COPY No. 178

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AUSTRALIAN MILITARY FORCES

TECHNICAL INTELLIGENCE SUMMARY

No. 20

COMPILED DECEMBER 1944

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

AUSTRALIAN MILITARY FORCES
TECHNICAL INTELLIGENCE SUMMARY
No. 20
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JAPANESE EQUIPMENT

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47 MM TK/A GUN MODEL 1
TELESCOPIC SIGHT

1. GENERAL.

This sighting equipment is used with the 47 mm Model 1 Tk A Gun described in AMF Technical Intelligence Summary No 11.

2. DESCRIPTION (figs 1 - 4)

The two main components consist of the telescope and telescope mount.

(a) Telescope. The reticle pattern consists of a vertical and horizontal mil scale on each side of an inverted "V". The erecting system consists of two 90 degrees prisms fastened to the base of a porro prism.

General characteristics of the telescope are as follows:-

Power	4 diameters
Field of view	7 degrees
Diameter of entrance pupil	.75 in.
" " exit pupil	.187 in.
Deviation of light in horizontal plane	7/8 in.

(b) Telescope Mount. The telescope adjusting bracket and range cam are located on the left-hand side. The bracket consists of the female portion of a dovetail and a lever for locking the telescope in place. The range setting mechanism is mounted on a bracket attached to the right side of the sleigh, the telescope mount proper is attached to a bracket on the left side of the sleigh and a shaft fitting over the top of the gun connects the two parts.

Operation of the range handwheel rotates the range drum and cam of the telescope mount. The range drum has two scales engraved about its periphery; one scale is graduated from 0 to 3000 metres and the other is graduated in increments of one mil from 0 to 356 mils.

The telescope adapting bracket is connected to the range cam by means of a pin that mates with a projecting lip on the right side of the cam. The cam is cut to conform to the ballistics of the projectile.

Thus, setting the range drum to the desired range causes the telescope to be moved through an angle equal and opposite to the super-elevation angle.

Quadrant elevation is introduced by placing the apex of the inverted "V" of the reticle on the target.

A deflection mechanism is located immediately below the telescope adapting bracket. The scale is

graduated in 2 mil intervals from 50 to 150; 100 mils represents normal or zero deflection.

3. REMARKS.

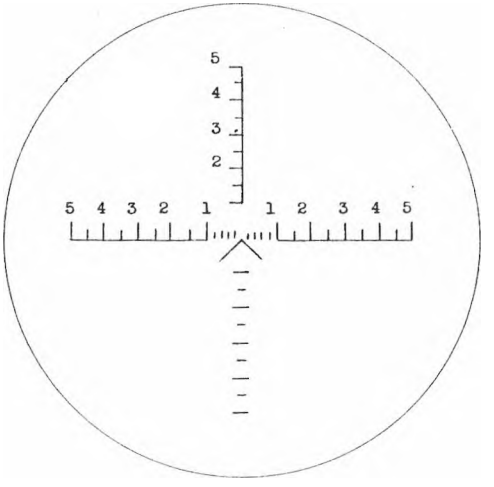
The telescope appears to be well built, but there is nothing exceptional in its design. The method of employing one man to set range leaves the gunner free to track the target and fire the weapon. The reticle design presents many extra markings in the field of view that may confuse the gunner when tracking an obscure target.

Source :- Aberdeen Proving Ground.

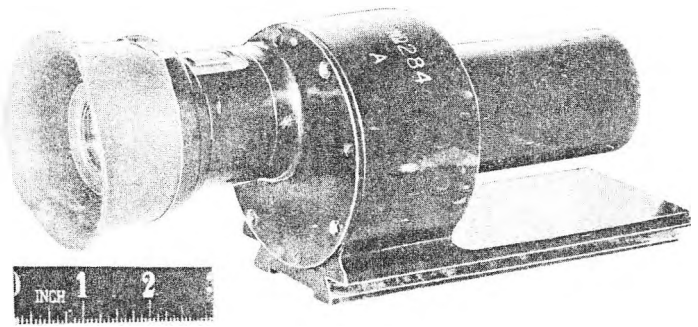
47 MM TK/A GUN MODEL 1

TELESCOPIC SIGHT

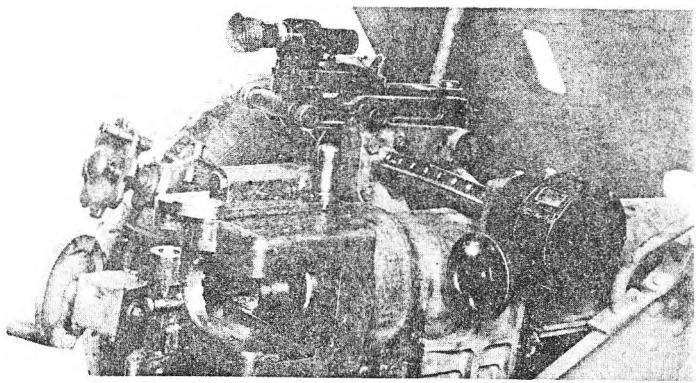
FIG 1 Reticle Pattern



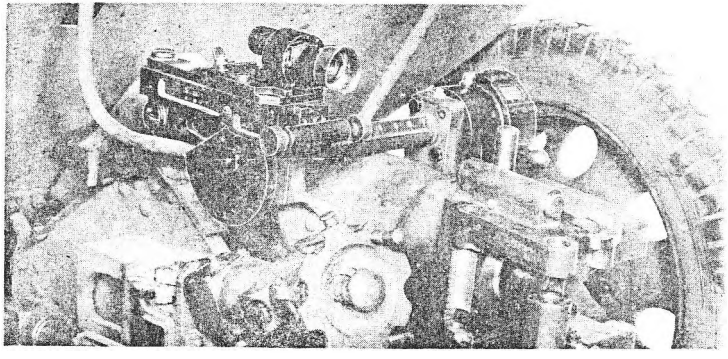
47 MM TK/A GUN MODEL I TELESCOPIC SIGHT FIG 2



47 MM TK/A GUN MODEL I TELESCOPIC SIGHT FIG 3



47 MM TK/A GUN MODEL I TELESCOPIC SIGHT FIG 4



GLASS INCENDIARY HAND GRENADE

1. GENERAL:

This grenade consists of a 300 cc green glass bottle closed with a crown cork and contains a colourless viscous liquid. Attached to the base of the bottle by a series of straps is a flat circular glass container filled with reddish black crystals. The grenade is stored in a tubular container with a separate compartment in the lid for the circular glass container. The specimens examined were recovered on Leyte Island, Philippines Group.

2. DESCRIPTION:(figs 1-4)

The grenade has the following components; (a) container, (b) ripcord, (c) carrying tape (d) bottle (e) igniter capsule and (f) mounting straps.

(a) Container. Various cardboard shapes have been made up to protect the bottle and igniter from damage. The pieces form a box to include the igniter capsule, which is further protected by felt pads.

(b) Ripcord. This component consists of a 45 cm length of 1 mm diameter twisted cotton and serves to cut the paper sealing band to allow removal of the lid.

(c) Carrying Tape. This consists of a 60 cm length of 2 cm wide herringbone weave cotton tape.

(d) Bottle. This part is made of green glass, has a capacity of 300 ml and is closed with a crown seal. The label attached reads, "Hand Incendiary Grenade". Moulded in the glass with raised characters is the following translation "Kirwin Brewery Coy Ltd., Registered Trade Mark". A clear white glass bottle is used as an alternative to the above. In this case, the moulded inscription is in English and the label carries the additional information "Manufactured August 1943 , Sagami Naval Arsenal". In each case, the bottle is filled to within 3 cm of the top with a 15% (by weight) solution of probable polymethyl methacrylate in benzene. The identity of this substance was assumed as a result of differential solubilities as compared with a laboratory sample of perspex. The viscosity of the filling at 29°C is 3.7 poises.

(e) Igniter Capsule. The glass container consists of two glass mouldings, similar to Petri dishes, fitting one within the other, and secured by cement. The container holds 26 gms of dark, reddish irregularly shaped lumps of phosphorus which ignite on slight friction. This phosphorus is the black variety described by Mellor Vol VIII p.748. The phosphorus content was estimated

by the procedure recommended by Scott Vol I p.694. The conversion of the phosphoric acid to the ortho form by heating with nitric acid apparently does not achieve complete conversion as the percentages obtained in six estimations varied considerably, the highest being 95%. In the form received the apparent density is 1.3 gm/cc while after crushing the density is 2.06 gms/cc indicating that the substance is slightly porous. The density given by Mellor for black phosphorus is 2.69 gm/cc. The sample is a good conductor of electricity, which property is peculiar to the black variety. The lid of the capsule bears a label with ideographs which, translated, read "Incendiary Hand Grenade - Ignition Capsule".

(f) Mounting Straps. Seven pieces of green rubberized fabric 2 cm wide 0.5 mm thick. One piece of green rubber, 0.8 cm wide, 0.5 mm thick and one piece of chocolate coloured rubber 2 cm wide 1 mm thick are stitched together to form a frog, enclosing the bottle and holding the igniter capsule in place against the base of the bottle. Final adjustment for tension on the capsule is made by means of the adjustable strap passing through a plastic buckle. In the clear model the harness was constructed of canvas strap and had largely perished.

(g) General Weights and Dimensions.

Weights.

Complete as packed	1327 gm	(2 lb	12 oz)
Bottle (filled)	750 gm	(1 lb	10½ oz)
Inflammable liquid	269 gm	(-	9½ oz)
Igniter	58 gm	(-	2 oz)
Igniter compound	26 gm	(-	1 oz)

Dimensions.	Length		Diam	
Container	34	cm (13⅜")	9 cm	(3⅝")
Lid	9.8	cm (4⅛")	9 cm	(3⅝")
Inner tube	31	cm (12¼")	8.6 cm	(3⅜")
Packing piece	5.5	cm (2¼")	7.9 cm	(3¼")
Packing piece disc depth	0.4	cm (⅛")	7.9 cm	(3¼")
Central hole			3 cm	(1¼")
Igniter case lid	2.5	cm (1")	7.7 cm	(3-3/16")
Igniter case body	2.2	cm (⅞")	6.5 cm	(2⅝")
Packing discs (6)	8 cm diam			(3⅛")
Base packing ring	8 cm outer diam, height 2 cm			(3⅛ in, ¾ in)
Felt Pads	5 cm sq, 0.3 cm thick			(2 in, ⅛ in)
Carrying tape	68 cm long, 2 cm wide			(26¾ in, ¾ in)
Ripcord	45 cm long, 0.1 cm diam			(17¾ in, 1/16 in)
Bottle	25 cm high, 6 cm diam			(9¾ in, 2⅜ in)
Igniter capsule	1.7 cm high, 6 cm diam.			(⅝ in, 2⅜ in)

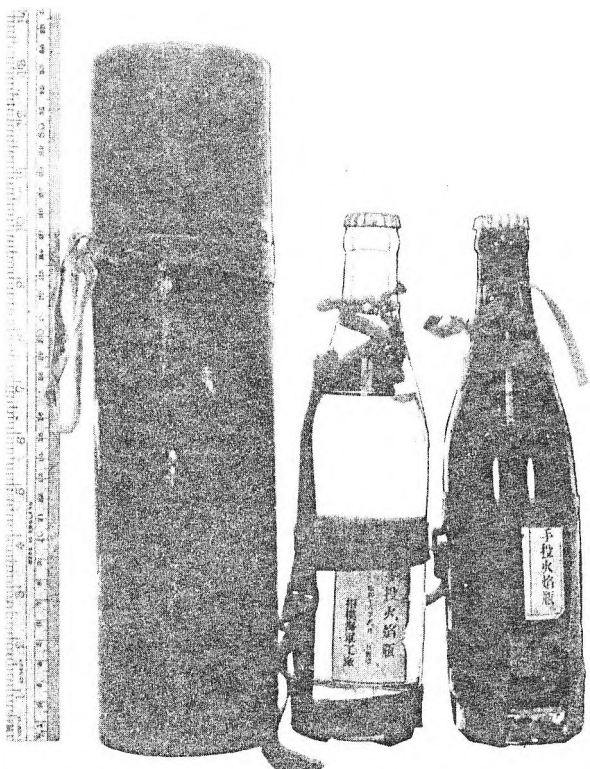
(h) Function. The igniter capsule is secured in position and the grenade thrown forcibly against a hard target. The bottle and capsule are shattered, and the friction between the pieces of phosphorus gives rise to instant ignition of the inflammable filling. The viscous nature of the filling prevents undue splashing and ensures adherence to the target. On actual trial it was found that the lateral spread of filling was about four feet and that, when functioned above ground level, most of the filling burnt at the point of impact. It was noted also that the rubberized harness itself had good incendiary properties and continued burning after the main filling was exhausted.

Another effect was that as the filling burnt from the surface of pieces of the phosphorus the latter burst into flames, accompanied by considerable spluttering and spreading of burning phosphorus. Actual burning times observed were: filling 75 secs, phosphorus 90 secs, rubber harness 3 minutes.

(SOURCE: 2/1 Aust CW Laboratory RAE)

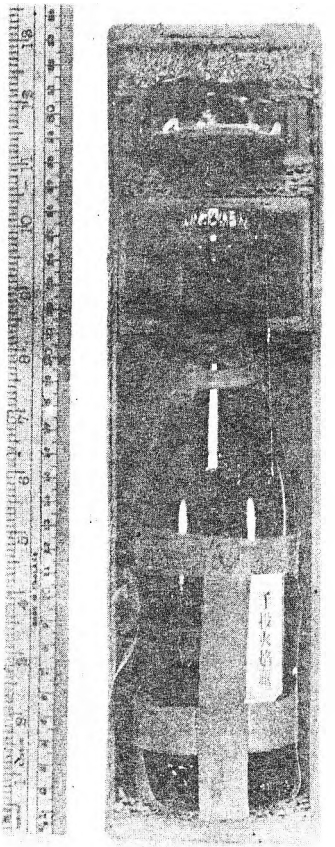
GLASS INCENDIARY HAND GRENADE

FIG 1 Container and Bottles with Different Harnesses



GLASS INCENDIARY HAND GRENADE

FIG 2 Showing Packing in Section.



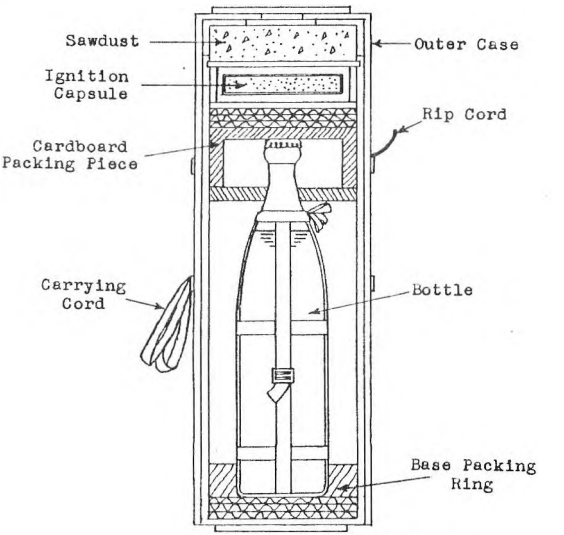
GLASS INCENDIARY HAND GRENADE

FIG 3 Components

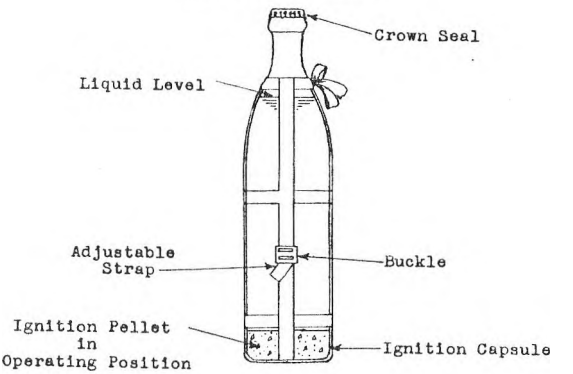
(A) Container Lid. (B) Container Body. (C) Cardboard Shape. (D) Part of Box for Ignitor Capsule. (E) Card--board Protector. (F) Ignitor Capsule. (G) Protector. (H) Part of D. (J) & (K) Cardboard Discs & Shape. (L) Bottle. (M) Straps. (N) & (O) Cardboard Protectors.

GLASS INCENDIARY HAND GRENADE

FIG 4



SECTION OF GRENADE



BOTTLE

SCALE 0 1 2 3 4 5 6 INCHES

NAVY TYPE 3 'FLOWER POT' LAND MINE

1. GENERAL.

The outstanding feature of this mine is that the mine case is made of terra-cotta and the majority of the fuse assembly is made of non-ferrous materials, thus probably rendering it impossible to locate with a magnetic type of detector. According to information received, there is a larger type of similar mine in existence. The dimensions of the larger type are given as 270 mm in diameter and the same height as the smaller type reported herein. The weight of explosive in the larger mine is given as 6½ lb.
The mine examined was recovered on Leyte Island, Philippines Group.

2. DESCRIPTION (figs. 1 - 4).

The mines are packed five to a box with five fuses in individual cardboard containers in one end of the box together with a spool of cotton trip cord. The mine consists basically of an explosive filled case and fuse.

(a) Mine Case.

The case is made of earth-coloured terra cotta with a thin dull glaze on the outer surface and a highly glazed surface on the inside. It appears to be moisture proof, as a rubber fuse seat is sealed in place. However, instructions on the outside of the packing box are :- "Do not plant in damp ground." A light rubber bag inside the mine contains the Type 88 explosive filler with composition as follows :

Ammonium Perchlorate	66%
Silicon Carbide	16%
Wood Pulp	12%
Oil	6%
	100%

This explosive is a loose gray powder which is dangerous to burn and sensitive to friction.

(Details of type 88 explosive from E in C. BD LIQ).

Information received indicates that the bursting charge might also be either :-

	Ammonium Nitrate	50%
	TNT	50%
		100%
or	Ammonium Nitrate	90%
	Dinitronaphthalene	10%
		100%

General Characteristics of the mine are as follows :

Total weight (fused)	11 lb 6 oz
Maximum diameter	220.0 mm
Height (without fuse)	105.0 mm
" (fused)	157.5 mm
Weight of explosive	4 lb 8 oz

(b) Fuse.

