FATHOMETER SYSTEM SECTION-S68

MODEL

"NMC"

ECHO SOUNDING EQUIPMENT

This chapter is intended to describe the installation and maintance of the MODEL NMC echo sounding equipment as installed on the "AP" type of Naval Vessels.

The operation of this equipment is magnetostrictive in principle and is designed for both DEEP and SHALLOW soundings by making use of two projectors. These two heads being installed in the hull of the ship, near the bottom of the ship. The two projectors, operated seperately, serve both to transmit and receive impulses from the floor of the ocean or some submerged object.

The projectors first transmit the impulse and then receive the echo as returned from the bottom. The received impulse striking the face of the operating projector head, causes an electrical impulse to be generated. This impulse is fed by wire to the input amplifier of the receiver amplifier. This in turn is amplified and emitted in the form of a conventional audible signal if desired, through the medium of a standard loudspeaker mounted on the bridge. The "RF" portion of the incoming signal is amplified and actuates a neon light . Also, it is possible to feed the output of the receiver through another circuit in which the recording means is a stylus needle operating across a calibrated sheet of paper.

The "NMC" echo depth finder unit is designed to operate on a 115 volt 60 cycle single phase source of power. Approximately 800 watts input is required to operate this unit, giving an output in the vicinity of 200 Watts. Both the receiver amplifier and the driver operate on 18 KCS. The driver and projector resonate at this frequency. The Driver and Receiver Amplifier have a frequency range of 17 to 24 KCS.

The depth is automatically indicated by a flash in the Neon tube which is visible through an aperture in the moving belt traveling behind a calbirated linear scale located in the receiver. The Neon light will not be energized unless a signal is received by the projector heads. When the driver oscillator is keyed and the impulse from the driver is fed to the projector, the Neon light flashes momentarily and is visible at the instant when the aperture is passing the zero point on the indicator scale.
During the interval between the projected impulse and reception of its echo, the aperture in the moving belt continues to travel across the scale. When the echo returns to the projector head, causing an impulse of current to be generated which is fed to the receiver amplifier. This amplified impulse causes the Neon light to flash. The interval of time between the initial flash (Keying Flash) and the second flash (returned echo flash) divided by two and considering the speed of sound in water as 4,800 feet per second, gives the depth of the water under the vessel for that instant. The Neon light flashing behind a calibrated scale gives this depth without the necessitity for timing or computations. FIG. 1 , shows an outline of this type of equipment.

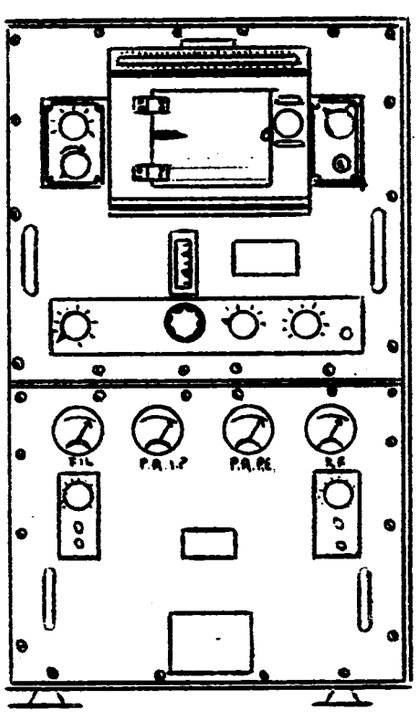


FIG. 1

The "RANGE SWITCH", in addition to selecting the proper length of keying for the approximate depth of water, is mechanically interlocked with another switch behind the panel which selects the proper projector head, that is, either the "SHALLOW" OR "DEEP" projector. Thus, alloperations are preformed by movement of this single switch. FIG. 2 , shows an outline of the installed equipment including the two projector heads located in the bottom.

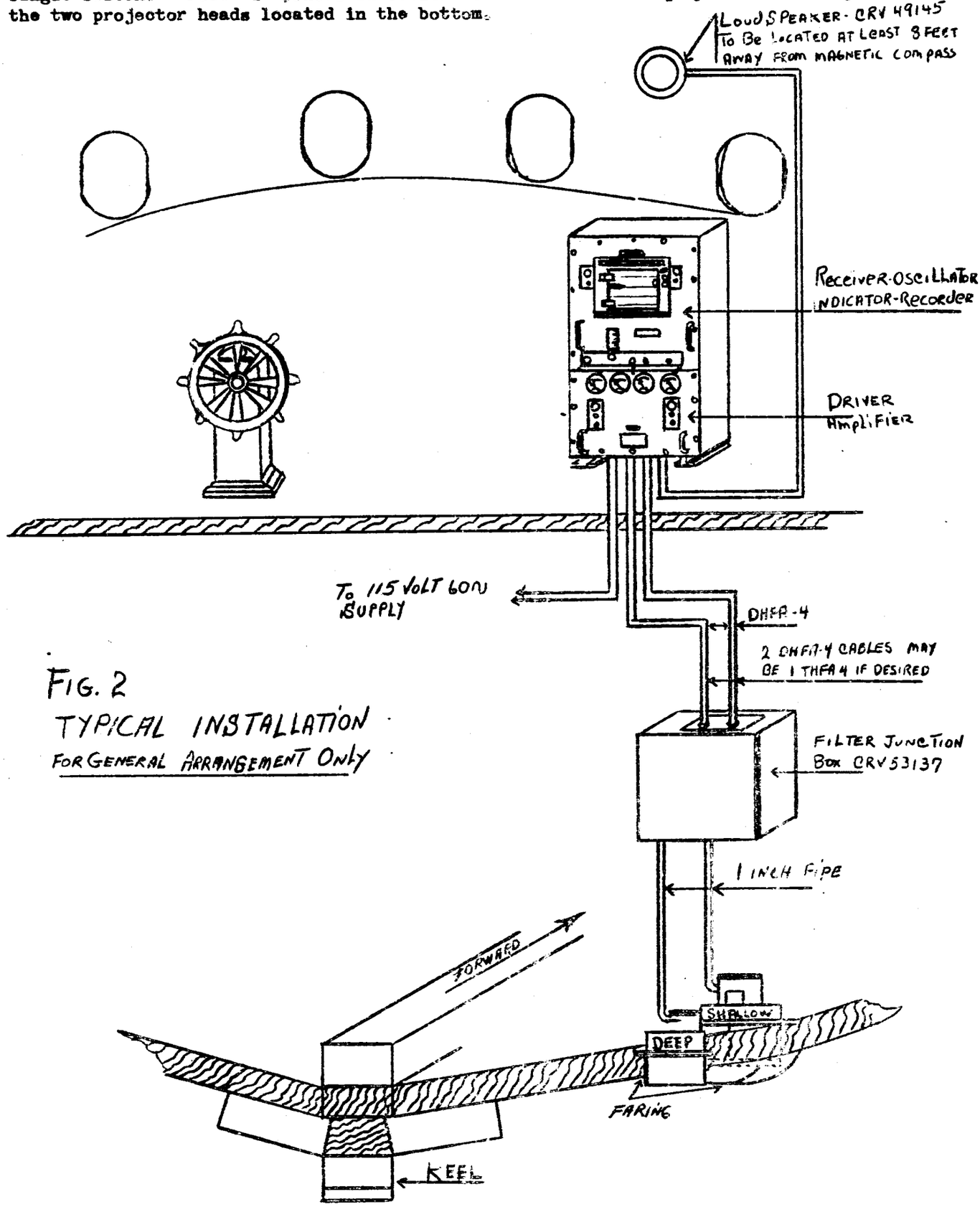


FIG. 2
TYPICAL INSTALLATION
FOR GENERAL ARRANGEMENT ONLY

FIG. # 3. shows a functional block diagram of the entire installation giving the direction of both the received and transmitted impulses.

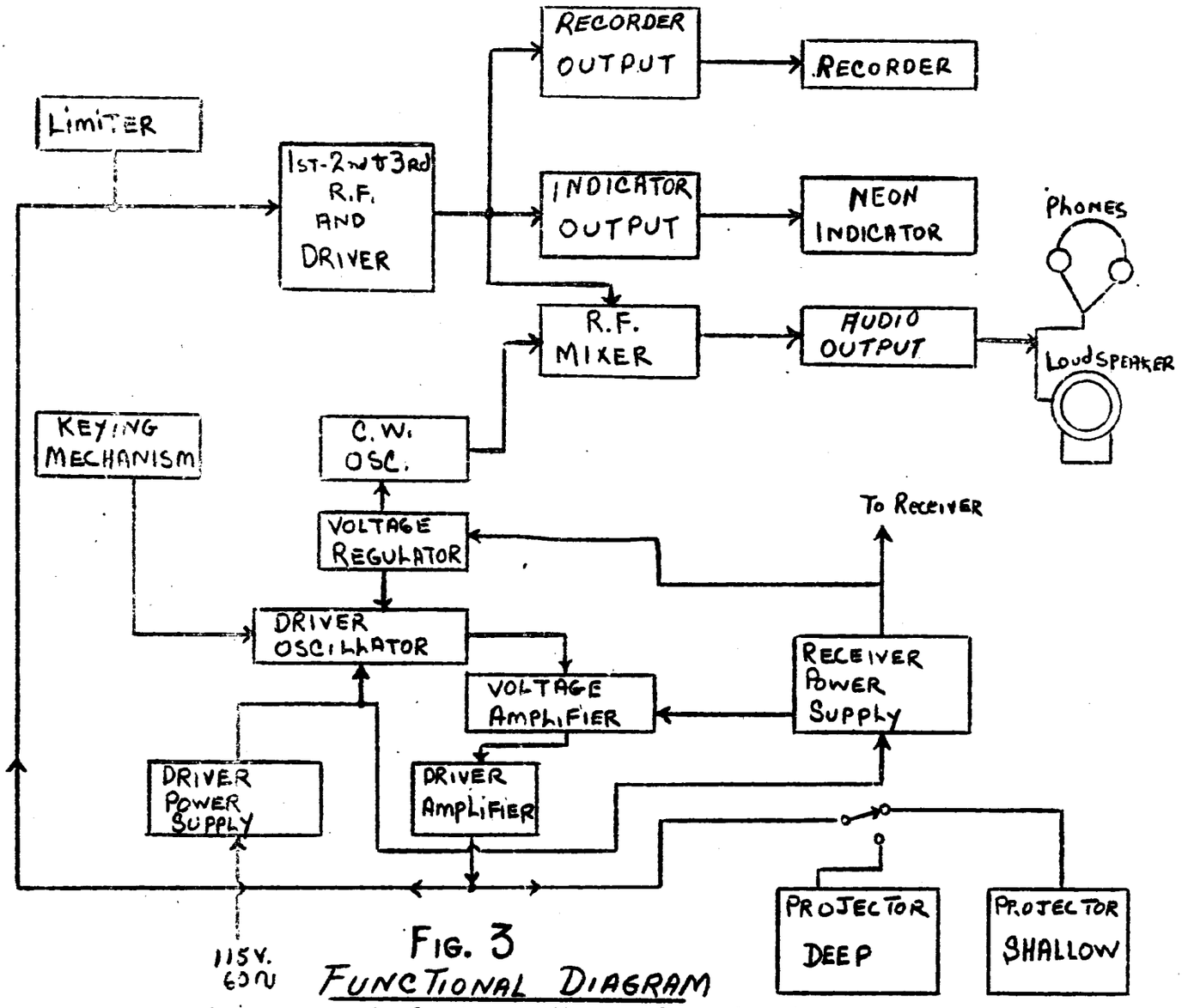


FIG. 3
FUNCTIONAL DIAGRAM

An average set of meter readings, such as should be seen when the equipment is functioning properly, is given below.

METER DESIGNATION	MANUAL KEYING SWITCH OPEN	CLOSED
Filament Voltmeter	6.3	6.3
P.A. Plate Current MA.	0	200
P.A. Plate Voltage	1500	1450
R.F. Current AMPS.	0	2.7

In placing this equipment in operation, the following steps are suggested.

1. Place the "RANGE SWITCH" in the "MANUAL" position.
2. Place the "RECEIVER ON-OFF" switch in the "ON" position.
3. Place the "DRIVER ON-OFF" switch in the "ON" position.
4. Observe the meter readings as listed above for indications of trouble. If all meters appear to be reading correctly, proceed. The Next step being that of tuning the equipment to the resonate frequency of the projector head.
5. Depress the "MANUAL KEYING" switch and rotate the receiver oscillator tuning control until a definite peak is observed on the driver amplifier "P.A.PLATE CURRENT" meter. This resonant peak will occur at about 18 KCS on the tuning dial and the needle of the "P.A.CURRENT "meter will swing about 10 MA. HIGHER than the average meter readings as listed above.

6. Release the "MANUAL KEYING" switch. The re-tuning procedure as outlined on the preceeding page will be necessary from time to time as the temperature of the installation changes due to tube heat, etc.

Should the "AUDIBLE" method of signaling be required, due to high water noise or excessive depth, instead of noting the neon flash, the scale is illuminated continuously by the audible lamp, and the signal monitored by the loudspeaker or phones. The range is determined by noting the exact position of the traveling circle of light when the echo is received.

When it is desired to use the "RECORDER", as in fairly shallow water where a constant record of the depth is required, turn the "RECORDER" control to "ON". This control operates a cam which causes gears to mesh, sets the paper take-up mechanism in motion and causes the recorder stylus to travel back and forth across the paper. This calibrated paper has a breakdown voltage test of about 110-115 volts. When the returning echo, in the form of an impulse, reaches the stylus, the voltage is increased by the impulse to a point over that value. This of course causes a breakdown through the paper allowing a shorting between the stylus and the metalic roller behind the paper. This shorting through the paper causes a mark to be made on the calibrated scale, thus indicating the depth of the water at that instant.

The "PAPER SPEED" control should be pushed in the "IN" position, to "WATCH" (paper traveling at 1/2 inch per minute), or pulled "OUT" in which case the paper speed is 1, 5/8 INCHES. When the knob is in mid position, the paper may be advanced by hand by turning the knob in a counterclockwise direction. When changing paper speed, the knob should be turned to insure meshing of the gears.

To shut down the equipment, proceed in the following manner.

1. Turn "OFF" the Driver Amplifier and the Receiver-Oscillator-Indicator-Recorder by placing the "RECEIVER ON-OFF" switch in the "OFF" position.

AA GUNS
SECTION-S74

References

Federal Shipbuilding and Drydock Co. Drawings:

#L6-908 - Elementary Wiring Diagram Gun Power System.
#27077-48040-1B - Cooling System for 1.1" AA Guns.
#2707-11054-2 - 100 Gal. Circ. Water Tank for 1".1 AA Guns
#2727-01010-6 - Outboard and Inboard profiles
#L6-907
#L6-807 Schematic Wiring Diagram - Sound Powered Battle Telephones

Bureau of Ordnance Pamphlets:

OP 772 1".10 M. G. Mounts Mk2, Mod. 2, 3, 4, 5, & 6.

