer is used with both rounds. There is no significant difference in performance. No other difference exists that appears to offer an adequate explanation. A possibility is that in the bourrelet round the perforations in the after support plate funnel the ignition flash to ignite the circumferential sticks, while in the straight round the flash does not jump the open gap between the ports in the chamber and the sticks. In such a case only the central stick would ignite and some time would be required for the burning to spread to all surfaces.

(b) Motor: This is also protected during shipment by a cap threaded into the forward end of the motor tube to insure sealing of the propellant. The motor is a tube threaded at both ends with forward and after bearing surfaces on its exterior. The forward end threads onto the projectile base plate; the after end receives the motor base plate. The interior contains a forward and after support for the propellant and the propellant itself.
The forward support is a plate which threads into the forward end of the motor. On the after side it has 3 concentric ridges to support the propellant sticks. The after support threads into the base forward of the motor base plate. It is a plate pierced to allow passage for the flow of gas from the propellant sticks and to allow the igniting flash to reach them. It also supports the 6 circumferential sticks.
The motor base plate is threaded on the exterior to fit the motor and on the interior for the ignition plug. It contains 6 nozzles offset 25°. The forward end of each nozzle is flared so as to funnel the gases into the nozzle as the projectile spins. The base is also threaded internally for a shipping plug which seals the nozzles. The ignition plug receives the primer and contains the ignition charge. Protruding from the base of the plug is a hexagonal boss. This is threaded to receive the friction primer. At the forward side a hollow

piece threads into the plug. This forms an ignition chamber for a black powder charge in two wafers made of two pieces of blue silk sewn together and lacquered. The hollow piece has 8 ports to lead the flash to the circumferential sticks, and a central port for the central stick. Its forward end has 4 prongs to form a support for the central stick. Igniting the propellant from the rear is an unusual feature.
The propellant is 8 single perforated cylindrical sticks of ballistite. Six long sticks form an outer circumference for the two short sticks, which fit end to end in the centre. The sticks are black in colour.

Motor Data:

	Bourrelet Round	Straight Round
Overall length	19.06 ins	
Diameter of bearing surfaces	7.94 ins	
Interior diameter	6.94 ins	7.06 ins
Wall thickness	.69 in	.72 in
Threads at ends:		
Per inch	10 US Std	8½ US Std
Outside diameter of threads	7.44 ins	7.19 ins
Length of threaded portion	2.25 ins	2.09 ins
Weight empty	47.2 lbs	52.0 lbs
Weight of forward support plate	2.0 lbs	4.5 lbs
Weight of after support plate	3.0 lbs	.75 lb
Propellant weight:		
Total	21.2 lbs	22.0 lbs
Individual long stick	3.0 lbs	
Propellant stick:		
Length	13.37 ins	
Diameter	2.28 ins	
Diameter of perforation	.40 in	
Weight of base plate	16.5 lbs	19.0 lbs
Weight of ignition plug	3.8 lbs	3.0 lbs
Ignition charge	4.0 grams	
Nozzles (6):		
Inside diameter	.59 in	
Offset from longitudinal axis	25°	

(c) Launcher: The launcher for this rocket is markedly superior to the trough types used for the Navy rockets. It consists of a tube, two legs, and a base plate. The tube slides into a clamp mounted on the legs, and is supported at the rear by a ball fitting into a socket in the base plate. Fine traverse and elevation is afforded by a worm gear and an elevating post on the clamp mounting. Larger changes can be made by moving the legs sideways or by changing their spread. Estimated maximum elevation is 65°.
Loading is done by lifting the hinged rear upper half of the tube and inserting the rocket which rests against a flange at the base. Firing is accomplished by a lanyard. The primer is a friction type.

Designation of the launcher is Type 4 20cm Rocket Launcher.

3. MARKINGS

The entire round is black. The projectile has a yellow band at the junction with the motor. Stencilled markings give the following information:

Projectile:

	Bourrelet Round	Straight Round
38 K 790 (weight : 38.79 Kgs)		38 K 740
Loaded August 1944 at Osaka Army Ordnance Branch Depot		

Motor:

42 K 630 "Su" (weight : 42.63 Kgs)		43 K 795
Loaded October 1944 at Osaka Ordnance Branch Depot		

Ignition Wafers:

20cm rocket

($\frac{44}{45}$ .724) August 1944

The bourrelet motor and its packing box are marked "Experimental"; the straight motor and box are not marked in this manner. Some projectile boxes are marked "Experimental" but no correlation with design could be established.

4. PERFORMANCE

Combat reports indicate a rapid rate of fire of from 1 to 2 rounds per minute. Test firing of two rounds of each type gave an average range of 2800 yds at an elevation of 45 degrees. Disregarding the weight variation the final velocity and effective gas velocity were calculated on the basis of a vacuum trajectory at:

Final velocity	520.1 ft/sec
Effective gas velocity	4173 ft/sec

(SOURCE: USSTU NO 1)

ARMY 20 CM
SPIN-STABILISED ROCKET

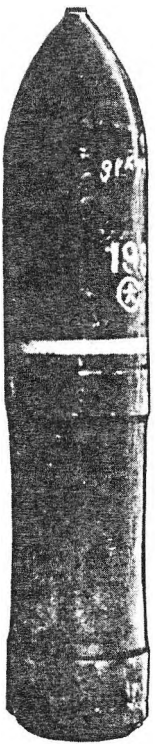
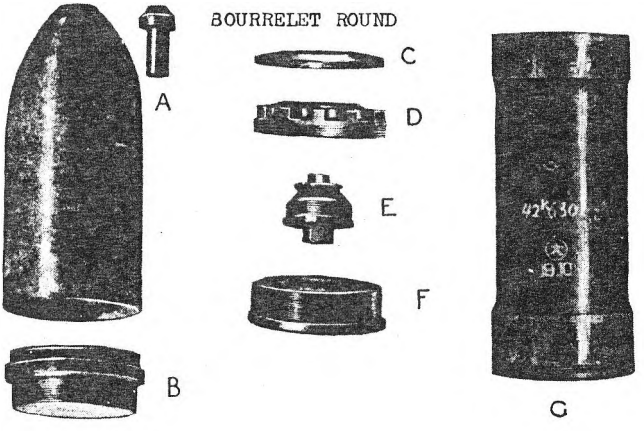


Fig 2 Forward view of bourrelet round.

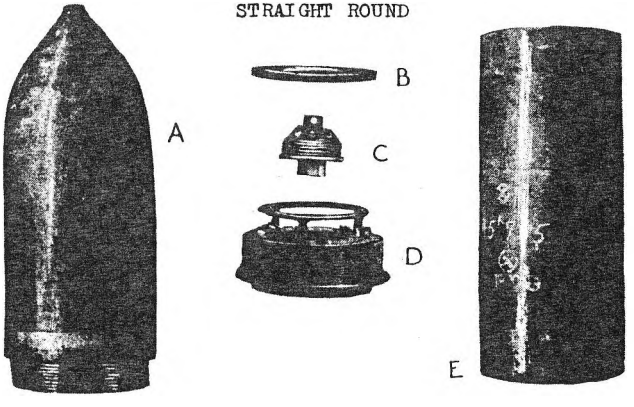
Fig 1 Complete bourrelet round.

ARMY 20 CM
SPIN STABILISED ROCKET

FIG 3 Components



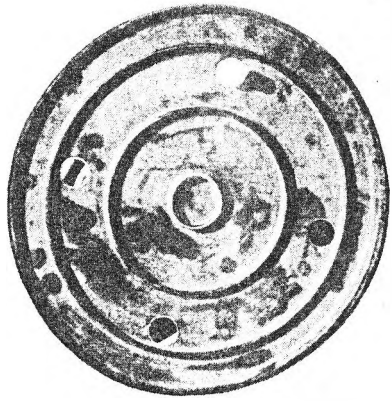
A Projectile & Adapter
B Projectile Baseplate
C Forward support plate
D After support plate
E Ignition plug
F Motor baseplate
G Motor

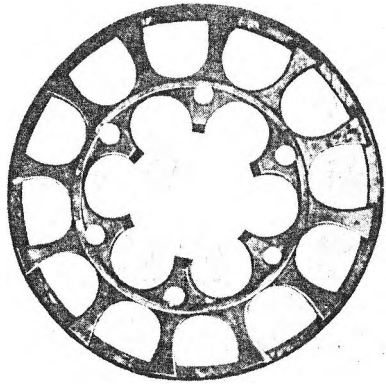


A Projectile
B Forward support plate
C Ignition plug
D Motor baseplate
E Motor

ARMY 20 CM
SPIN STABILISED ROCKET

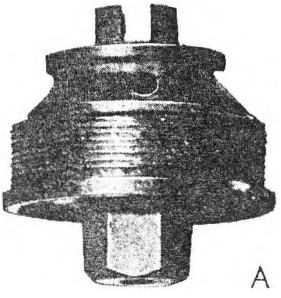
FIG 4 Support Plates

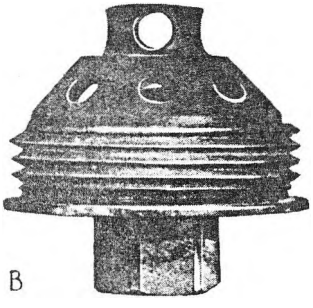


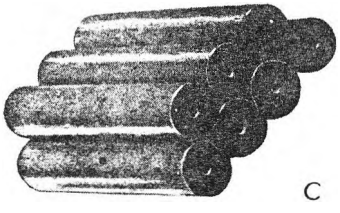


ARMY 20 CM
SPIN STABILISED ROCKET

FIG 5 Ignition Plugs & Propellant



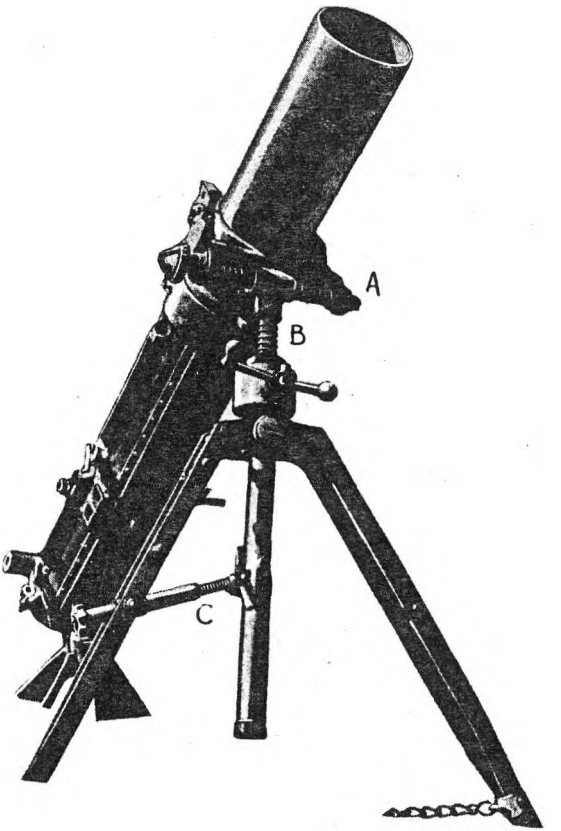




A Ignition plug (Bourrelet round)
B Ignition plug (Straight round)
C Propellant

ARMY 20 CM
SPIN STABILISED ROCKET

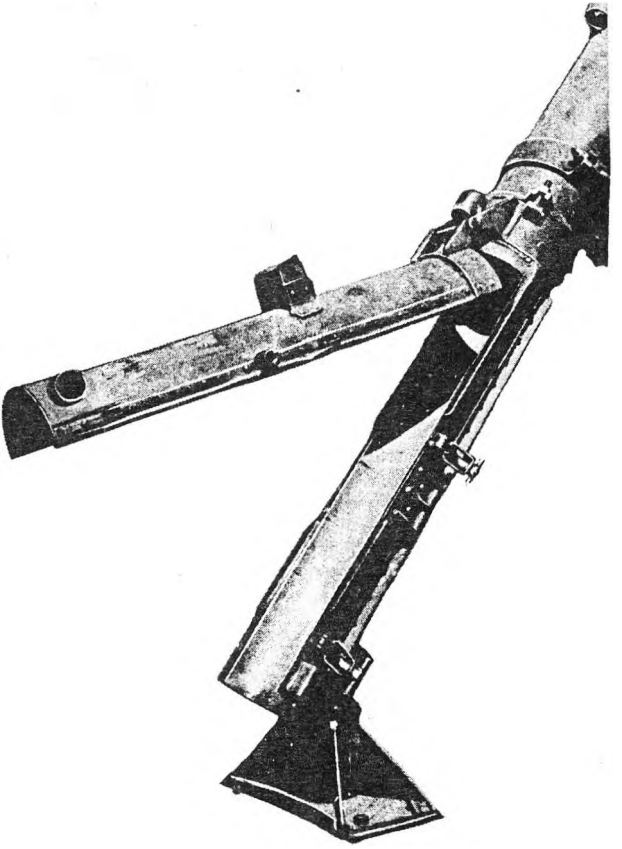
FIG 6 Forward view of Rocket Launcher



A Traverse gear
B Elevating gear
C Levelling gear

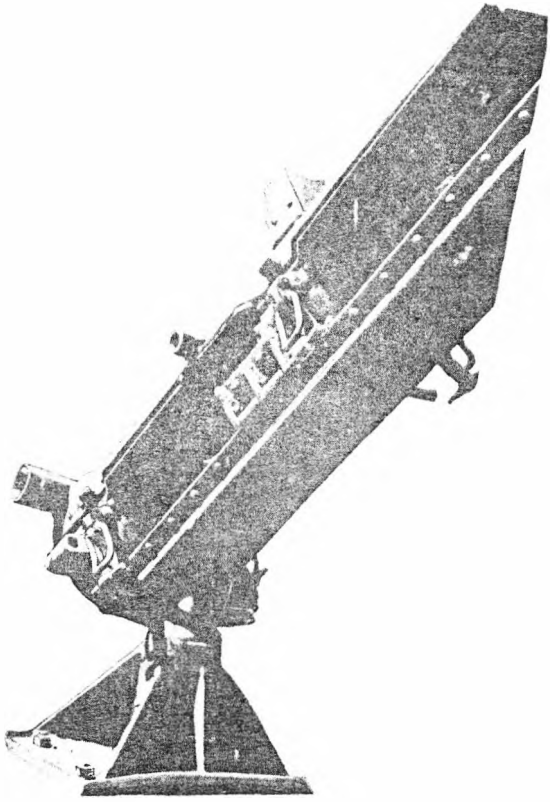
ARMY 20 CM
SPIN STABILISED ROCKET

FIG 7 Launcher open for loading



ARMY 20 CM
SPIN STABILISED ROCKET

FIG 8 Launcher showing Base Plate



ARMY 20 CM
SPIN STABILISED ROCKET

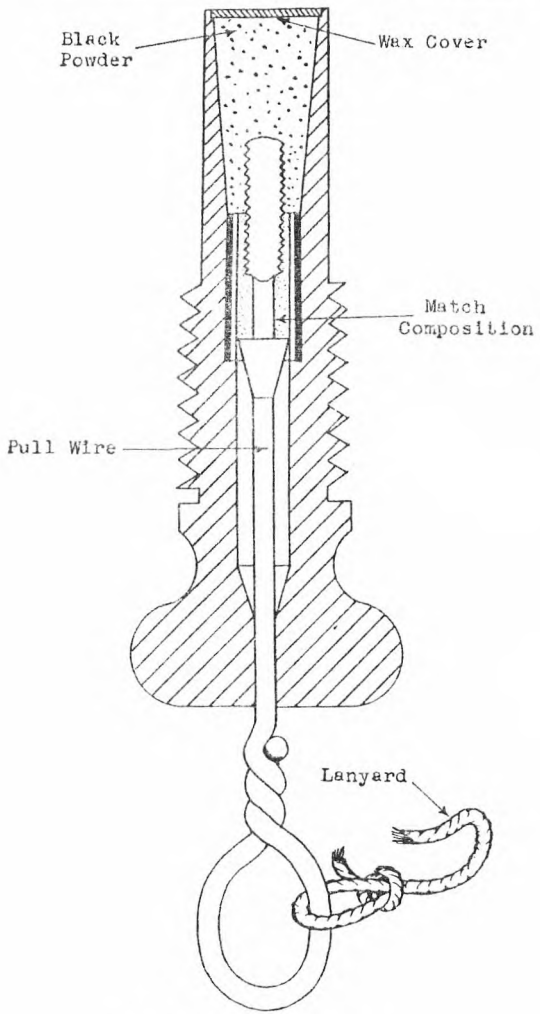


FIG 9 Rocket igniter

SCALE 0 ½ 1 INCHES

ARMY 20 CM
SPIN STABILISED ROCKET

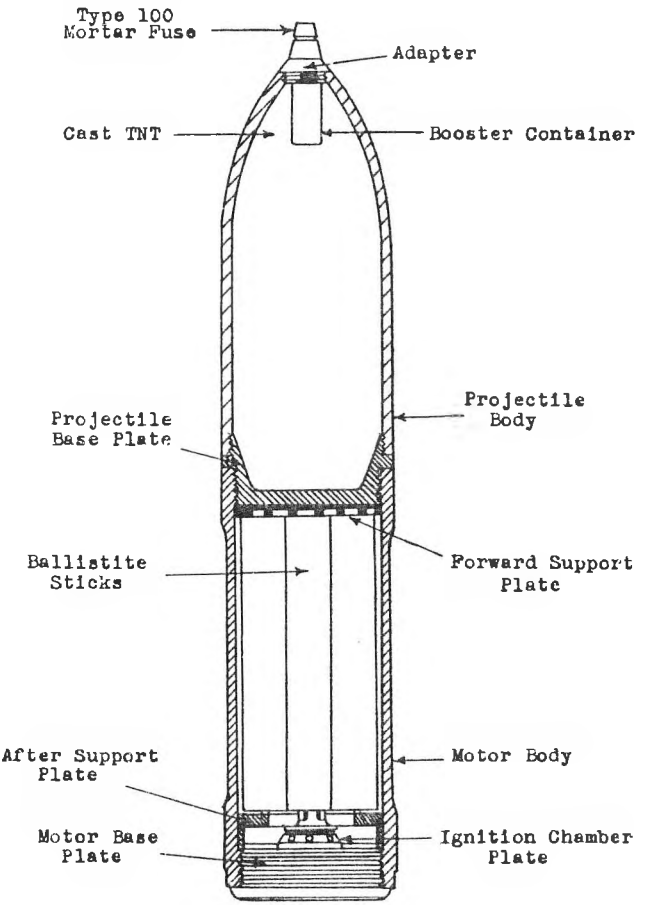
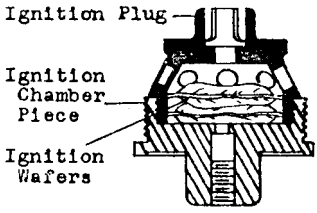


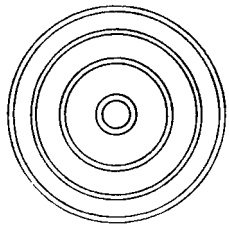
FIG 10

SCALE INCHES

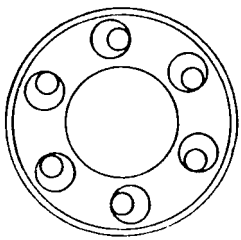
ARMY 20 CM SPIN-STABILISED ROCKET

FIG II

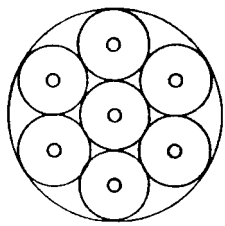




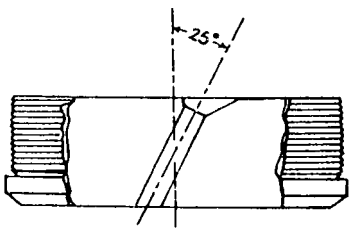
After View Of Forward Support Plate



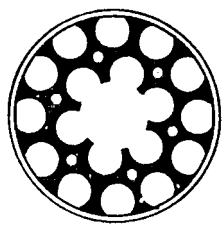
Forward View Of Motor Base Plate



Propellant Plan View



Side View Of Motor Base Plate Showing Angle Of Nozzle



Forward View Of After Support Plate

NAVY 250 KG BOMB ROCKET

1. GENERAL

A specimen was recovered on Iwo Jima. It had been fired, but had not exploded on impact. As a consequence of being fired no information is available on the propellant, igniter, or on detailed internal construction of the rocket motor. It is reported that the projectile is fired from truck-mounted launchers, but no launchers or launching sites have been found as yet.