The fuse body, cover, plunger and striker support are made of bakelite. The fuse is screwed into a threaded rubber fuse seat. The springs, percussion hammer, striker and release fork are the only metal parts of the mine and are all contained inside the fuse, with the exception of the release fork. The directions printed on the fuse container state that the fuse can be screwed in more easily after applying saliva to the fuse threads.
This fuse can be fired by either pressure or pull with suitable rigging. The percussion hammer, located within the fuse, is held in place by a release fork to which a trip wire may be attached. When the wire is pulled, the fork releases the hammer which is forced downward by the hammer spring. The hammer comes in contact with the striker, forcing it through its bakelite holder, into the percussion cap. As pressure is applied directly on the head of the fuse, the plunger spring is compressed, causing the hammer release fork to bear on the cover. The hammer head cams out the fork as the plunger spring is further compressed and fires as detailed above.
Characteristics of the fuse are as follows :-

Length	65 m m
Weight (without gaine)	56 gms
Gaine threads	
Length of threaded portion	4.2 m m
Outside diameter	11.0 m m
Threads per inch, US Std.	32
Body threads	
Length of threaded portion	12.5 m m
Outside diameter	18.0 m m
Threads per inch, US Std.	13

3. PERFORMANCE.

Report in a captured document states that this mine is effective against the tracks of a heavy tank. It is also stated that there would be considerable fragmentation of the mine wall with several fragments 2 ins. square, thus probably rendering it effective against personnel.

The results of actual tests indicate that, while the mine is an effective tank-attack weapon, the anti-personnel effect is limited primarily to blast, as little danger from fragments appears to exist.

It is estimated that personnel at a distance of 20 yds from the mine would not be endangered by the explosion of the mine.

The tests revealed that a crater 1 ft deep and 3 ft in diameter was formed on open ground, while the surface of the ground was heavily scoured by blast for a distance of about 10 ft.

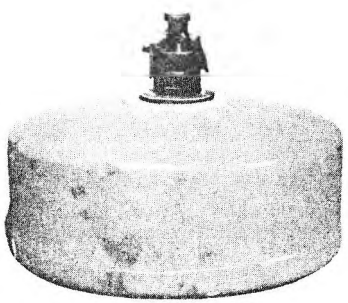
Practically no fragmentation damage was noted to palm trees only a few feet from the exploding mines. The mines exploded with a sound comparable with the detonation of an 81 m m mortar bomb and created a very large cloud of pure white smoke.

It was also discovered during the tests that the performance of these mines is affected when exposed to moisture because the cement which secures the rubber fuse seat is weakened and the fuse seat becomes loose. When the mine is in this condition a pull on the trip cord or a pressure on the fuse merely rolls the fuse and seat out of the mine without firing. This defect could possibly be overcome by taping or wiring the fuse seat in place.

Source - MEIU - Tests - USASOS

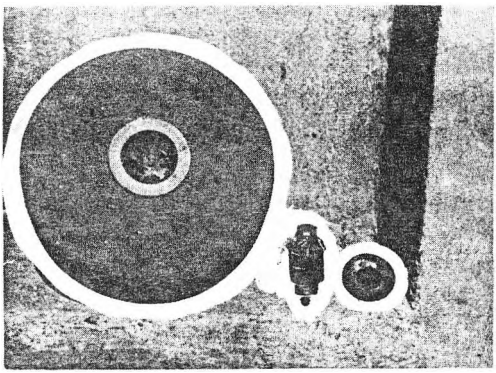
NAVY TYPE 3 'FLOWER POT' LAND MINE

FIG 1



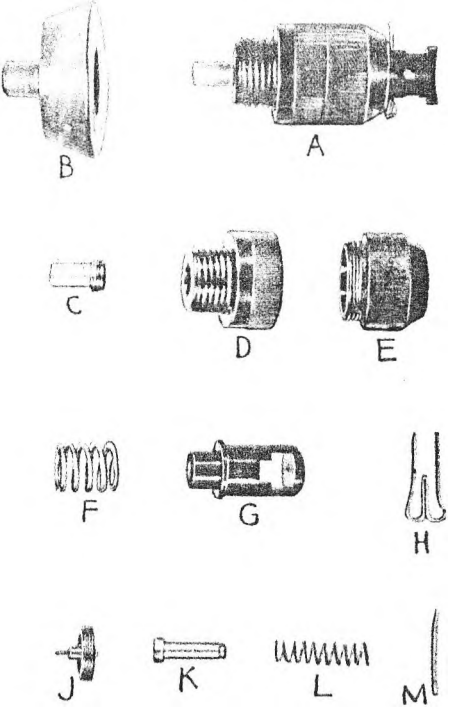
NAVY TYPE 3 'FLOWER POT' LAND MINE

FIG 2



NAVY TYPE 3 'FLOWER POT' LAND MINE

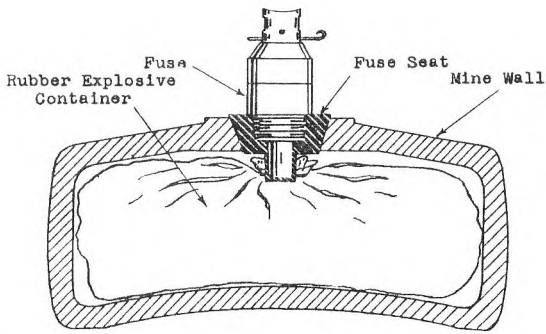
FIG 3



(A) Fuse. (B) Fuse Seat. (C) Detonating Tube.
(D) Fuse Body. (E) Cover. (F) Plunger Spring.
(G) Plunger. (H) Hammer Release Fork. (J) Striker.
(K) Percussion Hammer. (L) Hammer Spring. (M) Safety Pin.

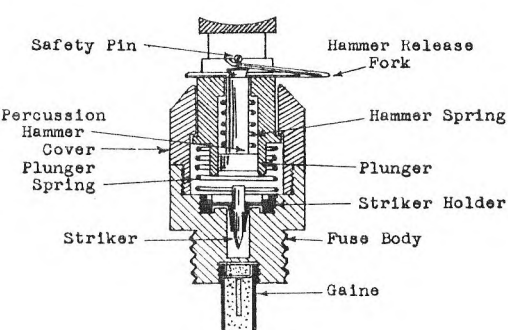
NAVY TYPE 3 'FLOWER POT' LAND MINE

FIG 4



SECTION OF MINE

SCALE 0 1 2 3 4 INCHES



SECTION OF FUSE

SCALE 0 1 2 INCHES

TRANSMITTER TYPE 94 MARK I

1. GENERAL.

This wireless set was recovered on ATTU and is intended for use as a semi-portable land base cw transmitter. The equipment operates on frequencies between 140 and 15000 Kcs, with an output of approximately 275 watts. The estimated range is 75 miles.

2. DESCRIPTION.(figs 1-9)

The equipment received consisted only of the transmitter unit and a voltage distribution and control panel. The aerial equipment and motor generator were not received.

(a) Transmitter. This component is 29½ ins high, 21½ ins wide, 15⅝ ins deep and weighs 150 lb. The transmitter has provisions for connecting external grid modulation equipment. Power is supplied from a petrol engine direct current generator system using two generators; one for voltages below 500 and the other for voltages above 500. Handles are conveniently located, two persons being required for carrying purposes.

The circuit is simple and conventional,and does not require any elaborate testing or aligning equipment. The transmitter name plate was missing.

The circuit consists of a pentode crystal controlled master oscillator using a UY511-B triode valve driving two UV812 tetrode power amplifiers in parallel. Voice modulation (grid) may be used by connecting an external modulator to the transmitter through a binding post located on the right side near the bottom of the case.

A knife switch is made available by removing the rear cover plates. This switches the grid of the final amplifier from its cw connection to the above terminal and must be in the correct position for operation.

Considerable time is required to change from cw to voice operation since high voltage and grille covers must be removed before this operation can be accomplished without danger to operating personnel.

Plug-in coils, which slide in on channels, are used and can be changed from the front panel through doors provided. Connections are made to the coils by means of clips and flexible wires. Considerable time is required in adjusting the tank coil and aerial loading taps unless the operator remembers the correct positions from previous experience.

No protective interlocks are provided to remove high voltage when the doors or side grilles are opened.

Panel lamps or luminous dials were not included as provision for night operation of the transmitter. The metal framework is provided with removable ventilated side shield in the form of grilles which fit on to the sides and rear. Solid olive drab coloured aluminium covers fit over the grilles and control panel during transport or storage.

The oscillator circuit is a crystal controlled series fed pentode oscillator and is capacitively coupled to the power amplifier stage consisting of two screen grid valves in parallel.

Power amplifier bias during cw operation is obtained from a tapped resistor connected across a 400 volt bias supply. For voice operation a knife switch connects the output of an external modulator to the grid circuit of the p.a valves to provide grid modulation. During cw operation, the screen-grid voltage of the p.a. valves is keyed. The oscillator is continuously energized with this type of keying.

Two aerial tuning circuits are used in the transmitter. One circuit employs a tapped inductance and a capacitor in series for the higher frequencies, and the other circuit has a parallel resonant circuit in series with a loading coil for lower frequency operation. Each aerial tuning circuit is connected to separate aerial binding posts and all d.c meters are shunted with protective by-pass condensers. The aerial current meter is equipped with two external thermocouples, one of which is used when the aerial current is less than 2 amps and the other is used when the aerial current exceeds 2 amps. Switching from one thermocouple to another is accomplished by a four pole, double-throw knife switch mounted in the rear of the transmitter.

Small neon lamps indicate presence of radio frequency energy at different points in the transmitter circuit. They also assist in isolating trouble if failure occurs. These lamps may also be used as tuning indicators, although the transmitter circuit is adequately metered for such purposes.

The type UY511-B valves were manufactured by the Matsuda Company of Japan in February 1942,and the UV812 valves were made in August 1940.

All wiring is rubber-covered stranded wire with a bare metal braid covering. The braid is secured at the ends by a metal band clamped around the cable. Colour coding of the wire is achieved by coloured bands painted at 3 ins intervals along the braid. Much duplication of coding is present.

Long leads are held in cable form by clamps. In many instances the design of the components was copied from American construction. The more obvious examples of copying were in the tuning condensers, resistors, valves, valve sockets, Lord type shock mounts used for supporting the valve socket base plate, by-pass condensers and the knife switches. The design of the rotary switches, coils, r.f. chokes, plug-in meter sockets, terminal strips and relays are of Japanese design and seem inferior to similar American components.

Various types of insulating material are used, including glass, wood, ceramics and phenolic resin plastic similar to bakelite. The switches and coil forms use treated wood.

(b) Voltage Distribution and Control Panel. This component is 19¾ ins high, 29½ ins wide, 9⅝ ins deep and weighs 65 lb.

The nameplate on the distribution panel states that the unit is a Model C Mark 40 panel, being part of Type 94 Mark 1 Wireless. The date of manufacture was April 1940.

Panel lamps are provided, in addition to a 12 volt d.c. outlet for an extension light.

The panel has provision for metering and controlling voltages obtained from the motor-generator system. Four overload relays and two automatic voltage adjustment relays are provided. Connections for input and output are made on terminal strips at the bottom of the front panel. White rubber cable is used for interconnections between generator, distribution panel and transmitter. Plug-in type meters are used with the panel. Drawers are provided in the bottom of the distribution panel for storing during transit such items as meters, fuses, lamp bulbs and relay coils. Rollers are located on the bottom of the control panel to facilitate its removal from the case. The distribution panel case is constructed of wood with metal strips along the edges. Rope handles are affixed at each end. Shock mounts are not provided for any components of this unit as the construction is heavy enough to withstand considerable shock without damaging the equipment.

3. REMARKS.

This equipment does not use an excessive number of controls or complicated drive mechanisms as is often found in Japanese equipment.

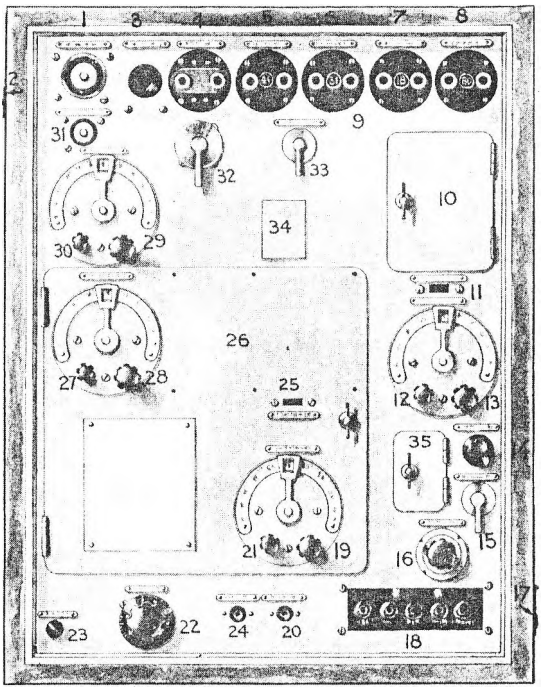
Neither the transmitter nor the voltage distribution panel is designed for weatherproofing, and no precautions against fungus or extreme humidity are evident. Much use is made of nickel plating on relay parts, bolts, nuts, panel lamps and coil taps.

The layout of the transmitter is very poor and many parts are unduly crowded,thus rendering the servicing of parts near the panel very difficult. The soldered connections are very brittle. All rheostats are wire wound and are comparable with American types manufactured ten years ago. The grid lead and screen dropping resistors are mounted in clips and shocks will shake them from their holders.

(SOURCE: Camp Coles Signal Laboratory
Fort Monmouth NJ.)

TRANSMITTER TYPE 94 MARK I

FIG I

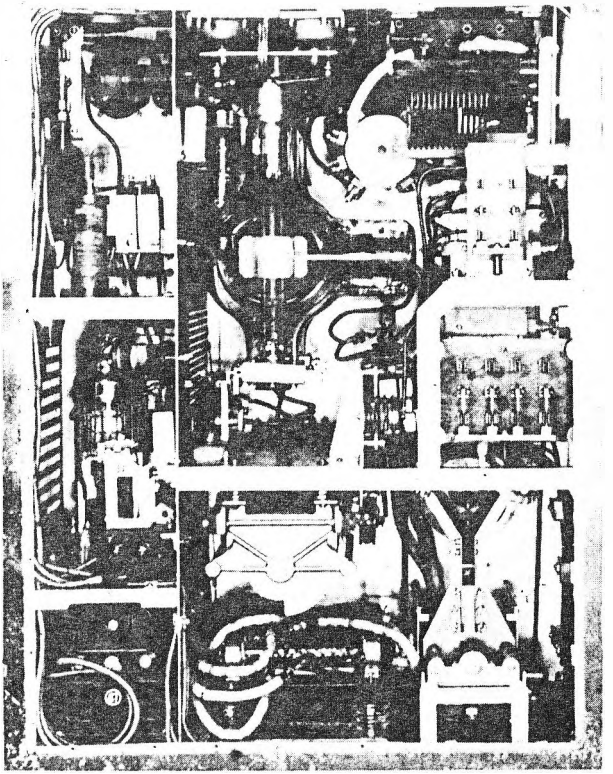


FRONT VIEW

1. Aerial #1. 2. Aerial #2. 3. Amplifier RF Indicator
4. Aerial Current. 5. Amplifier Plate Current.
6. Amplifier Grid Current. 7. Oscillator Plate Current.
8. Filament Voltage. 9. Metering Sockets.
10. Oscillator Tuning Coil (Inside). 11. Oscillator RF Indicator. 12. Dial Lock. 13. Oscillator Tuning.
14. Trimmer Condensor. 15. Crystal Out-In. 16. Fil--ament Voltage Control. 17. Modulator Input.
18. Voltage Input Strip. 19. Amplifier Tuning. 20. Key Jack. 21. Dial Lock. 22. Aerial Coupling.
23. Earth Terminal. 24. Key Jack. 25. Amplifier RF Indicator. 26. Amplifier Tuning Coil (Inside).
27. Dial Lock. 28. Aerial Tuning 1. 29 Aerial Tuning 2
30. Dial Lock. 31 Receiver Aerial. 32. Receive - Off - Fil 1 - Fil 2 - Transmit. 33. Adjust - Transmit.
34. Nameplate. 35. Crystal Holder (Inside).

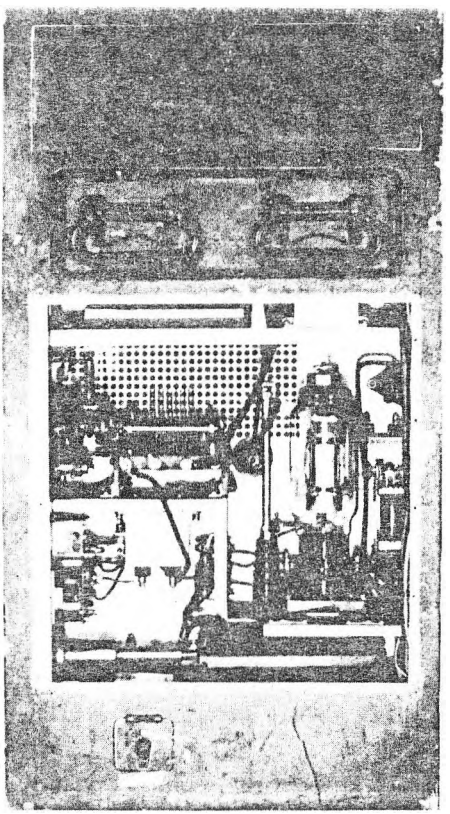
TRANSMITTER TYPE 94 MARK I

FIG 2 Rear Interior View.