OP 740 5"/38 Cal. Loading Machine Mk 14

OP 735 5" Gun Mounts

OP 909 20 MM Mounts Mk 2, 4, 5, 6, & 10

OP 911 20 MM Machine Gun Mechanism Marks 2 & 4; 20 MM Gun Barrels Mks 2, 3, 4, 4-1.

OP 826 (revised) 20 MM(AA) - Gun Mark 2 and Mark 4

OP 806 1".1 Machine Guns, 75 cal., Mk 1 and Mechanism Mk. 1 - Description

Ordnance Allowance Books - prepared by BuOrd for AP's 110 - 119

Section S-74 - Anti-Aircraft Guns

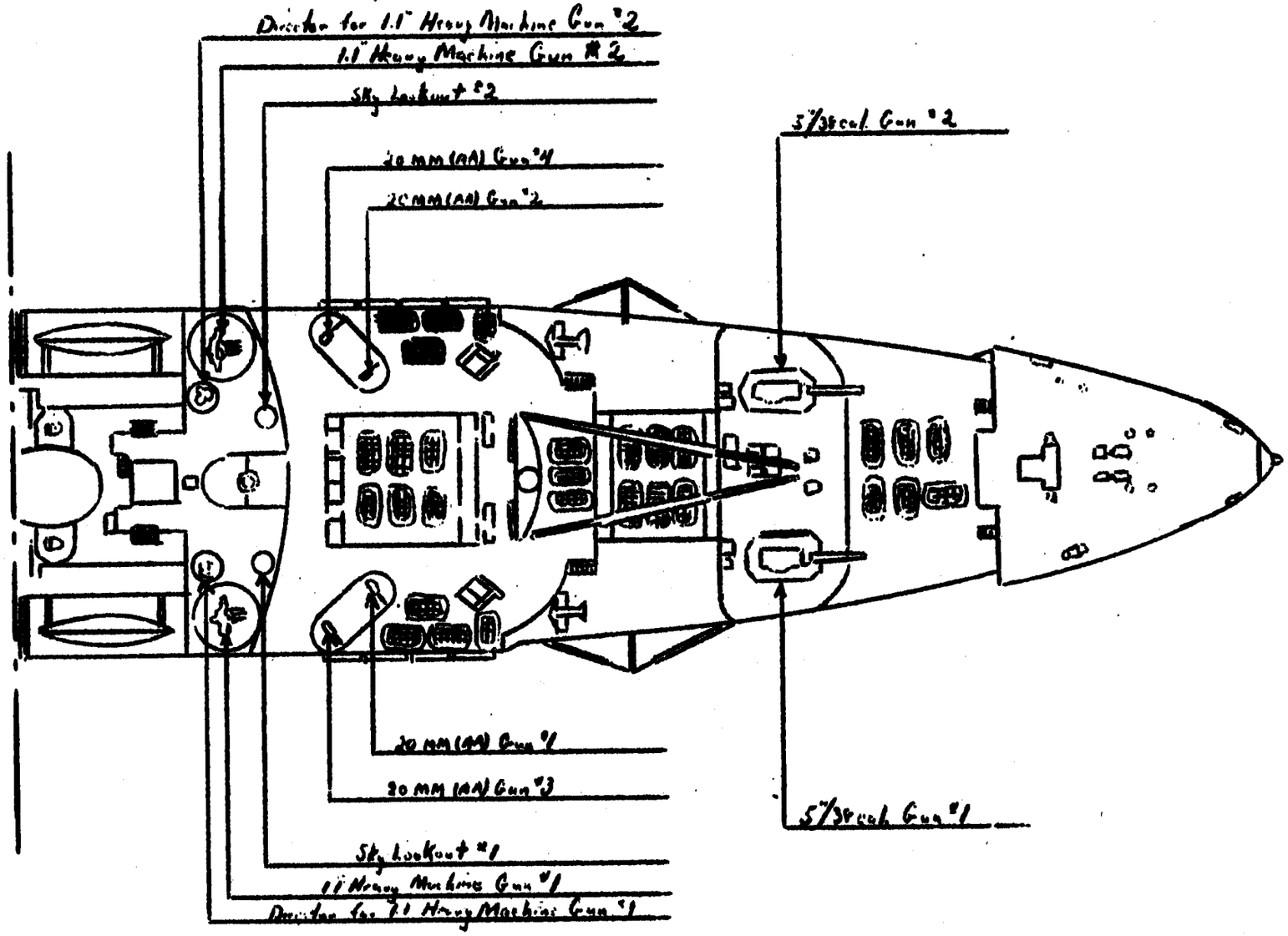
Contents

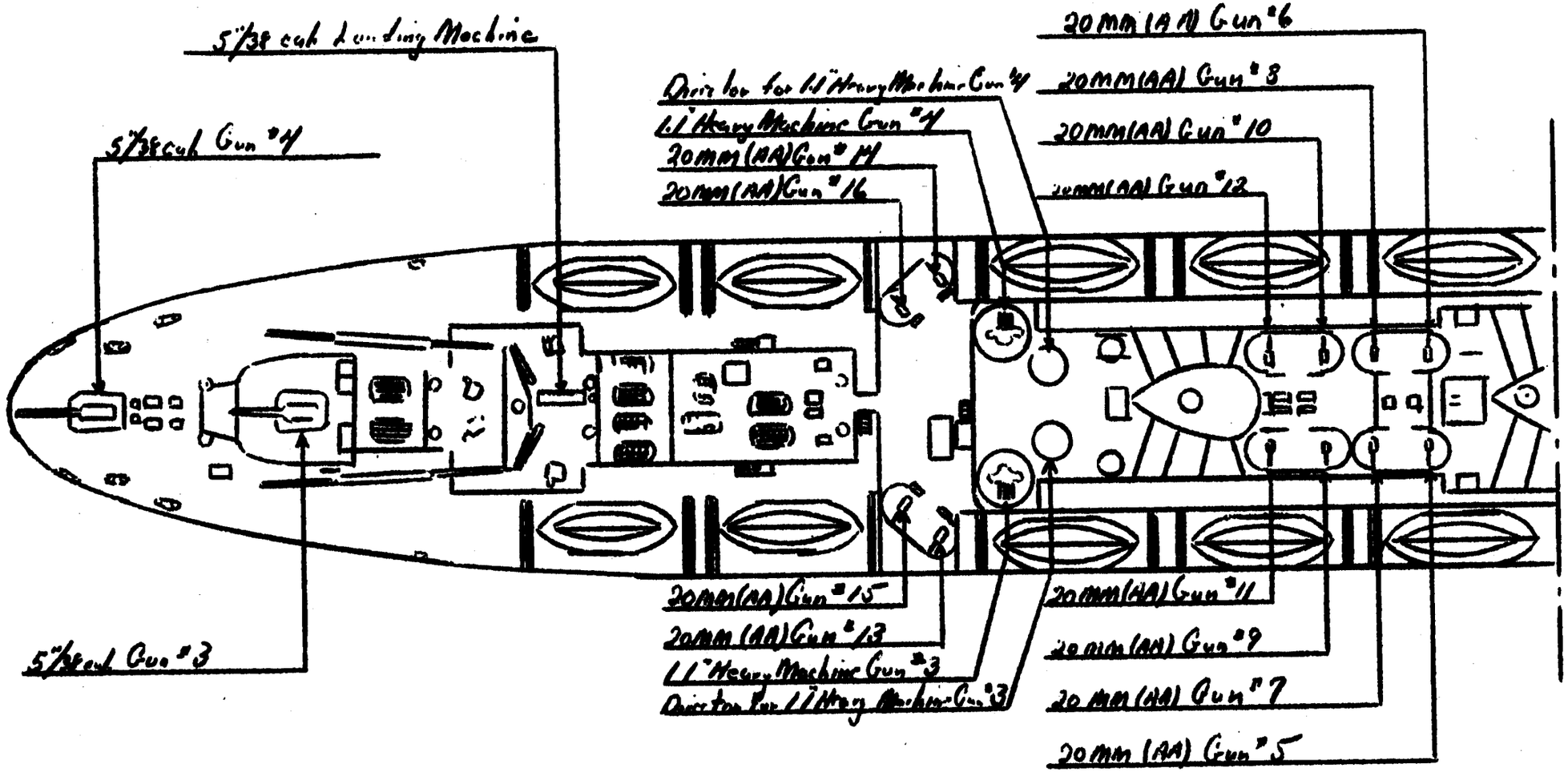
SECTION S-74-ANTI-AIRCRAFT GUNS

I. General Information.

The armanent of this class of ship consists primarily of Anti-Aircraft guns. The main battery has four (4) 5"/38 cal., Mark 37, Dual Purpose Guns. The machine gun batteries consist of the following: Heavy Machine Guns - four (4) 1.1" Quad Mounts Mark 2 Mod 2, and Light Machine Guns - sixteen (16) 20 MM(AA) Mark 2 and Mods., or Mark 4 and Mods.

Arrangement of guns and other ordance equipment is as shown on following drawings.


Director for 1.1" Heavy Machine Gun #2
1.1" Heavy Machine Gun #2
Sky Lookout #2
20 MM (AA) Gun #4
20 MM (AA) Gun #2
5"/38 cal. Gun #2
20 MM (AA) Gun #1
20 MM (AA) Gun #3
5"/38 cal. Gun #1
Sky Lookout #1
1.1 Heavy Machine Gun #1
Director for 1.1 Heavy Machine Gun #1


5"/38 cal Loading Machine
5"/38 cal Gun "4
5"/38 cal Gun "3
Director for 1.1" Heavy Machine Gun "4
1.1" Heavy Machine Gun "4
20mm (AA) Gun "14
20mm (AA) Gun "16
20mm (AA) Gun "6
20mm (AA) Gun "8
20mm (AA) Gun "10
20mm (AA) Gun "12
20mm (AA) Gun "15
20mm (AA) Gun "13
1.1" Heavy Machine Gun "3
Director for 1.1" Heavy Machine Gun "3
20mm (AA) Gun "11
20mm (AA) Gun "9
20mm (AA) Gun "7
20mm (AA) Gun "5

II. MAIN BATTERY - 5"/38 cal. DUAL PURPOSE GUNS.

a. The following tabulated information is taken from Std. Ord. Allowance List # 19179. In connection with this information an attempt will be made to furnish, prior to commissioning a complete table of serial numbers.

Article	Mark and Mod.	
Gun	12	1
Housing	1	8
Mount	37	-
Carriage	30	-
Slide	24	10
Stand	14	15
Platform	7	-
Sight	31	9
Telescope	79	-
Elevating Gear	14	-
Training	14	-
Firing & Lighting Circuit	24	6
Battery Box	14	-

In addition each gun is equiped with a Fuze Setter Mark 7, Mod. 1, Fuze Setting Indicator Regulator Mark 8 Mod. 1, and other items of Fire Control Equipment covered under Section S-71.

b. Infromation concerning location of mounts is tabulated below.

	Location			Height above Full Load
	Deck	Frame	Side	Draft - 25 ft.
Gun #1	Gun Deck	39	Port	45 Ft.
Gun #2	Gun Deck	39	Starboard	45 Ft.
Gun #3	Gun Deck	207	Centerline	45 Ft.
Gun #4	Main	227	Centerline	36 Ft.

The following data was used for plotting and cutting firing cut - out cams on the Main Battery Guns.

STOP FIRE CAM DATA
5"/38 cal. AA Mount Mk. 37

Gun #1		Gun #2	
Train	Elevation	Train	Elevation
196° 00	85° 00E	164° 00	85° 00E
196° 00	63° 00E	164° 00	63° 00E
215° 00	63° 00E	145° 00	63° 00E
215° 00	20° 00E	145° 00	20° 00E
300° 00	20° 00E	60° 00	20° 00E
300° 00	3° 00E	60° 00	3° 00E
325° 00	3° 00E	35° 00	3° 00E
325° 00	5° 00E	35° 00	5° 00E
13° 00	5° 00E	347° 00	5° 00E
13° 00	5° 00D	347° 00	5° 00D
160° 00	5° 00D	200° 00	5° 00D
160° 00	85° 00E	200° 00	85° 00E

STOP FIRE CAM DATA
5"/38 cal. AA Mount MK. 37

Gun #3		Gun #4	
Train	Elevation	Train	Elevation
342° 00	85° 00E	18° 00	85° 00E
342° 00	47° 00E	18° 00	15° 00E
339° 00	47° 00E	25° 00	15° 00E
339° 00	10° 00E	25° 00	5° 00E
325° 00	10° 00E	40° 00	5° 00E
325° 00	0° 00	40° 00	5° 00D
312° 00	0° 00	320° 00	5° 00D
312° 00	5° 00D	320° 00	5° 00E
200° 00	5° 00D	335° 00	5° 00E
200° 00	0° 00E	335° 00	15° 00E
160° 00	0° 00E	342° 00	15° 00E
160° 00	5° 00D	342° 00	15° 00E
48° 00	5° 00D		
48° 00	0° 00E		
35° 00	0° 00E		
35° 00	10° 00E		
21° 00	10° 00E		
21° 00	47° 00E		
18° 00	47° 00E		
18° 00	85° 00E		

For purposes of loading drill these ships are provided with a Loading Machine Mark 14, Mod. 4, Fuze Setter Mark 7, Mod. 1, and a Fuze Setter, Indicator Mark 2. This equipment is located on top of Resistor House, Forward at Main Mast between Frames 181-187. Power is supplied from the #1 Gun Control Generator. Ready Service Boxes are available for stowage of allowance of Dummy Drill Ammunition. This machine is described fully in O.P. 740 (Restricted)

c. Necessary information and data for maintenance and instruction in connection with the 5"/38 cal. Mounts is covered completely in O.P. 735 (Restricted).

