7. OVERLOAD DEVICE: (CONT)

(C) Operation - Device functions automatically in connection with control panel. Overload causes thermal metal to melt. After metal has congealed and set, pushbutton in door is pressed to reset relay.

8. LOW-VOLTAGE DEVICE:

(A) Manufacturers Type Designation	Part of Contactor
(B) Description of Equipment	This is a magnetic contactor which has dropout voltage of 12 volts. Operates in conjunction with the overload device and will not restart on return of voltage.

9. BRAKE DATA: (NONE

10. LIST OF APARE PARTS: Spare parts are listed on sheets 3 & 4 Drawing 1083-C on pages 56, 57.

THERMAL OVERLOAD RELAY

DESCRIPTION:
Under normal conditions the contacts of the relay are closed. The spring is under compression and tends to open the contacts. This is prevented by the outer part of the solder tube holding the ratchet mechanism. When the current to the heater coil is such value as to melt the solder film holding the outer part of the tube. the Tube rotates and releases the ratchet mechanism to open the control contacts. The opening of these contacts breaks the circuit to the coil of the contactor and opens the power circuit. At the time the power circuit is opened the solder film cools and hardens, after which the relay can be reset with the reset button in cover of elclosure.

HOW TO INSTALL THE HEATER COIL.

1. Remove the instruction Plate from the over load relay.
2. Remove the cover of the overload relay by sliding it to the extreme upper position and pulling outward.
3. Remove the terminal nuts at the side of the relay.
4. Insert the heater coil in the overload relay base, with the asbestos tube surrounding the coil. Be sure that the heater coil eyes fit over the terminal studs.
5. Fasten the celluloid calibration plate, which forms a part of the heater coil package, to the front of the overload relay base, using the screw provided for this purpose. The celluloid plate bears a symbol marking which should agree with that on the heater coils.
6. Replace the relay cover so that it encloses all of the coiled portion of the heater.
7. Replace the terminal nuts.

HOW TO SET THE OVERLOAD RELAY

This relay is adjustable. The pointer on the instruction plate should be set opposite the current marked on the calibration plate, at which it is desired to have the overload relay trip. This can be done by loosening the two screws which hold the instruction plate and the cover of the relay, #3, and sliding the entire cover until the pointer on the plate is in the proper position.

RELAY OPERATION

As the main line contactor closes to start the motor with resistance in series with the motor armature, the relay coil, which is paralleled with a condenser, is disconnected from the line. The condenser immediately discharges through the relay coil to keep the number 1 and number 2 contacts open for a definite time dipending on their settings. Number 1 contact operates first to close the accelerator which shorts out part of the resistor, increasing the rate of acceleration. Number 2 contact then closes the second accelerator to connect the motor across the line.

The Maximum total timing for the relay is about 4 seconds and the number 1 contact must always close before the number 2 contact closes.

The above timing period is for a 25 MFD. condenser at 230 Volts. If a larger condenser is used, the timing will be longer approximately in proportion to the condenser capacity.

ADJUSTMENT

The Relay is set at the factory for average operating conditions. If it is necessary to change the adjustment, proceed as follows, remembering that contact number 1 must ~~m~~ close before contact number 2 closes. The timing on each contact is independent of the setting on the other contact.

TO INCREASE THE TIMING ON THE CONTACTS

1. Turn the Thumb screws out a slight amount (about 1/8 to 1/4 turn) against the direction of the arrow, turning the screw for contact number 2 slightly more than the screw for contact number 1. The armatures of the relay should be held closed (contacts open) when this is done. Turning the screws in this direction will allow the armatures to move closer to the frame of the relay, increasing the timing.

2. Try the new settings and make further adjustments is necessary.

TO DECREASE THE TIMING OF THE CONTACTS

1. Turn the thumbs screws in a slight amount (about 1/8 to 1/4 turn) in the direction of the arrow, turning the screw for contact number 2 slightly less than the screw for contact number 1. The relay should be held with its armature closed (contacts open) when this is done, with the contact fingers free to move. Turning the screws in this direction will force the contact fingers away from the frame of the relay.

2. Try the new settings and if not satisfactory make further adjustment.

IMPORTANT: If it is necessary to replace the contacts, Replace all of them at the same time. When replacing these contacts place a 5/32" spacer between the outside levers and the ends of the frame at "A" and then adjust the movable contact brackets until the contacts just touch. Look the brackets in this position with the looking screws. For the center contact the dimension "A" should be slightly less than 3/16".

The above dimensions will provide the proper wear allowance on the contacts which need not be adjusted during their normal life.