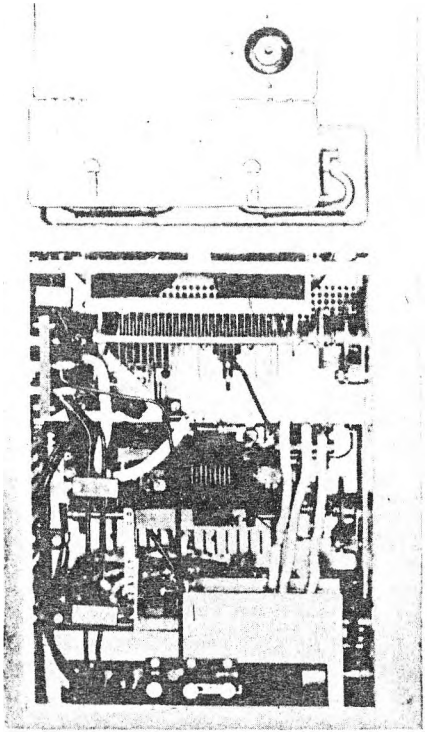
TRANSMITTER TYPE 94 MARK I

FIG 3 Right Interior View, Showing Oscillator Stage



TRANSMITTER TYPE 94 MARK I

FIG 4 Left Interior View, Showing Amplifier Components



TRANSMITTER TYPE 94 MARK I

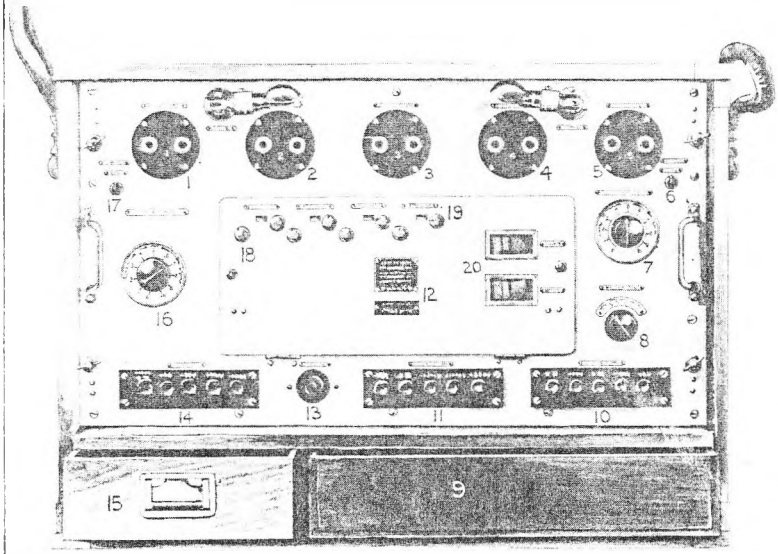


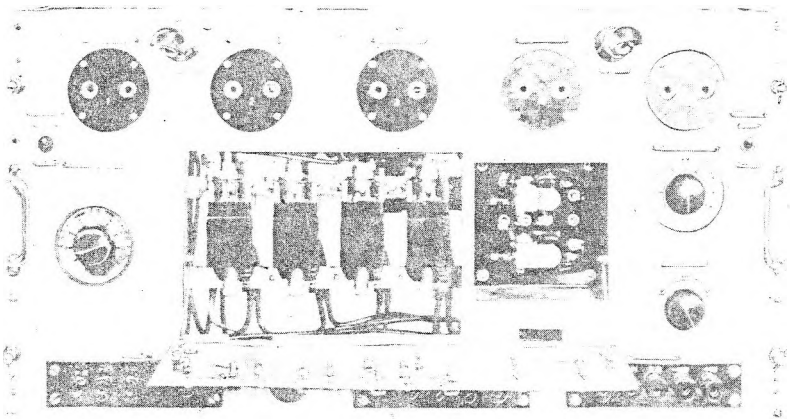
FIG 5

FRONT VIEW OF VOLTAGE DISTRIBUTOR CONTROL PANEL

1. Current in 2000 v Circuit.
2. Current in 1000 v Circuit.
3. Voltmeter.
4. Current in 12 v Circuit.
5. Voltmeter 12 v Circuit.
6. Automatic Regulator Switch.
7. Low Voltage Control.
8. Voltmeter Switch.
9. Spare Parts Drawer.
10. Low Voltage Generator Input.
11. High Voltage Generator Input.
12. Name Plate.
13. 12 Volt Outlet.
14. Voltage Output to Transmitter.
15. Meter Drawer.
16. High Voltage Control - +1000 and +2000.
17. Panel Lights Switch.
18. Overload Relay Trips.
19. Overload Relay Resets.
20. Voltage Regulator Relays.

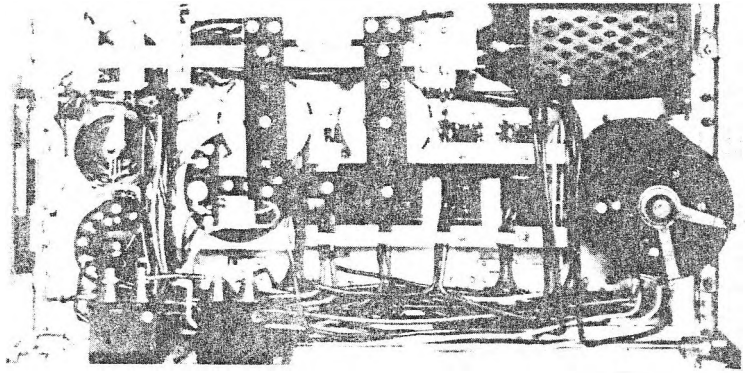
TRANSMITTER TYPE 94 MARK 1

FIG 6 Front View of Voltage Distribution and Control Panel, Showing Overload and Voltage Control Relays



TRANSMITTER TYPE 94 MARK 1

FIG 7 Rear View of Voltage Control and Distribution Panel.



TRANSMITTER TYPE 54 MK 1

Parts of Transmitter (see fig 8)

No.	Part	Value Rating & Tolerance
1	Crystal Holder	
2	Knife Switch	S.P.S.T.
3	Variable Condenser	86 mmf
4	Osc. Grid Resistor	30 K, 1 watt
5	Parasitic Suppressor Resistor	5 ohms
6	Osc.Valve Socket	
7	D.C. Blocking Condenser	.0001 4000 V
8	Relay Dropping Resistor	Wire Wound 1 ohm
9	Isolation Resistor	30 ohms Flat wirewound
10	Screen By-Pass Condenser	0.1 4000 V
11	Screen Dropping Resistor(2ea)	5000 ohms 1 watt
12	By-Pass Condenser	0.1 4000 V
13	Osc. Tuning Condenser	Variable 190 mmf.1500V
14	No Numbered Part	
15	" " "	
16	R.F. Choke	0.5 mh
17	Plate By-Pass Condenser	.05 4000 V
18	Meter Socket	For Plate Milliammeter
19	Condenser	.01 500 V
20	Osc. R.F. Indicator	Neon Bulb
21	Resistor	50,000 ohms 1 watt
22 -	No Numbered Part	
26	" " "	
27	Interstage Coupling Condenser	.001 4000 V
28	Interstage Coupling Condenser	.001 4000 V
29	Final Grid R.F. Choke	
30	Grid By-Pass Condenser	.001 4000 V
31	Meter Socket	For grid current meter.
32	Condenser	.01 500 V
33 & 34	Valve Socket	For UV812
35	Screen By-Pass Condenser (2 ea)	0.1 4000 V
36	Screen Dropping Resistor	2500 ohms 80 watt
37	Final Tuning Condenser	Variable 290 mmf. 3800 V
38	Plate By-Pass Condenser	.005 2000 V
39	Final Plate R.F. Choke	8 mh.
40	No Numbered Part	
41	Meter Socket	Final plate current
42	Condenser	.01 500 V
43	Indicator Protection Resistor	50,000 ohms 1 watt
44	Final R.F. Indicator	Light Bulb
45	No Numbered Part	
46	Final Screen Lowering Switch	S.P.D.T. (Rotary)
47	Filament Power Resistor	.44 ohms (Variable)
48	CW-Phone Switch	S.P.D.T. Knife
49	Modulator Terminal	
50-54	No parts	
55	Coil (9 turns)	Aerial Coupling
56	Aerial Meter Switch	4 P.2 T. Knife
57	Thermocouple	10 amp.
58	Thermocouple	2 amp
59	Aerial Switch	S.P.D.T. link
60-61	No parts	
62	Meter Socket	R.F. Ammeter

TRANSMITTER TYPE 94 MK 1
Parts of transmitter (continued) see fig 8

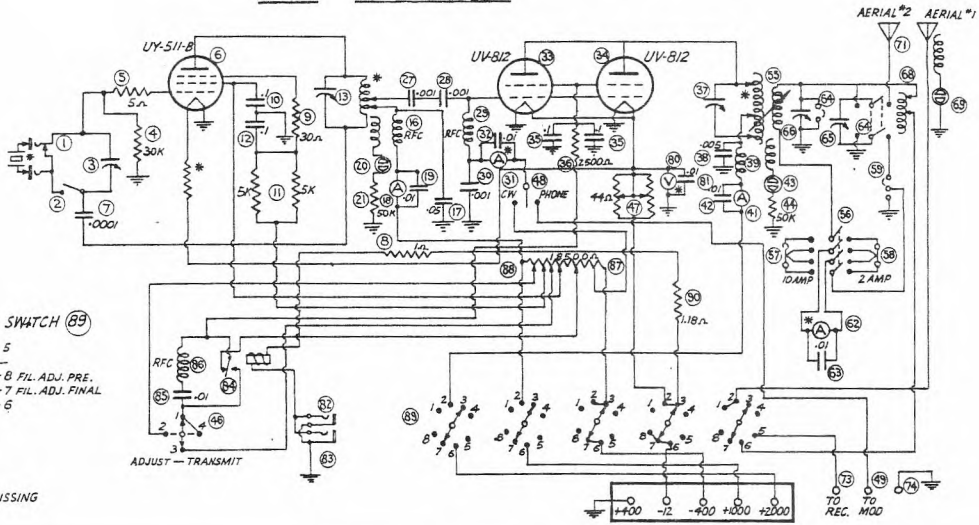
No.	Part	Value Rating & Tolerance
63	Condenser	.01 500 V
64	Aerial Switch	D.P.D.T. and Jumper Link
65	Aerial Tuning Condenser	Variable 348 mmf.3800 V min. 55 mmf.
66	Aerial Tuning Condenser	Variable 388 mmf.3800 V min. 60 mmf.
67	No Numbered Part	
68	Plug-In Coil (14 turns)	Coupling
69	Indicator	Neon Light
70-79	No Numbered Parts	
80	Meter Socket	Filament Voltage Voltmeter
81	Condenser	.01 500 V
82	Key Jack	Jack to fit Pl-55 plug
83	Key Jack	Jack to fit PL-55 plug
84	Relay	S.P.D.T.
85	Condenser	.01 4000 V
86	R.F. Choke	10 mh.
87-88	Resistor	18500 ohms
89	Switch	5P 6T (Rotary)
90	Resistor	1.18 ohms

Parts of Distribution Panel (see fig 9)

1	Ammeter Socket	2000 V supply
2	Ammeter Socket	1000 V supply
3	Voltmeter Socket	All supplies
4	Ammeter Socket	12 V supply
5	Voltmeter Socket	12 V supply
6	Metering Resistor	400 K 4 sections (3000 V 7.5 K)
7	Shunt	30 amps. 60 MV
8	Transmitter Terminal Strip	
9	High Voltage Generator Terminals	
10	Low Voltage Generator Terminals	
11	Panel Light	12 Volt
12	Panel Light	12 Volt
13	Panel Light Toggle sw	S.P.S.T.
14	Overload Relay	Adjustable 650 ma-1700 ma
15	Overload Relay	" 300 ma- 800 ma
16	Overload Relay	" 100 ma- 260 ma
17	Overload Relay	" 19 amp-50 amp
18	Voltage Control Relay	
19	R.F. Choke	
20	R.F. Choke	
21	Fuse	1 amp
22	Fuse	1 amp
23	Fuse	1 amp
24	Voltage Control Switch	D.P.S.T. Toggle
25	Outlet	12 Volt
26	Filter Condenser	.5 mfd. 5000 V
27	Filter Condenser	.5 mfd. 5000 V
28	Voltmeter Switch	D.P.S.T. Rotary
29	Resistor	10 ohms
30	Resistor	2600 ohms 100 watts
31	Resistor	500 ohms
32	Resistor	196 ohms Variable
33	Resistor	10 ohms - 2.5 ohms ganged
34	Fuse	1 amp
35	Fuse	1 amp

TRANSMITTER TYPE 94 MARK I

FIG 8 Circuit Diagram



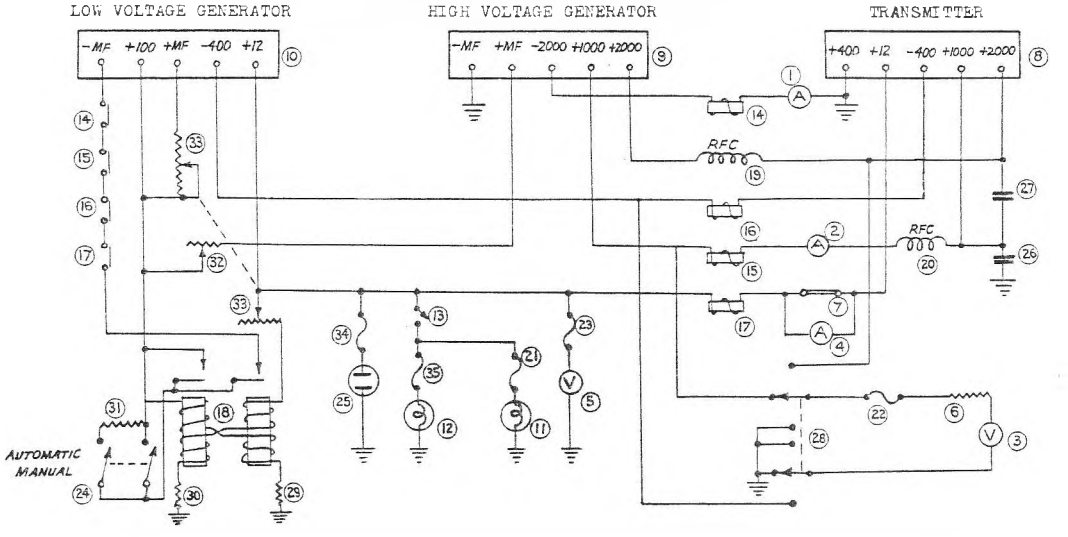
POSITIONS SWITCH (89)

REC.	1-5
OFF	—
LOW I	4-8 FIL. ADJ. PRE.
LOW II	3-7 FIL. ADJ. FINAL
HIGH	2-6

* PART MISSING

TRANSMITTER TYPE 94 MARK 1

FIG 9 Circuit of Voltage Distribution Panel



WIRELESS SET MODEL 94 TYPE 6

1. GENERAL

The complete equipment is a portable lightweight HF Transceiver providing both RT and MCW operation for both send and receive. It is considered that this equipment would be used in the field for communication where light self-contained short-range instrument is required.

2. DESCRIPTION (figs 1 - 6)

This equipment is versatile in operation, compact and robust in design. It exhibits strong characteristics of continental design practice and can be easily carried and operated by one man. The transmitter-receiver is fitted into a light alloy case provided with a hinged lid which fastens with a spring loaded clip and contains transparent pockets. These pockets contain, on the left, a circuit diagram and on the right a "frequency dial reading" calibration chart.
A microphone switch, transmit-receive switch, morse key button and hand generator power supply input socket are located on one side of the chassis. The alloy case is slotted at this end, so that the controls do not foul the case when the chassis is removed.
Mounted on the other end is an additional power supply socket which is intended for use with dry batteries.
Safety switches, operated by the insertion of power supply plugs, open HT and LT leads so that there is no danger of paralleling supplies.
A leather carrying case fitted with a shoulder strap is provided.
All controls may be operated while the set is still in its leather case; a thin leather diaphragm covers the key button.
Twin headset outlets are mounted on the top panel of the set. Aerial and counterpoise leads may be inserted through the leather case into two sockets mounted on the side of the chassis.
The circuit employs a twin 1.4 volt HF triode valve type OZ 30 MC fitted with a standard American six pin base. The valve is apparently of Japanese manufacture.
One triode portion is employed as an HF oscillator and super-regenerative detector. The other triode portion is employed as an audio amplifier.
The main tuning condenser (6) is connected directly across the six coils, (5), (30) and (31). Coils (5) and (30) may be shorted out by means of a three position wave change switch (29) providing three frequency bands.
The two bank, two way, four circuit switch (15) is used for the purpose of changing from send to receive. Two audio frequency transformers are employed as microphone and output transformers respectively.

3. OPERATION

(a) Receive Condition - MCW or R/T: Regeneration is controlled by the resistor (10) in the grid circuit of the first triode. The audio component (or modulation) appears across the primary of transformer (20) through

which HT is fed to the anode of this triode, via the associated RF filter network, namely RF choke (11) and by-pass condenser (12). By transformer action, the grid of the second triode receives the audio component of the incoming signal which then appears in an amplified form across the earphones. These are connected in series with the anode supply of this triode. Rheostat (16) is connected in the filament circuit and provides adjustment of the filament voltage. Fixed bias on the grid of the second triode is provided by means of the potential difference developed across resistor (18) connected in the negative HT lead.

(b) Send Condition - MCW: The resistor (10) is short circuited and the first triode oscillates normally at HF. The second triode becomes an audio oscillator, coupling between its anode and grid being provided by transformer (20). Keying is effected in the grid circuit The secondary windings of transformers (19) and (20) with condenser (21) comprise the oscillatory circuit. The audio frequency oscillations appearing across the transformer (20) modulate the anode HT supply to the HF oscillator. MCW transmission is thus accomplished.

(c) Send Condition - R/T: The transformer (19) is now used as a microphone transformer. Its primary is connected in series with the 1.5 volt cell, microphone and microphone switch (23).
The grid of the second triode is modulated by speech, which after amplification modulates the HF oscillator as for M.C.W.