III. Anti - Aircraft Machine Guns - Light - 20 MM(AA) Mounts

(a.) Type and Description

The 20 MM(AA) Gun Battery consists of 16 mounts. Under present plans ships will get Mounts Mark 2 and Mods. or Mounts Mark 4 and Mods. Information as to original outfits, spares, and tools maybe found in the following Ordnance Allowance Lists:

Standard Ord. List No. 18017
" " " " 17613
" " " " 16085
" " " " 17579
" " " " 17580
" " " " 17581

(b.) Location

20 MM(AA) Gun Number	Location	Height Above Full Load Draft
1.	Upper Dk.- Fwd., Fr. 78, Stbd.	49 ft.
2.	" " " " " Port.	"
3.	" " " " 81, Stbd.	"
4.	" " " " " Port.	"
5.	Top of Wheel House Level Fr. 112, Stbd.	66 ft.
6.	" " " " " " " Port.	"
7.	" " " " " Fr. 115, Stbd.	"
8.	" " " " " " " Port.	"
9.	Nav. Bridge Deck, Fr. 121, Stbd.	58 ft.
10.	" " " " " Port.	"
11.	" " " Fr. 125, Stbd.	"
12.	" " " " " Port.	"
13.	Super Structure Deck Fr. 153, Stbd.	50 ft.
14.	" " " " " Port.	"
15.	" " " Fr. 156, Stbd.	"
16.	" " " " " Port.	"

(c.) Maintenance

Complete descriptive instructions on maintenance and operation of these guns will be found in the following Ordnance Pamplets supplied to each ship by the Bureau of Ordnance:

1. OP-909 - 20 MM Mounts Mks. 2,4,5,6, and 10
2. OP-911 - 20 MM Machine Gun Mechanism Marks 2 and 4; 20 MM Gun Barrels Mks. 2, 3, 4, 4-1.
3. OP-826 (revised) - 20 MM(AA) Gun - Mark 2 and Mark 4

IV. Anti - Aircraft Machine Guns - Heavy - 1."1 Quad Mounts

(a.) Type and Description

The type mount supplied these ships will be 1."1 Machine Gun Mount Mark 2, Mod 2. There are four mounts, locations of which are given below. Information as to original mounts, spare parts, and tools will be found in the following Ordnance Allowance Lists:

(1.) Standard Ord. List No. 15745
" " " " 12852
" " " " 14494
" " " " 14495
" " " " 16530
" " " " 12687
" " " " 14496
" " " " 14497

(b.) Location

Location and height above mean load draft for each mount is as tabulated below:

Gun Number	Location		Height Above Mean Load Draft
1.	Top of Wheelhouse, Fr. 86,	Stbd.	63 ft.
2.	" " " " "	Port.	"
3.	Nav. Bridge Deck, Fr. 147,	Stbd.	53 ft.
4.	" " " " "	Port.	"

(c.) Maintenance

For definite information in operation and maintenance refer to following Ordnance Pamphlets supplied to the ship by the Bureau of Ordnance:

1. OP-806 - 1."1 Machine Gun, 75 cal., Mk 1 and Mechanism Mk. 1 Description.
2. OP-772 - 1."10 Machine Gun Mounts Mk 2, Mod. 2, 3, 4, 5, 6.

V. Cooling System for 1".1 Quad Mounts

a. General Information

Each of the four 1".1 Quad Mounts has an individual cooling outfit equiped for both electrical and hand operation. The outfits are located in pump rooms as tabulated below:

1. Forward Pump Room - 1".1 AA Guns # 1 & 2 - Nav. Bridge Deck - P, Frs #91-95
2. After Pump Room - 1".1 AA Guns # 3 & 4 - Bridge Deck - P, Frs #147-150

Each pump unit consists of the following main elements:

1. 100 Gallon Tank
2. 30 G.P.M. Hand Pump
3. 30 G.P.M. Electric Centrifugal Pump with 0.97 h.p. motor
4. Heat Exchanger
5. Relief Valve
6. Pressure Guage

In addition to pump units there are in each pump room electric control panels for distribution of power to guns and pumps. Refer to Section V. b, 3. for description and operation.

b. Description and Operation

1. Piping

Refer to Plate #1. Fresh water lines are in red and Salt water lines are in green. The flow through all lines is indicated by arrows.

Salt water from the firemain system is used as the cooling agent. Water from the firemain system enters the Heat Exchanger by a 2" pipe under a normal pressure of 100 lbs. This pressure maybe increased to 125 lbs. under emergency conditions. After circulating through Heat Exchanger the salt water flows to the overboard discharge by a 2" pipe.

Supply of Salt water enters forward Pump Room on Navigating Bridge Deck via two $1\frac{1}{2}$" risers from Bridge Deck, and for the after Pump Room by one $1\frac{1}{2}$" riser from Boat Deck.

Fresh water for circulating system is supplied to tanks by 3/4" risers from decks below each pump room. Should this source of supply at any time fail, the tanks maybe replenished by hand. For this a screw plug is located on the top of each tank.

Normally, following latest instructions from BuOrd, the system will be filled with an anti-freeze solution (a commercial product known as Prestone), and fresh water supply will be cut off completely. Definite instructions in connection with cooling liquid will be found in Appendix I of O.P. 772. Emphasis is placed on the use of water only as an emergency measure. Further instructions regarding cooling system, as it affects the mount proper, will be found in "OP 772", paragraphs 38-42.

The system may be drained either by gravity or by using the electric pump. For draining by gravity plugs are provided in tank, pumps, heat exchanger, and pressure guage. To drain system by use of electric pump, operate pump with drain valve on supply line from the pump open.

Table of Pressures & Temperatures:

Relief Valve (on supply line) - _____ lbs./Sq. inch
Pressure Guage - _____ Normal
Temperature of water from tank _____

2. **Pumps and Heat Exchanger**

Equipment listed below may vary in make on different units but will conform to specifications as listed. This equipment is for one unit only -

(1.) **Heat Exchanger** - Each unit has a 2" sea water supply and discharge and will reduce temperature of 100 gals. of water from 150° to 110° in 13 minutes.

Similar to Schuttle Koerting make.

(2.) **Hand Pump** Capacity of 30 G.P.M. These pumps are (or are similar to) Deming #6 Fig. #1570 Hand operated Rotary Type.

(3.) Horizontal Centrifugal Pump - Electrically operated pump rated as follows - 30 G.P.M. at pressure of 33 lbs./sq.in. using a 0.97 H.P., 440 Volt motor made by Gen. Electric. They are (or are similar to) Warren Enginering Co. type 1 - $\frac{1}{4}$ SED 5-$\frac{1}{2}$.

Fresh Water Tank and Piping For 1.1" Cal. AA Machine Guns Cooling System

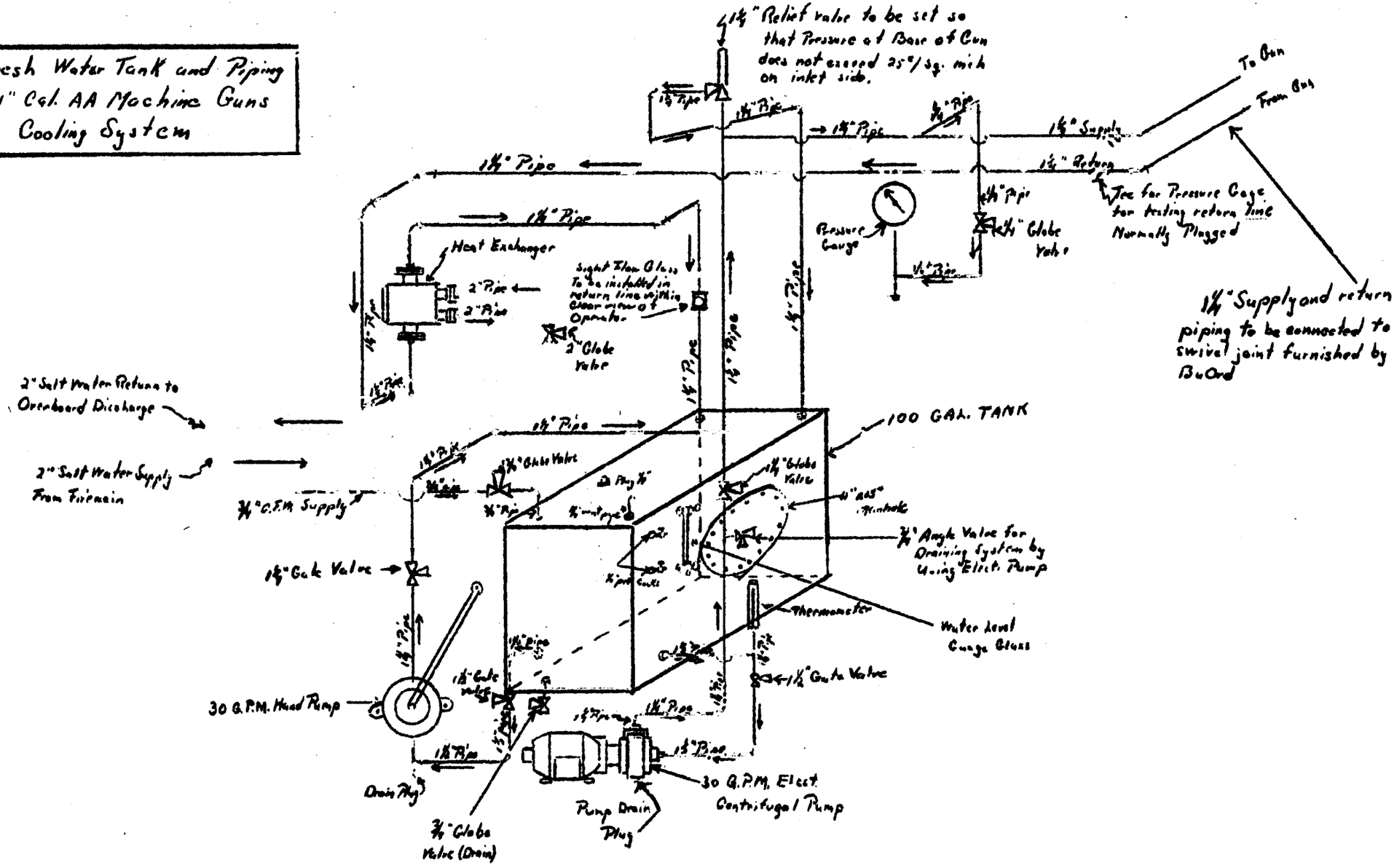


Plate # 1

VI. Electric Power Supply

(a.) Source & Wiring

1. Power for all Ordnance Equipment, except Ammunition Hoists, is supplied by two motor generator sets located in the Main Distribution Room on the Third Deck at Fr. 125, port and starboard, with No. 2 set being to Port of the centerline and No. 1 to Starboard. The M. G. sets are General Electric, 150 H. P., 230 V., D. C., 1800 R.P.M., Shunt wound D. C. Motors operating 460 V., 3 Ph., 60 Cycle, 120 KVA, Generators.

D. C. power is supplied from ship's main supply through Main Distribution Board to Motor Starting Panels (not shown in Plates 1 & 2) for operation of motors that drive A. C. generators. A. C. current enters Distribution Panels from Generator Sets #1 and #2 through Generator Panels. (see Plates #1 & #2). Either of the two (2) Generator sets maybe used to supply power to all ordnance units, but under normal conditions power is distributed to half of the units from Generator Set #1 and to half from Generator Set #2 with each unit acting as an emergency supply should a causalty occur to either unit.

The following table indicates type of supply, either normal or emergency, to various items of equipment from each Generator Set along with Switch markings.

Ordnance Equipment	M. G. Set #1	M. G. Set #2
Fire Control & Announcing System	Emerg.(FB-513)	Normal (FB-515)
20 MM AA Guns	Emerg.(FB-517)	Normal (FB-519)
Main Battery Directors	Main. (FB-509)	Emerg. (FB-511)
5" Loading Machine	Main. (FB-508)	No emergency
1."1 AA Guns & Directors #1	Main. (FB-505)	Emerg. (FB-507)
" " " " #2	Emerg.(FB-505)	Main. (FB-507)
" " " " #3	Main. (FB-500)	Emerg. (FB-502)
" " " " #4	Emerg.(FB-500)	Main. (FB-502)
5"/38 cal. Gun #1	Main. (FB-501)	Emerg. (FB-503)
" " " #2	Emerg.(FB-501)	Main. (FB-503)
" " " #3	Main. (FB-504)	Emerg. (FB-506)
" " " #4	Emerg.(FB-504)	Main. (FB-506)

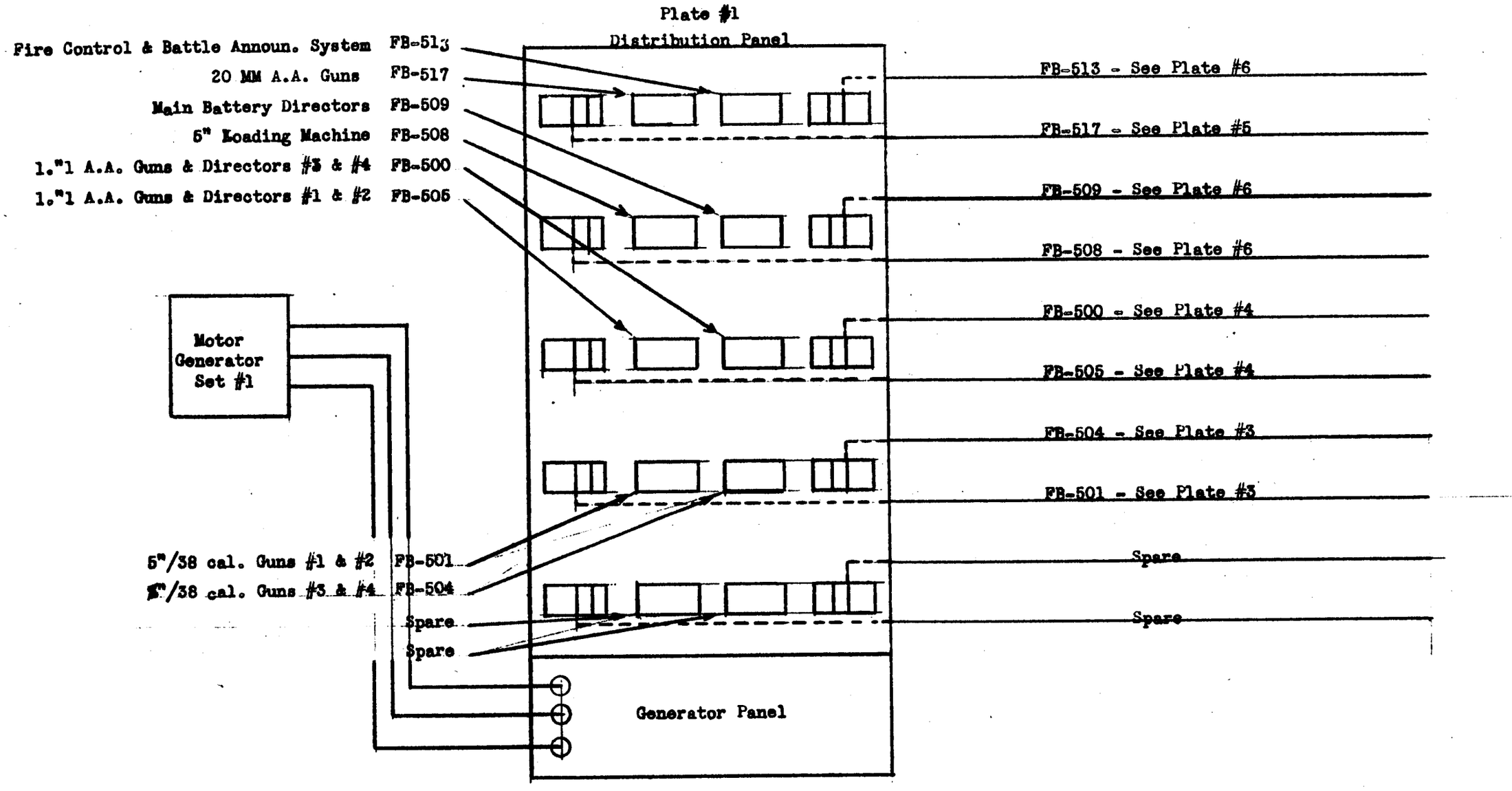
From the above table it may be seen that, disregarding use of Normal and Emergency, with No. 1 Generator Set operating close all "FB" switches in each Transfer Panel with the lower number, and all "FB" switches having higher numbers with No. 2 Generator Set in operation.