2. DESCRIPTION (Figs 1 - 2)

The approximate length of the complete bomb rocket is 118 ins, and its weight is 181 lbs without the propellant and igniter.
The projectile consists of four main components, viz: (a) Explosive Warhead, (b) Fuse, (c) Motor Adapter, and (d) Rocket Motor.

(a) Explosive Warhead: The warhead is a Navy Type 98 No 25 Land Bomb from which the tail assembly and tail cone adapter have been removed. A special internal base plate is slipped into the after end of the bomb, and is held in place against the explosive by the motor adapter. A cylindrical spacing ring, whose sides are pierced by four 1-in holes, is welded to the after side of the base plate. This spacing ring serves to hold the base plate securely against the explosive in the bomb after the bomb rocket is assembled, and also probably acts as a housing for the rocket motor igniter. The after end of the bomb casing is pierced by two circumferential rows of holes, having 20 holes in each row. The motor adapter is riveted only to the after row of holes. The forward row is partially covered by the base plate. The main charge of the bomb is Type 98 explosive (TNA-HND).
Additional data is as follows:

Overall length of bomb	39.6 ins
Maximum diameter of bomb	11-15/16 ins
Wall thickness of bomb	$\frac{1}{2}$ in
Overall weight of filled bomb, adapter and base plate	435 lbs
Weight of explosive	212 lbs
Thickness of base plate	$\frac{3}{8}$ in
Diameter of base plate	11 ins
Diameter of spacing ring	4-21/32 ins

The explosive head is blue-grey overall. As the force of impact had scraped the paint from the nose, it is not known definitely whether the old markings (green band), or the new markings (a brown band aft of a green band) were used.

(b) Fuse: The recovered bomb rocket was fused with an A-3(a) which used the green tipped A-3 gaine. (.025 sec delay).

(c) Motor Adapter: This is a shaped, steel ring which fits into the base of the bomb, and over the nose flange of the rocket motor. It has 20 holes in its forward section, and 16 holes in its after section by which the bomb and rocket motor, respectively, are riveted to the ring. Maximum diameter is 11-15/16 ins and its length $2\frac{5}{8}$ ins.

(d) Rocket Motor: The known parts of the rocket motor are the nose cap, main body, base cap, tail assembly and grid. The method of attaching the nose cap to the main body is not definitely known, as the forward section of the main body had buckled on impact, obscuring the joint. It appears that the nose cap threads into the main body. The nose cap has a flange at its forward end, to which the adapter is riveted, and a $\frac{3}{4}$-in threaded central hole into which the igniter is screwed. The main body is simply a cylindrical steel tube internally threaded at both its forward and after ends. An eye-bolt of flat steel plate is welded longitudinally to the main body. The base cap is in the form of a truncated cone. It threads into the rear of the main body and is internally threaded at its after end to take the venturi tube. Four tail fins are spot welded to the venturi tube and are braced by two rows of struts. A heavy steel grid, located in the after part of the main body, abuts against the base cap and positions the propellant.

Data:

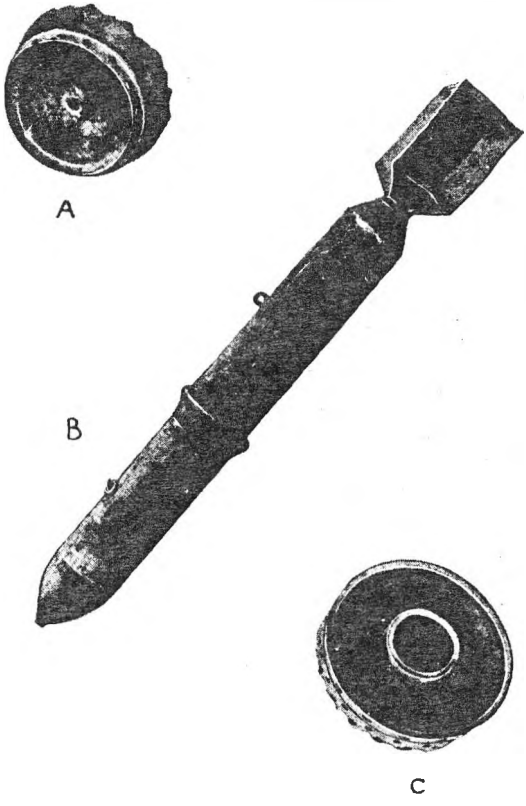
Overall length of motor	(approx) 78 ins
Diameter of main body	11-15/16 ins
Thickness of main body wall	$\frac{3}{8}$ in
Total weight of complete motor and grid (less propellant and igniter)	251 lbs
Length of flange on nose cap	$1\frac{5}{8}$ ins
Diameter of igniter well	$\frac{3}{4}$ in
Maximum thickness of grid	$1\frac{1}{4}$ ins
Length of tail assembly	$24\frac{3}{4}$ ins
Length of venturi tube	$24\frac{3}{4}$ ins
Diameter of venturi tube at forward end	$5\frac{3}{4}$ ins
Diameter of venturi tube at after end	$8\frac{1}{4}$ ins
Wall thickness at after end of venturi tube	$\frac{1}{8}$ in
Length of tail fins	22 ins
Width of tail	13 ins
Width of struts	$1\frac{1}{4}$ ins
Thickness of struts	1/16 in

The small amount of paint which had not been burned off on impact, indicated that the motor was painted blue-grey overall.

(SOURCE: MEIU NO 4)

NAVY 250 KG BOMB ROCKET

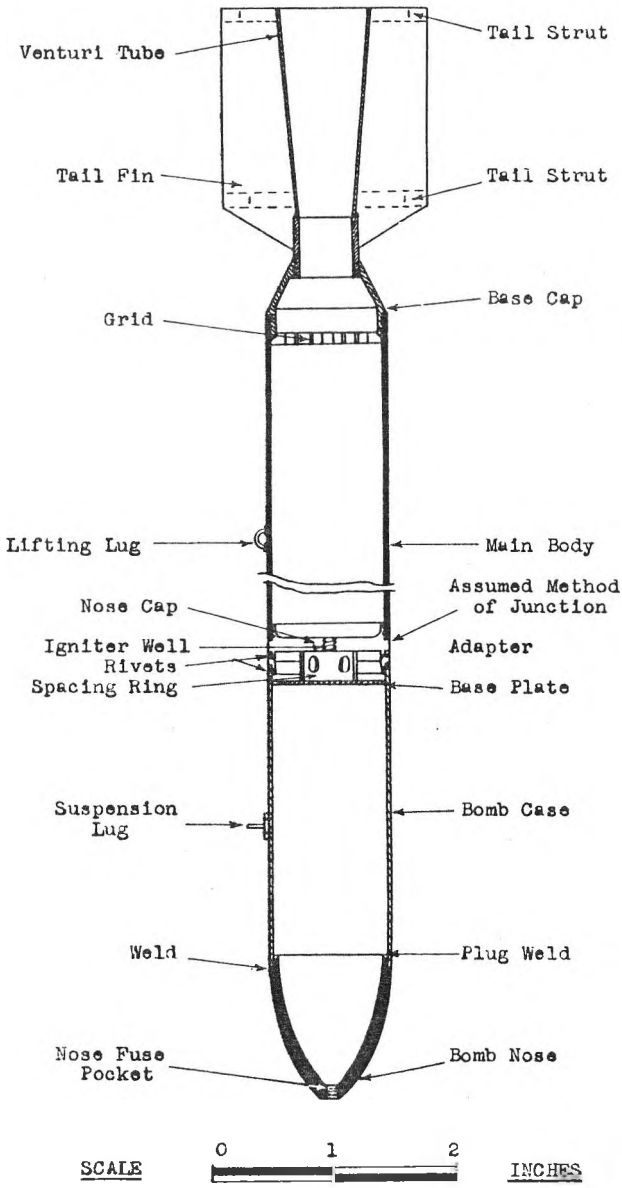
FIG 1 Bomb Rocket & Components



A Nose cap of motor showing igniter well and flange
B Complete bomb rocket
C After end of bomb showing base plate and adapter

NAVY 250 KG BOMB ROCKET

FIG 2



70 MM HOLLOW CHARGE AMN

FOR

TYPE 92 BATTALION GUN

1. GENERAL

This ammunition is designed for use in the Type 92 Battalion Gun, and is very similar in design and construction to the Type 41 75mm hollow-charge shell. The round is semi-fixed and takes the standard 70mm cartridge case. It is reported to be an effective AP shell designed for use against tanks, armoured vehicles and pill-boxes.

2. DESCRIPTION (Figs 1 - 2)

The body of the projectile is turned steel with a square base. The copper rotating band has a sloping forward edge but no grooves. There is a well pronounced bourrelet below the junction of the nose cap and the body.
The ogival nose of the projectile threads into the body and is secured by a set-screw. Unlike the early 75mm Hollow-Charge projectile, the nose is hard steel instead of zinc alloy.
The charge is a paper-wrapped cast block of 50 to 70% TNT and 30 to 50% Cyclonite (Tanoyaku). The charge is held in the cavity by wax. The top of the charge is hollowed out in the form of a cone, and there is an aperture all the way through the charge. A conical steel liner fits in the hollow cone in the explosive block. A steel tube welded to the apex of the liner extends through the hole in the charge.
The detonator and gaine are packed in a cylindrical aluminum container fitted in the hole at the base of the explosive block. It is held in place by shellac and a piece of cardboard glued to the base of the charge. In the top of the gaine is a flanged brass cup filled with cyclonite around a lead azide pellet. The cup is buried in the cyclonite gaine, which fills the lower part of the container, and is covered with felt and tinfoil. A tinfoil disc closes the top of the container.
The shell can be fused, according to the inscription on the nose plug, with Type 88 instantaneous or Type 100 Instantaneous-Short Delay Mortar Fuse. The flash from the gaine passes down the metal tube, detonating the lead azide and gaine. The wave of detonation of the main charge travels upward and is focused by the hollow cone at a point near the nose of the fuse. The liner is fused into the form of a slug which has great penetrating effect.

3. GENERAL DATA

Overall length	225.0mm
Length from base to rotating band	27.0mm
Width of rotating band	10.0mm
Length from rotating band to bourrelet	111.0mm
Length from bourrelet to nose cap	31.0mm
Length of nose cap	45.0mm
Diameter of bourrelet	69.7mm
Diameter of body	69.0mm
Diameter of rotating band	71.5mm
Outer diameter of nose	32.4mm
Inner diameter of nose	22.5mm
Threads per inch of fuse pocket	12 US Std (left hand)
Diameter of nose cap threads	63.5mm
Threads per inch of nose cap	12 US Std (right hand)
Depth of cavity	15.2mm
Wall thickness (top of the body)	5.6mm
Wall thickness (base)	12.5mm
Total weight of unfused projectile	7 lbs 12 oz
Weight of gaine complete	9.5 grams
Weight of main charge	400.0 grams
Weight of gaine explosive (cyclonite)	6.2 grams
Weight of lead azide detonator	.31 gram
Apex angle of liner	30°
Thickness of liner	2.0mm

4. MARKINGS

The nose is tipped in red, and a yellow band is painted around the projectile forward of the rotating band. There is a white band around the body forward of the yellow band at the centre of gravity. The date and place of manufacture of the projectile "January 1944, at Nagoya Arsenal" is stamped in the body forward of the rotating band. The projectile was loaded in October 1944 at the Tokyo Army Ordnance Branch Depot. This information is painted in white on the body. Stencilled on the explosive block is "Type 3 Armor-piercing Ammunition Bursting Charge, Type 92 Battalion Gun".

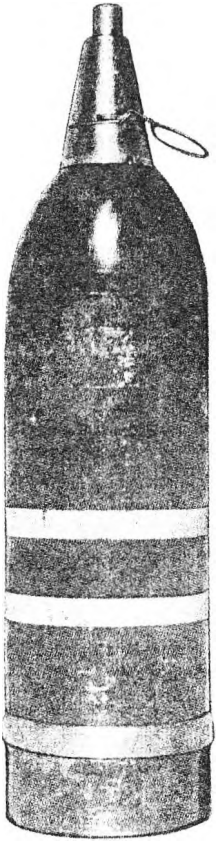
(SOURCE: MEIU NO 1)

70 MM HOLLOW CHARGE AMN

FOR

TYPE 92 BATTALION GUN

FIG 1 Complete round

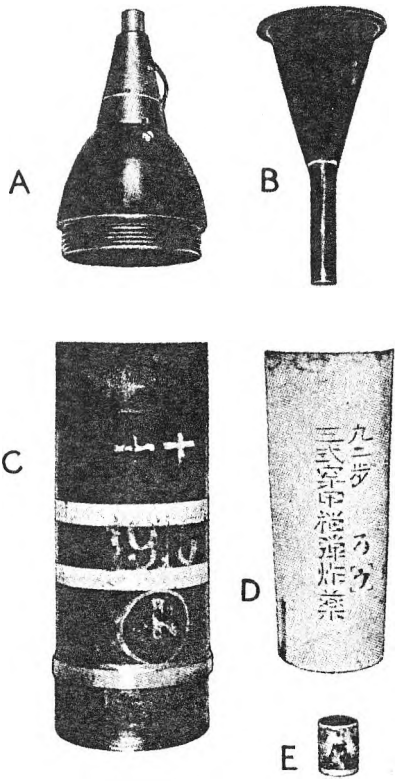


70 MM HOLLOW CHARGE AMN

FOR

TYPE 92 BATTALION GUN

FIG 2 Components



A Nose cap
B Conical liner
C Body
D Explosive charge
E Gaine

75 MM HOLLOW CHARGE SHELL

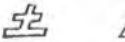
FOR TYPE 41 MOUNTAIN GUN

1. GENERAL

A complete round of 75mm hollow charge, loaded HE shell for the Type 41 Mountain Gun was examined. Several of the components are very similar in appearance and design to corresponding components of German ammunition.

2. DESCRIPTION (Figs 1 - 4)

The round, less fuse, is 15¾ ins long and weighs 10½ lbs. With fuse assembled (as fired), the round is 18 ins long and weighs 10 lbs 14 ozs. Although the fuse was furnished separate from the round, it is believed the complete round is shipped with fuse assembled since no shipping plug was present in the fuse cavity, and available information indicates that the fuse is assembled.
The exterior surface of the shell is painted black and is encircled by a narrow red band at its nose, and by a narrow yellow band approximately midway between the rotating band and the bourrelet. Marking on this shell was in poor condition due to handling. Outstanding over the other marking are the following symbols marked in white on the body just forward of the yellow band:



A complete round consists of: (a) Projectile, (b) Fuse, (c) Cartridge Case, (d) Primer and (e) Propellant.

(a) Projectile: The fused shell, as fired, weighs 8 lbs 2.7 ozs, and its overall length is 11-21/32 ins. With cavity liner, less explosive and fuse, it weighs 6½ lbs and is approximately 9.4 ins long. The shell is of two-piece construction, the two parts being threaded together: the nose comprising the entire ogival portion and a short cylindrical portion of the shell; and the steel body the remainder.
The bursting charge in the shell, which is a single pellet and weighs 1 lb 1.4 ozs, is 50.5% cyclonite, 49.5% TNT. This charge is encased in a paper carton. Surrounded by the hollow bursting charge with its flange resting on the front end of the charge is a cone-shaped cavity liner with a flash tube assembled at its apex. A detonator-booster is located inside the base of the explosive charge, with the open end adjacent to the flash tube. This detonator-booster consists of a cyclonite and wax booster charge, in an aluminium cup, encompassing the detonator assembly.

(b) Fuse: The point detonating fuse used is of the instantaneous type, and is designated as the Type 88 Instantaneous Fuse. It has a conical-shaped brass body

and a cylindrical aluminium striker projecting from the front (comprising part of the firing pin assembly). Threaded in the bottom end of the fuse base is a brass cup which houses the primer and the primer-detonator assembly. The fuse assembly weighs 6.1 ozs, is approximately 3½ ins long and, when assembled in the shell, protrudes 2¼ ins from the shell nose.
Functioning of the fuse is as follows: Prior to loading the round in the gun the safety wire, which is fastened around the fuse in a circumferential groove, is loosened and the safety fork which provides safety during shipment and handling, is withdrawn. On firing, the inertia ring moves rearward and is locked in place by the spring prongs of the inertia ring lock. The pressure exerted by setback acting on the firing pin assembly causes the knurling on the firing pin head, or shoulder, to hold the safety blocks against the action of centrifugal force. When setback force reduces to less than the resistance of the firing pin spring the firing pin assembly is returned to its foremost position and the safety blocks are free to move outward, removing the obstruction to the stroke of the firing pin. On impact with the target, the firing pin point is driven into the fuse primer. The flame passes to the fuse primer-detonator, functioning it. The detonating wave, or fragments of the primer-detonator body, pass through the cavity liner and flash tube into the open end of the detonator. The consequent detonation in turn fires the booster charge, resulting in detonation of the shell bursting charge.