4. REMARKS

A particular feature of this equipment is that it may be used as a small low power ground station since it is equipped with a terminal for a counterpoise or "earth" used in conjunction with the aerial. A thermal aerial ammeter is provided to facilitate accurate tuning, thus considerably improving the effective range.
The serial number "11139" stamped on the front panel nameplate did not correspond with the number "11138" painted on the bottom of the chassis.
The frequency range is covered in three overlapping bands as follows:-

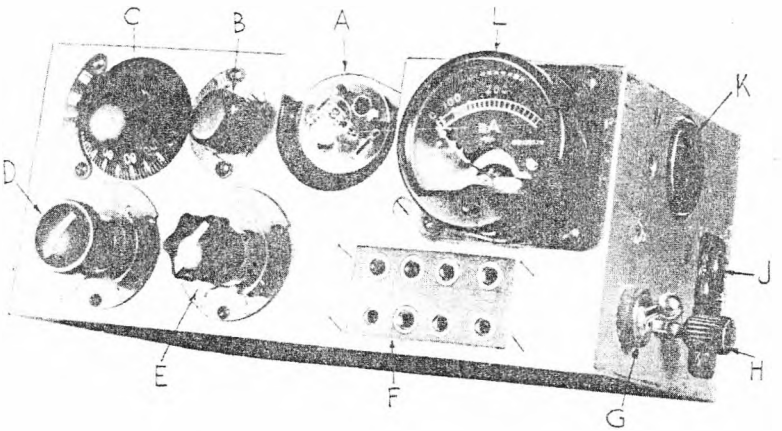
Band	1	-	24 - 31 Mc/s.
"	2	-	28 - 36.5 Mc/s.
"	3	-	34 - 47.25 Mc/s.

Using a rod type antenna without earth or counterpoise, the range is approximately 1.5 to 2 miles.

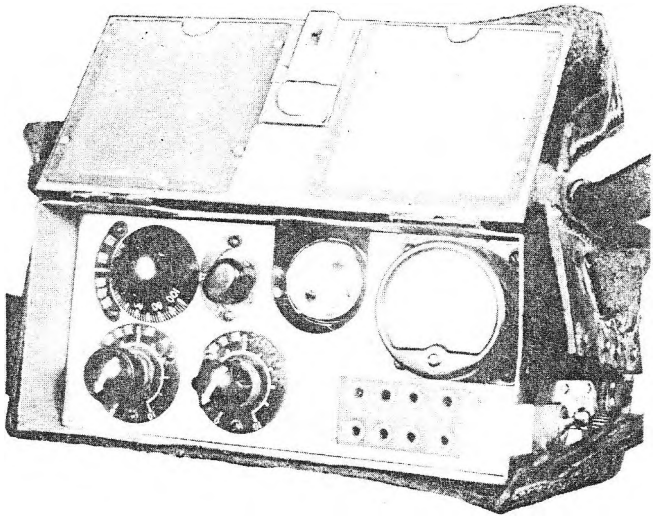
(SOURCE:- MEE - MGO Branch)

WIRELESS SET MODEL 94 TYPE 6

FIG 1



(A) Twin Triode Valve. (B) Wave Change Switch. (C) Main Tuning Condenser. (D) Filament Rheostat. (E) Regeneration Control. (F) Twin Microphone-Headset Plugs. (G) Microphone Switch. (H) Send-Receive Switch. (J) HT-LT Input. (K) Morse Key. (L) Aerial Ammeter.



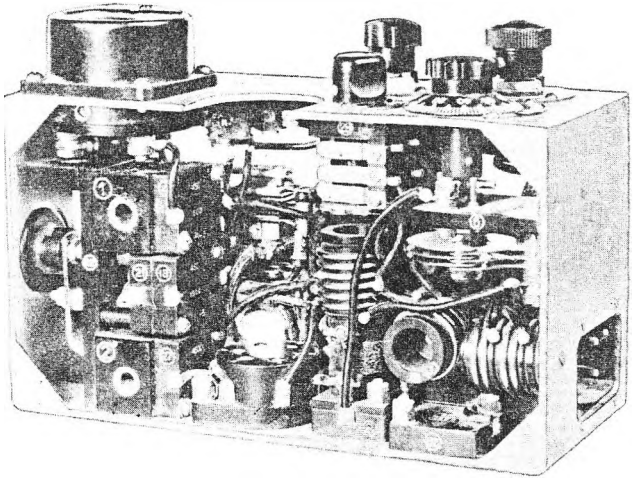
WIRELESS SET
MODEL 94 TYPE 6

FIG 2

Set in Metal Case, and Leather Carrying Case.

WIRELESS SET MODEL 94 TYPE 6

FIG 3 Top View



WIRELESS SET MODEL 94 - TYPE 6.

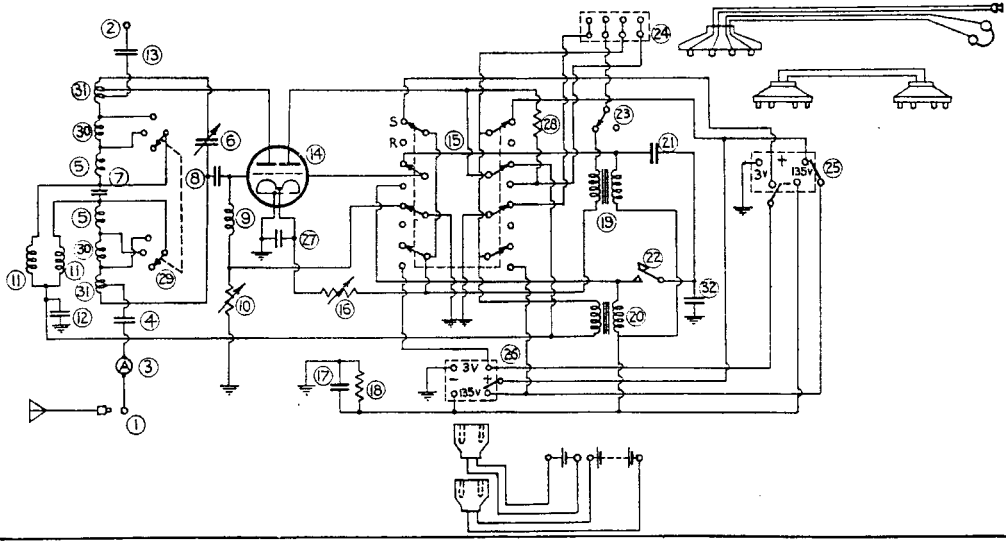
NOMENCLATURE LIST

1. Aerial
2. Aerial
3. Aerial Ammeter 0-1&mA movement shunted to 300mA
4. Aerial Coupling Cond. 450cm (499 pF) 1500v.Mica
5. Tuning Coil 24-31 Mc/s (approx)
6. Main Tuning Cond. Midget 6 Plate
7. Blocking Cond. 750cm (8325 pF) 1500v.Mica
8. Grid Coupling Cond. 450cm (499 pF) 1500v.Mica
9. R.F. Choke
10. Heterodyne Controls, 23,000Ω Potentiometer
11. R.F. Chokes, 27,000 /CT/27,000Ω
12. R.F. Bypass Cond. 1800cm (1998 pF) 1500v.Mica
13. Earth Cond. 450 cm (499 pF) 1500v. Mica
14. Valve, Twin Triode (UZ30MC)
15. Send Receive, Switch
16. Filament Rheostat 9.5Ω variable
17. Bypass Cond. 0.5μF 1000v.
18. Bias Resistor 230Ω Fixed
19. Microphone Transformer, ratio 1:20
20. Output Transformer ratio 1:2
21. AF Grid Cond. 4500cm (499 pF) 1500v. Mica
22. Key
23. Microphone Switch
24. Headset Plug. Dual type
25. Input HT/LT Power Supply, probably Hand Gen.
26. Input HT/LT Power Supply, probably Dry Batt.
27. Filament Bypass Cond. 4500cm (4995 pF) 1500v. Mica
28. Plate Resistor, 45000Ω Fixed
29. Wavelength - Change SW. 3 position double contact
30. Tuning Coil, 28 - 36.5 Mc's (approx)
31. Tuning Coil, 34 - 47 Mc's (approx)
32. R.F. Bypass, Cond. 450cm (499 pF) 1500v. Mica

.. ..

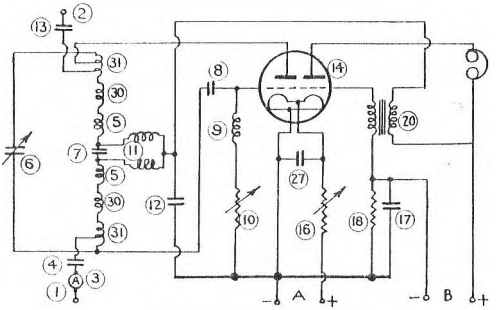
WIRELESS SET MODEL 94 TYPE 6

FIG 4 Circuit Diagram

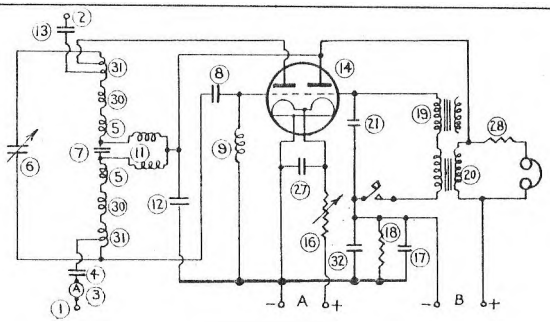


MODEL 94 TYPE 6 WIRELESS SET

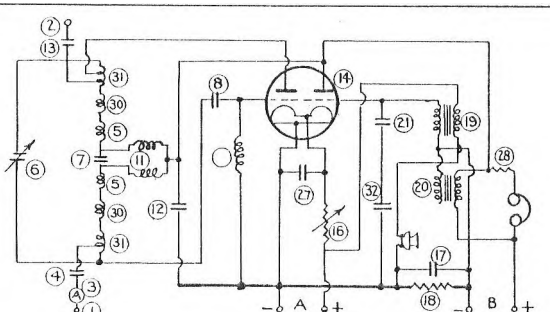
FIG 5 Functional Diagrams



RECEIVE — R/T or MCW



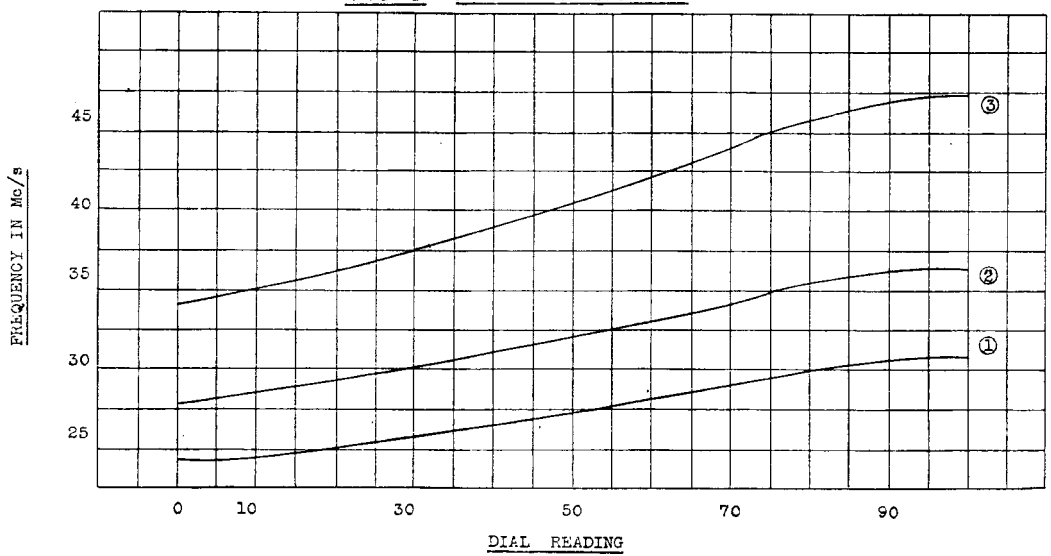
SEND — MCW



SEND — R/T

WIRELESS SET MODEL 94 TYPE 6

FIG 6 Dial Calibration Chart



SPEAKER UNIT NO 4 TYPE A
RELAY MACHINE

1. GENERAL

The equipment appears to be intended for use as a remote control DC keying device which provides simultaneous communication either by speech or buzzer. It is light but of robust mechanical construction and its general appearance and panel markings suggest the possibility of use as part of the associated equipment of Type 94 Model 36 Transmitter and Receiver.

2. DESCRIPTION (figs 1 - 4)

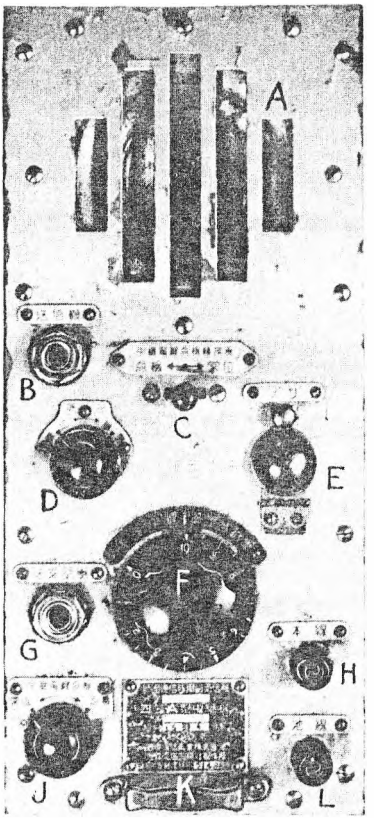
The instrument is built on a light alloy box chassis which slides into a light sheet metal case and is retained in the case by a single spring clip. The case is fitted with a front cover which also clips in position.
The batteries consist of two 22½ volts batteries for DC keying and one 1.5 volts cell for speech and buzzer circuits. These batteries are contained within the unit with special spring retained catches holding them in position.
The "buzzer" and "test" switch knobs perform dual functions; the centre portion must be held "on", the outer portion may be used to lock these controls in the "on" position if required. Jacks are provided for microphone headset and morse key and/or line current test meter.
Two line terminals are located at the bottom right-hand corner of the front panel, the lower one being connected to "frame".
The remaining controls comprise test-operate switch, buzzer adjustment fitted with cover and variable keying resistor.
The circuit diagrams show the complete wiring, simplified circuit for "operate" position of switch, circuit for "test" position of switch together with a legend of component parts. In the "operate" position, the keying circuit is shown by the heavy lines. The negative of the 45 volt battery is connected through the key and associated filter chokes to the line terminal. The positive connects via the fixed resistor, front panel variable resistor and audio choke to the line terminal.
"In" speech or buzzer tone; AF enters the instrument at the line terminal and as the condenser has a low reactance to AF choke, the AF passes through a fixed condenser, the coil of the magnetic speaker, (the speaker cone will vibrate at approximately 1000 C/s) and the secondary winding of the microphone transformer back to the earth terminal, via the resistor. The earphones are connected across portion of the secondary winding of the microphone transformer and the earth terminal. The "out" buzzer consists of the primary winding of the microphone transformer connected in series with a buzzer unit, switch and the 1.5 volt cell. The AF oscillations, by transformer action, appear across the line terminals.

"Out" speech component consists of the primary winding of the microphone transformer connected in series with the microphone, panel switch and the 1.5 volt cell and is conveyed to the line terminals as for buzzer operation.
"Side tone" is heard in phones for both "out" buzzer and "out" speech.
When in the "test" position, "in" and "out" speech and buzzer operation is unaffected, but keying is not possible. The key jack is connected in series with the filter chokes (11), 45 volt battery, resistors (9 & 8), AF choke (12) and resistor (6). It will be noted that the resistor (6) is not in circuit in the "operate" position. This resistor is thought to substitute the relay resistance when a 0-5 mA meter is connected to the key jack. The variable keying circuit resistor (8) may be adjusted to give the required line current. Allowance for line resistance, which would be known approximately by the amount of cable laid out, is made when switching back to operate by reducing the variable keying circuit resistor (8) the required amount. This amount is thought to be arrived at from the calibrated dial fitted to the variable resistor (8) assuming the calibrations to be a function of length of line. For example, if the length of line in use was two kilometres and each division of the dial was equivalent to one kilometre, the dial would be turned back two divisions when switching to operate, that is, after line current had been set on test.
The maximum current that can be obtained in the test position is 4.5 mA. It is to be noted that the keying relay fitted to the Type 94 Model 36 Transmitter (SP 3A) will operate with 1 mA and has a coil resistance of 6000 ohms, being equivalent to resistor (6).
Further characteristics are:

Effective range - estimated to 10 miles
Weight of equipment less batteries, headset and key .. .. approx. 8½ lb.

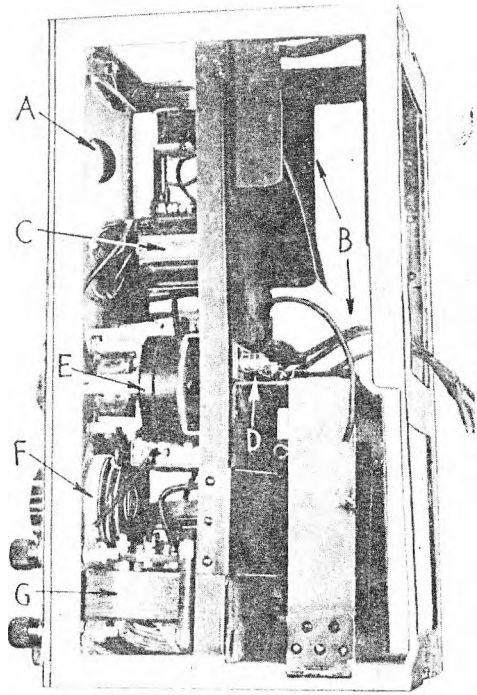
(SOURCE:- MEE - MGO BRANCH)

SPEAKER UNIT NO 4 TYPE A RELAY MACHINE FIG 1



(A) Speaker Grill. (B) Key Jack.(C) Operate-Test Switch. (D) Buzzer Switch. (E) Buzzer Adjustment Cover. (F) Variable Resistor. (G) Microphone Jack. (H) Line Terminal. (J) Test Switch. (K) Handle. (L) Earth Terminal.

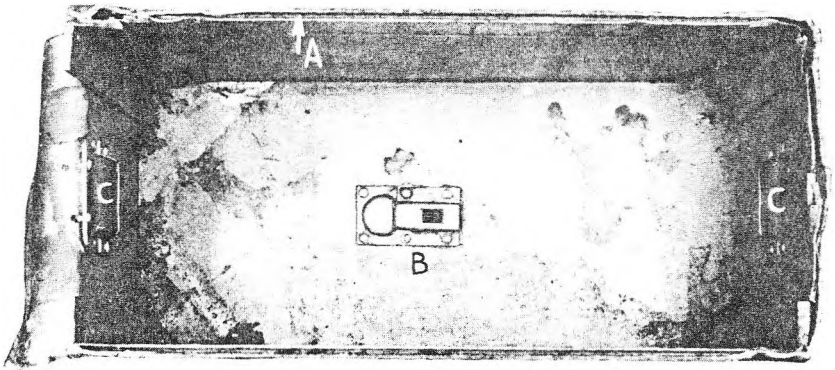
SPEAKER UNIT NO 4 TYPE A RELAY MACHINE FIG 2 Side View



(A) Magnetic Speaker. (B) Battery Compartment. (C) AF Choke. (D) Battery Terminal Strip. (E) Buzzer Unit. (F) Variable Resistor. (G) Microphone Transformer.