No. 1 Motor Generator Set, starboard generator, is the main source of supply for Starboard 1."1 Machine Guns and 5"/38 cal. Guns, and No. 2 Motor Generator Set, part generator, is the main source of supply for port guns.

2. Plates #1 and #2 following show "FB" supply circuits leading from Main Distribution Panels to various Transfer Panels discribed and diagramed in the remainder of this section.

DISTRIBUTION PANEL

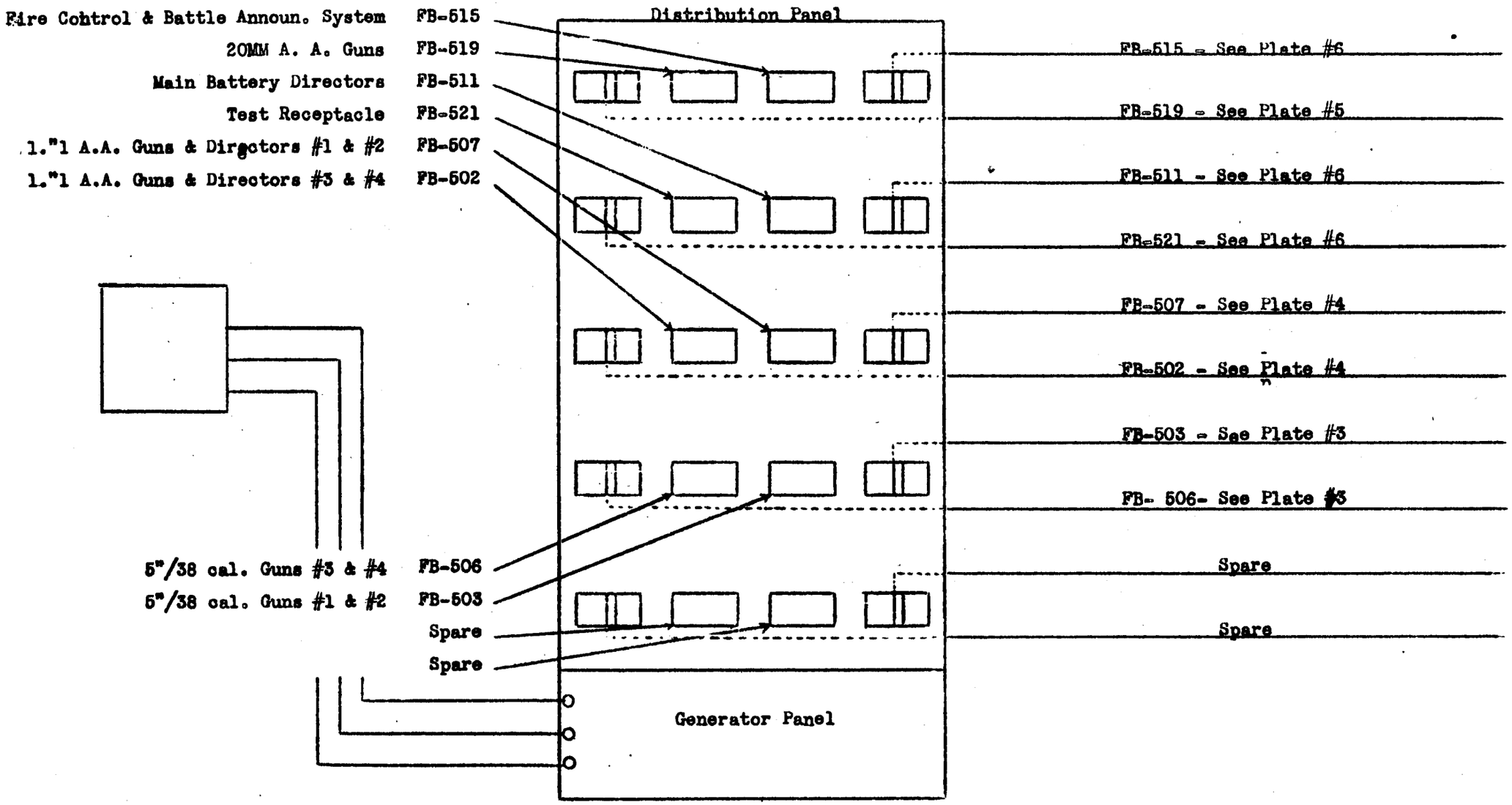
GUN CONTROL MOTOR GENERATOR SET #1



DISTRIBUTION PANEL

GUN CONTROL MOTOR GENERATOR SET #2

Plate #2



(b.) 5"/38 cal. Gun Supply

1. Plate #3 diagrams supply from Main Di - tribution Boards (Plates #1 & #2) to four Transfer Powe Panels located in vicinity of each gun mount. This dia ram further indicates name plate data, normal supply (in gr sn), emergency supply (in red), and distribution to Rammer M tors and Train and Elevation Motors. Not shown in this diag am are two line switches between panels and mounts that mu t be closed before supply reaches motors at green mounts. T ese switches are located on bulkheads alongside Transfer Po er Panels.

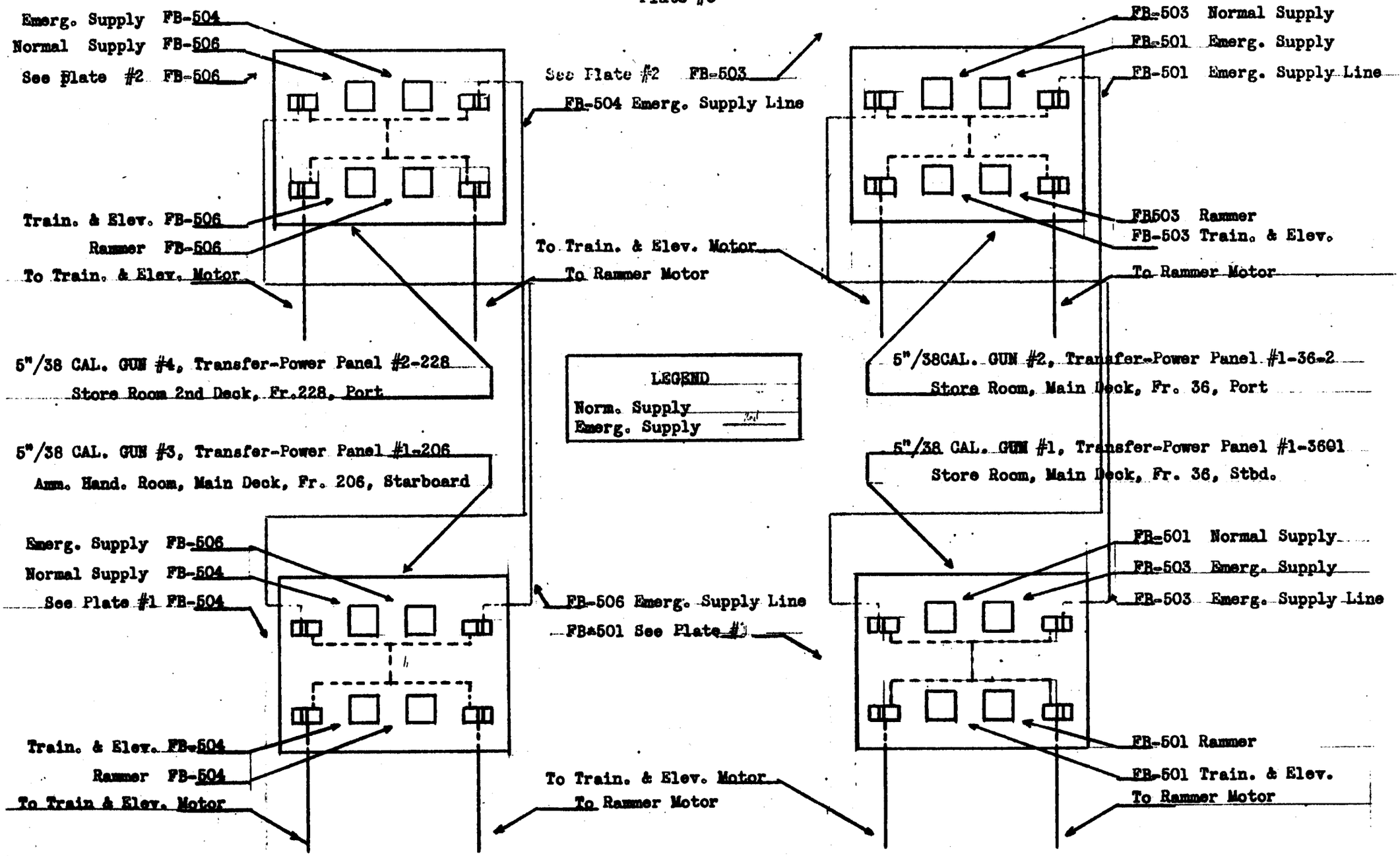
In operating regardless of the source of su ply, that is normal or emergency, switches marked Rammer and Train & Elevation must be in "ON" position.

2. In tracing through various supplies a diagramed in the following Plate #3 it will be well to efer to and follow the sources of supply from Plates #1 and 2.

TRANSFER-POWER PANELS

5"/38 CAL. GUNS

Plate #3



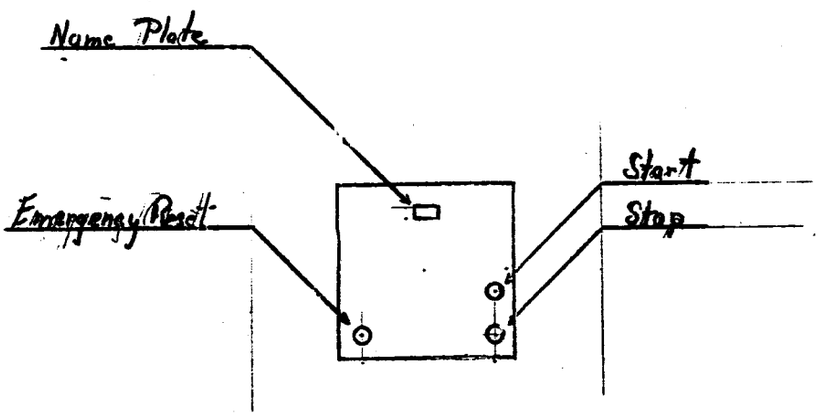
(c.) 1."1 Quad Mounts - Supply

1. The setup and operation of Transfer Power Panels for 1."1 Quad Mounts is basically the same as that for the 5"/38 cal. Mounts. The difference in switches (see Plate #4) is as follows : (1) only one (1) switch is provided for Gun Train and Elevation (2) power for 1."1 Directors is supplied through board; (3) power for cooling pump motor is provided through board; and (4) Control Circuit "GM" is supplied through board. Emergency and Normal Supply switchs are similar to those for 5"/38 cal. Mounts.

Supply from the Transfer Power Panels to the Gun Mounts and Directors is direct - that is, there are no line switches between as in the case of 5"/38 cal Mounts. The usual push-button switches for starting and stopping are located at the mounts.

In the operation of the Cooling Pump Motor the following information not shown on Plate #4 is offered.

Prior to operating cooling pumps motor, switch on Transfer Power Panel is closed, and the operating switch located near pump is closed. Stopping and starting of pump will normally be handled from this operating switch. The sketch below is of the operating switch on the line between Control Panel and Cooling Pump Motor.



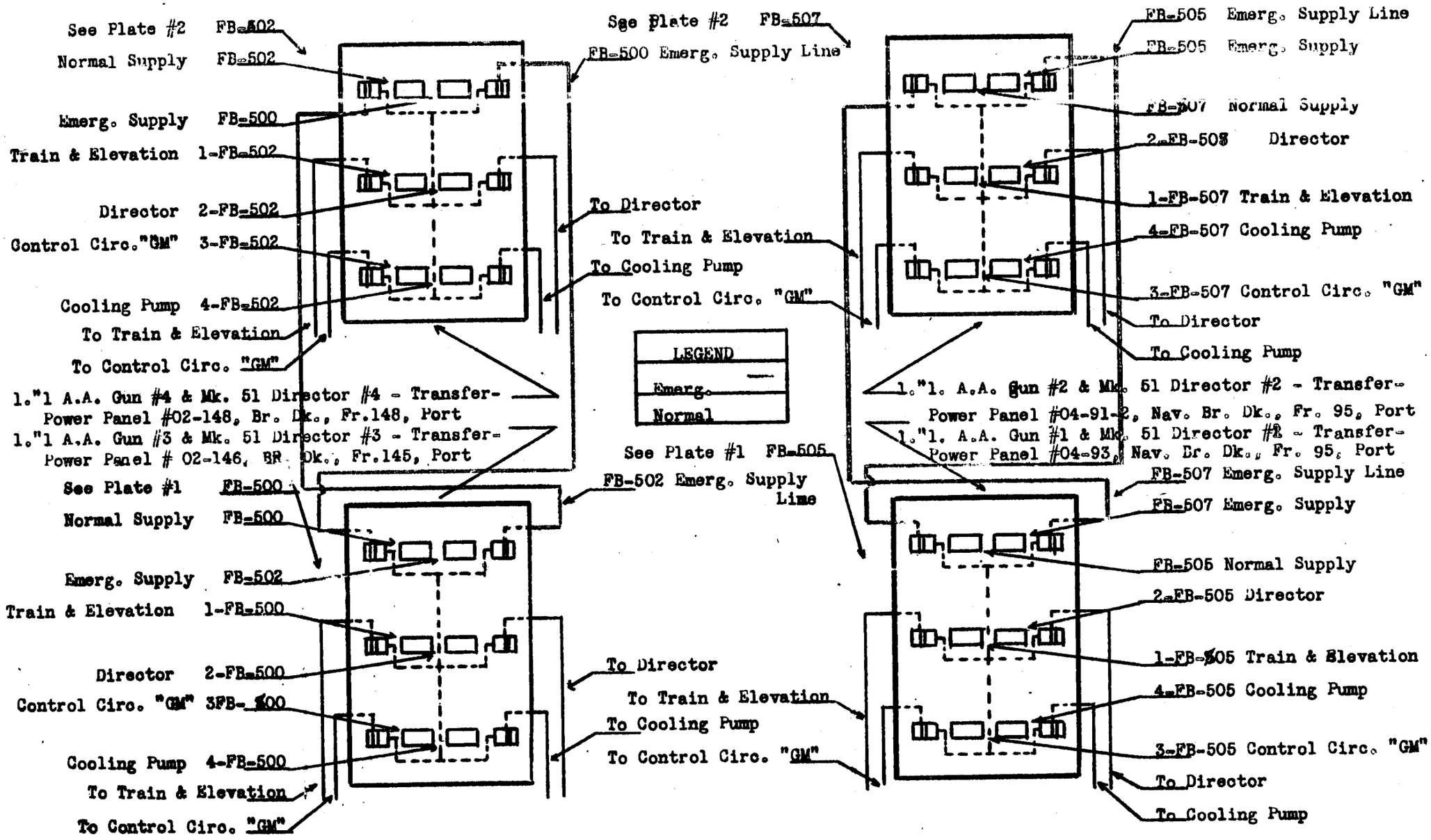
In addition to the above switches there is installed, on the splinter shield of each mount near the starting switches fro gun operation, a red indicator light for purposes of warning gun crew when electric pump has failed or is not operating.