(c) Cartridge Case: The short, steel brass-coated cartridge case is of the conventional short case design and its mouth was apparently expanded in assemblying the shell in order to provide a very tight force fit. The weight of the empty case is 2 lbs .8 oz, and its length approximately 7¼ ins. The case flange diameter is 3.59 ins.

(d) Primer: This is a short percussion primer, very similar in external appearance to those found in most rounds of German ammunition, and was found to be interchangeable with the German primers. It differs from the German primers in that a plunger (striker) is present in the rear face of the body.

(e) Propellant: The propelling charge, which weighs 6.85 ozs, is contained in a silk bag which weighs ¼ oz. This charge is held down in the case against the primer boss by a closing cup assembly which is made of chemically treated, dark brown paper. On the underside of the retainer is attached a strip of foil of a lead-tin alloy, in the proportion of 38 : 62, presumably used as an anti-fouling material. Between the upper surface of the closing cup assembly and the base of the shell is a strawboard spacer cut from sheet and folded to form a tube of trapezoidal cross section. This serves as a support for the closing cup assembly in preventing movement of the propelling charge away from contact with the primer boss in the case.
The principal constituents of the powder as indicated by chemical analysis are:

Nitrocellulose	96.4%
Nitrogen	12.8%
Diphenylamine and nitrosodiphenylamine	1.7%
Total volatile	1.4%

The grains are flake powder in the form of rectangles, averaging .31 in wide, .37 in long and .02 in thick.

(SOURCE: PICATINNY ARSENAL)

75 MM HOLLOW CHARGE SHELL FOR TYPE 41 MOUNTAIN GUN. FIG 1

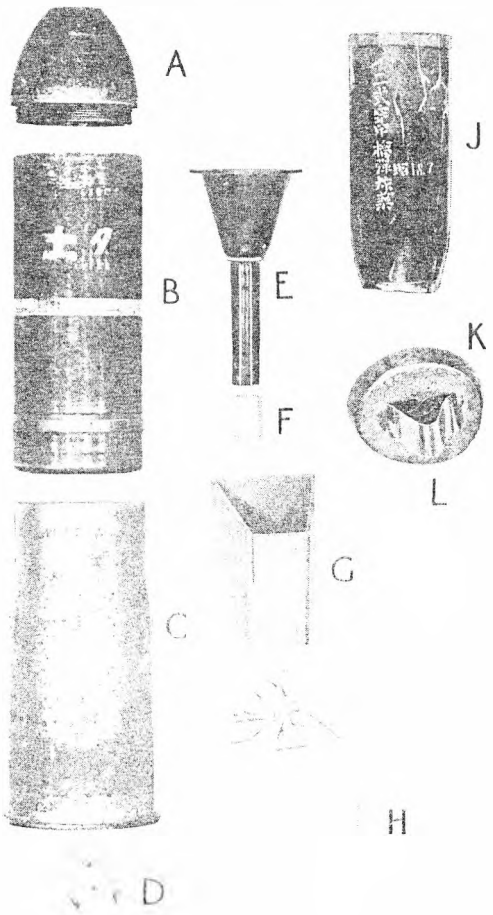
Complete round

75 MM HOLLOW CHARGE SHELL

FOR

TYPE 41 MOUNTAIN GUN

FIG 2 Components

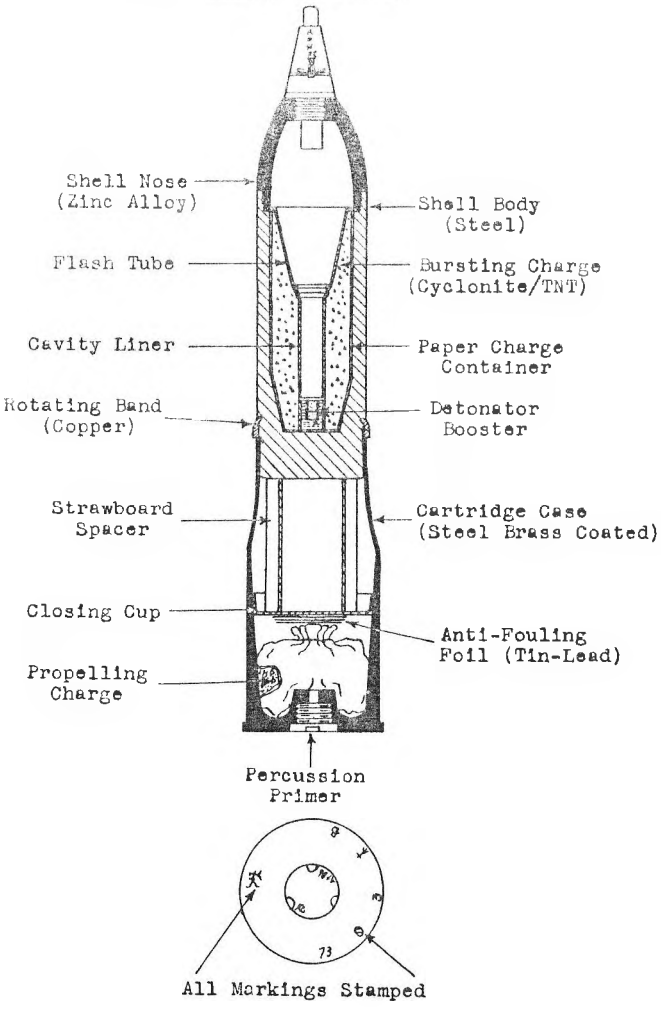


A	Shell nose	G	Spacer
B	Shell body	H	Propelling charge and Powder Grain
C	Cartridge case	J	Bursting charge
D	Percussion primer	K	Closing cup
E	Cone assembly	L	Anti-fouling metal foil
F	Detonator booster		

75 MM HOLLOW CHARGE SHELL

FOR TYPE 41 MOUNTAIN GUN

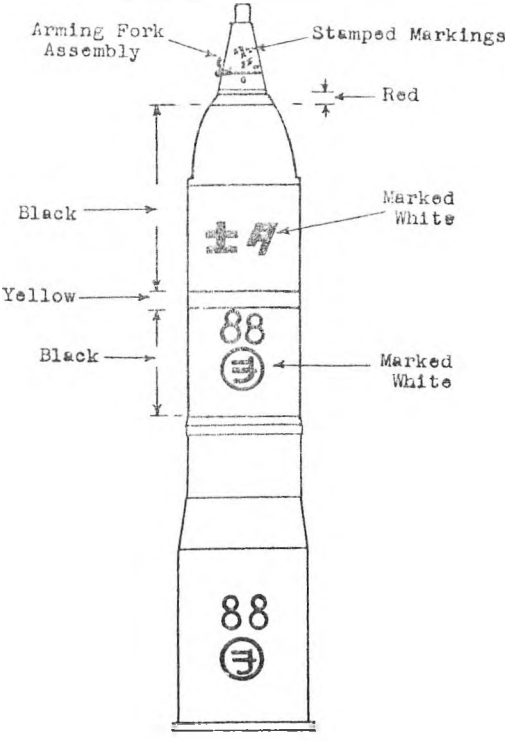
FIG 3 Assembly

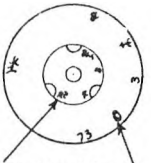


75 MM HOLLOW CHARGE SHELL

FOR TYPE 41 MOUNTAIN GUN

FIG 4 Marking diagram





SCALE 0 1 2 3 INCHES

105 MM H E SHELL

ADDENDUM TO REPORT IN AMF TECH INT SUM NO. 17

1. GENERAL

Further examination of the ammunition described in the above report reveals variation in details previously submitted.

2. DESCRIPTION

(a) Explosive Filling: Two of the shells examined were found to be press-filled with ammonium nitrate/RDX in approx. an 80-20 proportion. The weight of the filling is approx. the same as in the T N T filled shell, namely 2.4 Kg (5 1/4 lbs).
The marking "anga" on these shells is known to be an abbreviation for "Angayaku", being the Japanese Army designation for the ammonium nitrate /RDX mixture. This marking would not appear on the T N T filled ammunition.

(b) Exploder: The exploders in the ammonium nitrate-/RDX filled shells are made up of three pellets of RDX pressed in a graphited mould. These are similar in dimensions and weights to the picric acid pellets in the exploders of the T N T filled shells.
Markings on the R D X exploders are the date of manufacture, the filling factory stamp, a grenade sign and the ideographs for "shou" (Shouyaku), the Japanese Army designation for RDX.

(c) Fuse Magazine Cup: These housing cups in the ammonium nitrate /RDX filled shells are made of aluminium instead of copper as used in the T N T filled shell.

SOURCE: MUNITIONS SUPPLY LABORATORIES
(through MGO Branch)

MOBILE RADIO SET C - MARK I

1. GENERAL

This consists of a four valve, plate modulated transmitter and a three valve super-regenerative receiver intended for mobile installations in tanks and other vehicles. The transmitter has a range of 10 miles. Both the transmitter and receiver cover a frequency range of from 20-30 megacycles. All power is supplied by a dynamotor which operates from a 24 volt storage battery. Japanese Radio Set B is a similar unit and can be operated in conjunction with Set C.
The transmitter has facilities for phone, tone modulated C.W., and interphone talking. The maximum undistorted modulation is 30% on voice.
The transmitter, receiver and dynamotor power supply are mounted in a metal box measuring 19½ ins by 8½ ins by 7¼ ins, with a total weight of 53½ lbs. This box and all accessories are housed in a wooden chest 29½ ins by 19¾ ins by 9⅞ ins, which weighs 110 lbs when filled. The complete radio unit was manufactured in June 1943, while the dynamotor was built in April of the same year.

2. RECEIVER (Figs 1 - 5)

(a) Description: (1) Mechanical Structure: The receiver is of the super-regenerative type using a separate quench oscillator. One stage of radio frequency amplification is used ahead of the detector. Two transformer coupled stages of audio frequency amplification are used.
The receiver is a compact well-built unit. It measures 6½" wide, 7" high, 7¼" long, and weighs 8 lbs. It has an aluminium or aluminium-alloy frame, the main members of which are angular cross-sections. All components and parts are rigidly mounted, well spaced, easily accessible, and are labelled with a number. The valve sockets are depressed below the chassis, and that portion of the valve which lies between the socket and the chassis is encased in a round metal shield. The valve pin connections are marked clearly on the top of the valve socket.
The fixed resistors are marked "Fox Ohms" and are large and sturdy in outward appearance. A screw running through the centre of each bolts it securely to the chassis. The variable resistances are wire-wound and covered with a lacquer-like substance. Both the variable and fixed resistors resemble the American 1930 style of construction. The leads on the mica condensers are ⅜ in wide metal bands, which, when screwed or soldered to a point, are rigid enough to form a very secure mounting.
The only shields, other than those about the valve bases, are the metal encasings about the ganged condensers and the RF coils. In most cases, each screw is securely held by two nuts which have been daubed with yellow paste. The wires are flexible, and when long, well cabled. Tinned copper braided shielding is

used in abundance. All solder joints are neat and mechanically sound. The dial and meter scales on the front panel are easily read, the meter scales and the regeneration control dial being luminous.

(ii) Valve Data: The radio set uses the following valves:-

	PENTODE SECTION	TRIODE SECTION
1-UT 6F7	R.F. Amplifier	1st Audio
1-UT 6F7	Superregenerative Detector	Quench Oscillator
1-UT 6F7	2nd Audio	Not used
1-UT 6F7	Interphone amplifier	Crystal Calibrator
1-UT 6F7	Master Oscillator	Preamplifier
1-UY 807A	Final Amplifier	- - -
1-UT 807A	Modulator	- - -

The UT 6F7 is a pentode triode valve. Typical operating voltages, as deduced from values used by the Japanese in this set, are as follows:

Amplifier Service

	Triode Unit	Pentode Unit
Plate Voltage	100	225
Screen Voltage	--	100
Grid Voltage	- 4	- 7

Oscillator Service

Plate Voltage	55	15 - 35
Screen Voltage	--	15 - 35
Grid Voltage	- 6	- 8

Heater Voltage - 6.3 dc volts
Current - 0.3 amp

In outward appearance, pin connections and typical operating voltages, the valve is almost identical with the American 6F7 valve. The following experiments were performed to determine whether or not these valves can be interchanged and give satisfactory results:

Twenty-five new American 6F7 valves were each substituted in the super-regenerative stage to determine over how much of the frequency range they would super-regenerate (based on a noise output of 50 mw). The results are tabulated below:

No. of Valves	% of Frequency Range over which Valves would Super-regenerate
3	90
5	85
2	80
5	75
3	70
1	65
1	60
2	55
3	0

(Note: The best Japanese valve would super-regenerate over 70% of the frequency range. The others were slightly less)

Nine new and tested American 6F7 valves were substituted in the super-regenerative detector stage. The super-regenerative hiss never exceeded 0.1 mw at any frequency. The grid bias on these valves averaged 0.6 volt more positive than that on the valves used in the first experiment.
These new and tested American 6F7 valves were substituted in the amplifier stages, one at a time. The sensitivity in each case was the same as that obtained with the Japanese valves. These tests show that the super-regenerative stage is very critical, but American valves (Manufacturer "A") can be used satisfactorily in this stage if they are hand picked. A direct substitution of American valves may be made, however, for either or both of the other Japanese valves.

(b) Circuit Analysis: There is an elaborate network of dropping resistors in the plate and screen circuits of each valve so that the same power supply (400 V.) may be used for both the transmitter and receiver. Resistances 52, 53, and 54, each 2000 ohms, are connected in series with each other and with all plates and screens. In addition, each valve element connected to the 400 volt source has additional resistors in series with it to drop its voltage to the required value. The filaments are connected in series. A 17 ohm resistor between the filaments and the power supply drops the 24 volt input sufficiently to provide 6.3 volts on each filament..
There is one stage of RF amplification in which the tuned grid circuit is inductively coupled to the aerial coil. A 500 ohm resistor, in series with the valve cathode, provides a negative operating grid bias of 4 volts. The plate operates with 225 volts and the screen with 90. The RF output of the stage is inductively coupled to the tuned grid circuit of the regenerative detector.
The regenerative detector circuit is an ultraudion oscillator which uses the pentode half of the tube. A 500 M ohm grid resistor provides a negative grid bias of 8.2 volts. Resistance No. 38, which is controlled from the front panel, controls the amount of regeneration by varying the plate voltage from 15 to 35 volts. When this half of the valve is operating correctly, there is a hiss of considerable intensity in the absence of a signal.
The quench frequency is obtained from a separate quench oscillator (triode) which pulses the detector plate at the rate of 20 kc/sec. A 50,000 ohm grid resistor provides a negative grid bias of 6.6 volts. The plate operates with 55 volts. Between the quench oscillator and the first AF amplifier there is a filter network to eliminate the RF and quench frequencies in the output.
The audio output of the super-regenerative detector is inductively coupled to the grid of the first AF amplifier by an audio transformer. A 500 ohm resistor in series with the first AF Amp. cathode biases the grid 4 volts negative. The plate operates with 100 volts. Its output is inductively coupled to the grid of the second AF amplifier by an audio transformer. A

1000 ohm resistor in series with the second AF amp cathode provides a negative grid bias of 7 volts. The screen operates with 100 volts and the plate with 225 volts. The optimum impedance across the secondary of transformer No. 50 is 4000 ohms.

3. TRANSMITTER (Figs 6 - 14)

(a) Description: The transmitter is a master oscillator-power amplifier type using the pentode section of a UT 6F7 as the oscillator and a UY 807A as the power amplifier. Also incorporated in the transmitter is an amplifier for interphone operation. This amplifier, in conjunction with a junction box (Model YT-507B Serial No. 622), permits interphone talking between two radio operators and two additional crewmen, as well as permitting the use of two radio sets. A hand switch on the headset-microphone lines is used for interphone talking. The radio operators' lines have an additional push-to-talk transmitter switch below the interphone switch. The microphones are the single button carbon type connected with a pair of magnetic earphones of 4800 ohms impedance, each at 400 cycles.
The power amplifier is operated with insufficient grid drive for efficient or high power operation due to the small value of the coupling condenser, and due to the fact that the p.a. is coupled to the grid end of the oscillator tank.
The final amplifier is both plate and screen modulated, but the maximum undistorted modulation capabilities of the modulator plate circuit is only 55%, showing inferior design.
A crystal calibrator is employed for checking the dial calibration. The main dial is marked with red lines at the correct crystal check points (multiples of three mc.). With the switch in the upper calibrate position, a zero beat note indicates the true position of the nearest red marked frequency. When the switch is in the lower position the calibrator stage becomes part of the interphone amplifier.
The interphone amplifier system and the modulator amplifier are separate. Operation on interphone alone or interphone and MCW, or interphone and phone, is selected by means of a three position selector switch on the transmitter. The modulator functions as a feedback oscillator on tone modulated CW operation. Push-to-talk operation on phone is accomplished by means of a relay which switches from "receive" to "transmit" and shifts the aerial from the receiver to the transmitter.

(b) Technical Analysis: All measurements were made with a dummy aerial of 52 ohms and a series variable capacity connected between the transmitter aerial post and ground.