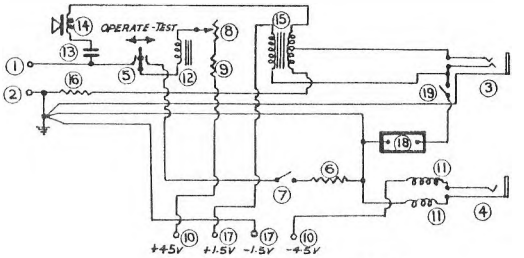
SPEAKER UNIT NO 4 TYPE A RELAY MACHINE

FIG 3 Metal Case.



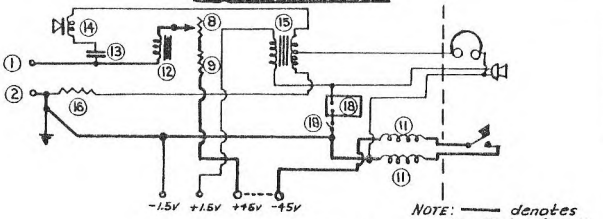
(A) Groove for Waterproof Lid. (B) Chassis Retaining Clip. (C) Carrying Strap Recesses.

SPEAKER UNIT
NO 4 TYPE A RELAY MACHINE
FIG 4

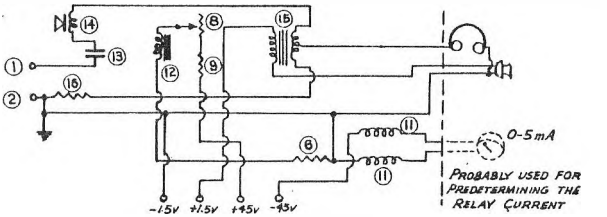


COMPLETE WIRING DIAGRAM

FUNCTIONAL DIAGRAMS



OPERATE POSITION



TEST POSITION

(1)Line Terminal(2)Earth Terminal(3) Receiver-MicrophoneJack (4)Key Jack(5)Operate-Test Switch(6)Foxohm 6000 Resistor (Probably lw carbon)(7)Test Switch(8)Variable Keying Circuit Resistor 5000 ww(9)Foxohm 4000 Resistor(Probably lw carbon) (10)H.T.Terminal Strip(11)R.F.Choke (2)(12)A.F.Choke 10H (13)Fixed Condenser (Probably .05 Paper)(14)Magnetic-Speaker (Call System)(15)Microphone Transformer(16)Foxohm 750 Resistor(Probably lw carbon)(17)L.T.Terminal Strip(18)Buzzer-Unit(19) Buzzer Switch.

20 DROP MK I TELEPHONE SWITCHBOARD

1. GENERAL.

This equipment is a complete, transportable single position, manually operated telephone switchboard with associated protective equipment for serving magneto lines and common battery or dial trunks.

2. DESCRIPTION (figs 1 - 2)

The component parts consist of the following:- Two 1½ volts batteries, twenty ground rods, one head and chest set, spare parts, one switchboard MI, one terminal board and three 5 circuit repeating coils.

Each switchboard contains the following :-

1 Operator's position
1 " telephone circuit
8 cordless circuits
8 grouping circuits
1 operator's grouping circuit
1 ringing circuit
20 line circuits (magneto)
4 trunk circuits (common battery, manual or dial)
1 night alarm circuit

Ring down trunk circuits are provided for connection to common battery manual or dial offices. Drop signals, located on top front of board, are associated with lines and trunks for signalling incoming calls. Drop signals on the left front of the board are provided for ring off or recall signals.

Eight grouping buttons and one operator's talking and ringing current button are provided for grouping two switchboards MI. A night alarm button is also provided and batteries for talking and night alarm circuits are inserted in the bracket in the rear of the board. Terminals are provided on the rear of the board for external battery.

3. SETTING UP PROCEDURE.

(a) Remove the front cover from the switchboard and place in a suitable operating position.

(b) Detach the front cover, containing the terminal board, from the spare parts chest and secure in a position adjacent to the switchboard.

(c) Remove the locking device from the station drops and lower the locking device on ring-off drops.

(d) Instal two 1½ volts batteries in the battery bracket.

(e) Connect the lower pairs of binding posts of the terminal board to the corresponding pairs on upper three rows in back of the switchboards. The incoming lines are also connected to the upper pairs of binding posts on the terminal board.

(f) Repeating coils should be installed when ground return circuits are used. One side of the upper pair of binding posts of the repeating coil is connected to the incoming line; the other side is connected to ground. The lower pairs of the repeating coil are connected to the upper pairs on the terminal board. In case there are insufficient repeating coils, connect the metallic circuit and ground directly to upper terminals of the terminal board.

(g) A terminal is provided on the right side of the lower section of the terminal board to connect the protectors to ground. The five ground rods, used to connect the protectors to ground, should be spaced well apart.

4. CONNECTION OF TWO SWITCHBOARDS.

Connect the lower eight pairs of binding posts in the rear of the switchboard to the corresponding binding posts on the other switchboard. The operator's talking and ringing circuit is connected to the second switchboard by connecting the right hand pair, located above the line terminals, to corresponding pair on the second switchboard. The eight grouping buttons and operator's grouping button are then pulled out to complete the operation.

5. OPERATION :

(a) When making station to station connections, and trunk to station connections, buttons in one horizontal row only must be used. This rule also applies to connections between two connected switchboards.

(b) Incoming calls on lines or trunks are indicated by drop signals. When a drop signal operates indicating an incoming call, the red button located at the bottom of the board associated with that line or trunk, must be pulled out to answer the call.

(c) To make a station to station call, pull out a black button associated with the calling party's station and push in the red button at the bottom of the same vertical row of buttons. Then pull out the red button associated with the

called party's line on the same horizontal line of buttons as the button of the calling party, and operate the hand generator. The operator will have supervision of this call as long as the red button is pulled out. Restore the red button before answering another call.

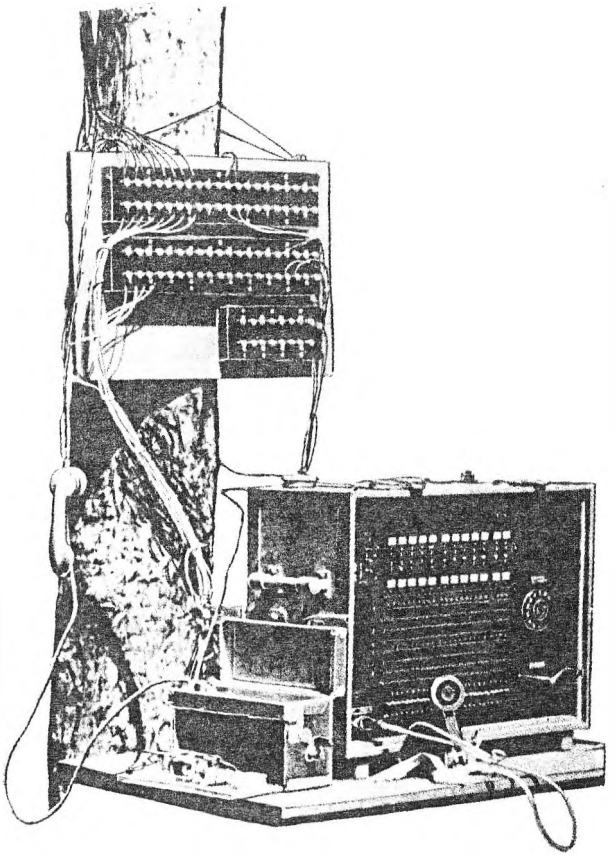
(d) To make a call on a manual trunk, proceed the same as for a station to station call with the exception that the generator is not used to signal the operator. Pull out the red button of an idle trunk and give the distant operator the number desired. Pull out the black button of called trunk on the same horizontal line as the calling party's to complete the circuit. The red button may be left pulled out for supervisory purposes, but must be pushed in before answering succeeding calls.

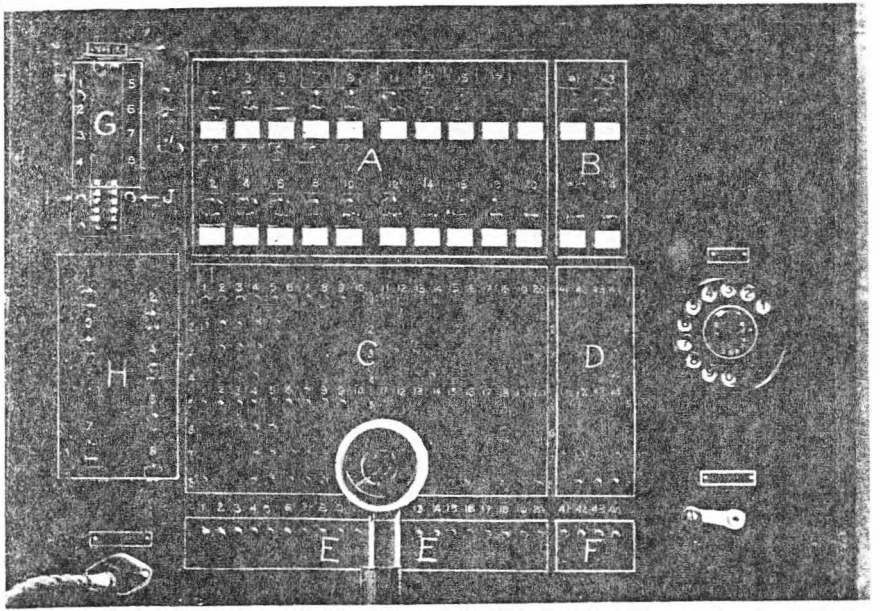
(e) To make a call on a dial trunk, proceed as before when making a call on a manual trunk, except that when the red button of an idle dial trunk is pulled out, the dial tone will be heard. Dial the desired number, and then pull out the black button associated with the called trunk on the same horizontal row as the calling party, and push in the red button.

Source :- USAFPOA

20 DROP MK I TELEPHONE SWITCHBOARD

FIG I Complete Unit





20 DROP MK 1 TELEPHONE SWITCHBOARD

FIG 2

(A) Line Drop Signals
(B) Trunk Drop Signals.
(C) Black Call Button.
(D) " " "
(E) Red Incoming Call Button.
(F) Red Incoming Call Button.
(G) Grouping Buttons.
(H) Ring Off Drop Signal
(I) Night Alarm Button
(J) Talking & Ringing Current Button.

HIGH VOLTAGE DIRECTION FINDER

TYPE 98

1. GENERAL.

This type of direction finder is designed to locate power plants producing AC. electric power ranging in frequency from 20 to 100 cycles per second. The obvious use appears to be the location of the allied portable power units producing 60 cycles AC. This is possible without interference from Japanese units as DC generators seem to be the standard unit employed in the Japanese Army.

The equipment examined was recovered in the Imphal and Myitkyina areas, Burma.

2. DESCRIPTION.(figs 1-9)

The equipment consists of three basic components in addition to associated cables. headset and output meter. The components are (a) Directional Loop. (b) Low frequency high gain amplifier. (c) Battery case. The following information includes that obtained from a relevant instruction manual.

(a) Directional Loop. The loop consists of a hardened aluminium spool in which there are roughly 500 turns of 0.65 mm silk covered and waterproofed wire. A compass and spirit level are fixed to the upper part of the revolving graduated base.

Below the base is a revolving plate and a supporting plate to the underside of which is attached the supporting tripod. The outside is painted khaki colour and the inside silver.

The scale is graduated from 0 to 180 degrees in one degree markings, the markings being painted with luminous paint to enable the instrument to be used at night.

The loop can be carried either on the back or by hand, this being effected by means of a carrier made of waterproof cotton material.

The dimensions and characteristics of the loop are as follows:-

Overall height	22⅝ ins
Loop diameter	14⅝ ins
Tripod height	6¼ ins
DC resistance	27.1 ohms
Self inductance factor	156 milli-henrys .

(b) Amplifier. A strengthened aluminium case contains the amplifier, earphones, ammeter power connection and input lead.

The interior of the case is lined with felt approximately 10 mm thick. The amplifier is painted khaki externally and silver on the inside.

Reading from left to right, the panel arrangement is as follows:-
Input terminal sockets, potentiometer, power on - off switch, output meter, change switch, power terminal sockets and output terminal (earphones).

In order to change the valves, the cover lid is opened by pressing down the top stud on the inner case.

The front face of the inner case is removed by unscrewing the six main screws which are behind the bars. On the inside there is an electro magnetic screen and from the left the valves are arranged as follows:-

1st Stage - amplification valve (receiving type) V1
2nd " " " (" ") V2
3rd " " " (" ") V3

The potentiometer adjusts the input on the second stage amplifier control grid in 10 steps. The total output increases with an increase on the potentiometer control scale.

The amplifier is a three stage low frequency unit of the resistance capacity type utilizing UZ-77 amplifying valves in all three stages.

The degree of amplification is 300,000 and the frequency range 20-100 cycles. During laboratory tests, it was not possible to get such a high gain; as a consequence the distance range is far below what it is assumed to be when the set is operating properly.

The output is adjusted by varying the second stage valve V2 - UZ77 grid controlled potentiometer (P1).

The output meter, which is next to the copper oxide rectifier, is a 200 micro-amp ammeter and reads the battery voltages, that is, if the change switch K2 is turned to "A" volts, point 3 on the diagram is connected to A and 10 B, the output meter (M) and the shunt resistance (R 17) are connected in parallel and also to the low voltage battery through the series resistance (R 15, 20000 ohms). The output meter pointer should stop near the red luminous paint mark of graduation 125, with the change switch turned to "A" volts graduation point is equivalent to 6.5 volts.

When the change switch (K2) is turned to "B" volts, point 1 is connected to A and 8B. The output meter (M) and the shunt resistance (R18) are connected in parallel and also to the high voltage battery, through the multiplier (R16, 500,000 ohms); the output meter should stop near the red luminous paint mark of graduation 125.

With change switch (K2) at "B" volts, graduation point 125 corresponds to 135 volts. If the meter switch (K2) is put as "output meter", points 5A are joined and the output meter (M) and the secondary of the output transformer (T2) are across opposite corners of the bridge. If the meter switch (K2) is put at "short circuit", the output meter will be disconnected and its moving coil short circuited.

When accurate measurement is essential a 100 micro amp ammeter is used in the place of the 200 micro amp ammeter. In this case the change switch must definitely not be put at short circuit. The two direction finder units recovered in the Myitkyina area differ, both electrically and mechanically, from the unit recovered in the Imphal area.

Electrically, the former units differ from the Imphal unit as follows:-

Output transformer (T2) does not incorporate the condenser coupling arrangement as is the case in the Imphal unit. The transformers are the same size but there are four terminals on the Myitkyina units as compared with six terminals on the Imphal unit. Mechanically the units differ as follows:-

The Myitkyina units have in effect double panels due to the method of mounting employed. The outer panel is finished in a dull brown or khaki. Holes are cut in the panel for all the inner panel controls to project through. Beside each hole is riveted a small tab with the function of each printed on it. This outer panel is backed with felt and when in place, is fastened to the carrying case by means of four screws, one in each corner. Thus the amplifier is completely suspended in felt. The inner panel is made of soft iron and is finished in aluminium paint. It bears no markings other than the factory assembly number.

Another mechanical difference is in the layout of the power input plugs and the headset meter output plugs. Cabling designed for the Imphal unit does not fit the plugs on the units recovered at Myitkyina, due to a slight difference in mounting centres. The loop cabling will fit all three units recovered.

Dimensions are as follows:-

Carrying Case	
Height	11⅛ ins
Width	12¼ ins
Depth	7¾ ins

Amplifier (Overall)	
Height	7 ins
Width	9 ins
Depth	6 ins

Loop Cord - length 58½ ins
Power Cord - length 59 ins
Meter Cord - length 38⅝ ins
Phone Cord - length 53 ins

Total weight of loop, amplifier and battery case is approximately 76½ lb.

(c) Battery Case. This case is 12½ ins high, 7¼ ins wide, 7 ins deep and is painted khaki colour on the outside.

The inside is covered with felt which had been impregnated with an acid resistant material to prevent corrosion by the dilute sulphuric acid of the battery.

The box contains three 2 volts colloid batteries and three 45 volts dry batteries. The battery terminal, to which the power lead is attached, is recessed and covered by a flap.

3. Method of Operation.

(a) Inspection. Before operating the set and after connecting the D/F loop, amplifier and battery case with the respective leads, pay particular attention to the following points:-

(i) Are the batteries connected securely and correctly inside the battery case?.

(ii) Is the amplifier power switch (K1) in the "off" position?

(iii) Does the amplifier potentiometer read "0"?

(b) Operation.

(i) Plug power cable into the amplifier, and then into the battery case.

(ii) Turn amplifier power switch to "off".

(iii) Turn change switch (K2) to "A" volts and "B" volts.

(iv) Plug headphones into the output sockets, turn the potentiometer from C to 10 and switch on the amplifier

(v) If the D/F loop is turned slowly, there should be heard loud and faint sounds from the commercial frequencies. When it is known that the set is functioning correctly at once turn the amplifier power switch to "off".

(vi) Level the D/F loop with the spirit level, loosen the compass locking screw and turn the loop until the compass points accurately North and South. It is essential to see that there is no magnetic substance near the D/F loop. With the compass pointing north and south, rotate the graduated base until the index reads 0^{o} and clamp the compass needle.

(vii) Switch on the power switch, slowly rotate the loop and roughly find the point of minimum signal.

(viii) Unplug the headphones, plug in the current indicator (100 micro-amp) and if the meter switch is turned to "on", the pilot lamp inside the meter will light up and the pointer will move. Now adjust the potentiometer until there is a measurable reading on the meter.

(ix) Revolve the loop slowly in the region of the angle of minimum signal, note the change of output with angle and obtain the angle of minimum meter reading. Observe the output meter readings shown on the graph and the minimum angle will be clear.