2. For further information on various panels and circuits refer to following sketch (plate #4). As stated in proceeding sections reference should be made to Plate #1 & #2 for original source of supply.

DISTRIBUTION PANELS

1."1. A.A. GUNS and MK. 51 DIRECTORS

Plate 4



(d.) 20 MM A.A. Guns - Supply

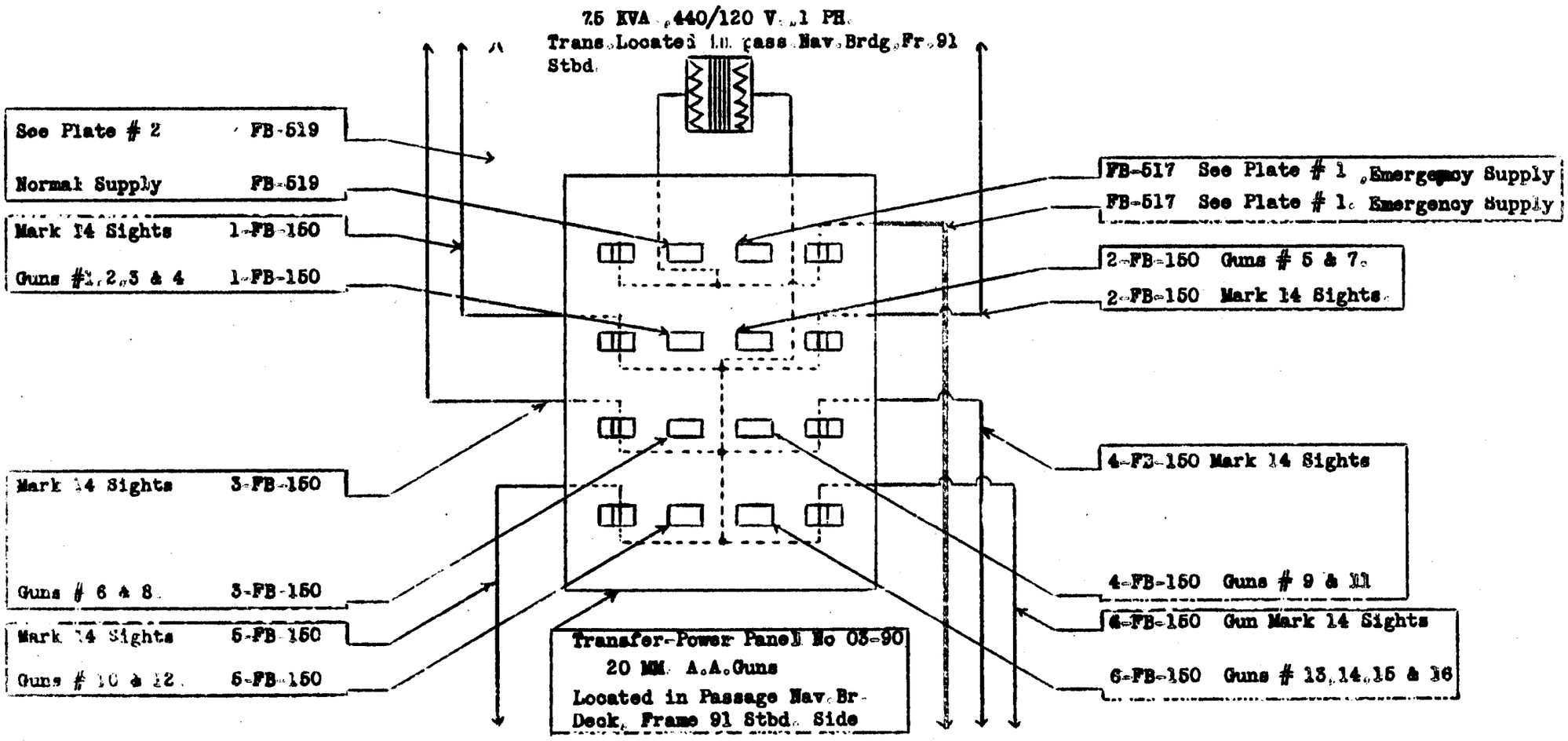
1. Power supplied through Transfer Power Panel #03-90 to 20 MM AA Guns is for the operation of Mk. 14 Sights. The supply is direct from Panel to guns with no line switches in between. Normal and Emergency supply switches are the same as on other Panels.

A Single Phase Transformer is located at the Transfer Power Panel which reduces the supply, that is, the supply furnished through Circuits FB-519 and FB-517, from 440 Volts to 120 Volts.

2. For information on distribution to guns and source of supply refer to following sketch (Plate #5) Supply made also be traced from Plages #1 and #2.

TRANSFER-POWER PANEL
20 MM. A.A. GUNS

PLATE # 5



(e.) Miscellaneous Equipment

1. The remaining items of equipment supplied by Motor Generator Sets #1 and #2 are (1) Fire Control and Battle Announcing System, (2) Main Battery Directors, (3) 5"/38 cal. Loading Machine, (4) and Test Receptacle. Supply to 5"/38 cal. Loading Machine and Test Receptacle is from one source only, there being no emergency supply. There are no Transfer Power Panels for these two items, and supply is direct from Distribution Panels #1 and #2 respectively.

Transfer Power Panels for Fire Control and Battle Announcing System and Main Battery Directors are the same as those used in equipment previously discussed. There is a Single Phase Transformer between the supply switch and distribution switches at the Transfer Power Panel for Fire Control and Battle Announcing System that reduces voltage from 450 volts to 120 volts. For further information on latter system refer to Federal Ship Yard & Dry Dock Co's Drawing No. L6-907.

2. Additional information regarding source of supply and distribution will be found in the following sketch Plate #6. Ref. to Plates #1 & #2 for original source of supply.

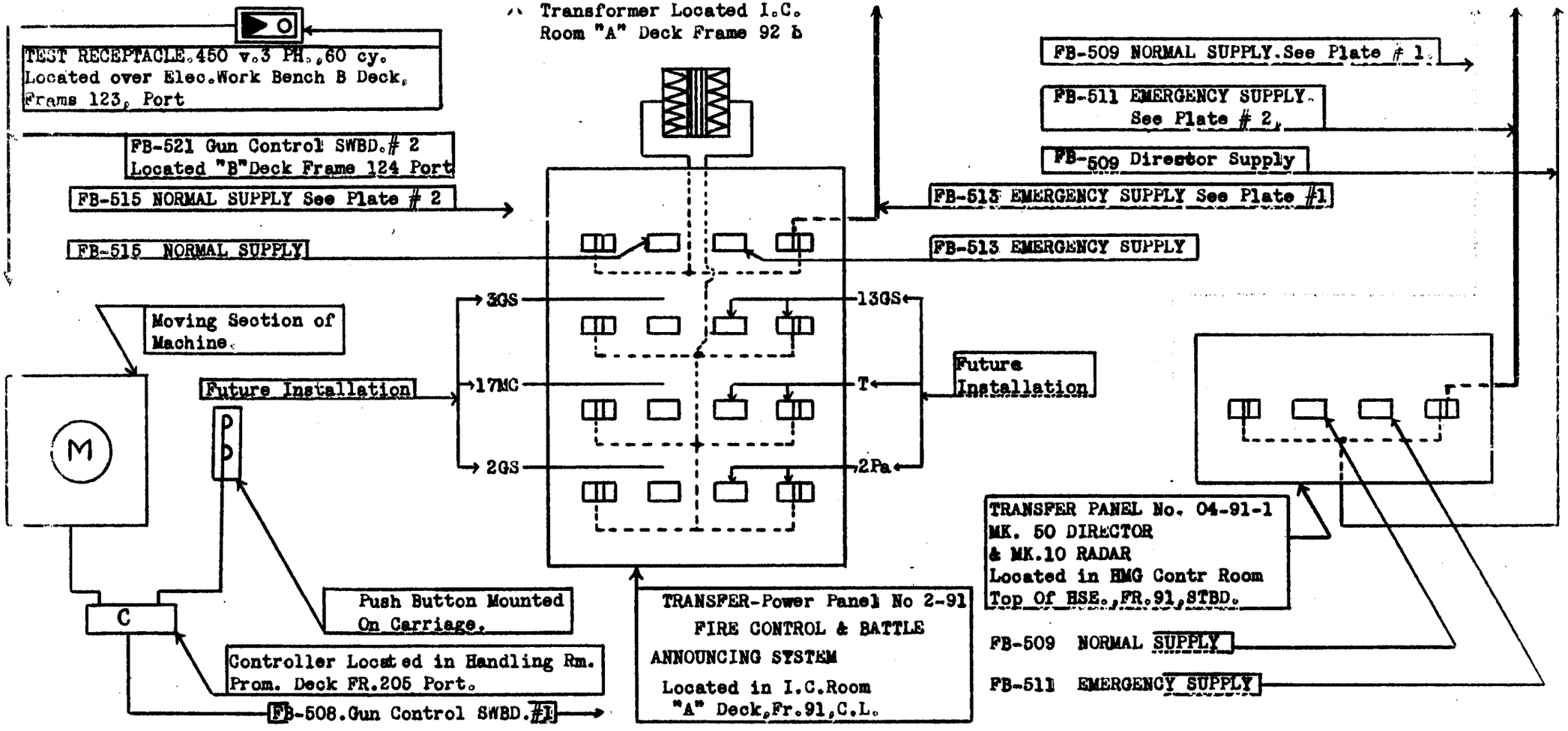
Note: Correction to Plate #6

Supply leads from Transfer Power Panel #2-91 indicate "Future Installation". This is in error, and, as stated above, further information on this system maybe obtained in Federal Ship Building and Dry Dock Co.'s, Drawing No. L6-907.

DISTRIBUTION PANELS
FIRE CONTROL BATTLE ANNOUNCING SYSTEM,
MAIN BATTERY DIRECTORS 5" LOADING MACH.
TEST RECEPTACLE

PLATE # 6

7.5 KVA, 450 V./120 V. 1 PH
Transformer Located I.C.
Room "A" Deck Frame 92 b



VII. Sound Powered Battle Telephones & Cease Firing and Salvo Circuits

(a.) Sound Powered Telephones

1. Sound Powered Battle Telephone Circuits provided are as tabulated below:

Circuit	See Plate #	Description
1. JA	1	Captain's Battle & Lookout Stations
2. 1JP	2	5" Gun Control
3. 1JQ	2	5" Sightsetters
4. 1JY 2JY 3JY 4JY	3	1.1" Machine Guns and Directors
5. 15JY	4	20 MM(AA) Machine Gun Control
6. 1JK	4	5" Fuse - Setters

Circuit 17 X J1-6 - 5" Ammunition Handling is covered under Section S-78

The system is typical of installations on most Navy Auxillaries with an individual jack-box for each circuit and a Selector Switch with a jack-box locacted at Main Battery Control on Top of Navigating Bridge Deck House. Switch Boxes as sketched in the following diagrams are located along with the jack-boxes on the forward bulwark of Main Battery Control.

2. The following diagrams were made from information available and will be corrected when changes and corrections ordered by BuShips have been made.

SOUND POWERED BATTLE TELEPHONES

Captain's Battle and Lookout Stations
Circuit JA
Main Battery Control Station

JA-1	JA-2	JA-3	JA-4	JA-5
JA-6 Tie Switch JA to 1JP	JA-7 Sky Lookout No. 3	JA-8 Sky Lookout No. 4	JA-9 Crows Nest Forward	JA-10 Crows Nest Aft
JA-11 Sky Lookout No. 1	JA-12 Sky Lookout No. 2	JA-13 Pilot House	JA-14 Radar and Plotting Rm.	JA-15
JA-16 Surface Lookout No. 1	JA-17 Surface Lookout No. 2	JA-18 Surface Lookout No. 3	JA-19 Surface Lookout No. 4	JA-20

← To 1JP

→ To Selector Switch

JA-1	JA-2	JA-3	JA-4	JA-5	JA-6 Tie to 1JP	JA-7 Sky Lookout #3 - Fr. 138, Nav. Brdg. Dk. Stbd.	JA-8 Sky Lookout #4 Fr. 138, Nav. Brdg. Dk. Port	JA-9 Crows Nest Fwd. On Mast, Fr. 63 C	JA-10 Crows Nest Aft On Mast, Fr. 187 C
JA-11 Sky Lookout #1 - Fr. 82 Top of House Stbd.	JA-12 Sky Lookout #2 - Fr. 82 Top of House Port	JA-13 Pilot House	JA-14 Radar Ind. & Plotting Rm. Bridge Deck Fr. 98 - Port	JA-15	JA-16 Surface Lookout #1 - Fr. 25 Main Deck Stbd.	JA-17 Surface Lookout #2 - Fr. 25 Main Deck Port	JA-18 Surface Lookout # 3 - Fr. 216 Main Deck Stbd.	JA-19 Surface Lookout #4 - Fr. 216 Main Deck Port	JA-20

SOUND POWERED BATTLE TELEPHONES

5" Gun Control and 5" Sightsetters
Circuits 1JP and 1JQ
Main Battery Control Station

1JP1	1JP2	1JP3	1JP4	1JP5	
	Tie Switch 1JP to 1JY	Tie Switch 1JP to 2JY	Tie Switch 1JP to 3JY	Tie Switch 1JP to 4JY	
1JP6	1JP7	1JP8	1JP9	1JP10	To
5" Gun Mount No. 1	5" Gun Mount No. 2	5" Gun Mount No. 3	5" Gun Mount No. 4	L. C. Room	Selector Switch
1JP11	1JP12	1JP13	1JP14	1JP15	
Range Finder	Main Battery Director	24" Searchlight # 1	24" Searchlight # 2	Pilot House	
1JQ1	1JQ2	1JQ3	1JQ4	1JQ5	
5" Gun Mount No. 1	5" Gun Mount No. 2	5" Gun Mount No. 3	5" Gun Mount No. 4	Main Battery Director	

1JP1	1JP2 Tie Switch 1JP to 1JY	1JP3 Tie Switch 1JP to 2JY	1JP4 Tie Switch 1JP to 3JY	1JP5 Tie Switch 1JP to 4JY	1JP6 5" Gun No. 1 Fwd. Gun Deck Stbd.	1JP7 5" Gun No. 2 Fwd. Gun Deck Port	1JP8 5" Gun No. 3 Top Aft. Hand Room C	1JP9 5" Gun No. 4 Main Deck Aft. C	1JP10 L. C. Room 2nd. Deck Fr. 98 Stbd.