(1) Frequency Response (based on percent modulation): An audio oscillator was connected to the input of the transmitter through a .25 mfd condenser. A cathode ray oscilloscope was loosely coupled to the 52 ohm dummy aerial. The input voltage from the audio oscillator was set to give undistorted output as the frequency was varied over the frequency range. The maximum and minimum trace heights, H_1 and H_2, were measured on the cathode ray oscilloscope. The percent modulation was calibrated from the following relationship:

% modulation = $H_1 - H_2/H_1 + H_2$. The results are tabulated below:

Frequency	H_1	H_2	% Modulation
100	6	6	0
200	6	5	9
300	6	4.5	14
400	6	4	20
500	6.5	4	23
600	6.5	4	23
700	6	4	20
800	6	4.5	14
900	6	4.5	14
1000	6	5	9
2000		6	0

Based on modulator audio response: An audio oscillator was connected to the input of the transmitter through a .25 mfd. condenser. A general radio power output meter was connected across the modulation choke and its impedance adjusted for maximum power output. The db vs. frequency curve obtained is shown in Graph I.(Fig 14)

(ii) Dummy Aerial: Using different values of resistors as dummy aerials, the transmitter was tuned at three different frequencies and the output current was observed on the aerial current meter. The results are tabulated below:

Frequency Megacycles	150 ohms	75 ohms	52 ohms	34 ohms	26 ohms
20	100 ma.	180 ma.	320 ma.	260 ma.	260 ma.
24	120 ma.	220 ma.	340 ma.	300 ma.	200 ma.
30	125 ma.	145 ma.	120 ma.	198 ma.	100 ma.
Max.Power	2.34 w.	3.62 w.	6.0 w.	3.1 w.	1.7 w.

A 52 ohm dummy aerial gives the maximum output.

(iii) Power output: The transmitter was tuned to give maximum reading on the aerial current meter. The dummy aerial used was 52 ohms. The power output was calculated from the formula $P = I^2R$. Maximum power output is $.340^2 \times 52$ or 6 watts.

(iv) Power Drain: Total plate power drain and filament power drain were measured. The results are tabulated below:

Operation	Input Voltage	Current Amps	Power Watts	Input Voltage	Current Amps	Power Watts
Phone	24	5.1	122	22½	4.7	106
Tone CW	24	5.65	136	22½	5.3	119
Interphone	24	2.95	71	22½	2.8	63
Filament	24	1.0	24	22½	.95	21.3

The drain on the dynamotor at 400 volts is 140 ma. on phone, and 115 ma. on tone CW. With an input voltage of 24 volts the B supply voltage from the dynamotor is 550 volts. With 22½ volts input, the rated 400 volts dynamotor output voltage is obtained.

The transmitter power amplifier efficiency was calculated by Output Power/Input Power and is 21.4%.

(v) Stability: The stability of the transmitter was checked with a heterodyne frequency meter over a period of 1½ hrs. Readings were taken every 5 mins. The frequency drifted 29.3 kc the first 15 mins, 4.0 kc the second 15 mins, 8.28 kc the second half hour, and 6.86 kc the third half hour. The stability with varying input voltages was found to be + 3 kc at 20 mc for a supply voltage change from 20 to 22½ volts, and an additional + 5 kc from 22½ to 24 volts supply voltage change.

(vi) Field Tests: Different lengths of aerial were used and it was found that a mast aerial of 14 ft gave the maximum output over the frequency range. The 14 ft mast aerial is the only one that can be used with the coaxial feeder system supplied. Without the coaxial feeder, aerial kits for American Signal Corps Radio Set SCR-510 should load up satisfactorily. The aerial trimming system employed will match aerials cut to frequency for the 20-30 mc range. Tracking over the range is not perfect and additional power increase (10%) can be obtained by adjusting the tracking condenser at each frequency.

(vii) Dial Calibration: A heterodyne frequency meter was used to measure the transmitter frequency. The results are tabulated below. A considerable change from these values can be made by varying the position of the internal tracking condenser):

Calibration

Dial	Frequency in mc.
20	19.85
21	20.83
22	21.80
23	22.78
24	23.72
25	24.68
26	25.65
27	26.60
28	27.53
29	28.35
30	29.00

(viii) Maximum Modulation Capabilities: An audio oscillator was fed through a .25 mfd condenser and was coupled directly across: (a) modulation choke of the transmitter; (b) modulator grid to ground; (c) speech amplifier grid to ground; (d) microphone. The maximum, undistorted percentage modulation of the carrier was determined from oscilloscope patterns of the RF output. The results show that distortion occurs in the audio system and that the maximum percentage of modulation never exceeded 55% in any case.

4. INSTALLATION

The receiver and transmitter cannot normally be operated separately, because they have common connecting cables. To prepare the set for operation connect the following

cables after throwing the dynamotor switch to the left (off) position:

(i) Battery cable from the 24 volt battery source to the lower right hand corner of the dynamotor (black wire-negative).

(ii) The 18 ins 4-wire power cable from the lower left socket on the dynamotor to the lower right socket of the transmitter unit.

(iii) The 18 ins 8-wire cable from the lower left side of the transmitter to the lower right side of the receiver.

(iv) A wire from the aerial post on the right side of the receiver to the aerial post on the left side of the transmitter.

(v) A wire from the ground post on the left side of the receiver to the ground post on the right side of the transmitter.

(vi) The coaxial aerial feeder to the connector at the top of the transmitter.

(vii) The junction box cable from the upper male socket on the left side of the junction box to the lower centre socket on the transmitter. If radio set B is also used, connect the cable from it to the upper socket on the right side of the junction box.

(viii)Plug the telegraph key into the jack on the right side of the transmitter.

(ix) Connect the headsets to the junction box. The dual switch headset cords should plug into the front sockets, while the two remaining sockets are for interphone use only.

To calibrate the unit set the transmit-adjust switch to the adjust position, and then turn the main tuning dial to one of the four positions marked in red nearest the desired operating frequency. Pull the transmitter nearly out of the case to expose condenser No. 12, and while listening in the earphones adjust this condenser until a zero beat is obtained. For best tracking throughout the complete tuning range condenser No. 12 must be set by trial to an arbitrary position.

5. OPERATION

Set the power switch located on the dynamotor to the filament (centre position) and allow a short time for warm-up. Check the filament voltage by switching the voltage check switch on the left of the receiver panel to the low voltage (lower) position. The meter should read 24 on the lower scale.
Move the power switch to the operate (right) position, starting the dynamotor. Check the plate voltage by moving the voltage check switch (on the left side of the receiver panel) to the upper position. The meter should read 400 on the upper scale.
To operate on phone turn the interphone-telegraph-phone selector switch (upper right side of transmitter) to the

right (phone) position. Set the main tuning dial to the desired frequency. Press the microphone switch located on the microphone cord (lower switch) and adjust the aerial trimmer for maximum output on the aerial current meter.
To operate on tone modulated CW turn the transmitter selector switch to the telegraph (centre) position. Adjust the aerial trimmer for the maximum aerial current on the aerial current meter while holding the key down. Operate the key for transmission.
As long as the lower microphone switch of the operators' cord is not pressed the set is on receive (in the phone or telegraph switch position). Tune the receiver to the correct frequency by varying the main tuning dial. Adjust the regeneration control (upper right receiver control) for the best reception of the incoming signal.
To operate on interphone for communication between four phones, without picking up the receiver noise, turn the transmitter selector to the extreme left position (interphone). Press the interphone switch, located above the microphone switch on the headset cord, when talking.
Operators No. 1 and No. 2 may talk on interphone at any time by pressing either or both sides of their single press-to-talk (cord) switches. Operators No. 3 and No. 4 may talk on interphone at any time by pressing their press-to-talk (cord) switch nearest the microphone. Operator No. 3 can talk only on radio set C. However, he can also listen to set B by moving the left switch (junction box) from the normal left position to the right position. Operator No. 4 can talk only on radio set B, but may listen to set C by moving the right hand switch (junction box) from the right to the left position.

6. ACCESSORY EQUIPMENT

The receiver, transmitter, and all accessory equipment (excluding the batteries) is contained in a brown wooden case which is divided into six compartments. The top three compartments each contain a drawer for spare parts; the bottom one contains the receiver, transmitter, and dynamotor; the remaining two are used for housing the accessories. A lid extending over the entire front of the case drops down when the two catches at the top are released. The set may be operated either in or removed from its case.

7. CONCLUSIONS

The set is compact and well built. The numbering system used, the type of components, and general layout are very similar to common German design practices of 1938-1942. The mechanical design of the transmitter is good but shows overcrowding of the modulator and final amplifier parts. The basic electrical design is good, but the engineering is poor and the final results are not as good as would be expected from the valves used. The weak points are: (a) The gain of the speech amplifier is too low to fully drive the modulator; (b) The modulator wave shape distorts badly before full output is reached; (c) The maximum modulation capabilities of the modulator are about 25% lower than good practice values; (d) The final

amplifier does not have sufficient RF drive for proper operation; (e) The aerial matching is critical; (f) The calibrator is not coupled tightly enough to the receiver.
The transmitter's maximum undistorted modulation is 30% on voice. The receiver sensitivity was found to be 9 microvolts when a signal plus noise to signal power ratio of 4:1 was maintained. Below 23 mc. this receiver would not super-regenerate and the sensitivity dropped to 250 microvolts under the same conditions. The selectivity at 10 times down varied from 150 kc. at 20 mc. to 300 kc. at 30 mc.

(SOURCE:- SIGNAL CORPS GROUND SIGNAL AGENCY, BRADLEY BEACH)

MOBILE RADIO SET C(NO 1)

Receiver - Nomenclature List

No.	Name	Function	Value
1	Binding Post	Antenna	
2	Binding Post	Ground	
3	Coil	Antenna	
4	Coil	r-f grid circuit tuning	
5	Capacitor, variable,air	r-f grid circuit tuning	
6	Capacitor, trimmer	r-f grid circuit tuning	
7	Resistor, fixed	Filament voltage droping	17 ohms
8	Resistor, fixed	r-f amplifier screen dropping	100 M ohms
9	Capacitor, fixed	r-f screen by-pass	.01 mfd,1000VDC
10	Valve Socket	r-f and 1st a-f amplifier	
11	Capacitor, fixed	r-f plate return	.01 mfd,1000VDC
12	Capacitor, Fixed	r-f cathode by-pass	.01 mfd,1000VDC
13	Resistor, fixed	r-f amplifier cathode bias; 1st a-f amplifier cathode bias	500 ohms
14	Resistor, fixed	r-f plate filter	1000 ohms
15	Capacitor, fixed	r-f screen by-pass	.01 mfd,1000VDC
16	Coil	r-f amplifier plate	
17	Coil	Super-regenerative detector grid tuning	
18	Capacitor, variable,air	Super-regenerative detector grid tuning	
19	Capacitor, trimmer	Super-regenerative detector tuning	
20	Capacitor, fixed	r-f by-pass	.003 mfd,1000VDC
21	Capacitor, fixed	Detector grid	.004 mfd,1000VDC
22	Resistor, fixed	Detector grid	500 M ohms
23	Valve socket	Detector and quency oscillator	
24	Capacitor, fixed	Quench oscillator grid	.001 mfd,1000VDC
25	Capacitor, fixed	Quench oscillator plate	.0015mfd,1000VDC
26	Coil	Quench oscillator plate	
27	Coil	Quench oscillator grid	
28	Resistor, fixed	Quench oscillator grid	50 M ohms
29	Capacitor, fixed	Filter network	.003 mfd,1000VDC
30	Coil	Filter network	
31	Coil	Filter network	
32	Capacitor, fixed	Filter network	.002 mfd,1000VDC
33	Transformer	1st a-f transformer	Ratio 1:3
34	Capacitor, fixed	1st a-f grid r-f by-pass	.002 mfd,1000VDC
35	Resistor, variable	Quench oscillator plate voltage control	100 M ohms

No.	Name	Function	Value
36	Resistor, fixed	Quench oscillator plate dropping	100 M ohms
37	Capacitor, fixed	Quench oscillator "B" supply r-f by-pass	.01 mfd,1000VDC
38	Resistor, variable	Regeneration control	100 M ohms
39	Resistor, fixed	Detector plate dropping	100 M ohms
40	Capacitor, fixed	Filter	.55 mfd
41	Resistor, fixed	2nd a-f cathode bias	1000 ohms
42	Capacitor, fixed	2nd a-f cathode by-pass	.55 mfd
43	Valvesocket	2nd a-f amplifier	
44	Capacitor, fixed	2nd a-f grid by-pass	.001 mfd,1000VDC
45	Transformer	2nd a-f transformer	Ratio 1:3
46	Resistor, fixed	1st a-f plate dropping	50 M ohms
47	Capacitor, fixed	1st a-f plate filter	.55 mfd
48	Capacitor, fixed	2nd a-f screen by-pass	.55 mfd
49	Resistor, fixed	2nd a-f screen dropping	100 M ohms
50	Transformer	Audio output transformer	Ratio 2:1
51	Resistor, fixed	Bleeder	25 M ohms
52	Resistor, fixed	Voltage dropping	2 M ohms
53	Resistor, fixed	Voltage dropping	2 M ohms
54	Resistor, fixed	Voltage dropping	2 M ohms
55	Capacitor, fixed	Filter	.55 mfd
56	Capacitor, fixed	Filter	.55 mfd
57	Resistor, fixed	Voltmeter multiplier	500 M ohms
58	Switch	Voltage Test Switch	
59	Voltmeter	Indicates plate and filament supply voltages	
60	Input Receptacle	To transmitter	
61		Missing	
62	Capacitor, fixed	Filament by-pass	.01 mfd,1000VDC

MOBILE RADIO SET C(NO.1)

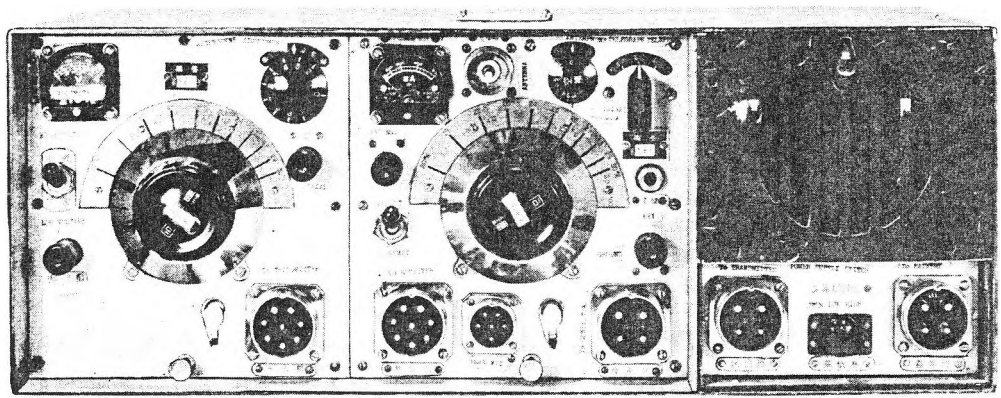
Transmitter - Nomenclature List

No.	Name	Function	Value
1	Resistor	A.F. Amplifier grid	100 M ohms
2	Resistor	Calibrator Oscillator grid	100 M ohms
3	Crystal	Dial Calibrator	3 mc
4	Capacitor	Cathode by-pass	.5 mfd
5	Resistor	Plate load	20 M ohms
6	Resistor	Screen dropping network	100 M ohms
7	Capacitor	Coupling	.05 mfd
8	Transformer	Audio oscillator	
9	Capacitor	D.C. blocking	.01 mfd 1000VDC
10	Capacitor	Audio oscillator transformer	.01 mfd 1000VDC
11	Resistor	Screen dropping network	50 M ohms
12	Capacitor	Oscillator trimming	Variable-air
13	Capacitor	Oscillator tuning	Variable-air
14	Capacitor	Oscillator tracking	800 mmfd 1500VDC
15	Capacitor	Oscillator	200 mmfd 1000VDC
16	Coil	Oscillator tank	
17	Capacitor	Oscillator grid coupling	100 mmfd 1000VDC
18	Resistor	Oscillator grid	50 M ohms
19	Resistor	Oscillator plate-dropping	20 M ohms
20	Resistor	Oscillator plate-dropping	50 M ohms
21	Capacitor	R.F. by-pass	.01 mfd 1000VDC
22	Capacitor	Coupling	100 mmfd 1000VDC
23	Capacitor	R.F. by-pass	.01 mfd 1000VDC
24	Choke, R.F.	Parasitic Suppressor	
25	Resistor	P.A. grid	20 M ohms
26	Capacitor	D.C. blocking	.01 mfd 2500 VDC
27	Capacitor	P.A. Cathode by-pass	.01 mfd 1000 VDC
29	Resistor	P.A. Cathode	2000 ohms
30	Coil	P.A. Tank	
31	Capacitor	P.A. Tank	Variable-air
32	Resistor	Screen dropping	20 M ohms
33	Capacitor	Screen Audio by-pass	.1 mfd 1000 VDC
34	Capacitor	Screen R.F. by-pass	.001 mfd 1000VDC
35	Choke	R.F.	
36	Capacitor	P.A. R.F. plate return	.01 mfd 2500 VDC
37	Capacitor	Aerial Coupling	.01 mfd 2500 VDC
38	Choke	Parasitic Suppressor	
39	Capacitor	Modulator Cathode by-pass	.5 mfd.
40	(80) Resistor	Modulator Cathode bias	500 ohms
41	Capacitor	Modulator Screen by-pass	.5 mfd.
	Capacitor	Modulator plate	.01 mfd 2500VDC
42	Resistor	Screen dropping	100 M ohms
43	Milliammeter	Antenna Current	0-500 MA R.F.
44	Binding Post	For Receiver Antenna	
45	Coaxial plug	Antenna feeder fitting	
46	Jack	For key	
47	Relay	Circuit relay	
48	Choke	Modulation	
49	Capacitor	DC blocking	.01 mfd 1000VDC
50	Resistor	Side tone level	50 M ohms
51	Resistor	Mike transformer shunt	5 ohms
52	Switch	Calibrate-transmit	SPDT
53	Resistor	Mike current	130 ohms
54	Switch	Interphone, MCW phone	3 position rotary
55	Socket	To generator	
56	Socket	To microphone	

No.	Name	Function	Value
57	Socket	To receiver	
58	Transformer	Mike Transformer	
59	Transformer	Interphone transformer	
60	Capacitor	Interstage Coupling	.01 mfd 1000VDC
61	Resistor	Cathode bias	80 ohms
62	Resistor	Cathode bias	220 ohms
63	Resistor	Filament dropping	5 ohms
64	Resistor	Filament shunt	21 ohms
65	Valve socket	For 6F7	
66	Valve socket	For 6F7	
67	Valve socket	For 807	
68	Valve socket	For 807	
69	Binding post	Ground	
70	Choke	R.F. choke	1 mh.
71	Capacitor	Interstage Coupling	.01 mfd 1000VDC
72	Relay	Keying relay	SPDT 24 V.
73	Resistor	Modulator grid	50 M ohms
74	Resistor	Plate load	100 M ohms
75	Resistor	Plate load	100 M ohms
76	Choke	R.F. choke	
77	Capacitor	Cathode by-pass	.01 mfd 1000VDC
78	Capacitor	Series	.01 mfd 1000VDC
79	Capacitor	Aerial trimmer	Variable
80	(40) Resistor	Modulator Cathode	500 ohms
81	Resistor	Amplifier grid	100 M ohms