(x) When accuracy is required, revolve the loop through 180 degrees, find the point of minimum output and take the mean of the true and reciprocal bearings. To get accurate results, the receiver, ammeter and D/F loop must not be within one metre of each other.

4. REMARKS.

The equipment is extremely well built mechanically and all components are designed for carrying. It appears that three to four men would be required for operation.

The range of detection is not known, but under ideal conditions, it is believed that it would not exceed 2 miles maximum.

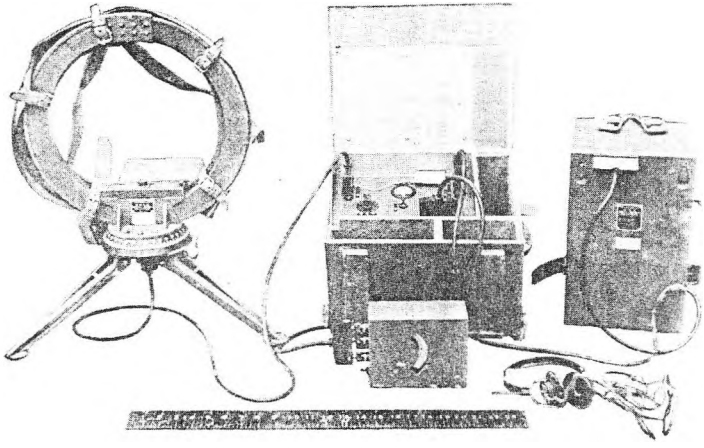
An accuracy of within one degree is claimed in the factory test record.

The units examined were made by Nippon Donki KK, Tokyo and dates of manufacture are given as April 1939 and December 1939.

(SOURCE: EEIS - INDIA).

HIGH VOLTAGE DIRECTION FINDER TYPE 98

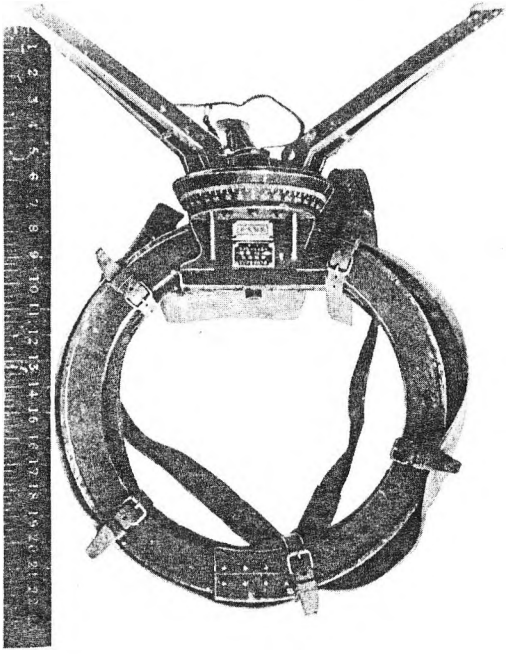
FIG 1



HIGH VOLTAGE DIRECTION FINDER

TYPE 98

FIG 2 Directional Loop with Carrying Pack Straps



HIGH VOLTAGE DIRECTION FINDER

TYPE 98

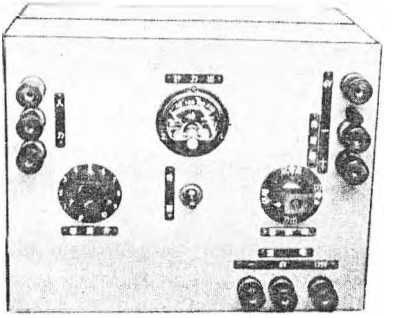


FIG 3 Amplifier

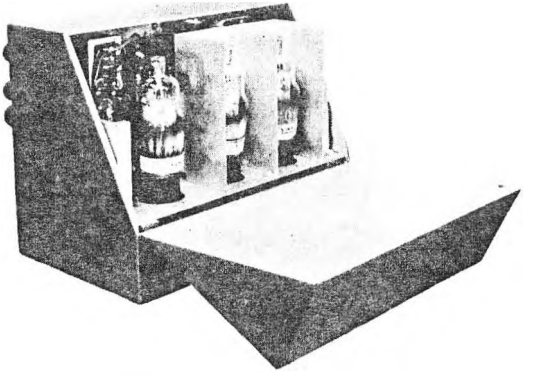


FIG 4 Amplifier, Rear View.

HIGH VOLTAGE DIRECTION FINDER

TYPE 98

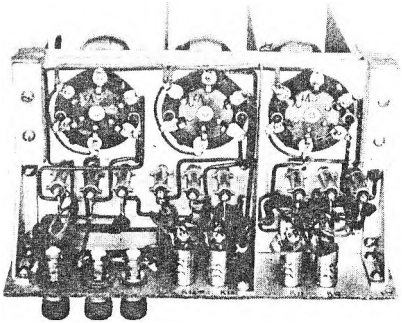


FIG 5 Amplifier, Bottom View

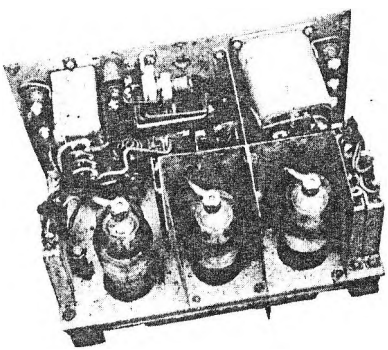


FIG 6 Top view of Amplifier recovered at Myitkyina, Note Pilot Light.

HIGH VOLTAGE DIRECTION FINDER

TYPE 98

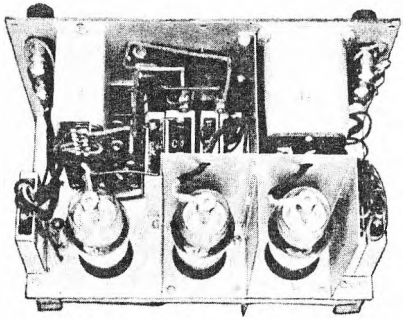


FIG 7 Top View of Amplifier recovered at Imphal. (See Fig 6)

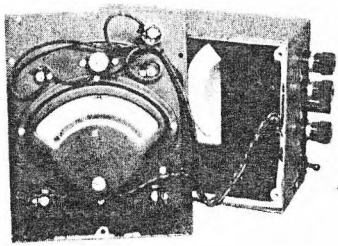


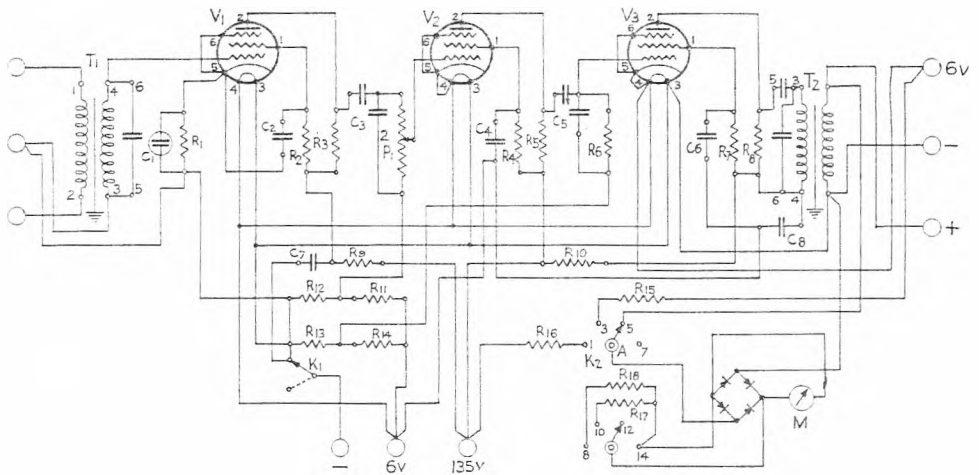
FIG 8 Exposed view of Microammeter.

HIGH VOLTAGE DIRECTION FINDER TYPE 9B
KEY TO CIRCUIT DIAGRAM

T1	Input transformer 50-500000 ohms	
T2	Output transformer - 100000-5000 ohms	
V1) V2) V3)	Amplifying Valves UZ-77	
K1	Power on-off switch	
K2	Change switch	
P1	Potentiometer	
R1	Resistance	10000 ohms
R2 R3 R4	"	300000 "
R5	"	200000 "
R6	"	1 Meg ohm
R7	"	300000 ohms
R8	"	100000 ohms
R9 R10		50000 ohms
R11 R13	1 X A Resistance	80 ohms
R12 R14	" "	160 ohms
R15	Series Resistance	20000 ohms
R16	Multiplier	500000 ohms
R17 R18	Shunt Resistance	each approx 500 ohms
C1	Electrolytic Condenser - approx 10 mf	
C2	Condenser	1, 2 mf
C3	"	C1 .05 mf C2 .007 mf
C4	"	1, 2 mf
C5	"	C1 .01 mf C2 .045 mf
C6	"	1, 2 mf
C7 C8	"	2, 5 mf
M	Output meter	0-200 m ADC

HIGH VOLTAGE DIRECTION FINDER TYPE 98

FIG 9 Circuit Diagram



WIRE LINE CONSTRUCTION EQUIPMENT

1. GENERAL.

The equipment recovered in Burma consisted of a wire grip, wire guide and improvised pole climbers.

2. DESCRIPTION.

(a) Wire Grip (fig 1)

The grip, which is designed for use on small gauge wire has an overall length of 11 ins and weighs 2 lb. While the grip will open to 3/16 in, the length of the jaws precludes its use for sagging wire heavier than about .080 in.

(b) Line Guide (fig 2)

This consists of a wooden handle on which is mounted a metal rod with a spiral opening in the outer end. The metal part of the guide appears to be made of copper. The overall length is 8½ ins and weight 1 lb. The guide is apparently intended for use in guiding wire where hands would normally be used.

(c) Improvised pole climbers (fig 3).

This equipment appears to have been manufactured in a field blacksmith's shop out of 1 in. by ¼ in. stock. The climbers are apparently fastened to the legs by means of ropes. As no padding is used, the climbers would be very uncomfortable and can not be used for long periods. The overall length is 16½ ins. and weight 4 lb.

Source - EEIS APO 629 -

WIRE LINE CONSTRUCTION EQUIPMENT

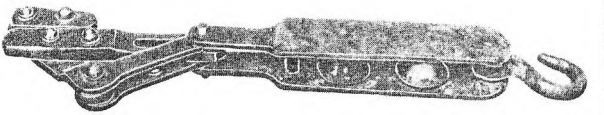


FIG 1 Wire Grip

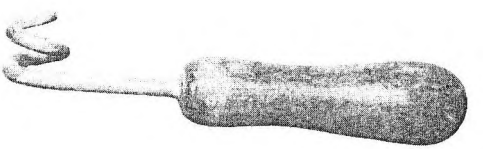


FIG 2 Line Guide.

FIG 3 Pole Climbers

SIGNAL ROCKET

MODIFICATION 1

1. GENERAL

The rocket is similar to the British Signal Rockets (1 lb) Mk III and is probably used for the same purpose, namely day or night signalling. The weight of this rocket is 550 gms (1¼lb).

2. DESCRIPTION (Figs 1 - 2)

The components of the rocket consist of (a) composition-filled case closed by a removable plug (missing) and (b) upper cylinder containing white stars. A stick, which was missing from the equipment examined, fits into a metal socket lashed and glued to the case and stabilizes the rocket during flight. The rocket is painted brown and has label pasted on side of case and translated as "Manufactured Nov 1942 L of A Nippon Fireworks Company".
Another label on the upper cylinder is translated as "Signal Rocket Modification 1".

(a) Case: This consists of a rolled paper tube choked at the lower end to form a vent. The rocket composition, which is pressed into the case, has a conical cavity in the centre. A piece of quickmatch is attached to the inside of the case below the vent and a short length of it protrudes through the vent into the cavity. The remainder is coiled up loosely between the vent and the removable plug and when uncoiled serves as a wick igniter.
The rocket composition is a gunpowder with the following ingredients:-

Potassium Nitrate	64%
Sulphur	12%
Charcoal (by difference)	24%
	100%

Above the rocket composition is a primed paper disc to which is attached a piece of quickmatch. The ends of the quickmatch pass through two channels in a 15 mm thick layer of cardboard above the rocket composition and into a small charge of gunpowder which, when ignited, ignites and ejects the stars.
The gunpowder ejection charge weighs 8 gms and has the following composition:-

Potassium Nitrate	64%
Sulphur	13%
Charcoal (by difference)	23%
	100%

(b) Upper Cylinder: This cylinder consists of a cardboard tube with an outer layer of paper and is filled with sixteen white stars.
One end is closed by nine cardboard spacing discs and a circular wooden block covered with a paper cone. The other end is attached to the case, the joints being sealed with paper strips.
The sixteen stars are arranged in the cylinder in four

layers of four each, each star weighing approximately 8 gms. The stars are heavily primed with gunpowder to ensure rapid ignition. The average burning time is 5 seconds, during which a brilliant white light is emitted.
The composition of the stars is as follows:-

Potassium nitrate	63.1%
Sulphur	20.8%
Antimony Powder	14.7%
Resinous material	1.1%
	99.7%

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Branch.)

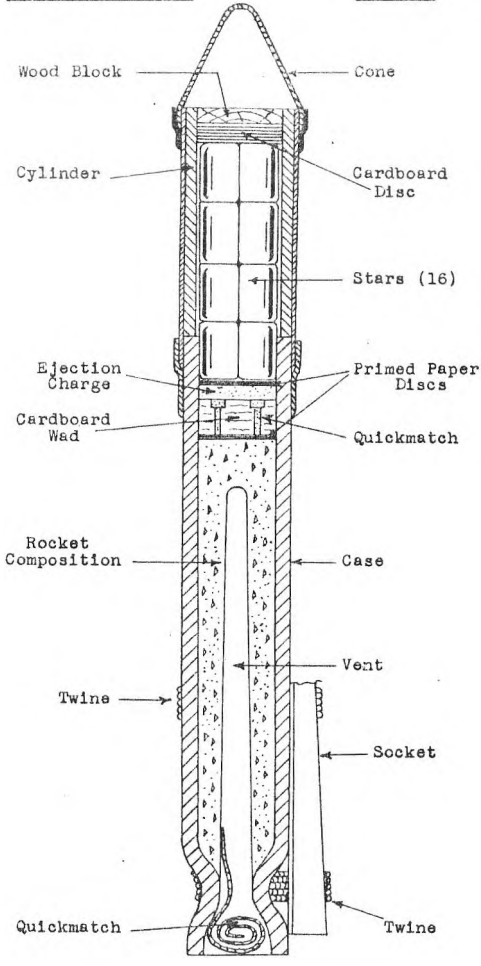
SIGNAL ROCKET

MODIFICATION 1

FIG 1

SIGNAL ROCKET

MODIFICATION 1 FIG 2



HOOLAMITE TYPE
CARBON MONOXIDE DETECTOR

1. GENERAL

This item is a standard commercial carbon monoxide detector, its action depending on the liberation of iodine from iodine pentoxide in the presence of fuming sulphuric acid. It is apparently intended for civilian use and has been applied for military use. The equipment was recovered in New Guinea.

2. DESCRIPTION (Figs 1 & 2)

The equipment total weight 1.175 kg is housed in a khaki painted aluminium alloy case 22.5 cm x 10 cm x 6.5 cm. Four leather carrying straps are attached to four metal loops riveted to the case. The case contains one rubber bulb aspirator with barrel, one support tube, 36 detector tubes, one packet of spare carbon granules and a packet of spare parts. The latter were missing from the sample received.

(a) Case: This is made from 2 mm aluminium alloy welded at the edges. The lid comprises the top and the upper half of three sides and is hinged on the front edge and opens forward. The lower half of the case is divided into two compartments, separated by a wide wooden partition (3 cm wide) bored out to receive the pump, the support tube and a glass knife. Each compartment holds a cardboard box containing 18 detector tubes. The lid has two metal compartments, each provided with flat springs to hold containers for spare charcoal and accessories (not received) and a small lug in the centre, covered with black plush to hold the support tube in place when the lid is closed. The inscription visible inside the back of the case reads -

"Kyo (Tokyo)
December 1937

(FUJIKURA). Industrial Coy Ltd."

The case is painted khaki outside and cream inside.

(b) Aspirator seen complete with support tube in Fig 1, is shown "exploded" in Fig 2. The parts are numbered in the direction of air flow. Parts (1-4) form the inlet valve, a spring loaded rubber disc type. A binding wire ensures air tight fit between the bulb and the inlet valve. The outlet valve consists of a body with nipple for insertion into the bulb, a thick (0.6 mm) rubber seat and a 0.6 mm thick flap valve, and a spider, fitted with a light spiral spring bearing on the tongue of the flap valve. The spider screws into the body and retains the rubber seat and the flap valve, in position. The barrel is of nickel plated brass, 8.6 cms long, 1.8 cms diameter with 1 mm walls. It contains 6 gms activated charcoal, retained by two brass gauze circles. On top of the charcoal and separated from it by gauze

is the stiff capped spring, which is compressed when the barrel is screwed into the outlet valve. The far end of the barrel is fitted with a spigot to which is wired a 1.4 cms length of 7.5 mms rubber tube. The spigot also carries two pins, which engage in the bayonet slot in the support tube.

(c) Support Tube: This is a 9 mm. length of plated heavy brass tube cut away on both sides to allow observation of the detector tube in operation. It has two bayonet slots cut in the base to engage the pins in the barrel and two spring clips, seen on the left in Fig 2 and on the right in Fig 1, to hold the Standard colour tube.

(d) Standard Colour Tube: This is an 11 cms length of 9 mms glass tube sealed at both ends enclosing a paper cylinder divided into six equal portions of varying shades of blue. Each blue section is over-printed with the percentage carbon monoxide appropriate to the colour assumed by the detector tube filling. The range provided for is 0.05% - 1.0%.

(e) Detector Tube: The tube is an 11 cms length of 4 mms glass tube drawn out and sealed at both ends with a constriction 2 cms from one end. The dark portions seen in Fig 2 are painted red to accentuate any blue colour developing in the filling. The active filling which occupies 3 cms of the tube is composed of pumice granules impregnated with iodine pentoxide and fuming sulphuric acid held in place with a plug of glass wool at either end. The presence of sulphate and iodine was qualitatively confirmed, and the reaction to carbon monoxide verified.