1JP11 Range Finder Top of House Fr. 84 C	1JP12 Main Battery Director Top of House Fr. 87 C	1JP13 24" Search- light # 1 Stbd. on Stack Fr. 101	1JP14 24" Search- Light # 2 Port on Stack Fr. 101	1JP15 Pilot House	1JQ1 5" Gun No.1 Fwd. Gun Deck Stbd.	1JQ2 5" Gun No. 2 Fwd. Gun Deck Port	1JQ3 5" Gun No. 3 Top Aft. Hand Room C	1JQ4 5" Gun No. 4 Main Deck Aft. C	1JQ5 Main Battery Director Top of House Fr. 87 C

SOUND POWERED BATTLE TELEPHONES

1.1" Machine Guns and Directors
Circuits 1JY - 2JY - 3JY - 4JY
Main Battery Control Station

1JY1	1JY2	1JY3	1JY4	1JY5
1.1" Gun Director #1	1.1" Machine Gun #1	Clipping Room # 3	Tie Switch to 2JY-3JY	Tie Switch 1JY to 2JY
2JY1	2JY2	2JY3	2JY4	2JY5
1.1" Gun Director #2	1.1" Machine Gun #2	Clipping Room # 3	Tie Switch 2JY to 3JY	Tie Switch 2JY to 4JY
3JY1	3JY2	3JY3	3JY4	3JY5
1.1" Gun Director #3	1.1" Machine Gun #3	Clipping Room #6		Tie Switch 3JY to 4JY
4JY1	4JY2	4JY3	4JY4	4JY5
Tie Switch 4JY to 1JY	1.1" Machine Gun #4	Clipping Room # 6	1.1" Gun Director # 4	

To Selector Switch

1JY1	1JY2	1JY3	1JY4	1JY5	2JY1	2JY2	2JY3	2JY4	2JY5
1.1" Direct.#1 Top of House Fr. 87 Stbd.	1.1" Gun #1 Top of House Fr. 86 Stbd.	Clipping Rm.3 Nav. Bridge Dk Fr. 94 Stbd.	Tie Switch 1JY to 2JY and 3JY	Tie Switch 1JY to 2JY	1.1" Direct.#2 Top of House Fr. 87 Port	1.1" Gun #2 Top of House Fr. 86 Port	Clipping Rm.3 Nav. Bridge Dk Fr. 94 Stbd.	Tie Switch 2JY to 3JY	Tie Switch 2JY to 4JY

3JY1	3JY2	3JY3	3JY4	3JY5	4JY1	4JY2	4JY3	4JY4	4JY5
1.1" Direct. #3 Nav. Bridge Dk Fr. 143 Stbd.	1.1" Gun # 3 Nav. Bridge Dk Fr. 147 Stbd.	Clipping Rm.6 Bridge Dk. Fr. 143 Stbd.		Tie Switch 3JY to 4JY	Tie Switch 4JY to 1JY	1.1" Gun # 4 Nav. Bridge Dk Fr. 147 Port	Clipping Rm. 6 Bridge Dk. Fr. 143 Stbd.	1.1" Direct.#4 Nav. Bridge Dk. Fr. 143 Port	

SOUND POWERED BATTLE TELEPHONES

20 MM (AA) Machine Gun Control and 5" Fuse-setters
Circuits 15JY and 1JK
Main Battery Control Station

15JY1	15JY2	15JY3	15JY4	15JY5
	Clipping Room #1	20 MM M.G. Group #1	Clipping Room # 2	20 MM M.G. Group # 2
15JY6	15JY7	15JY8	15JY9	15JY10
20 MM M.G.= Group # 8	20MM M.G.= Group # 7	Clipping Room # 6	20 MM M.G.= Group # 6	20 MM M.G. Group # 5
15JY11	15JY12	15JY13	15JY14	15JY16
Clipping Room #4	Clipping Room # 5	Pilot House	20 MM M.G.= Group # 4	20MM M.G.= Group #3
1JK1	1JK2	1JK3	1JK4	1JK5
5" Gun No.1	5" Gun No. 2	5" Gun No. 3	5" Gun NX. 4	

To Selector Switch

15JY1	15JY2 Clipping Rm #1 Upper Deck Fr. 80 Stbd.	15JY3 20 MM Gr. # 1 Upper Deck Fr. 80 Stbd.	15JY4 Clipping Rm #2 Upper Deck Fr. 80 ##### Port	15JY5 20 MM Gr. # 2 Upper Deck Fr. 80 Port	15JY6 20 MM Gr. # 8 Bridge Deck Fr. 155 Port	15JY7 20 MM Gr. # 7 Bridge Deck Fr. 155 Stbd.	15JY8 Clipping Rm #6 Bridge Deck Fr. 143 Stbd.	15JY9 20 MM Gr. # 6 Nav. Bridge Dk Fr. 123 Port	15JY10 20 MM Gr. # 5 Nav. Bridge Dk Fr. 123 Stbd.
15JY11 Clipping Rm.#4 Nav. Bridge Dk Fr. 115 Port	15JY12 Clipping Rm #5 Nav. Bridge Dk Fr. 115 Stbd.	15JY13 Pilot House	15JY14 20 MM Gr. # 4 Top of House Fr. 115 Port on Plat.	15JY15 20 MM Gr. #3 Top of House Fr. 115 Stbd. on Plat.	1JK1 5" Gun No. 1 Main Deck Fwd. Gun Plat.	1JK2 5" Gun No. 2 Main Deck Fwd. Gun Plat.	1JK3 5" Gun No. 3 Main Deck Top Aft Hand. Room	1JK4 5" Gun No. 4 Main Deck Aft.	1JK5

AMMUNITION
SECTION-S78

SECTION S-78

This section has been divided into two parts. The first part covers information pertaining to the ammunition hoists and the second part includes available information on magazines and Clipping Rooms. Information other than that provided by manufactures of ammunition hoists, is subject to correction as authorized changes are made in the ships. As information on these changes becomes available, corrections will be forwarded to holders of Information Book.

REFERENCES

BOOKS

1. Instructions for the Operation & Maintenance of Kiesling Electric Ammunition Hoists "Whip Type" - John W. Kiesling & Son, Inc.

2. Instruction & Information provided by Chain Belt Co.

3. Instructions for Preparing & Furnishing Plans & Booklets for Vessels of the United States Navy.- Buships

FEDERAL SHIPBUILDING AND DRYDOCK CO. DRAWINGS-

27077-78030-12	Ammunition Storage
27077-78030-13	Arrangement of Clipping Rooms
27077-78030-15	Location of Ready Service Boxes
27077-78030-10	
26877-4830-6	
2727-38010-1	

INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE

OF

KIESLING ELECTRIC AMMUNITION HOISTS - "WHIP TYPE"

This section contains instructions for guidance in the operation and maintenance of the KIESLING ELECTRIC MACHINE GUN AMMUNITION HOIST aboard these vessels.

OPERATION

LUBRICATION - The gear housing at the end of the motor, when shipped is filled with oil. Before starting the motor make sure that the gear housing is filled with a heavy gear case oil.

The gear housing is fitted with a bayonet oil gauge with a mark showing the proper oil level.

A list of recommended lubricants will be included in this section. See Sheet #

STARTING - The controller is full-automatic. The pushbuttons are instantaneous pressure. The pushbuttons are marked as follows: send button from magazine to the upper deck; emergency stop button and a emergency run button. This pushbutton is located in the magazine. The pushbutton at the upper deck is fitted with a down or send button to send the car to the magazine for the next load of ammunition. This pushbutton is also fitted with a stop button and an emergency run button. The ammunition car will automatically stop at eigher the upper deck or the magazine.

The emergency run button bridges out the overload relay. In order to operate the hoist with the emergency run button, hold in the emergency run button and press the button desired.

MAINTENANCE

LUBRICATION - The following places will require lubrication:-

The motor gear head should be kept filled with a heavy gear oil up to the level marked on the bayonet gauge. Recommended lubricants will be found upon sheet #

The oil level in the gear head should be checked at least once every three months.

The sheaves over wiich the cable passes should belubricated occasionally, greased or oiled as the lubricant system warrants.

The guide rails should be greased occasionally with cup grease.

MAGNETIC BRAKE - Instructions for adjusting and ti htening the tension on the brake, see instruction sheet# of this instruction book.

INSPECTION- The motor should be inspected at the oil level and lubricated at least once every three months.

Check all bolts and screws. Make sure that they are tight, including the motor foundation holding down bolts. See that the brake is properly adjusted. Check the controller, especially the points. ake sure that they are kept smooth and clean.

SPARE PARTS-In ordering spare parts, be sure to include the following information:-

1 - Part number.
2 - Name of part.
3 - Number of drawing showing the part number and name.
4 - Navy contract number or Shipyard number.
5 - JOHN W. KIESLING shop order number.
6 - How the part is to be shipped, with full shipping instructions.

MOTOR SPECIFICATIONS

1. Identification:
(a) Manufacturer - THE MASTER ELECTRIC SOMPANY, Dayton, Ohio.
(b) Navy Contract or Shipbuilders Order No. _____
(c) For U.S.S. _____
(d) For driving HOIST
(e) Mfr. of Driven Auxiliary JOHN W. KIESLING & SON, INC.

2. Reference Specifications: The motors described herewith will conform strictly with AIEE #45 SPECIFICATIONS, unless exceptions are specifically enumerated under item 15 below.

3. Reference Drawings: The following drawings show details as required by the Specifications or order -

Title of Drawing	Master Electric Co. No.	Bureau No. & Alt.
Assembly & Parts List	Sd-25-338	
Coil Form & Conn. Dia.	SD-25-324	

4. Motor Ratings:
(a) HP 5 RPM No Load 1800 RPM Full Load 1750 Frame 254
(b) Volts 230 Winding Compound Speed Class Varying Method Thermometer
(c) Amb. Temp. 40 OC Temp. Rise 50 OC Insulation Class A
(d) Type of Gearhead Right Angle Ratio 36:1
(e) Countershaft RPM 48 Full Load
(g) Brake Torque 30 Ft. Lbs. Brake Connections Shunt

5. Motor Classification:
(a) Service Classification Marine
(b) Degree of Enclosure Drip Proof
(c) Duty Classification Intermittent 30 minutes
(d) Type of Motor Copound
(e) Horizontal or Vertical Mounting Horizontal
(f) Position of Gearhead A-1

6. Performance:

	Loads	Amperes	Efficiency
(a)	4/4	19.1	85.0
(b)	3/4	14.5	84.0
(c)	2/4	10.0	81.0

7. Weights:
(a) Motor Complete 330 lbs. (b) Armature with shaft 50 lbs
(c) All Spares 135 Net 150 lbs. boxed.

8. Frame and End Covers:
(a) Frame Material Cast Iron
(b) End Cover-shaft end-material " "
(c) End Cover-other end- Material " "
(d) Method of lead wires Conduit Box

9. Shafts, Bearings and Lubrication:
(a) Shaft-Material Steel- SAE 1345, or equivalent
(b) Type of Bearings Ball on motor shaft, tapered roller on co/Shaft
(c) Navy Type No. of Ball Bearings Type A Class A Grade 11
(d) Name of Manufacturer Marline Rockwell Corp. for Ball, Timken for tapered Roller or equivalent.
(e) Type of Lubricant Grease for Ball brg. Oil in Gear Case for Timken
(f) Navy Symbol for lubricating oil or grease 14-1-3 Grade B

10. Field Winding Data:

	Shunt	Series	Commutating
(a) Wire Size and Insulation	#26 Formvar	#15 SPE	#13 DCC Square
(b) Number of Turns per Coil	2000	17	67
(c) Wires in Parllel	1	2	1
(d) Weight of Copper in lbs	8	2	3
(e) Field connection diagram	SD-25-324		
(f) Coil dimension and insulation	SD-25-324		

11. Field Winding Treatment:
(a) Preheat for 1/2 Hrs. at 250 of
(b) Dip in Sterling 410 Varnish
(c) 1st Bake 2 hrs. at 250 of
(d) Coils are then wrapped with varnish combric and then inserted in field core.
(e) Dip in Sterling R-583 Varnish
(f) 2nd Bake 4 hrs. at 250 of

12. Armature Winding Data:
(a) No. of slots 25
(b) No. of Commutator Bars 75
(c) No. of Single Coils 75
(d) Wire Size and Insulation #15 Formvar
(e) No. of Turns per Coil Per Slot 1st coil 5 2nd coil 4 3rd coil 5
(f) Weight of copper in lbs. 6
(g) Coil Span 1 to 7 slots
(h) Armature connection diagram SD-25-324
(j) Coil dimension SD-25-324

13. Armature Winding Treatment:
(a) Preheat for 2 hrs. at 250 of
(b) Dip in Sterling R-583 Varnish
(c) 1st Bake 8 hrs. at 250 of
(d) Dip in Sterling R-583 Varnish
(e) 2nd Bake 8 hrs. at 250 of

14. List of Spares:
See spare parts list sheet No. 1

15. Exceptions to Specifications:
No Exceptions.

JOHN W. KIESLING AND SON, INC.,
LIST OF MATERIAL
QUANTITIES AND FOR THE MOTOR

PIECE NO.	NAME OF PIECE	NO.REQ.	MASTER ELECTRIC PART NO.
1.	Shaft	1	531483
2.	Armature Assembly	1	10543
3.	Field Assembly	1	10725
4.	Field Ring	1	530341
5.	Front Head	1	530019
6.	Rear Head	1	531852
7.	Bearing Housing Open	1	531030
8.	Bearing Housing Closed	1	530024
9.	Brake Cover	1	531853
10.	Brush Ring Assembly	1	27291
11.	Field Studs	4	531857
12.	Bearing (Front)	1	50606
13.	Bearing (Rear)	1	52429
14.	Fan Ass'ly	1	25450
15.	Commutator	1	25735
16.	Stud Nuts	8	52293
17.	Condulet Base	1	95746
18.	Condulet Cover	1	95747
19.	Condulet Cover Screws	8	50104
20.	Break Head Band	1	531918
21.	Brake Winding	1	16371
22.	pole Assembly	3	29702
23.	Armature Plate	1	530934
24.	Release Cam Follower	1	94407
25.	Rotating Disc.	1	530935
26.	Release Cam Follower Screws	4	50609
27.	Stationary Disc.	2	530932
28.	Brake Plate	1	530933
29.	Release Cam	1	74328
30.	Release Cam Lock	1	74291
31.	Brake Studs	3	531855
32.	Brake Stud Spring	3	531856
33.	Brake Stud Nuts	6	50364
34.	Armature Plate Screws	3	54680
35.	Worm	1	92728
36.	Worm Gear	1	96410
37.	Co-Shaft	1	532354
38.	Co-Shaft Bearing (Rear)	1	50638
39.	Co-Shaft Bearing (Front)	1	51106
40.	Oil Seal Assembly (Co-Shaft)	1	26066
41.	Oil Seal Assembly (Motor Shaft)	1	25040
42.	Worm spacing Collar	1	15362
43.	Worm Gear Spacing Collar	1	530199
44.	Worm Spacing Collar	1	15363
45.	Bearing Cap	1	98623
46.	Bearing Housing Screws	20	51858
47.	Grease Plug	1	50198
48.	Grease Plug	3	22
49.	Ball Bearing (outboard)	1	5701
50.	Leads Terminal Lugs	8	54859

LUBRICATION

RIGHT ANGLE WORM GEARHEAD MASTER MOTORS. LUBRICATION.