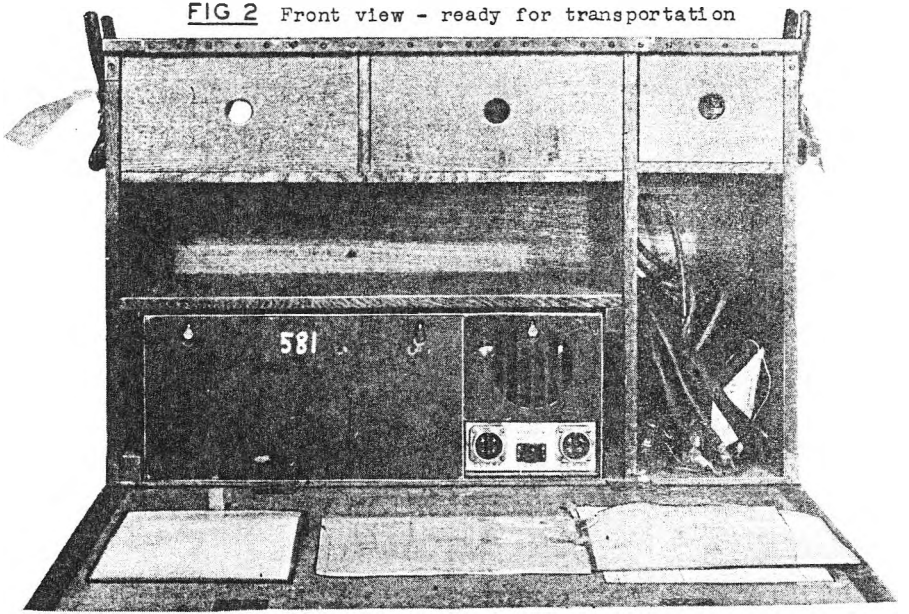
MOBILE RADIO SET C - MARK I

FIG I Front view - showing main components



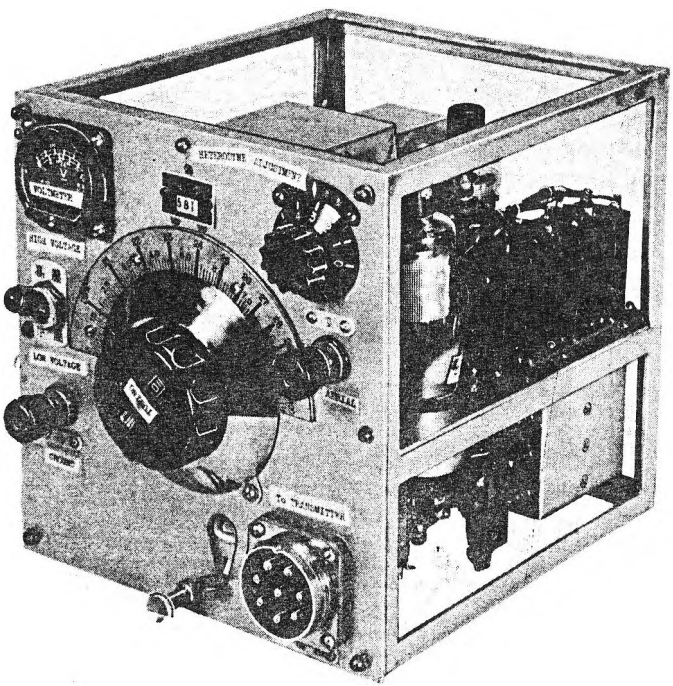
MOBILE RADIO SET C - MARK I

FIG 2 Front view - ready for transportation



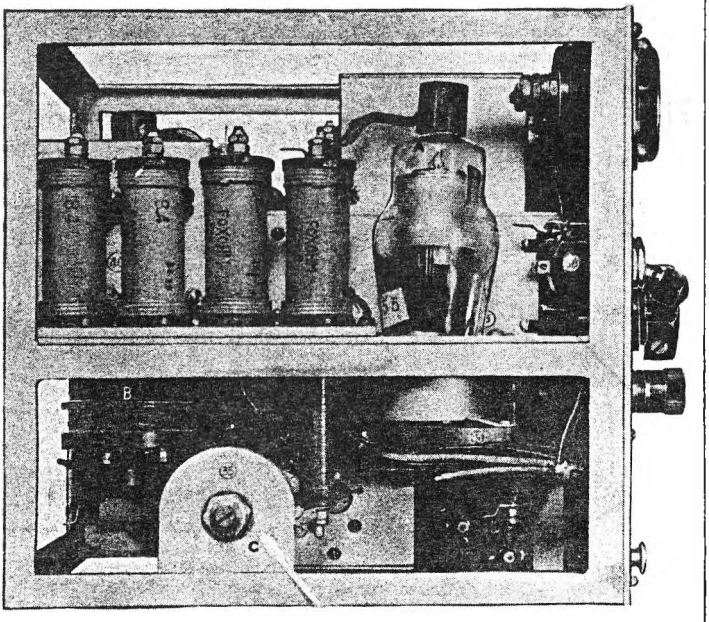
MOBILE RADIO SET C - MARK I

FIG 3 Receiver - showing front panel and controls



MOBILE RADIO SET C - MARK I

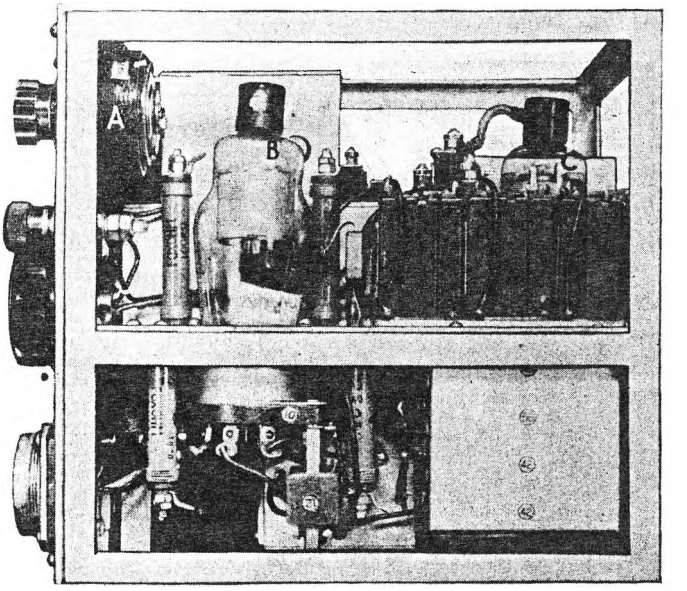
FIG 4 Receiver - side view



A 2nd A-F Amplifier
B Quench oscillator plate and grid coils
C Quench oscillator plate voltage control

MOBILE RADIO SET C - MARK I

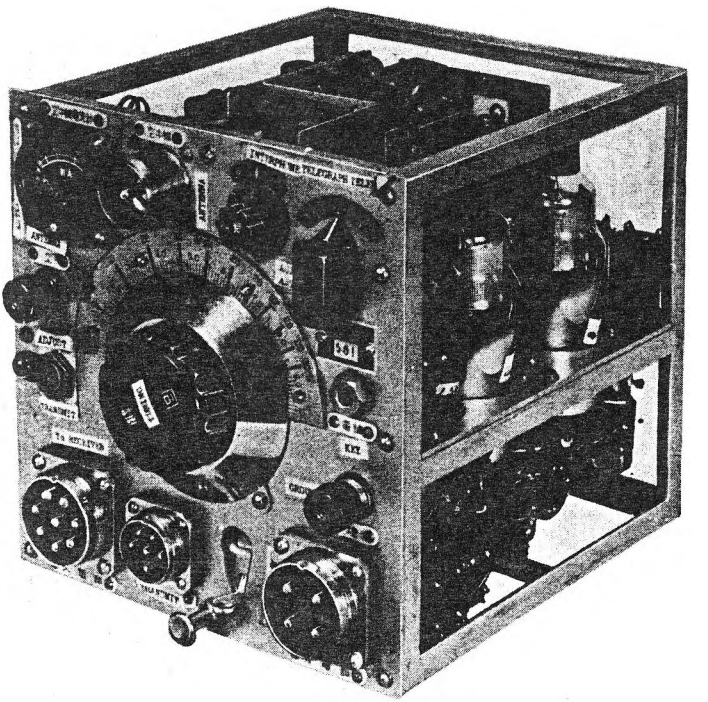
FIG 5 Receiver - side view



A Regeneration control
B R-F and 1st A-F Amplifiers
C Super regenerative detector and quench oscillator

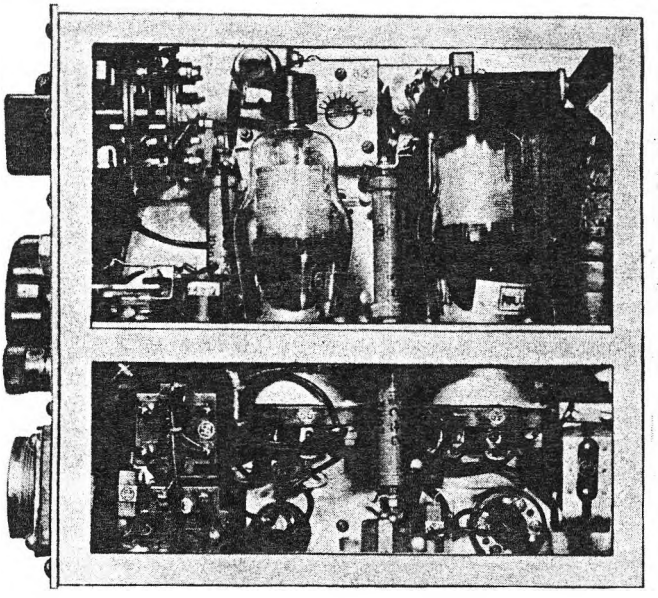
MOBILE RADIO SET C - MARK I

FIG 6 Transmitter - showing front panel and controls



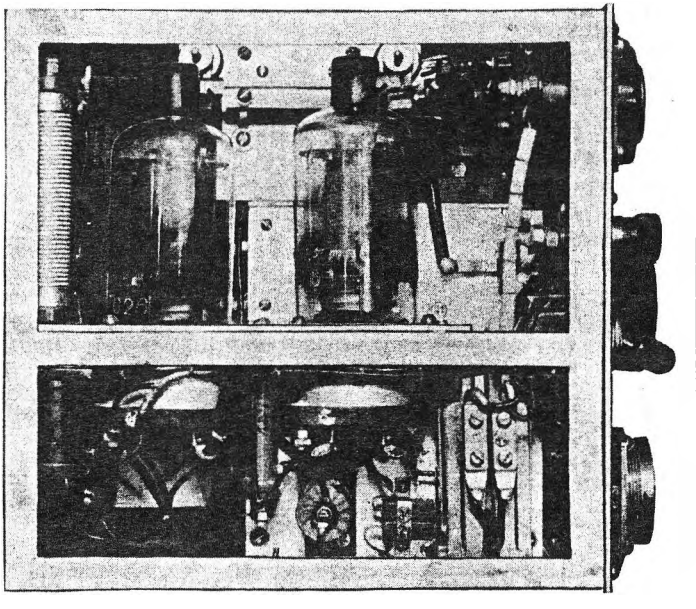
MOBILE RADIO SET C - MARK I

FIG 7 Transmitter - side view showing oscillator and pre-amplifier stages



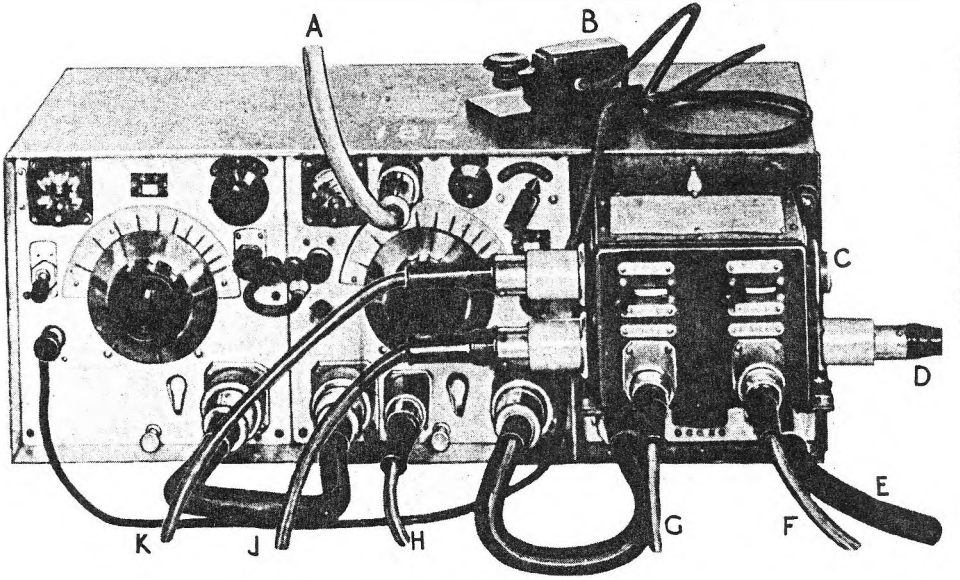
MOBILE RADIO SET C - MARK I

FIG 8 Transmitter - side view showing modulator and final stages



MOBILE RADIO SET C-MARK I

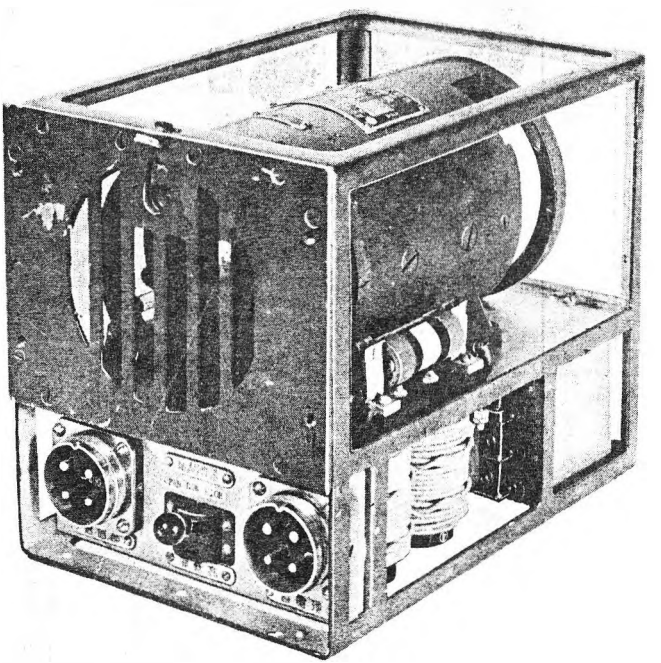
FIG 9 Front view - Junction box with cable connections



A Aerial
B Key for tone CW
C Connection to radio set B
D Interphone headset
E Battery cable
F Set B Operators Headset
G Set C Operators Headset
H Set C to Junction Box
J Interphone Headset
K Junction box to Set C
L Radio Set C