3. FUNCTION

No check has been made on the accuracy of the quantitative indication. As constructed it could not be used to detect any war gas.

Extracts:-

The detector tube consists of a glass tube with the detector reagent, (Pumice saturated with an aqueous solution of iodine pentoxide to which fuming sulphuric acid has been added after drying), fire sealed at both ends. These ends are cut off before use.

Although the detector chemical is ash white at first it turns blue to a degree varying with the concentration of carbon monoxide. This is compared with the standard colours and the concentration determined. This detector is able to measure from 0.05% to 1% concentration of carbon monoxide. The following procedure is adopted when using the equipment: Open the cover of the portable box. Take out the pump and place the support tube and standard colour tube in the front end of it. Cut off both ends of the detector tube and insert it into the support tube with the end with the swelling fitting into the rubber tube at the front end of the absorption tube.

Squeeze and release the rubber bulb 10 times. Then the tone of colour in the detector material is compared with the standard colour tube. The detector tube will be discarded after use. However in case of continuous use it can be used further when it is made

colourless again. However three times is the limit and any that has been left over twenty minutes after the first use will not be used. The replacement of absorptive material will be made, as a rule, after the use of 100 detector tubes. However when it has come into contact with high humidity and in other cases when its absorptive power is thought to be greatly reduced it will be replaced immediately.

4. COMMENTS

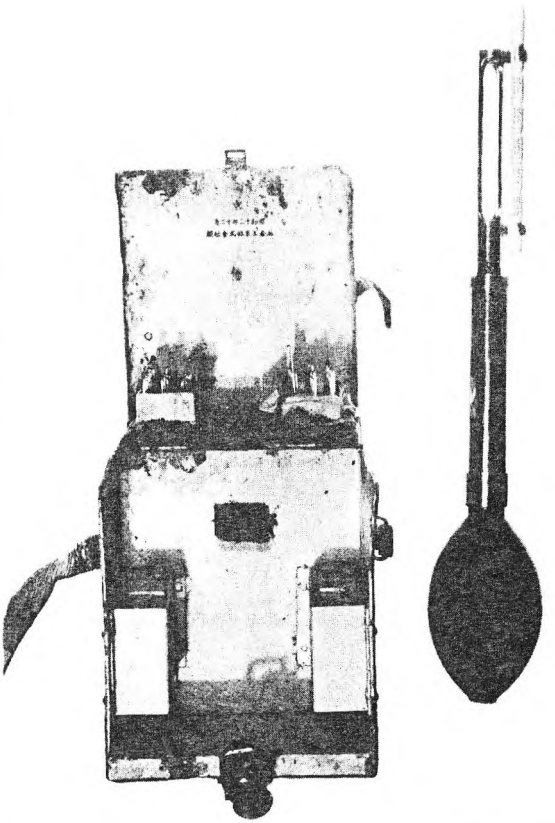
The whole equipment is sturdily constructed and well finished and bears every evidence of being a peace-time commercial article. The reference (para 3) to decolourization was checked with the samples and it was found that direct sunlight destroyed the blue colour.

(SOURCE:- 2/1 Aust CW Lab. RAE)

HOOLAMITE TYPE

CARBON MONOXIDE DETECTOR

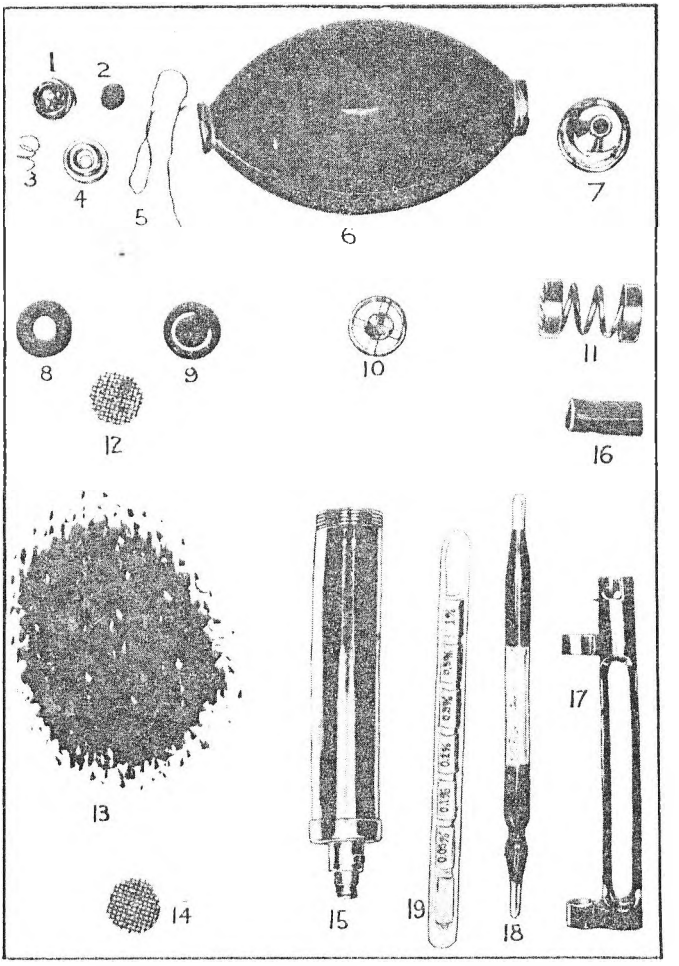
FIG 1



HOOLAMITE TYPE

CARBON MONOXIDE DETECTOR

FIG 2



(1)-(4) Inlet Valve Components. (5) Binding Wire. (6) Bulb. (7) Outlet Valve Body. (8) Outlet Valve Rubber Seat. (9) Outlet Valve Flap. (10) Outlet Valve Spider. (11) Capped Spring. (12) Gauze. (13) Activated Charcoal. (14) Gauze. (15) Barrel. (16) Rubber Tube. (17) Tube Support. (18) Detector Tube. (19) Standard Colour Tube.

MAGAZINE LOADERS

1. GENERAL.

These loaders are for use with 6.5 mm Type 96 and 7.7 mm rimless Type 99 MGs. They are hand operated units, readily portable, and are intended for quickly charging clipped rifle ammunition into machine gun box magazines. These two items are combined in one report because the construction and operation of the two are similar, the major difference being in size and the addition of a small cartridge oiler to the 7.7 mm unit. The 6.5 mm MG Type 96 and 7.7 mm rimless MG Type 99 were discussed in AMF Technical Intelligence Summaries Nos. 1 and 11 respectively.

2. DESCRIPTION (Figs 1-2)

The principal characteristics of these loaders are:-

	6.5 mm Type 96.	7.7 mm Type 99
Weight, complete - - -	14½ oz.	21 oz.
Weight without oiler	14½ oz.	17 oz.
Weight, oiler - - - - -	(none used)	4 oz.
Dimensions, closed - - (Dimensions are max. as shape is irregular)	5x5x2¼ in.	5x5x3 in.

Both loaders permit rapid charging of magazines. The standard box magazines of both the Type 96 6.5 mm LMG and the Type 99 7.7 mm LMG each have a rated capacity of 30 rounds. Actually from 32 to 33 rounds may be inserted. The loader is intended to utilize ammunition in the standard 5 round metal clip, the hopper holding three clips. A folding handle, retained in its closed position by a spring clip on the side of the loader, is used to strip the cartridges from the bottom clip in the hopper, the three clips of ammunition being held in position by light thumb pressure. As one clip is stripped of its contents, these rounds are forced into the magazine. Retraction of the operating handle permits the next clip to drop to the bottom of the hopper, forcing the empty clip through a slot in the bottom.

The cycle is repeated until the three clips have been consumed, whereupon three additional clips are inserted and the charging continues.

(a) Construction.

(i) Type 96, 6.5 mm loader.

Inexpensive stampings are used to form the feed mouth slipping over the magazine, the bottom plate, the hopper, and other parts. Such parts are flash welded at numerous points for strength. All openings are

reinforced with a 3/16-inch bead of the same sheet metal, flash welded. This material is of 20 gauge steel (.037 inch). The bottom plate, forming the foundation of the unit, is of 17 gauge (.055 inch) sheet steel. The construction of the magazine mouth is similar to the magazine receptacle on the machine gun. A simple spring loaded hook-latch locks it to the magazine body. This latch is a stamping, machined only on the locking lip. The charging handle is a crude forging, showing a minimum of machine work and with the hinge joint at the outside of the bullet end of the hopper. A simple, riveted hinge joint permits the operating handle to be folded upward and when closed, this clips to the outside of the hopper in such a manner that rattling cannot occur.

The 2-3/4 in handle is of two pieces of a wood similar to walnut, 9/16 ins. diameter, attached to the forged hinge section by a rod running longitudinally through their centre and riveted over a pressed steel end cap. The upper portion of the wood handle is 15/16 in long while the lower is 1-1/8 ins. A steel sleeve 9/16 in. diameter and 1/2 in. long, forms a waist unit at the centre of the handle. This serves no purpose other than as a bearing point for the spring clip holding it in the folded and closed position.

A riveted pin near the hinge joint of the charging lever contacts a stop lip on the lever to prevent it from being withdrawn completely from the hopper. Since this arm is a low carbon stamping steel, the lip upsets with use, permitting the arm to be withdrawn a slight fraction of an inch. Thus on the return stroke, the cartridge face of the arm is slightly withdrawn from the hopper opening, and due to normal play in the hinge joint, slips out of position and jams against the outside of the hopper. This could be corrected by minor redesign.

(ii) Type 99, 7.7 mm loader.

This differs only in minor dimensions from the above, plus the addition of a detachable oiler. The oiler is held to the top of the loader between the hopper and the magazine mouth by a female dovetail receptacle welded to the unit. A male dovetail lug on the oiler tank fits into this, and a flat spring latch holds the oiler in position. The oiler holds an estimated 1 fluid ounce of oil in the flat rectangular tank measuring 1-5/16 x 3-1/8 x 9/16 in. of pressed steel, seam welded. A vented screw cover serves as a filler cap.

(b) Function and features of oiler. This unit

combines crude Japanese manufacture with unnecessarily complicated design. The screw cap threads into a collar welded to the top of the oiler and permits a ½ in. opening. Plug cap threads are 24 to the in. This cap is vented by a small side hole at the top of the threads and a hole through the bottom centre. The plug is hollow with a cylindrical cavity 25/64 in. diameter and 21/64 in. deep. The purpose of this cavity is not known,other than to lighten the plug. It apparently is a stamping with a disc seal in the base. the disc being double beveled on the edge and the mouth of the plug spun over it to lock it securely. The outer surface is then machined to thread it, knurl the rim, and turn a groove for the retainer ring. This retainer is locked by a toggle link chain to a stud on top of the oiler. This construction seems unnecessary as it is expensive and a simple chain would admit more flexibility with full protection against loss.

Oil feed is through a top spring loaded cone-shaped bevel seating valve having a stem projecting through the valve seat. When this valve is raised oil flows around it, down the stem to a pressed steel comb having 18 openings in its face, diameter .033 in. The comb is a hollow steel stamping open at the top and measures 1½ ins. long, .2 in. wide, and .2 in. high, with the face slightly beveled to permit easy passage of the cartridge beneath it. It is locked to the oiler by screws on either end operating through elongated holes to permit free action. As a cartridge is forced from the hopper through the loader mouth into the magazine, it passes under this comb which is pressed upward slightly to permit passage of the cartridge and to wipe it with a smear of oil through the openings in the comb.

On the inside centre of the comb is a riveted pin post. As this comb is forced upward by the passage of the cartridge, the post contacts the stem of the cone seated lift valve, raising it to permit a gravity flow of oil into the comb. This lift valve is spring loaded at the top, operating in the oil chamber against a spring retaining plug screw in an extension tube projecting ½ in. from the top. As the passage of the cartridge relieves the pressure on the comb, the spring reseats the valve with the beveled shoulder against the cone opening, stopping the oil flow.

3. REMARKS.

To determine speed of loading, a test was conducted with both the 6.5 and 7.7 units, and their corresponding magazines and cartridges. A magazine was held in the left hand, the loader in the right, and sufficient clips of cartridges made available. The loader was attached, 30 rounds charged into the magazine, and the loader removed. The maximum time

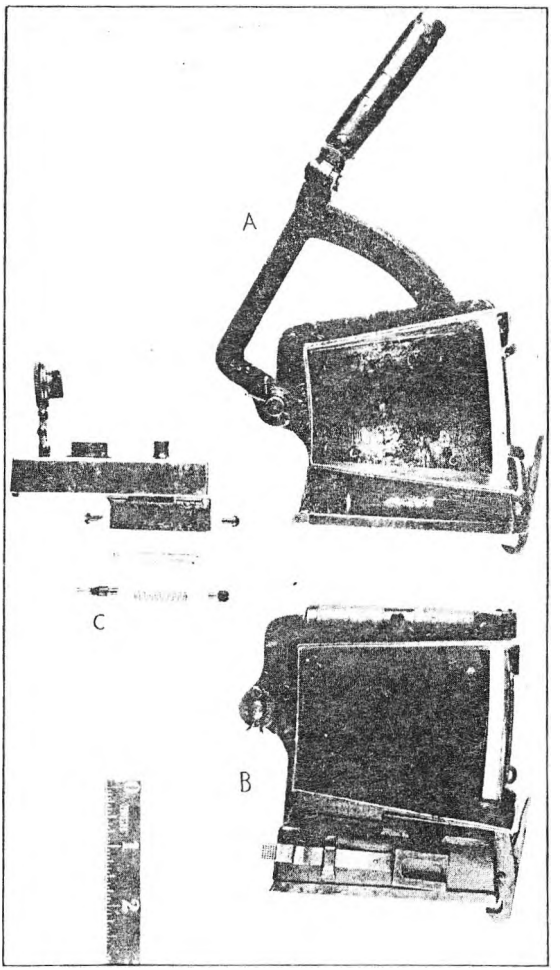
required was 26 seccnds, and the minimum, 16 seconds. Charging times for both magazines were about the same.

These units are basically excellent in design and when in perfect condition leave little to be desired in their functioning. If they are abused they are readily jammed because of minor weak points in design which could easily be corrected.

(SOURCE: Aberdeen Proving Ground)

MAGAZINE LOADERS

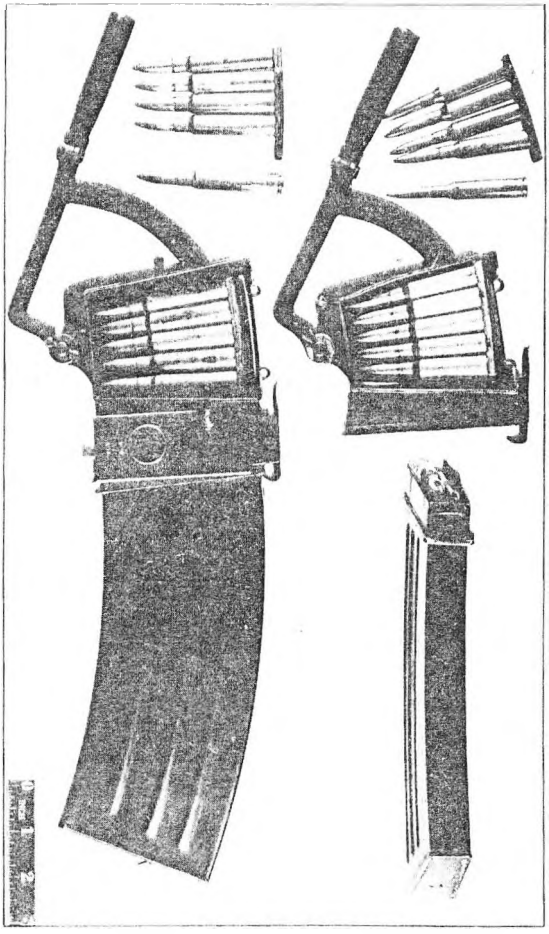
FIG I



(A) Type 96 Loader. (B) Type 99 Loader with Oiler removed. (C) Oiler dismantled.

MAGAZINE LOADERS

FIG 2



A A SPOTTING BINOCULARS

1. GENERAL.

This instrument is similar in appearance and design to the type 89(1929) 15 x 4° aircraft spotting binoculars reported in AMF Technical Intelligence Summary No 6. The chief difference between the two models appears to be in size.

2. DESCRIPTION.(fig 1)

General characteristics are as follows:-

Power	15 diameters
Field of view	4°
Dia. of entrance pupil	80 mm (3.14 in)
Dia. of exit pupil	5.25 mm (.2 in) approx
Inter-objective distance	115 mm (4.52 in)
Inter-pupillary distance	60 to 70 mm (2.36 to 2.75in
Diopter movement	Minus 4 to plus 2 diopters
Weight	22 lb
Length	17 in.

The arrangement of the optical parts is similar to the arrangement of these components in the type 89, 15 x 4° binoculars. The erecting system is of the same design.

The telescope body and eye piece housing are made of cast aluminium, the remaining major metal parts being of brass. An elevation arc, graduated in degrees from minus 20 to plus 90 is attached to the right side of the instrument. A clamping knob is provided to lock the binoculars in the desired vertical position.

A prism is located between the two eye-pieces to facilitate using the open sight placed between the two objective housings. The open sight consists of a pointed vertical post, protected by a metal ring, and an open "V" sight.

The adapter for the instrument light is the "screw-on" type found in many Japanese instruments. An amber filter, contained in a metal holder that slips over the eye-lens cell, accompanies the instrument.

The reticle design consists of a simple cross formed by a vertical and horizontal line the junction of which denotes the centre of the field of view.