Lubrication is extremely important for satisfactory operation of gearhead motors, therefore proper oil level must be maintained in gear case at all times. The correct level is indicated by the red hex head plug. Frequent inspections, with motor not running, and preferably when warm, should be made by removing the plug to see that level is being maintained. If low, additional lubricant must be added through one of the upper openings until it comes out oil level hole, which must be kept open during this operation.

Certain motors are equipped with sight oil gauges having correct level marked on the gauge.

Lubricant should be drained and gear case refilled every 750 hours of operation when in normal daily use: every 500 hours if operated continously or in excessively high temperatures. Use only recommended lubricants as listed on the reverse side of this tag.

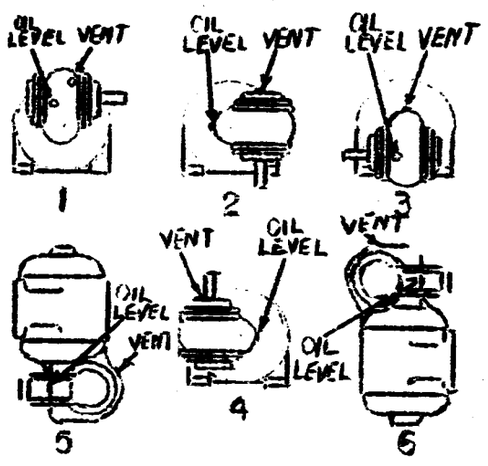
Motor shaft ball bearing at gear end is lubricated by oil in gear case: rear motor shaft bearing must be lubricated separately, with a good grade of bearing grease.

GEAR CASE VENT- All gear cases require a vent to prevent excessive air pressure being built up in gear case due to heat which would force lubricant through seals, causing leakage. This venting is provided by a small plug which has a plunger or held closed by a light spring pressure. This arrangement prevents entrance of dirt or water into gear case and yet will open and release pressure before it reaches a point where it is injurious to the seals.

GEARHEAD MOUNTING. This motor has been lubricated at factory for only one position of mounting. Before starting the motor, check diagrams below to see that oil level plug location and oil level are correct for the position in which the motor is to be operated. This is very important as insufficient lubricant will result in damage to gears and bearings in a short time. If any change is necessary the vent plug should be removed to position above the new oil level. Where motor is mounted in position other than shown in diagrams, write factory.

OPERATING TEMPERATURES. Heating is a natural characteristic of worm gear units and a maximum temperture of 200°F. is not uncommon. However lubrication and design have fully taken into consideration these conditions, and there is no danger of damage from this cause, when recommended lubricants are used and motors are not carrying excessive loads.

MAINTENANCE.Gearhead motors are accurately adjusted and tested at the factory. Extreme care must be taken should it be necessary to open or reassemble the motor or gear case. Whenever possible this work should be done by a Master authorized service station as damage to bearings, gears and seals may result through improper handling and assembling.



LUBRICATION (CONT.)

USE ONLY THESE RECOMMENDED LUBRICANTS

WHEN ROOM TEMPERATURE IS NORMAL 50° TO 100° F.

GULF I.C. OIL B	THE GULF REFINING CO.
M NO. 80 NON -FLUID OIL	N.Y.-N.J. LUBRICANT CO.
6 MINERAL OIL	THE PURE OIL CO.
VALVA NO. 79	SHELL PETROLEUM CORP.
OPALINE GEAR LUBRICANT BX	SINCLAIR REFINING CO.
GARGOYLE CYLINDER OIL 600W MIN RAL.	
MOBILOIL CW"	SOCONY VACUUM OIL CO.
STANOIL NO. 200	STANDARD OIL OF IND.
VALESSO NO. 150	STANDARD OIL OF N.J.
THUBAN SAE 90	TEXAS CO & INDIAN REF.
PHREPENN 50	Union Oil Co of Calif
VALVOLINE SAE 70	VALVOLINE OIL CO.

WHEN ROOM TEMPERATURE IS HIGH 85° to 115°F.

GULF I.C. OIL D	GULF REFINING CO.
OPALINE GEAR LUBRICANT CX	SINCLAIR REFINING CO.
GARGOYLE CYLINDER OIL EXTRA HECIA MINERAL	SOCONY VACUUM OIL CO.
CALUMET CYLINDER OIL	STANDARD OIL OF IND.
THUBAN SAE 250	TEXAS CO. & INDIAN REF.

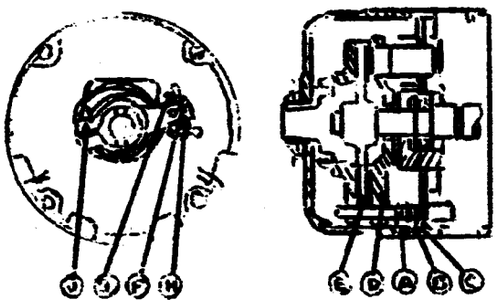
WHEN ROOM TEMPERATURE IS LOW.-10° to 60° F.

OPALINE GEAR LUBRICANT AX	SINCLAIR REFINING CO.
GARGOYLE VOCO ENGINE OIL NO.1	SOCONY VACUUM OIL CO.
STANOIL NO. 50	STANDARD OIL OF IND.
TERESSO 100	STANDARD OIL OF N.J.
THUBAN SAE 90	TEXAS CO. & INDIAN REF.
GULF HARMONY OIL "E"	GULF REFINING CO.

NOTE-All worm gearhead motors are lubricated for normal operating conditions unless otherwise specified. When motors are required to operate in temperatures above 115° F. or below-10° Write factory for further information.

MASTER UNIBRAKE MOTORS

DESCRIPTION. The Unibrake which is an integral part of this motor., consists of a metallic disc which is splined to the motor shaft and rotates with it. This disc revolves between two composition friction discs. When the switch is opened to stop the motor powerful coil springs force the friction disc against both sides of the rotating disc bringing the rotor or armature to a quick stop. When the switch is closed to srart the motor. These coil springs are compressed by electric magnets which action relieves the pressure on the friction discs and allows the motor to start and run freely.



ADJUSTMENT FOR QUICKNESS OF STOP.
This brake is adjusted at the factory for minimum braking torque. If this stop is too slow the brake can be adjusted for a quicker stop by first removing the sheet steel band around the brake head, which expose 3 compression springs shown at A on diagram. The tension of these springs is adjusted by means of the adjusting nut B. Loosen the 3 lock nuts C and then tighten the 3 adjusting nuts B to increase the spring pressure. It is very important that the adjusting nuts B be each turned an equal amount otherwise the armature plate D with its friction disc E will be thrown out of true. It is recommended that each of the adjusting nuts B be turned one full revolution and then try the brake to see if the desired stopping time is secured. It is not necessary to replace the steel cover band before trying the adjustment is secured then tighten all 3 lock nuts C so that the adjustment will remain permanent.

CAUTION:
It is possible to set the spring pressure up so tight that the coils of the spring will be xompressed solid and prevent the armature plate from making contact with the magnet pole pieces. This will result in excessive noise and vibration and damage to pole piece surfaces as well as excessive heating of magnet coils.

Single phase magnets are inherently weaker than three phase but will operate just as satisfactorily and quietly on normal or light spring pressures. When spring pressures are increased above normal. It will result in noisy operation.

To make the braking less abrupt decrease the brake pressure in the same manner as described for increasing it by loosening the spring adjusting screws instead of tightening them. After having tightened the lock nuts C replace the steel cover band.

ADJUSTMENT FOR DISC WEAR. There will be some wear after the brake has been in use, and unless this wear is taken up the brake will eventually become ineffective. To compensate for wear, loosen the lock nut F on the adjusting screw G in the lever or quick release handle H. With motor running, back up or loosen the adjusting screws G which will allow the lever or quick release handle to go down taking up the wear on the friction disc E. The most satisfactory adjustment is secured by moving this handle down until the brakes begin to drag, then raising it by the adjusting screw until the drag desappears. Tighten the lock nut to maintain adjustment.

CAUTION: If the adjustment is left with the brakes set so tight that they will drag while the motor is running, it will result in very rapid wear and disintegration, of friction discs on account of excessive heat. This point can be determined by the sound of the motor while running, as the drag of brake disc can be heard.

After adjusting screw has been turned to its extreme limit further adjustment can still be made as follows: Loosen clamp screw J on the lever or quick release handle, raise lever or handle approximately $\frac{1}{2}$ ", making sure that aluminum brake hub which protrudes through lever does not turn tighten clamp screw while lever is in raised position.

WIRING CONNECTIONS

The connections for 3 phase brake motors are shown on the metal wiring diagram plate attached to the condulet. If the motor is for any other current specifications the connection diagram will be found in an envelope attached to the motor.

Yellow leads are used for the brake except on 2 phase motors yellow indicates one phase of the brake and red indicates the other phase of the brake. On D.C. motors with shunt connected brakes, the brake leads are red.

On dual voltage motors, it is customary to wind brake coils for lower voltage. On some installations it is desirable to energize brake coils separately. With dual voltage brake motors, this can be done when motor is operated on lower voltage. If motor is operated on higher voltage, lower voltage must be applied to brake. Otherwise it will require especially wound brake coils.

LUBRICATION

All brake motors, frame 284 and smaller are equipped with pre-lubricated ball bearings on the armature or motor shaft on the brake end of the motor. These bearings have a definite quantity of lubricant sealed into them by the manufacturer. This original supply of lubricant is kept free from dirt grit or outside contamination by the bearing closures and does not require replenishment under normal operating conditions.

Brake motors in larger frames have standard ball bearings and should be lubricated in accordance with general instructions for atandard ball bearing motors.

CAUTION: If any lubricant gets on the discs, it will interfere with the proper operation of the brake.

ENGINEERING DATA

All chains for Hoist #1 - #2 - #3 and #4 are 80' 0" long.
32 carriages @30" centers = 80'0"
18 carriages on carrying side =
9 " with Proj. @ 60# ea. approx. = 480#
8 " " Cans @ 40# " " = 320#
Unbalanced load = 800#

MOTOR

G.E. CDM-0067-0-156 - 7-1/2 H.P. 1150/1750 RPM 230 v. D.C.
Gear Head output speeds - 186/282 RPM
Cleveland Worm Reducer - 9-2/3 to 1 ratio.
Drive shaft speed High = 282 ÷ 9-2/3 = 29.17 RPM
" " " Low = 183 ÷ 9-2/3 = 19.24 RPM

Drive sprocket 13T - 2-1/2" pitch
$\frac{13T \times 2\text{-}1/2}{12}$ = 2.71 ft. circumference

High chain speed 2.71 x 29.17 = 79 F.P.M.
Low " " 2.71 x 19.24 = 52 F.P.M.
Delivery at high speed = 79' ÷ 2-1/2' Space of carriages = 31.6 pcs.
" " low " = 52' ÷ 2-1/2' " " " = 20.8 "
or = 15.8 pounds of 5" amm. per min. at HIGH SPEED
and 10.4 " " " " " " LOW SPEED
H.P. at HIGH SPEED = $\frac{800\# \times 79 \text{ F.P.M.}}{33{,}000}$ = 1.9

H.P. at LOW SPEED = $\frac{800\# \times 52 \text{ F.P.M.}}{33{,}000}$ = 1.2

Friction loss in conveyor runs and sprockets action plus bearing losses estimated to be 25%
Then, Horsepower at worm gear output shaft will be:

at HIGH SPEED - 1.9 x 1.25 = 2.48
at LOW SPEED - 1.2 x 1.25 = 1.5

Efficiency of worm reducer, gear head and motor estimated at 70%
Motor input Horsepower:
At HIGH SPEED - 2.48 ÷ .70 = 3.5 H.P.
At LOW SPEED - 1.50 ÷ .70 = 2.1 H.P.

HOIST OPERATION

REFERENCE PLAN: CHAIN BELT CO. PLAN NO. 60460-1

1. Loosen Dog Bolts on top and bottom doors. Swing out from clamps.

2. Pull bottom door into "horizontal" position and let rest on supports. This forms the loading table or platform. The opening of the bottom automatically sets the limit switch "CR5896-A1K6" Plate #3 into operating contact. Move trip gear handle into open position before raising Flame Door. Raising Flame Door against closed trip will jam the door, making it extremely difficult to correct the error. With Flame Door in up position, lock the trip with an outward pull and "Half Turn" then release.

3. Make sure that the "Removable Discharge Car" and "Removable Discharge Shelf" shown in Plate #2 are not in position shown on drawing, but on hanging hooks provided on outside of hoist below loading door. Be sure shifter lever is up causing engagement of jaw clutch with motor jaw sleeve.

4. Top Door is opened far enough to reach underneath and release side flame doors by pulling back latches. The side flame doors have a clip that holds them against the door coaming. Correct position is shown Plate #1. The limit switch "CR5896-A1K6" Plate #3 will then be in operating position. Be sure such delivery table is sloped down so as to rest against door frame and is not held up in lowering position with rod provided for this purpose.

5. Unlash cargo mat and place on Main Deck as shown in Plate #1.

6. Man at Top Door presses ready button on switch "CR2940-2MW7-2" which will light green indicating light over bottom door, Light CR2940-Y1B. Light will stay lit only when ready switch is held down.