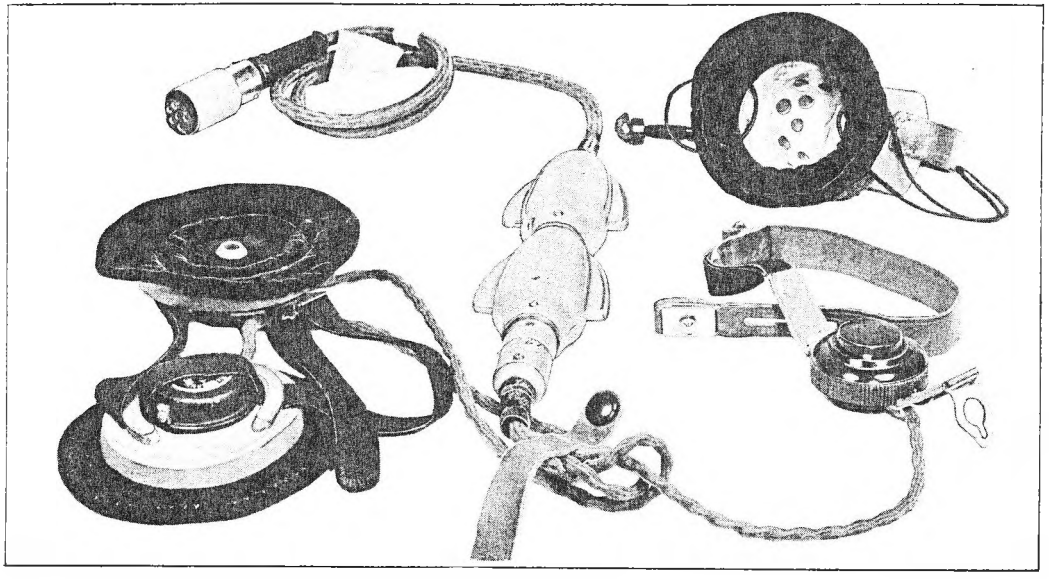
MOBILE RADIO SET C-MARK I

FIG 10 Dynamotor



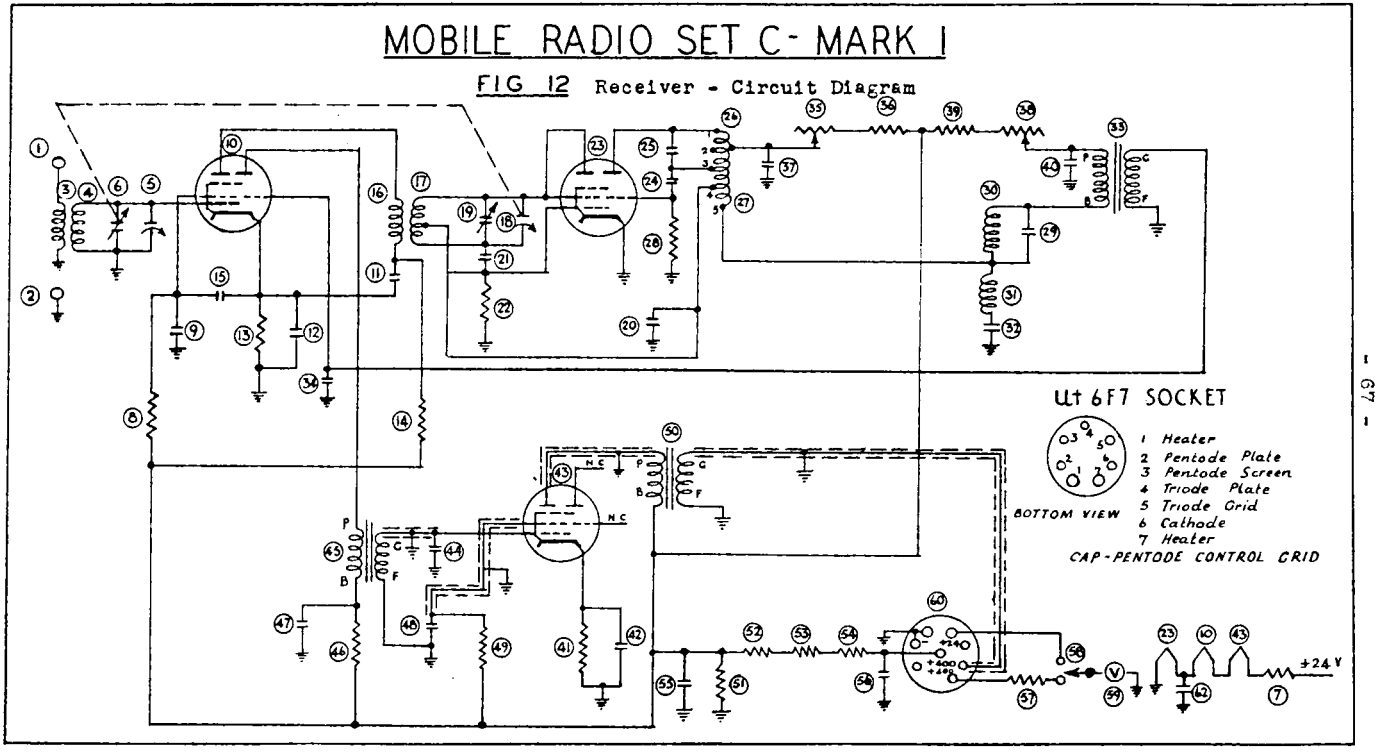
MOBILE RADIO SET C - MARK I

FIG II Microphone, Headphones and Press Switch



MOBILE RADIO SET C- MARK I

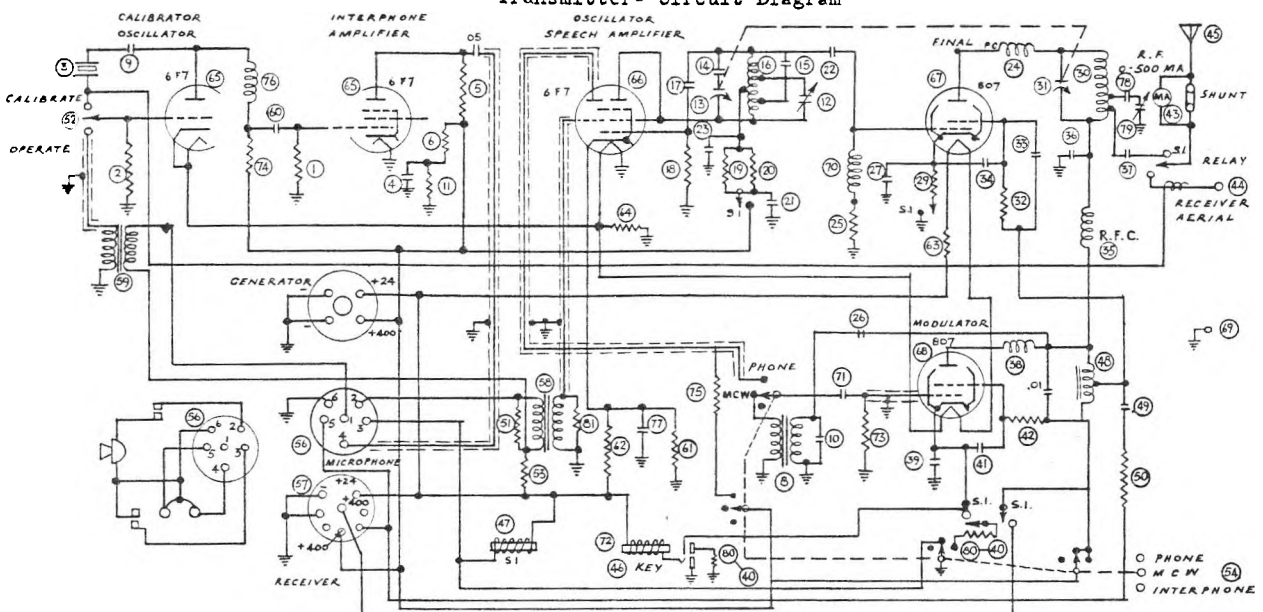
FIG 12 Receiver - Circuit Diagram



MOBILE RADIO SET C - MARK I

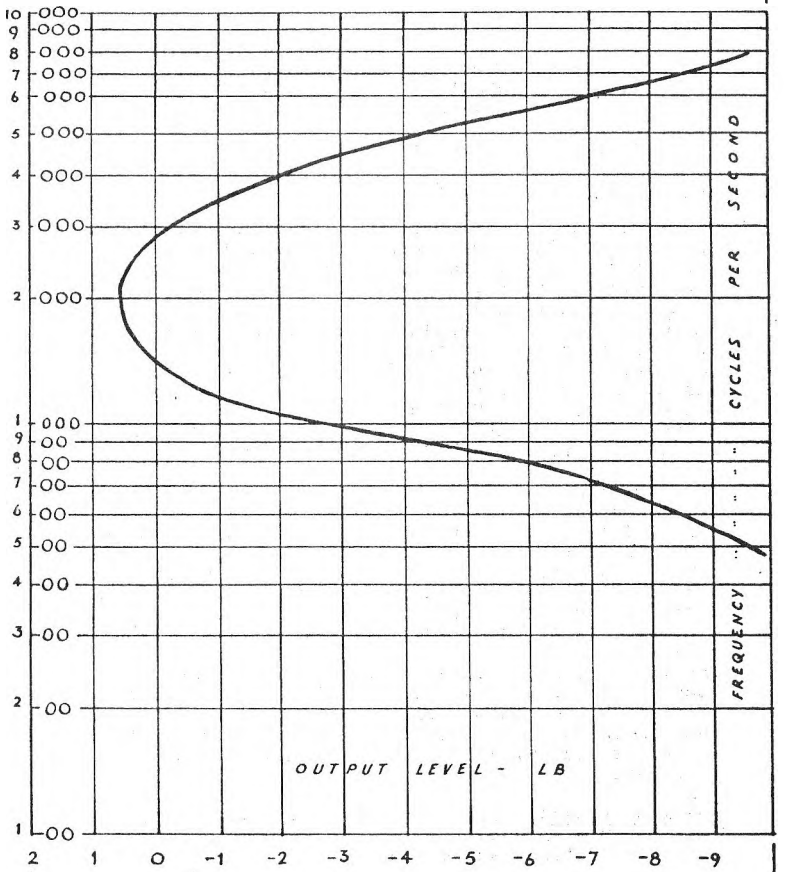
FIG 13

Transmitter- Circuit Diagram



MOBILE RADIO SET C - MARK I

FIG 14 Modulator Frequency Response



SIGNAL SMOKE GENERATOR TYPE 1

1. GENERAL

Two slightly damaged smoke generators, received on 27 Nov 44, were submitted to a functioning trial. They were found to emit a white smoke under considerable pressure from the 1cm diameter aperture in the top of the container for approximately 75 secs.

2. DESCRIPTION (Figs 1 - 2)

The generator is cylindrical in shape and painted a matt cream. Two labels bearing Japanese characters are affixed to the side of the container. The upper one indicated that the generator was a Type 1, Signal Smoke Generator, Model 1 (White), and was manufactured in October 1943 by the Japan Pyrotechnic Co Ltd. The lower label contained instructions for operation. The generator has an overall length of 10-1/16 ins, its maximum diameter is 2-7/32 ins and the total weight 2 lbs 13 ozs. The filling weighs 2 lbs 8 ozs. Principal components are: (a) Container, (b) Match-head, (c) Primer and Igniter, and (d) Smoke Filling.

(a) Container: This is constructed of 28 SWG tinplate. All seams are folded and pressed; the seam around the base being soldered externally. An outward swaging, 1.5mm in depth, is present 1.9cm from the top of the container. The seam up the side of the container is soldered externally between the swaging and the top. There are no smoke ports. A lid, pressed from 28 SWG tinplate, is fitted. The internal surface of the lid is shellacked.
The top of the container is recessed to a depth of 1.2cm. The match-head is protected by a moulded pad of sulphur and cottonwool. The igniter tube is soldered into an aperture in the top of the container. There was no striker block present in either of the samples received.

(b) Match-head: This consists of a small hemispherical mass of greyish brown powder, containing sulphur, potassium nitrate and charcoal.

(c) Primer and Igniter: The primer and igniter are contained in a tube of approx 25 SWG brass, 6.0cm in length and 0.9cm in diameter. The primer consists of a plug of compressed greyish powder (1.25 gms) tightly wrapped in thick white paper. The plug extends to a

depth of 1.5cm into the tube. The composition of the primer was found to be:-

	Percent
Organic material ether soluble	5
Potassium chlorate	54
Aluminium	10
Antimony	1
Charcoal and insoluble organic material	30

The igniter mixture - approx 3.5 gms of a greyish powder - is loosely packed into the lower 4.5cm of the tube. Its composition was found to be:-

	Percent
Sulphur	8.8
Potassium nitrate	48.9
Aluminium	14.3
Antimony sulphide	28.0

(d) Smoke Filling: This is a moist greyish powder smelling strongly of carbontetrachloride. Analysis showed it to be a typical Berger type smoke mixture containing:

	Percent
Carbontetrachloride	33
Zinc	16
Zinc oxide	48
Zinc chloride	0.5
Acid insoluble material	3.0

3. OPERATION

In operating this flare, bury the lower part in the ground so it will stand upright. Tear off the tape and remove the outer cover. Ignite the flare by rubbing the match composition with a striker block. When igniting turn the face away as much as possible.

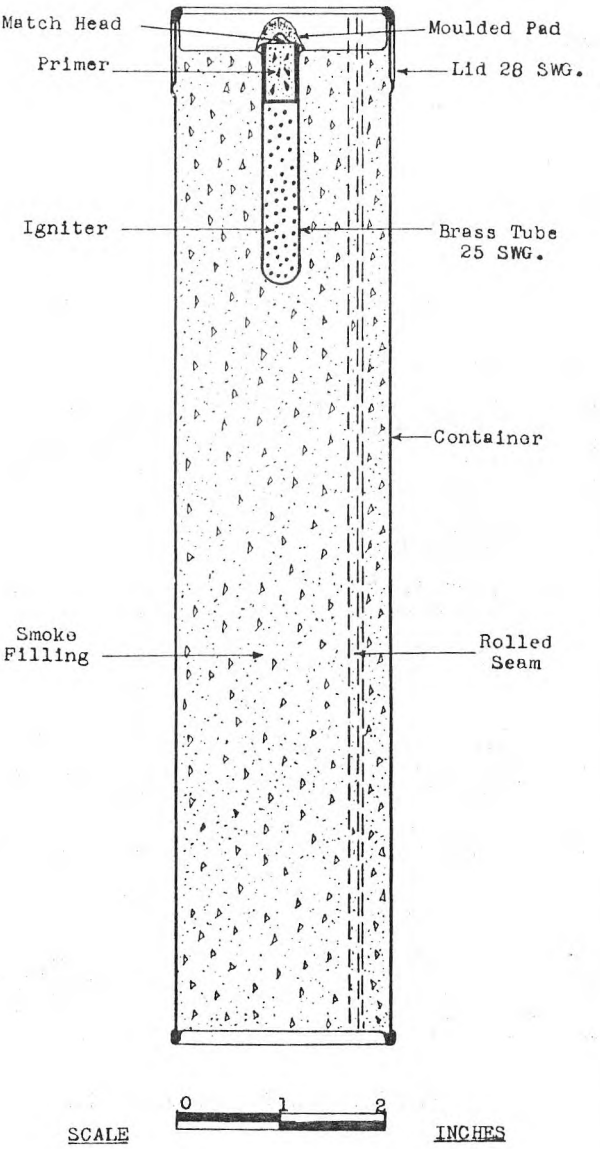
(SOURCE: 2/1 AUST CW LABORATORY RAE)

SIGNAL SMOKE GENERATOR TYPE 1

FIG 1

SIGNAL SMOKE GENERATOR

FIG 2 Constructional Details



IMPREGNANT FOR HORSE RESPIRATOR

Addendum to report in AMF Tech Int Sum No. 17.

1. GENERAL

An olive green can containing an impregnant for the filter bag of the Japanese horse respirator was recently recovered by chance from an enemy horse-drawn gun limber at an Australian dump of Japanese equipment. The impregnant consisted of a mixture of hexamethylenetetramine, potassium carbonate and sodium chloride.
No attempt will be made in this report to indicate a method of preparing the impregnating solution. The label on the can bore instructions for use, but the greater portion was missing.

2. DESCRIPTION (Fig 1)

The can measures 18.7 cms by 13.2 cms by 9 cms, and is heremetically sealed. It is painted a matt olive green, and is constructed of three sheets of approximately 28 SWG tinplate. The base and top are folded and pressed on to the body, and the body seam is positioned in the centre of the rear panel. A label, 14.3 cms by 10.2 cms is affixed to one panel.
The can contained:-

(a) Approx 1.5 Kgs of a white crystalline powder, the composition of which was found to be:

Hexamethylenetetramine ..	55.9%
Potassium carbonate ..	25.9%
Sodium chloride	19.1%

(b) A light brown paper packet containing approximately 100 gms of a white crystalline powder, which, when analysed, proved to be of the same materials as the main filling but in different proportions.

(c) A black paper packet containing approximately 100 gms of small green crystals which were found to be:

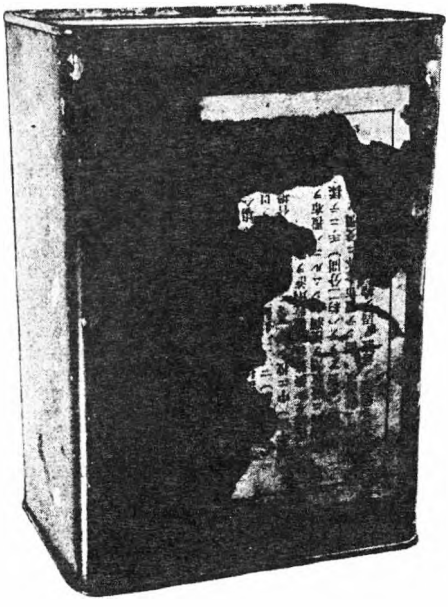
Nickel sulphate	95%
Unaccounted for	5%

In order to impregnate the respirator with the absorbent solution the muzzle or filter pad is immersed in the solution for about four minutes, and is kneaded in with the hand at the same time. After the entire muzzle pad has been saturated the excess solution should be wrung out.

(SOURCE: 2/1 Aust CW Laboratory RAE)

IMPREGNANT FOR HORSE RESPIRATOR

FIG 1 Container



"CAMOTE"
NAVAL CONTACT MINE

1. GENERAL

Specimens of a new type aircraft-laid moored mine of the chemical horn type have been recovered in the Philippines. None has been complete. There is no clue as to the Japanese designation of the mine. The only visible markings were several numbers and the year of manufacture (1944). It is possible, however, that "Camote" is the Type 3 Mk 1 Model 1 aerial mine mentioned in captured documents.

2. DESCRIPTION (Figs 1 -13)

The mine consists of seven distinct parts, viz: (a) Mine Case and Parachute Housing, (b) Horns and Horn Release Mechanism, (c) Detonator and Booster, (d) Base Plate, (e) Hydrostat, (f) Parachute Release Mechanism and Housing Cap, (g) Anchor.

(a) Mine Case and Parachute Housing: The mine shell is constructed of $\frac{1}{4}$ in sheet steel rolled and welded into two cylinders, which in turn are welded together to form the case. The concave base and top pieces are welded to either end of the case. The top piece is recessed within the case, creating a top flange $3\frac{1}{2}$ ins in length. The case is painted black over red lead. On the top centre line of the case 10 ins forward of the base piece weld is a guide stud. The booster release mechanism pocket is located 90° to the right of the stud (looking forward from the base of the mine), while the detonator holder well is 90° to the left of the stud. An inspection hole covered with a bung and keep ring is 11 ins aft of the top flange of the case on the bottom centre line. There are two parachute housing guide studs on the top flange of the case on the top and bottom centre lines, and two slots to receive the latches on the parachute housing are cut in the top flange 90 to 270° around from the top centre line.
The charge case is cylindrical with slightly domed ends and is filled with cast Type 98 Explosive (a mixture of 30 to 40% Hexanitrodiphenylamine and 70 to 60% Trinitroanisol). It is secured to the mine case by brackets, six around the bottom and three near the top. The filling hole is in the bottom above the base plate and is closed by a threaded cap. The booster tube, running from the booster release mechanism pocket to the detonator holder well, passes through the charge case. A terminal board is bolted to the bottom of the charge case.
The circular base plate bed is welded to the base piece of the mine case. It is drilled and tapped to receive the six base plate bolts and the locating pin. A

rubber gasket is set in an annular groove machined around the inner edge of the bed. Four small iron plates with eyes in them are welded to the base piece perpendicular to it and 90° apart. Two anchor eyes are secured to brackets on the base piece but are free to turn in the brackets.

Four horn pockets are recessed in the top piece of the mine case. In the centre of the top piece is a large steel eye pivoted in a forked hub on the top piece by a pin. The notched horn release disc and its coil spring slip over the eye and the hub. Rotation of the release disc due to the spring is limited by two screws in the hub which ride in slots in the disc. The disc is apparently held under spring tension by a safety fork inserted through two holes in the disc and in an angle iron under the disc. There are four brackets on the top piece around the release disc on which the horn extensions rest.

The parachute housing is a light steel cylinder 20 ins long. Two notches 180° apart in the lower end of the housing mate with the lugs on the top of the mine case, while two spring-loaded latches fit through the two slots in the mine case and through similar slots in the housing, locking the two together. There is a hole in each latch to which release lanyards are presumably secured. On the top centre line of the housing is a removable inspection plate and two lengths of rubber cord secured to eyes on the housing. Four triangular stops are welded 90° apart around the inner surface of the housing, and an aluminium band is bolted to the outer end of the housing. Eight green cloth straps with two metal rings in their ends are secured to the band on the inside. Near the top centre line is a recess in the band which might accommodate a push rod housing cap release.