3. REMARKS.

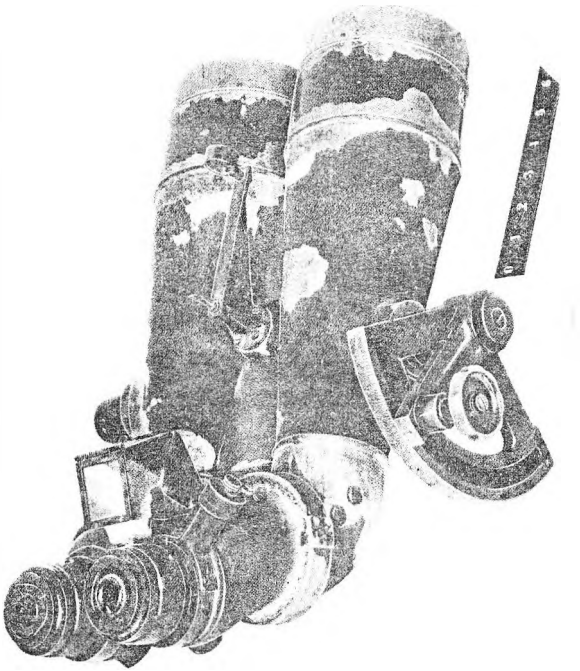
The lack of any angular graduations on the reticle would limit the use of these binoculars to general observation and target identification, with any degree of efficiency.

The exterior elevation scale limits the accuracy of the angle measurement in a vertical plane to one degree, which is unsatisfactory for fine correction. Any discussion on the measurement of horizontal angles is impossible,due to the absence of a mount.

(SOURCE: Aberdeen Proving Ground)

AA SPOTTING BINOCULARS

FIG 1



2 METRE RANGE FINDER

MODEL 97 TYPE 2

1. GENERAL

This instrument is believed to be designed for use with coastal defences. It is provided with an elbow telescope for tracking purposes and a graphical computer for converting slant range to altitude. No tripod was received for examination.

2. DESCRIPTION (Figs 1-4)

(a) Range Finder: The range finder has an outer tube, optical tube and two tubular diaphragms, all of which are made of steel. The outer tube is covered with asbestos treated canvas. The optical tube is attached inside the outer tube by two yokes. A diaphragm is placed in each side of the outer tube and extends almost all the way from the penta prism to the objective. The penta prisms are housed in cage-like assemblies and slide into the outer tube where they are properly positioned by locating lugs. This also prevents the prism assembly from being accidently rotated. A retaining ring and locking ring retain the prism assembly against end play. End cover plates are used for closing the ends of the outer tube. These plates slip into place and are retained by a series of holding screws spaced about the circumference of the plate. Desiccating plugs are placed in each end cover plate.
The following design features are quite similar to those found in the Japanese 2 metre base height finder.

Penta prism mounting
Central prism assembly
Reticle assembly
Night lighting of scales
Eyepiece assembly
Filter assembly.

The range is measured by translating an optical wedge placed between the central prism assembly and the right objective. The instrument is adjusted for range in the following manner.
The range drum and measuring wedge are moved until stereo-contact is obtained on a target of known distance or infinity. If the range index does not indicate the correct range, the measuring wedge is disconnected from the range roller and the range drum is moved independently of the measuring wedge until the range index agrees with the known range. A small lever, located immediately to the right of the eye-piece, is connected to an intermediate gear in such a manner that actuating the lever causes the intermediate gear to slide in or out of mesh with the gearing of the measuring wedge. Moving the lever to the left causes the measuring wedge to become engaged with the range roller; moving the lever to the right disconnects the measuring wedge from the range roller and range drum.
The height of image is adjusted by translating a wedge that is located between the central prism assembly and

the left objective. The adjusting roller for height of image is located on the under side of the outer tube approximately 180° from the range roller.
Because of the design of the penta prism holder and the lack of adjusting ports in the outer tube, it is assumed that the penta prisms are adjusted by trial and error outside of the instrument until the prisms are properly aligned with the optical axis of the range finder. Plano-parallel windows, instead of the usual wedge windows, are placed in front of the penta prism.

(b) Tracking Telescope: The instrument received was incomplete as the entire eyepiece was missing. Data engraved on the cover plate for the erecting system state that the instrument has a power of ten diameters and a field of view of five degrees. The reticle consists of a small circle (angular diameter undetermined) engraved on a piece of plano-parallel glass.
The body of the telescope is made of cast aluminium to which is attached the male portion of the dovetail adapting bracket. A spring latch locks the telescope in place.
The erecting system consists of a modified Amici prism.

(c) Graphical Altitude Computor: This accessory consists of a pendulum arm enclosed in a circular holder. The pendulum is graduated with a vertical scale in increments of 50 metres from 100 to 1000 metres, representing slant range. The face of the holder has a graduated scale consisting of vertical lines representing altitude and a segment of a circular scale graduated in single degrees from 0 to 70° denotes the angle of site.
A light oil is used to dampen the movement of the pendulum.
The graphical computor is attached to the outer tube to the right of the range drum by a dovetail bracket.

(d) Cradle: The trunnion bearing arms are cast as an integral part of the body. The body fits over the azimuth worm wheel which is assumed to be clamped to the tripod head. Turning the azimuth worm, which is part of the cradle, causes the range finder and cradle to be rotated about the worm wheel. Elevation is accomplished by direct manual pressure applied to the handle attached to the range finder.

(e) General Characteristics:

Power	24
Field of view	undetermined
Diameter of entrance pupil	1.9 ins
Diameter of exit pupil	.08 ins
Base length	2 metres
Diopter movement	+ 2 to −4 diopters
Measuring limits	500 to 20,000 metres
Inter-trunnion distance	35-1/2 ins
Overall length	.86 ins
Weight	148 lb
Manufacturer	undetermined
Date of Manufacture	1942

3. REMARKS

The method provided to correct for range eliminates an

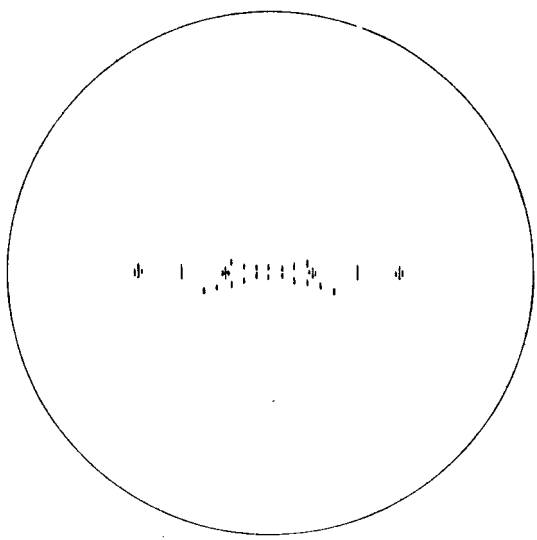
extra optical wedge and allows a more symmetrical optical assembly to be used. This appears to be desired by the Japanese in order to have both fields of view equally bright. The eyeguard assembly is a direct copy of the Carl Zeiss design and is particularly good in that it will accommodate faces of various width without disturbing the inter-ocular setting or cause uncomfortable pressure on the observer.
The lack of adjusting ports and wedge windows in the outer tube necessitates major dismantlement to correct any maladjustments that cannot be corrected by the height of image or range mechanism.

(SOURCE:- ABERDEEN PROVING GROUND-MARYLAND)

2 METRE RANGE FINDER

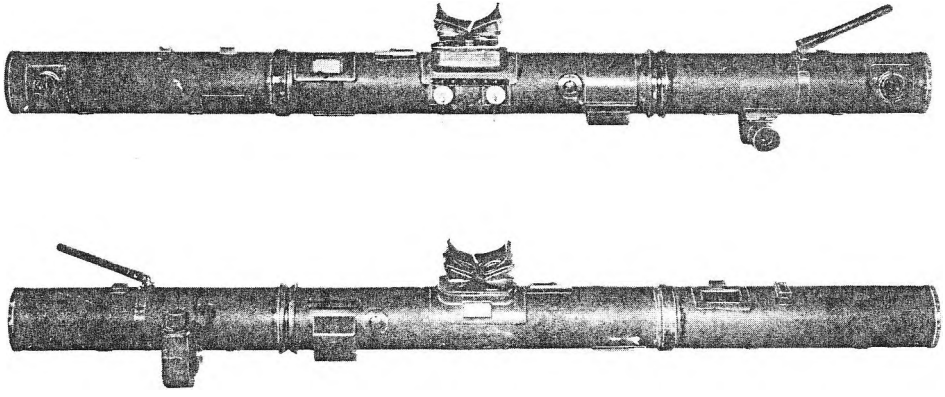
MODEL 97 TYPE 2

FIG 1 Reticle Pattern.



2 METRE RANGE FINDER MODEL 97 TYPE 2

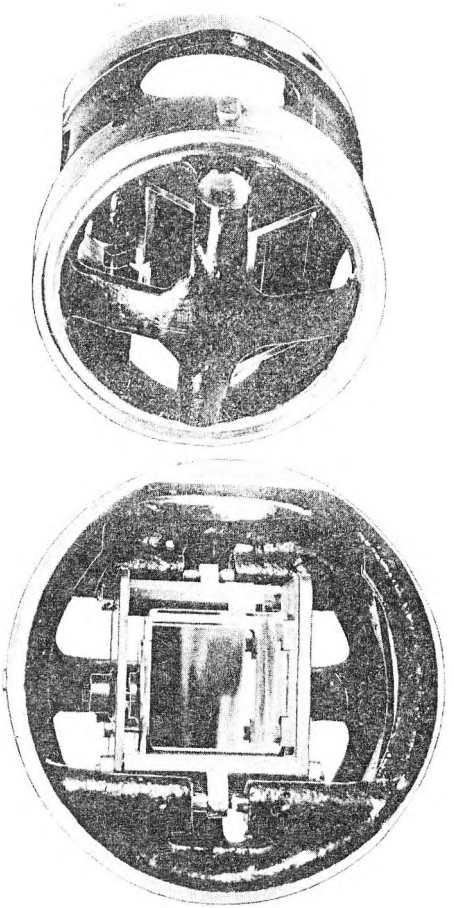
FIG 2 Front and Rear Views.



2 METRE RANGE FINDER

MODEL 97 TYPE 2

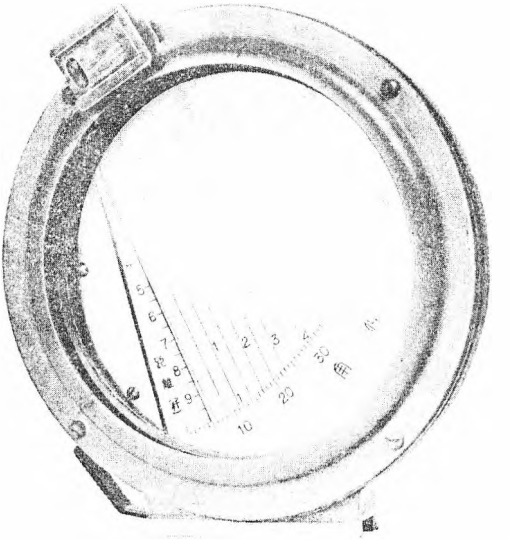
FIG 3 Penta Prism Mountings.



2 METRE RANGE FINDER

MODEL 97 TYPE 2

FIG 2 Graphical Altitude Computer



SURVEYING INSTRUMENT

1. GENERAL.

This instrument was recovered at SAIPAN and is identified from the markings as "Land Plotting (Surveying) Instrument No 92". Date of manufacture was given as July 1930 and place, Japan Optical Stock Company.

2. DESCRIPTION (figs 1-3)

The instrument is constructed almost entirely of highly polished brass. It is equipped with four levels, three levelling screws, magnetic compass, vertical scale with vernier, horizontal scale with vernier tilting crosshair scale with vernier and a 12 in., 10 power 5 degree field prismatic telescope. The telescope is provided with a $\frac{5}{8}$ in diameter eyepiece and a 2 in diameter objective lens.

Small magnifying lenses are fitted over each scale in order that verniers may be read to a higher degree of accuracy. The scale (fig 2 B) on the prism housing is 3200 mils graduated in 100 mils intervals with the vernier for this scale (fig 2 A) graduated to read in 1 mil intervals. One revolution of this vernier registers 100 mils on the above scale (fig 2 B) and rotates the tilting crosshairs correspondingly. The vertical scale (fig 2 C) reads in mils, 300 mils below and 500 mils above horizontal, making the total vertical angle 800 mils or 45 degrees. The adjusting screw for levelling the vernier of the vertical scale is shown in fig 2 D. Fig 2 E refers to the vernier adjustment screw which operates the vertical scale on the telescope. The vertical and horizontal scales can be read accurately to 1/5 mils.

The fixed reticle in the telescope is graduated in 1 mil intervals along the "X" and "Y" axes of the objective lens with zero at the centre. Figures increase from the origin of co-ordinates both horizontally and vertically.

The wooden carrying case is 10 ins wide, $13\frac{1}{2}$ ins. deep and 15 ins. high and is large enough to house the instrument and all accessories. The instrument, tripod and carrying case constitute a complete unit which weighs approximately 50 lb. Shoulder straps are provided on the carrying case.

3. OPERATION.

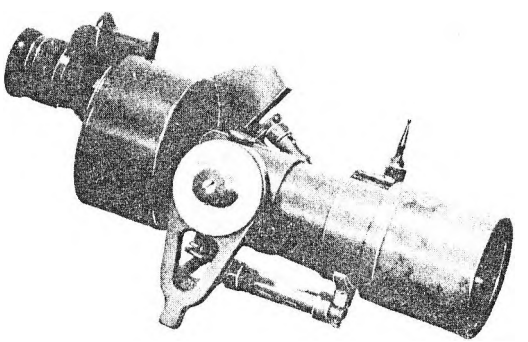
The telescope is directed on its horizontal and vertical axes to the target. By sighting through the telescope and adjusting the eyepiece until the target is in focus, the several vernier scales on the instrument may be adjusted to zero the telescope.

The magnetic azimuth of the target together with its angle of declination or inclination from a horizontal can then be read directly on the scales and compass of the instrument. By use of a third scale the range of the target from a known reference point can also be computed. An additional feature, the reason for which is not apparent, is also embodied in the instrument. In sighting through the telescope, a system of crosshairs appears in the field of vision. These crosshairs are in one direction only, 5 mils apart, are parallel to each other and the centre cross-hair passes through the intersection of the "X" and "Y" axes of the telescope. By means of a rotating element, these crosshairs can be "tilted" through 3200 mils until they parallel either the "X" or "Y" axes or can be set to any intervening angle to the accuracy of one mil.

(SOURCE: - EEIS - USAFPOA).

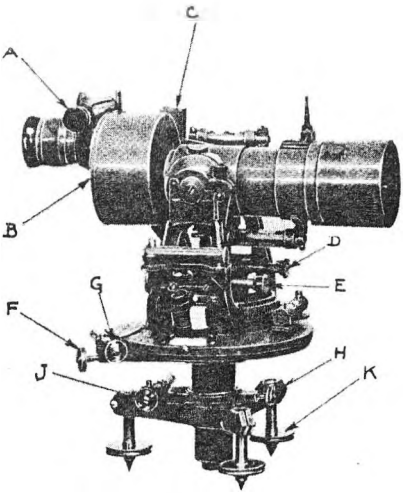
SURVEYING INSTRUMENT

FIG 1 Telescope Component



SURVEYING INSTRUMENT

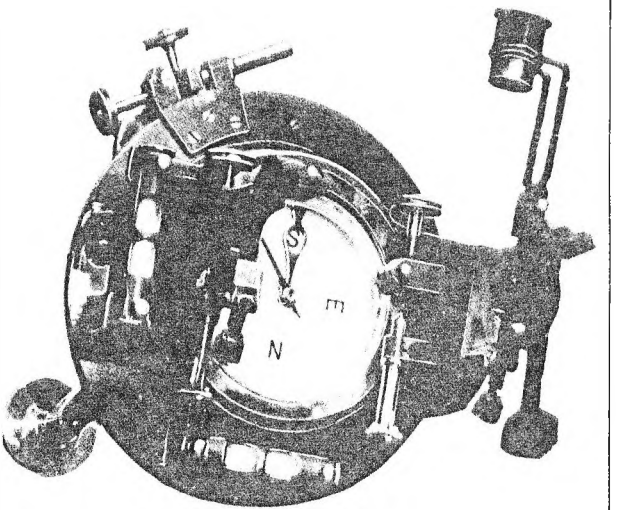
FIG 2



(A) Prism Scale Vernier. (B) Prism Housing Scale.
(C) Vertical Scale. (D) Vertical Scale Ajdusting Screw.
(E) Vertical Scale Vernier Screw. (F,G,H,J) Locking Screws and Vernier Adjusting Screw for Horizontal Scale.
(K) Levelling Screws.

SURVEYING INSTRUMENT

FIG 3 Telescope Removed.



ENTRENCHING SHOVEL & COVER

1. GENERAL.

This shovel may be carried on the pack by withdrawing the handle from the blade or it may be slung over the shoulder on a rope through the holes in the blade and handles. It was manufactured in 1940 and recovered in the Central Pacific Area in 1944.

2. DESCRIPTION (fig 1)

The component parts of this equipment consist of a blade, detachable handle and case.

(a) Blade. The blade is made of steel uniformly hardened to a Rockwell C value of 51 to 52 and has the following composition:-

Carbon	0.38 %
Manganese	1.56 %
Phosphorus	0.02 %
Sulphur	0.02 %
Silicon	0.25 %
Chromium	0.25 %

The edges of the blade are bevelled. The blade has been given a phosphate type of pretreatment and enamelled. Two 3/16 in diameter holes are located near the centre 2½ ins apart. Another hole ⅜ ins in diameter passes through the blade near the curved spine.

(b) Handle. This part is fabricated from wood of good commercial quality which resembles ash. A thin organic dressing, possibly oil, had been applied. A 5/16 in diameter hole is drilled through the handle 8 ins. from the upper end, through which a cord passes to the ⅜ in. hole near the spine of the blade.

(c) Case. The case is shaped similarly to the shovel. It is cut down the centre front and hemmed. Two pairs of webbing ties are used to close the case. All the corners are mitred and the same fabric is used throughout. Two webbing loops are stitched to the back of the cover; the upper one accommodates the shoulder strap and the lower one is used for holding the handle when not in use.

3. GENERAL CHARACTERISTICS.

Weight		
	Blade	1.85 lb
	Handle	0.75 lb
	Cover	0.40 lb
Width		
	Blade and Handle Assembly	7¾ ins
	Case	Tapers to 9¼ in. (Max)
Length		
	Blade and Handle Assembly	31 ins
	Case	10⅜ ins

(SOURCE:- QMG - War Dept Washington)

ENTRENCHING SHOVEL & COVER

FIG 1 Front and Rear Views.