7. Upon green ready light signal, operator at bottom door may start the hoist.

8. The hoist is started by using switch CR2940-4AG9-5- button station. Hoist - low speed or Hoist high speed may be used as desired. Hoist low speed button will make the hoist run at 52 F.P.M. continuously. Hoist high-speed will start the hoist on low speed and automatically go into high speed in a short interval of time. The high speed is 79 F.P.M. delivering 15 rounds of amm. per minute if fed to full capacity.

9. Roll pieces of 5" amm. onto the bottom door table all the way back to the loading shelf. The hoist automatically picks up one-piece per carriage and elevates to the top and automatically delivers them onto the cargo mat.

10. Do not use switch CR2940-2MV7-2 button, except in emergencies. Emergency stop applies the magnetic and dynamic breaking instantly and at once bringing the hoist to rest in shortest possible time. Emergency run is to be used only in case electrical controls are damaged or cease to function. The emergency run connects the motor across the line without any safety relays.

LOWERING OPERATION

1. Place "Delivery Table" in raised position and hold by means of bar placed in the provided clips.

2. Swing Top Door all the way back on top of the hoist.

3. Raise Flame Door into vertical position and lock it there by hooking the clasp into the door handle located between the hinges.

4. Place removable "Discharge Cam" and discharge shelf into position shown in Plate #2.

5. Upon green ready signal start hoist by pressing Hoist lower button on switch CR2940-4AG9-5 button station. Hoist always lowers at slow speed of 59 F.P.M.

6. Feed one piece of 5" amm. at a time onto top Delivery Table. Be sure to time with carriage to avoid a jam by having a carriage pinch a piece of ammunition against the table. The best method is to release the ammunition piece just at the passing of a carriage. Correct timing by the operator is very easily learned in a few minutes.

7. The ammunition will automatically be discharged.

HAND OPERATION

1. Hand operation is for testing and for emergencies in case of powerrfailure.

2. The motor and gear head reducer are disconnected by bringing the shift lever to the down position. It may be necessary to rotate the hand lever slowly so as to line up the jaw clutch and shifter.

3. The hand drive is accomplished by means of the crank thru a set of bevel gears with drive thru the worm reducer and head shaft of the hoist conveyor.

MAINTENANCE

Chain Adjustment

a. The Hoist Conveyor Chain must not be slack. Adjustment is provided by a screw jack at the head section. There is a screw on each side. Take out the chain slack evenly and equally in both strands.

Lubrication: Lower Casing

a. Boot Section: Pin Type Alemite fittings at -

1. Shifter collar - one fitting
2. Flame Door Trip Mechanism - 3 fittings
3. Drive shaft - 2 fittings. One at each end.

b. Worm Gear Reducer:-

1. Equipped with Sight-Feed Drip Oiler to lubricated imput shaft bearing.
2. Filler plug, drain plug and oil level pet cock to service the worm and worm gear.

c. Gear-Head Motor:-

1. Has convenient oil outlets in steel cover housing plainly marked - Oil-Fill, Oil-Level and Oil-Drain.

Lubrication: Upper Casing

a. Pin-type Alemite fittings at:-

1. Takeup screw on each side of casing, - 2 fittings.
2. Each stub shaft on each side of casing, - 4 fittings.

General

All plain hinges, catches, conveyor chain and flexible couplings to be serviced occasionally with medium cylinder lubricating oil.

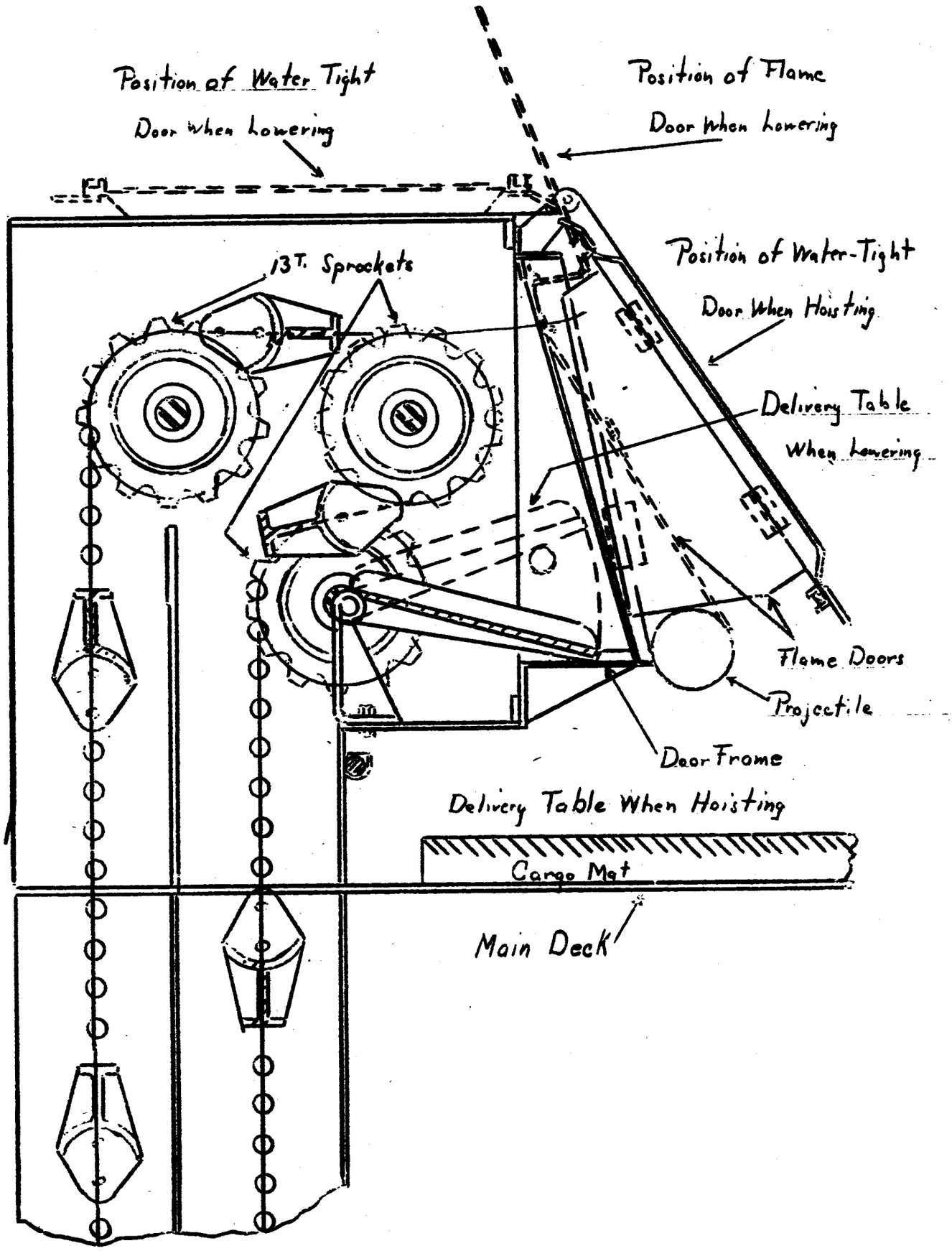


Plate #1

5" Ammunition Hoist

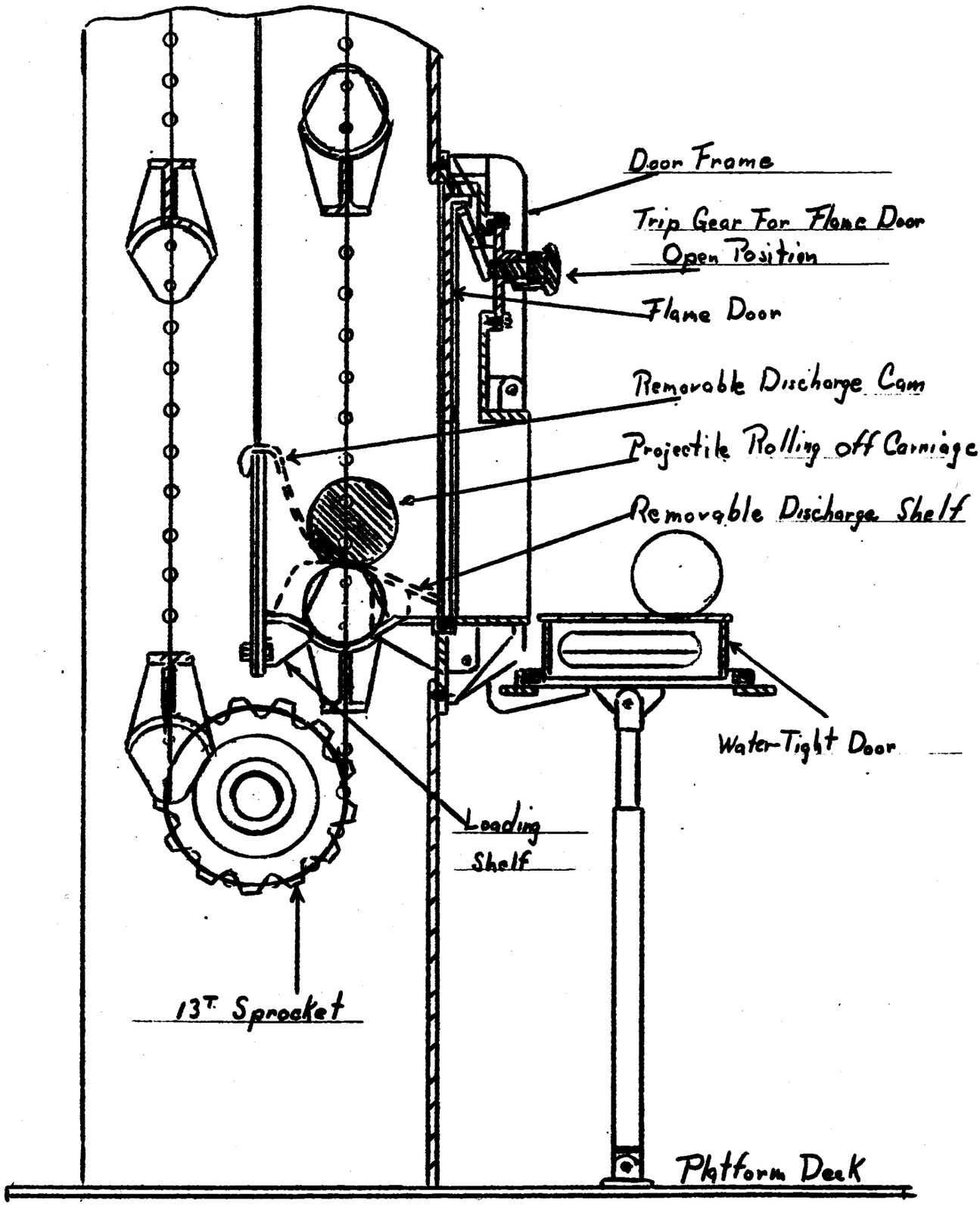


Plate 2

5" Ammunition Hoist

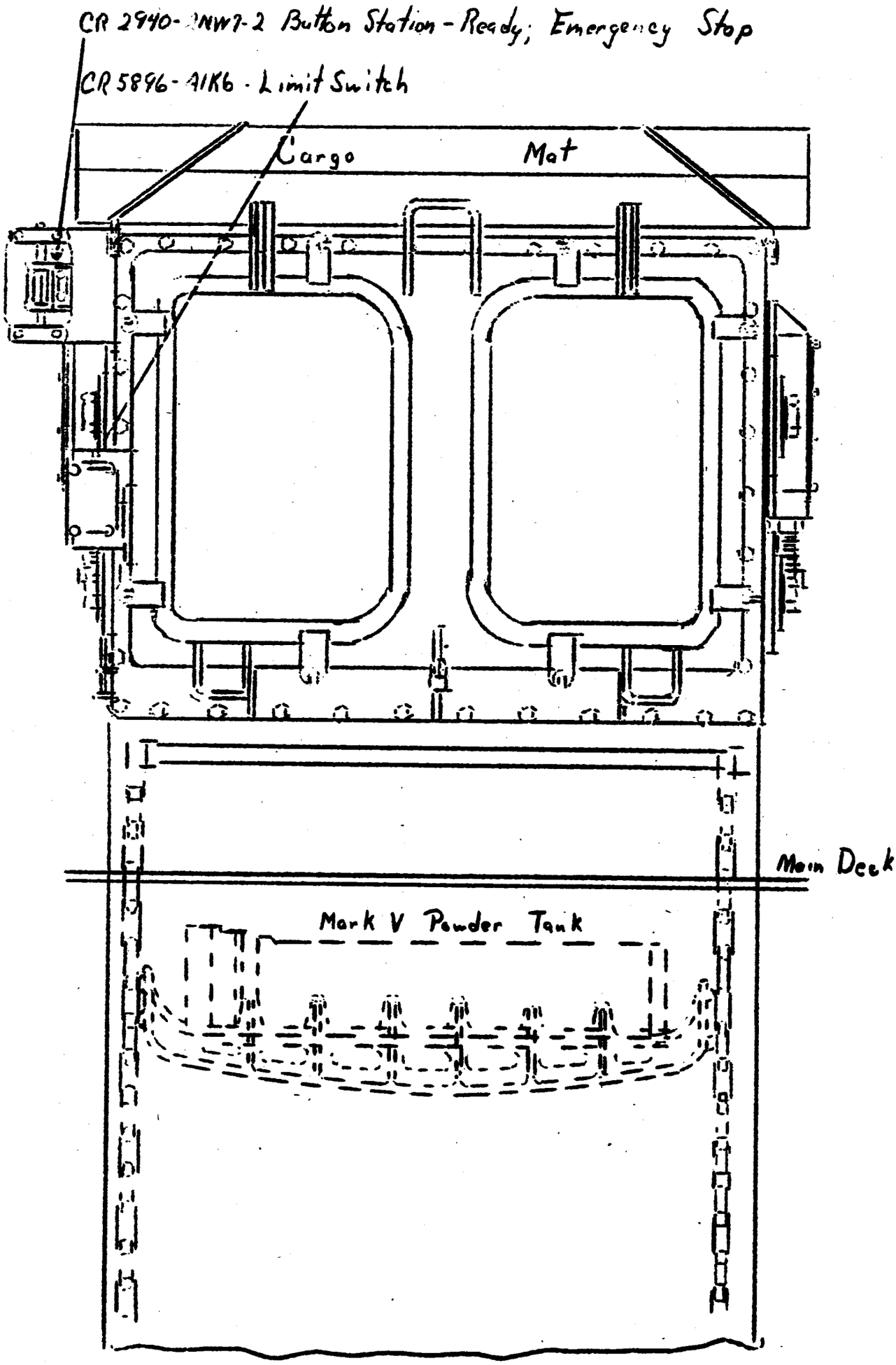


Plate 13

5" Ammunition Hoist