Mine Case Data:

Length of mine and parachute housing (less tail cap)	70 3/4 ins
Length of mine case	52 3/4 ins
Diameter of mine case	23 1/2 ins
Weight of assembled mine (less parachute and tail cap)	600 lbs
Weight of charge (Type 98 Explosive)	240 lbs
Length of charge case	18 1/4 ins
Diameter of charge case	16 1/2 ins
Length of booster can	13-11/16 ins
Diameter of booster can	2-11/16 ins
Weight of booster explosive (picric acid)	1 lb 4 oz

(b) Horns and Horn Release Mechanism: The four horns are of the standard Japanese chemical type and screw (left-hand threads) into the four pockets in the top piece of the mine case. Standard horn cups are set in the pockets under the horns. Each horn is fitted with a folding horn extension. A split collar fits around each horn and threads into the base of the horn extension body. Annular grooves in the inner face of the collar mate with the ribbing on the lead horn and hold the latter securely in the horn extension body. The horn extension is a rounded spike hinged to the extension body by a pin. A coil spring on the ends of the pin is secured by screws to the horn extension body and bears against the horn extension, tending to move the extension to the upright position. A spring-loaded plunger in the horn extension fits into a hole in the top of the horn extension body when the horn extension is upright and

locks it in that position.
In the unarmed state the horn extensions are folded over and are held against the tension of the coil spring under the horn release disc. When the safety fork in the disc is pulled out, the disc spring causes the disc to rotate until the knotches in the disc are presented to the horn extensions. The extensions are then free to move upward and outward. When they reach the upright and armed position, the spring-loaded plunger moves into the hole in the extension body, locking the extensions in the armed position where they protrude above and out from the top flange of the mine case. Then, sufficient pressure on the horn extension will crush the chemical horn below it and explode the mine.

(c) Detonator and Booster: The detonator and booster mechanisms are very similar to those of the K-2 Drifting Mine. The detonator holder is identical and the detonator and carrier are standard electric Type 91.
The booster release mechanism is hydrostatically operated instead of spring operated (K-2 Mine). For that reason the release groove is cut in the top instead of the bottom of the booster release sleeve. Water pressure moves the sleeve inward, compressing the booster release spring until the balls can move into the groove in the release sleeve and free the spring-loaded booster. In the K-2 booster release the release spring drives the release sleeve upward until the balls are released.
There is no release key and threaded cap on the "Camote" booster release. The cover plate with four water entry holes in it fits loosely over the release spindle and compresses the rubber diaphragm against the top of the release mechanism body. The mechanism is held in its pocket by a keep ring bearing against the cover plate. Outside of these differences, and the slightly different dimensions of the mechanism housing, the booster release mechanism is identical with that of the K-2.
The booster is similar to the Type 93 booster but smaller. The booster spindle threads into a plug in one end of the booster can. A raised shoulder on the other end will catch the two leaf spring locking detents on the detonator holder when the booster houses itself on the detonator. The booster explosive consists of three paper-wrapped blocks of granular picric acid.

(d) Base Plate: The base plate is a heavy circular steel casting, incorporating a lever system and mooring switch which resembles those of the British Mk XIV base plate. The mooring chain is secured by a shackle to the mooring lever on the outer face of the plate. One end of this lever is secured to the rocker arm by a nut and cotter pin. The other slips into a rectangular hole in the safety spindle.
The safety spindle fits in a housing which is an integral part of the base plate casting. The soluble plug housing is bolted on tothe outer face of the base plate directly below the safety spindle housing. The mooring lever spring is located around the safety spindle, between a nut on the upper end of the spindle and the upper end of the soluble plug housing, so that it tends to resist downward movement of the safety spindle and mooring lever. The soluble plug piston fits snugly in the soluble plug housing and bears on the lower end of the safety spindle. Below the piston in the housing is

a soluble plug and the perforated closing plug. The piston will prevent downward motion of the mooring lever until the soluble plug dissolves.
The rocker arm is pivoted in the base plate by means of a ball and socket joint. A hemispherically shaped shoulder is turned out of the lower part of the rocker arm. A hemispherical collar secured on the rocker arm bears against the flat top of the shoulder and is secured by a nut. The upper half of the socket is formed by the bearing surface on the base plate on which the shoulder rests. A socket plate slips over the lower end of the rocker arm and fits over the curved surface of the collar. A cap below the socket plate threads onto the base plate.
The mooring switch consists of two pairs of spring contacts secured to the mooring switch shaft. There are also two pairs of button contacts connected to terminals mounted on the switch. Either a plastic or a light metal cover protects the switch contacts. A crank is splined to the mooring switch shaft and a connecting rod joins the upper ends of the crank and the rocker arm. Rotation of the mooring switch shaft causes each pair of spring contacts to close a double break in the circuit between the horns and the detonator by bridging the two pairs of button contacts.

(e) Hydrostat: The mooring hydrostat is bolted to the base plate. It is made up of three assemblies; the depth setting, hydrostat, and release gear. The last consists of a spur gear to which a setting dial is attached. The dial is graduated from 1 to 10, presumably in metres. The gear and dial are secured in the side of the depth setting mechanism body by a bolt and nut. The depth setting mechanism body threads on to the depth setting mechanism flange which is in turn bolted to the hydrostat body. The depth setting spindle passes through the depth setting mechanism body and flange and into the hydrostat body. A shoulder on the spindle prevents it from moving upward through the flange. Leather packing in the upper face of the flange is compressed around the spindle by a steel washer and a collar which threads into the flange. A worm gear meshing with the depth setting spur gear is splined to the spindle above the collar and is held in place by a nut. The top of the spindle protrudes through the closing plug in the depth mechanism body and is square in shape in order to facilitate depth setting.
The lower portion of the depth setting spindle is threaded to receive the depth setting collar. This collar is keyed to the inner face of the hydrostat body. The hydrostat piston is a well machined steel disc fitting snugly in an enlarged section in the base of the hydrostat body. The depth spring slips around the spindle between the depth setting collar and the piston. The hydrostat body is bolted to the release mechanism body. A release coupling screws into the base of the hydrostatic piston. The diaphragm between the coupling and the piston is compressed between the hydrostat and release mechanism bodies. The release lever and release hook are pivoted in the release mechanism body by means of two pins. One end of the release lever is forked and fits around the bottom of the release coupling. Two screws, one in each of the two forks of the release lever, ride in an annular groove in the release coupling and thus create a rocking joint. A roller on the other

end of the release lever bears against a projection on the release hook when the forked end of the lever is up in the locking position. The end of the release hook rests on the release mechanism body and is prevented from opening by the release lever. A safety pin with a pulley on its lower end threads through the base of the release mechanism and fits in a socket in the bottom of the release coupling, holding the coupling and the release lever up in the locking position. A length of line is secured to and wound around the pulley. It is believed that the other end is secured to the mine anchor.

Depth setting is accomplished by turning the square end of the setting spindle to the left. As the spindle rotates the setting collar moves down the threads of the spindle putting compression on the depth spring. At the same time the worm on the spindle turns the spur gear and the depth setting indicator dial. The force of the depth spring against the upper face of the piston tends to push the piston, the coupling, and the forked end of the release lever down, freeing the release hook. Water pressure working on the lower face of the piston tends to move it and the lever upward, locking the release hook closed.

The release lever and hook are locked closed by the safety pin until the mine and anchor reach the bottom. As the mine case rises after its release from the anchor, the safety pin is unscrewed; but the high water pressure at the bottom keeps the hydrostat locked. The mine case rises until water pressure decreases enough to be overcome by spring pressure, at which point the piston is driven down by the spring, pivoting the release lever and lifting the roller on the release lever free of the projection on the release hook. The hook opens and the mine moors itself.

The depth at which the hydrostat operates (i.e. the depth setting) depends on the amount of compression on the depth spring. As the compression increases, the amount of water pressure the spring can overcome also increases. In other words, greater compression on the spring will permit the hydrostat to open at deeper depths. Hence the spring is compressed to increase the depth setting.

(f) Parachute Release Mechanism and Housing Cap: The parachute release mechanism is hydrostatic in operation. Two jaws are pivoted so that they fit around the eye on the top piece of the mine case when their other ends are held apart by the hydrostatic spindle. The spindle is threaded to a hydrostatic piston fitting snugly within the mechanism housing. A spring between the piston and the end of the housing tends to keep the spindle between the ends of the jaws.

The jaw end of the release mechanism is secured to the mine, while the other is shackled to the shroud ring of the parachute. Fragments of braided parachute shroud found at Cavite were very similar to the shrouds used on the US Mk 12 Mod 1 Mine. Lanyards shackled to the jaw pivot are secured to the latches on the parachute housing and presumably to the horn release safety fork.

Lightaluminium fragments of the parachute housing cap show it to be hemispherical in shape. It is secured to the parachute housing by a duralumin band. Two annular

grooves in the band fit in similar grooves in the cap and in the end of the parachute housing. Two lengths of bungee cord around the band hold it tight around the ends of the parachute housing and the cap. The ends of the cord are secured to two clips which slip over two toggles secured loosely on the band. The outer ends of the toggles are held together by some type of safety fork.
It is believed that a spring loaded plunger on the cap fits in the recess on the housing.

(g) Anchor: The anchor is composed of two parts, the base and the body, which are joined together by large screws. The base is a thick heavy steel casting with four legs around the body. The mooring cable drum is mounted on a pedestal bearing inside the base. Two spring brakes, adjustable from the outside, bear against the bottom of the drum. A screened water entry hole is located in the bottom of the base casting.
When the mine is laid by aircraft, a light metal dome is secured to the bottom of the anchor. The dome is used to control the flight characteristic in the air and protects the anchor upon impact with the water. The dome is sealed across the open end but has several holes which permit the dome to sink when released from the anchor. A plate with a pin in it is bolted to the anchor. This pin fits in a hole in the edge of the dome. One hundred and eighty degrees around the dome is another hole through which a cotter pin is inserted into one of the anchor legs. The pin is apparently pulled out by a short lanyard when the mine is dropped from the plane. Several eyes on the dome and a tapped hole in the anchor leg indicate that part of the dome release mechanism is missing.
The cross member mounting the drum locking mechanism is bolted to two heavy brackets located 180° apart on the inside of the base casting of the anchor. In one bracket is a pulley fairlead for the mooring cable. The pawl shaft is mounted vertically with the lower end fitted in a bearing in the other bracket. The pawl is secured to its shaft below the cross member opposite to the ratchet on the top of the mooring drum. The pawl release collar is pinned to the upper end of the pawl shaft above the cross member. It is notched to receive the end of the pawl release arm and is secured to a coil spring which tends to rotate the collar, shaft, and pawl counter-clockwise.
The pawl release arm is pivoted on the upper side of the cross member. One end fits in the notch in the pawl release collar, holding the pawl away from the ratchet on the mooring cable drum. On the other end of the release arm is a mooring cable fairlead so positioned that tension on the cable tends to hold the fairlead up and the other end of the release arm down in the notch in the collar. A coil spring tends to lift the end of the arm out of the notch in the collar.
The mooring cable drum shaft protrudes through the cross member under the fairlead on the pawl release arm. The notched hold-off nut threads on to this shaft. Rotation of the nut is prevented by a thumb screw. The spring-loaded locking plunger fits in a hole in the pawl release arm and in that position locks the end of the release arm in the notch in the release collar. The plunger is linked to a metal vane which is located directly above the water inlet in the bottom of the anchor.

The mooring cable is coiled on the drum. One end is secured to the drum. The other passes up through the fairlead in the cross member bracket, through a fairlead on the cross member to the pulley on the pawl release arm, and then is shackled to the mooring bridle on the base plate. Some type of ring near the upper end of the cable is locked within the jaws of the hydrostat on the base plate, leaving a loose bight of cable between the ring in the hydrostat and the upper end of the cable.

The body of the anchor is a cylindrical piece fitting snugly on the bottom of the mine. Two identical mine release mechanisms are screwed to the inside of the body 180° apart. These are composed of two release hooks controlled by soluble plugs and spring dash pots. The hooks are pivoted on a brass casting bolted to the anchor body and slip through the anchor eyes on the base of the mine case. The upper part of the casting is machined to form a cylinder into which the piston is fitted. The piston is hollow and houses a spring which is compressed against the cap on the cylinder.

The soluble plug mechanism is located in a sleeve in the bottom of the casting. The sleeve protrudes through the anchor body so that the soluble plug is accessible from the outside. A jaw is pivoted on the lower end of each release hook. A similar jaw attached to a spindle fits snugly in the sleeve and grips the jaw on the release hook when both jaws are in the sleeve. In this position the hook will engage the anchor eyes on the mine case.

The locking piece and soluble plug slip over the jaw spindle in the sleeve and are held there by the soluble plug retaining washer and nut. A bell crank connected by a linkage to the dash-pot piston rests in a "V" groove cut in the locking piece and prevents the latter from moving within the sleeve.

Anchor Data:

Length	28 ins
Diameter	23¾ ins
Weight in Air	610 lbs

3. OPERATION

When the mine is released from the plane, the fork secured to the toggles on the band around the parachute housing is pulled. This releases the clips and loosens the bungee cords and release band. The cap, aided by the spring-loaded plunger, flies off, pulling the parachute out of the housing.

The anchor dome is separated from the anchor after the mine hits the water. As the mine sinks, water pressure forces the hydrostatic spindle and piston of the parachute release mechanism inward. The spindle moves out from between the jaws, and the jaws open, releasing the parachute from the mine. The lanyards from the parachute release to the latches on the parachute housing and to the horn safety fork are pulled. The parachute housing drops off the mine, and the horn extensions spring out into the armed position. The mine and anchor continue to sink to the bottom. Water flowing into the anchor

through the bottom moves the spring-loaded vane upward, driving the locking plunger into the hole in the release arm.
When the soluble plugs dissolve, tension from the buoyant mine on the release hooks causes them to rotate, pulling the two pairs of jaws out of the sleeves in the mine release mechanisms. The jaw pivoted on the hooks drops free, and the release hooks rotate clear of the anchor eyes. The mine case rises and starts to unreel the mooring cable. As the mooring cable drum rotates, the hold-off nut threads down the drum spindle until the notch in the nut is clear of the thumb screw, and, at the same time, a strain is taken on the cable. This tension holds the fairlead on the release arm up after the hold-off nut has moved down out of contact with the release arm. In the meantime the locking plunger has been withdrawn from the release arm by its spring. The hydrostat on the mine base plate will release the bight in the mooring cable when the mine case reaches the depth set on the hydrostat. The resulting momentary slack in the mooring cable allows the spring on the pawl release arm to force the fairlead end of the arm down. The other end is lifted out of the notch in the pawl release collar. The collar, pawl shaft, and pawl are rotated counter-clockwise by the pawl shaft spring until one end of the pawl engages the mooring cable drum ratchet, preventing further unreeling of mooring cable. The mine is now moored and will be armed as soon as the mooring switch in the base plate is closed.

4. RENDERING SAFE PROCEDURE

(i) Check the position of the mooring lever. If the end of this is resting on the top of the soluble plug housing, the mooring switch is open and the mine is comparatively safe to work.

(ii) Remove the detonator cover nut (rolling the mine from a distance if necessary) and thread an 8-32 machine screw into the hole in the base of the detonator carrier. Remove the carrier froma distance. This can be accomplished if the mine is new or is dry inside the detonator holder. In most cases the plastic carrier will be stuck fast due to swelling and corrosion.

(iii) If the carrier will not come out, break the detonator circuit by inserting slivers of wood or cardboard between the two spring contacts in the detonator holder and the two button contacts on the detonator carrier.

(iv) Unscrew the detonator holder keep ring. The booster spring will tend to push the holder out of its pocket. To prevent this, hold the detonator holder down with one hand and remove the keep ring with the other. When the keep ring has been removed place or lean a weight of at least 25 lbs against the holder. This is easy to do because the detonator cover is flush with the mine case.

(v) Remove the weight from a distance. The holder should move out from the pocket. Unscrew the two leads from the detonator terminal board (or cut them and tape all bare wires) and lift out the holder. The booster, attached to the holder by the leaf spring detents, will come out with it. Separate the booster and detonator holder.

(vi) Unbolt and remove the base plate from a distance. Unscrew or cut the base plate leads.

(vii) Unscrew the horns and horn extensions. Due to the extensions these horns are much easier to break than the ordinary chemical horn.

(viii) The explosive charge can be steamed out through the filling hole in the bottom of the charge case.

5. CONCLUSIONS

The design of the mine release mechanism in the anchor is puzzling. The only purpose served by the dashpots and bell-cranks is to lock the release hooks until the soluble plugs dissolve. No shock-absorbing or damping action could be observed. It is believed either that the rig found in the anchors is a modification of an unsatisfactory release mechanism or that some of the parts of the mine release have yet to be recovered. It is possible that the mine release assembly was originally designed to separate the anchor and mine before they hit bottom by means of a dashpot delay. This would explain the spring-loaded locking plunger and flap which would serve to insure that the anchor did not pawl before reaching bottom. With the soluble plug mine release there is no reason for the presence of the locking plunger device.
A "Camote" found at Cavite and Zamboanga had been rigged for surface rather than aircraft laying. At Cavite a barge equipped with a hoist and two rails was so employed. The rails were positioned so that the mines could be pushed over the stern. A report from Lingayen Gulf described the dropping in the bay of a bomb-like object attached to a white parachute. This was probably a "Camote", but mine sweepers found no trace of the mine.

(SOURCE: MEIU NO 1)

CAMOTE

NAVAL CONTACT MINE

NOMENCLATURE LIST

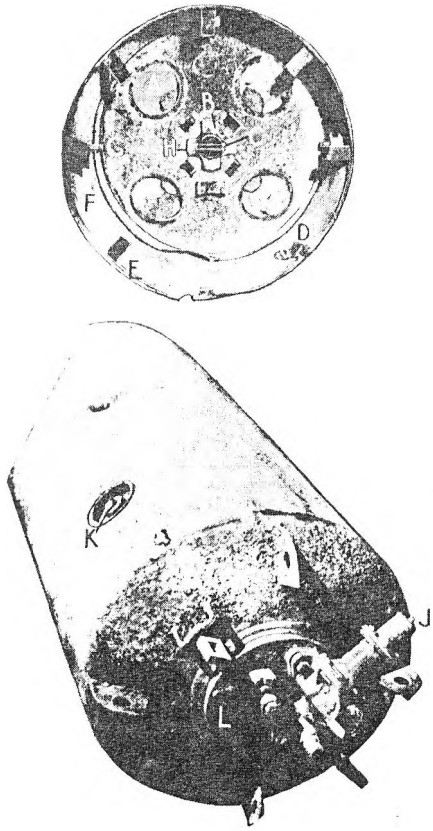
1. Parachute Housing Cap Release Band
2. Clip
3. Toggles
4. Bungee Cord
5. Parachute Housing
6. Mine Case
7. Detonator Holder Well
8. Anchor
9. Soluble Plug Retaining Nut
10. Anchor Dome
11. Dome Release Pin
12. Parachute Release Jaws
13. Hydrostatic Piston and Spindle
14. Lanyard to Parachute Housing Latch
15. Hydrostat Release Hook
16. Mooring Cable Secured to the Mooring Lever
17. Mooring Cable
18. Mooring Cable Drum Ratchet
19. Pawl
20. Pawl Shaft
21. Pawl Release Arm
22. Fairlead on Pawl Release Arm
23. Pawl Release Arm Spring
24. Locking Plunger Hole
25. Pawl Shaft Spring
26. Pawl Release Collar
27. Hold-off Nut
28. Dashpot Cylinder
29. Cylinder Cap
30. Piston Spring
31. Piston
32. Mine Release Hook
33. Bell Crank
34. Release Hook Jaw
35. Sleeve
36. Locking Piece
37. Soluble Plug
38. Jaw Spindle
39. Water Inlet
40. Spring Brakes
41. Mooring Cable Drum Shaft
42. Cross Member
43. Cross Member Bracket
44. Locking Plunger
45. Locking Plunger Vane
46. Thumb Screw
47. Fairlead on Cross Member
48. Mooring Cable Drum

"CAMOTE"
NAVAL CONTACT MINE

FIG I Mine adrift

"CAMOTE"
NAVAL CONTACT MINE

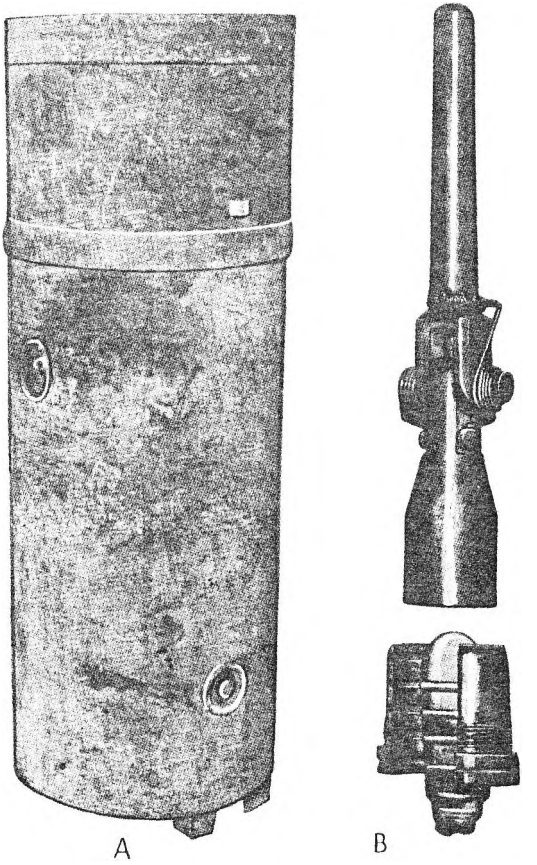
FIG 2 Top and bottom views



A Horn pocket
B Safety fork hole
C Eye
D Cloth strap
E Aluminium band
F Parachute housing
G Spring latch
H Horn release disc
J Hydrostat
K Detonator holder
L Base plate

"CAMOTE"
NAVAL CONTACT MINE

FIG 3 Side view

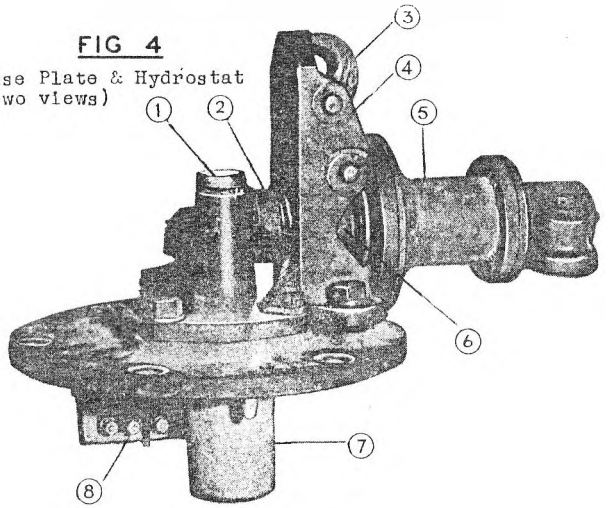


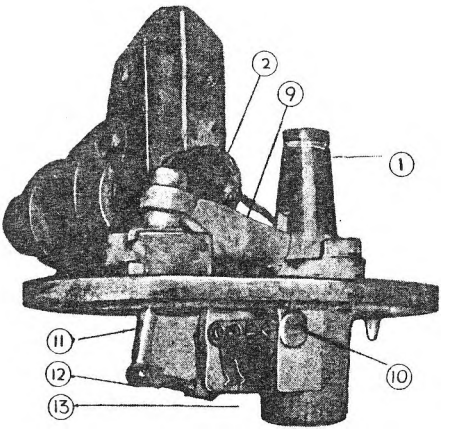
A Side view
B Horn extension mechanism

"CAMOTE"
NAVAL CONTACT MINE

FIG 4

Base Plate & Hydrostat
(two views)





1 Soluble plug housing
2 Safety pin
3 Release hook
4 Release mechanism body
5 Hydrostat body
6 Release lever
7 Safety spindle housing
8 Mooring switch terminals
9 Mooring lever
10 Mooring switch shaft
11 Rocker arm
12 Connecting rod
13 Mooring switch contacts

"CAMOTE"
NAVAL CONTACT MINE

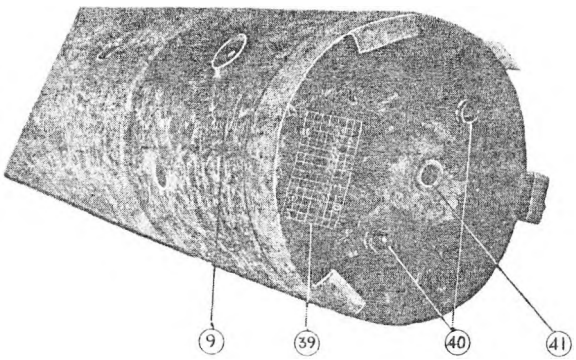


Fig 5 Base view of anchor

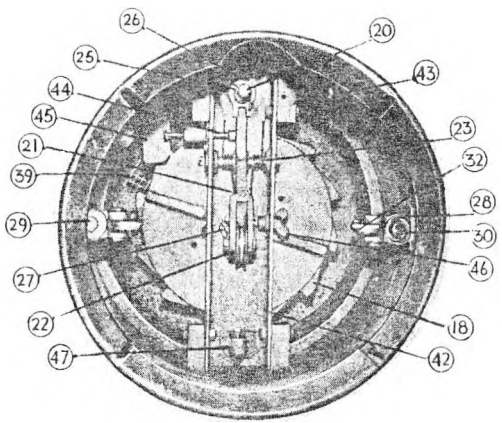
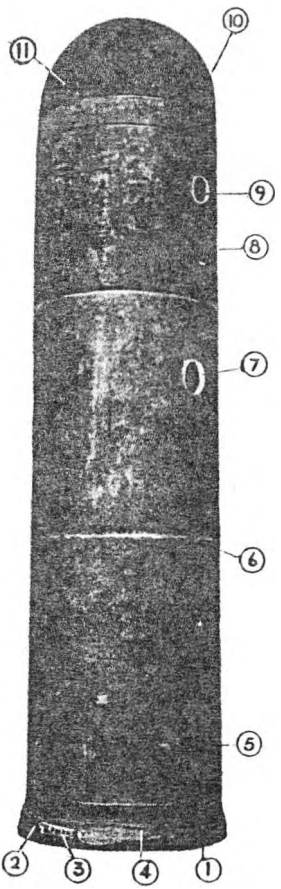


Fig 6 Top view of anchor

"CAMOTE"
NAVAL CONTACT MINE

FIG 7 Side view of anchor



"CAMOTE"
NAVAL CONTACT MINE

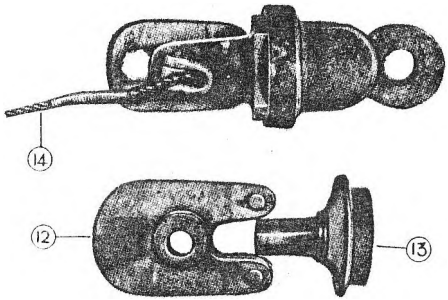


Fig 8 Parachute Release Mechanism

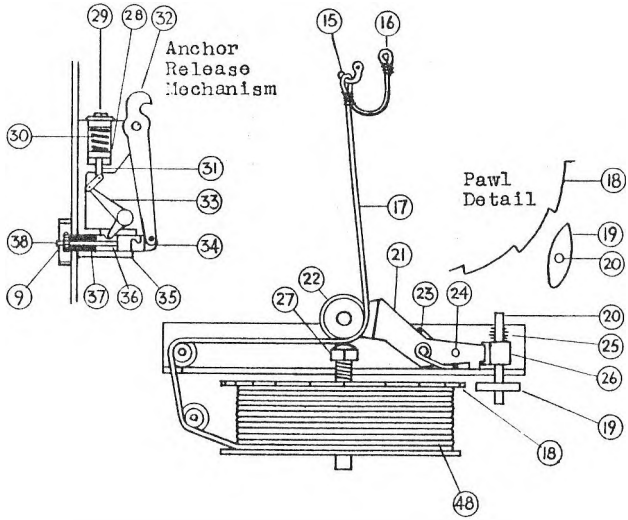
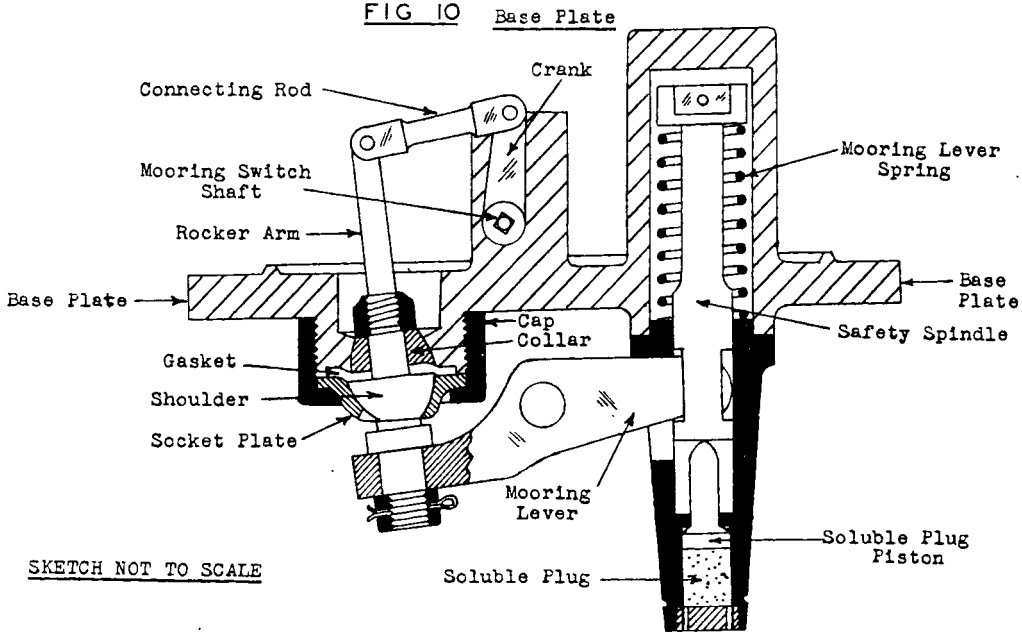


Fig 9 Schematic drawing of Anchor

"CAMOTE" NAVAL CONTACT MINE

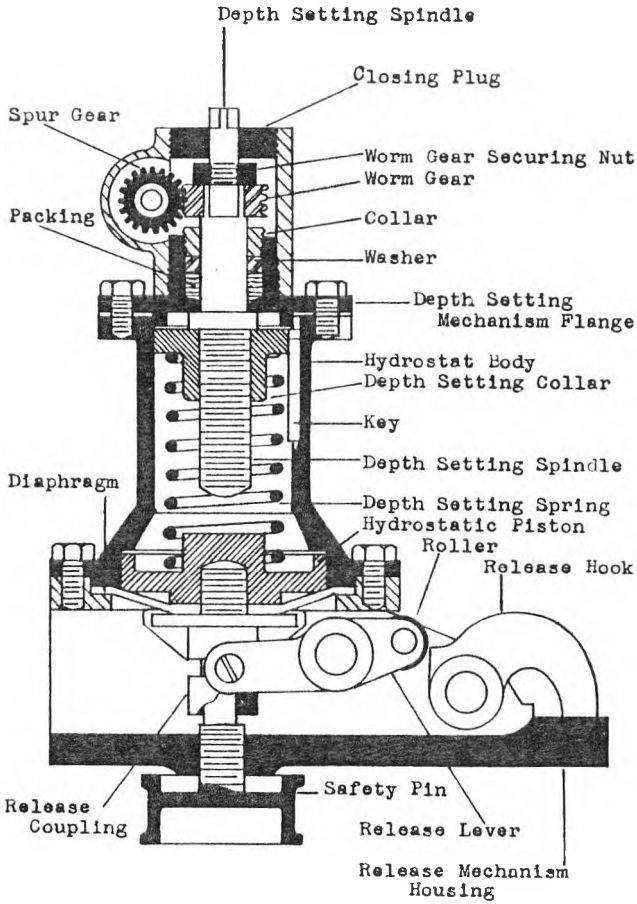
FIG 10



SKETCH NOT TO SCALE

"CAMOTE"
NAVAL CONTACT MINE

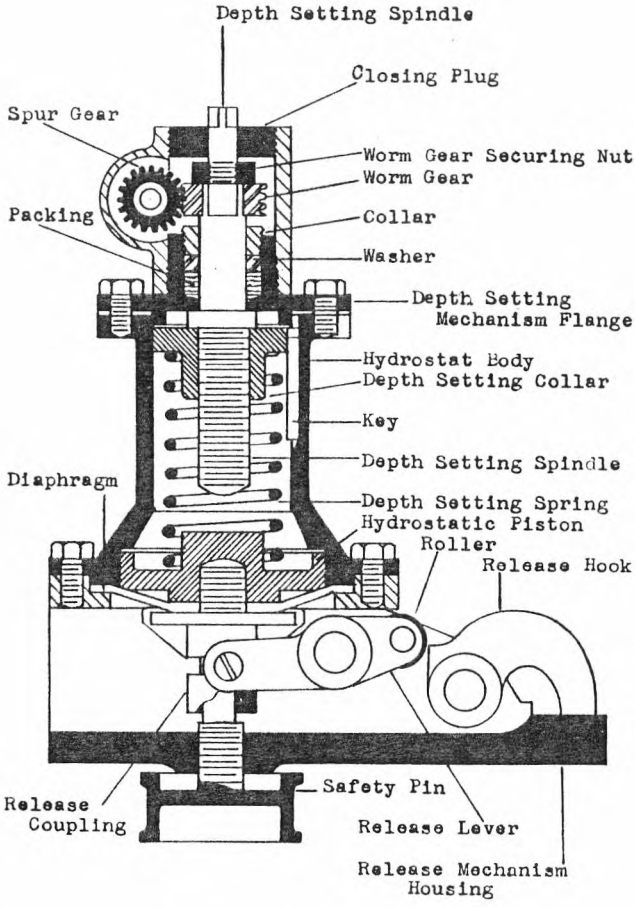
FIG II Mooring hydrostat.



SKETCH NOT TO SCALE

"CAMOTE"
NAVAL CONTACT MINE

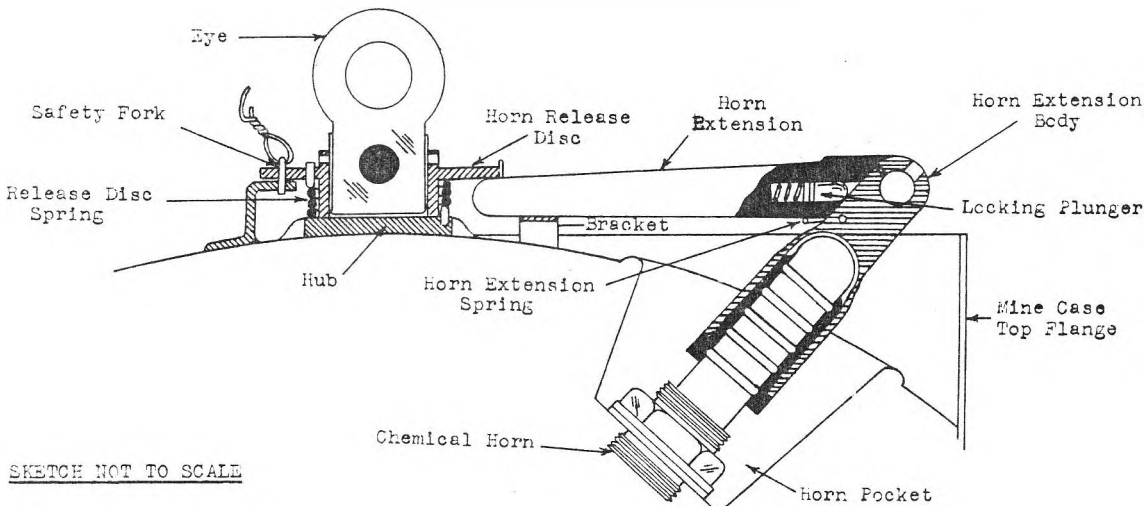
FIG II Mooring hydrostat.



SKETCH NOT TO SCALE

"CAMOTE" NAVAL CONTACT MINE

FIG 13 Horn extension & Release mechanism



SKETCH NOT TO SCALE