LIST OF SPARE PARTS AND TOOLS

For 30" Underdriven Extractor — Appliance Extractor
Reproduced from MFG DR. NO. 1052 — Bu. Dr. No.
Shipbuilders Dr. No. — Shipbuilders P.O.No. 268-403
Manufacturer U.S.Hoffman Machinery Corp.
Vessels Name and Number

Item No.	No Of Units	Measure of unit	Quantity per unit	Name of Part or Tool	Catalog, Serial or stock No. Ordering Data	Box No.	PC No.	DWG No.
1	1	PC	1	Brake Block	70468	kk	11	1052
2	1	PC	1	Belt	o17174		22	1052

LIST OF SPARE PARTS AND TOOLS

For 30" Underdriven Extractor — Appliance 3.5 HO Electric Motor
Reproduced from MFG Dr. No. 1082D — Bu.Dr.No.
Shipbuilders Dr. No. — Shipbuilders P.O. No. 268-403
Manufacturer Louis Allis Company
Vessels Name and Number

Item No.	No. of Units Per Ship	Measure Of Unit	Quantity Per Unit	Name of Part or Tool	Catalog, Serial or Stock No. Ordering Data	Box No.	PC NO.	DWG NO.
1 X	1	PC	1	Front Ball Bearing	#206		71	1082D
2	1	PC	1	Rear Ball Bearing	#308		32	1082D
3	1	PC	1	Grease Cup - FEM.			3	1082D
4	1	PC	1	Grease Cup - Male			29	1082D
5	1	PC	1	Grease Pipe - 1/8 X 3			2	1082D
6	6	SET	4	Carbon Brushes			11	1082D
7	1	PC	1	Brush Holder with 3 extra springs.			12	1082D
8	1	SET	4	Brush Rigging Insulation Bushings	SK-22310-3		8	1082D
9	1	SET	4	Brush Rigging Insulation washers	Sk-22996-1		9	1082D
10	1	SET	2	Main Field Coils			49	1082D
11	1	SET	2	Interpole field coils on pole pieces			39	1082D
12	1	PC	1	Bearing Lubricant Seals			13	1082D
13	1	PC	1	Bearing " "			16	1082D
14	1	PC	1	" " "			23	1082D
				TOOLS				
15	1	PC	1	Bearing Removal Tool-Front				
16	1	PC	1	" " " Back.				

For 30" Laundry Extractor — Appliance 3 ½ HP Controller
Reproduced from mfg. Dr. No. 1069B, 1243, 1286, 2014 Bu. Dr. No.
Shipbuilders Dr. No. — Shipbuilders P.O.NO. 268-403
Vessels Name and Number

				#369 Contactor (M)				
1	1	PC	1	Contact Tip	1321-61		10	1243
2	1	PC	1	Contact Finger	640-246		12	1243
3	1	PC	1	Contact Finger Spring	69-95		14	1243
4	1	PC	1	Tail Spring	69-179		18	1243
5	1	SET	2	N.C.Stat. Int. Contact	21-174-6		47	1243
6	1	SET	2	N.O. " " "	21-174-4		53	1243
7	1	SET	2	Mov. Int. Contact	23-887		51	1243
8	1	PC	1	Mov. Int. Spring	69-524		46	1243
9	1	PC	1	" " "	69-525		44	1243
10	1	PC	1	Shunt Coil	9-483-7		6	1243
				#513 Relay (CT)				
11	1	PC	1	Contact Bracket	21-387-3		1	2014
12	1	PC	1	Stationary Contact BKT	21-387-2		2	2014
13	1	PC	1	Contact finger Spring	69-348		4	2014
14	1	PC	1	Contact Plate	21-391		22	2014
15	1	PC	1	Contact Spring	69-643		19	2014
16	1	PC	1	Contact Plate	21-385		24	2014
17	1	PC	1	Shunt Coil			16	2014
				#307 Overload Relay (OL)				
18	1	PC	1	Contact Lever	34985-IF IG.3		11	1286
19	1	PC	1	Contact Lever Spring	69-264		12	1286
20	1	SET	2	Stat. Contact Finger	640-217		8	1286
21	1	PC	1	Reset Button Spring	969-452		-	1286
				RESISTORS				
22	1	PC	1	2 Ohm Resistor	57-49-5			
23	1	PC	1	2.6 Ohm Resistor	57-49-6			
				Total 4.6 Ohms				

INSTALLATION, SETTING AND CONNECTION

INSTRUCTIONS

HOFFMAN DRYING TUMBLERS

OPEN END TYPE

REFER: Hoffman Instruction Book, Laundry Equipment.

Setting the machine in place.
The uncrated tumbler should be handled on the skids until lowered into position. Mounting saddles must be provided to give a rigid level foundation. Before bolting to the mounting saddles, the machine must be perfectly leveled in both the transverse and longitudinal directions. Leveling of the machine may be accomplished along the angles at the base of the tumbler and across the top of the tumbler. Use only metal shims when shimming is necessary. The tumbler must be bolted to the mounting saddle in such a manner as to insure against the loosening of the hold down bolts by vibration.

ELECTRICAL WORK.
The tumbler is furnished with a single motor that drives both the cylinder and the fan. An automatic across-the-line starter is furnished for the motor. The starter must be mounted on the wall adjacent to the tumbler. The necessary control push-button stations and limit switches are mounted on the tumbler. The control wires from these stations are run in conduit to a junction box mounted on the rear of the tumbler. See wiring diagram No. 1558 of reference for the proper method of interconnecting the push button station and across-the-line starter and the wiring terminating in the junction box.

It is suggested that the following checks on electrical work be made:

(1) Does the Fan run in the same direction as shown by arrows on motor Bracket?

(2) Does the pushbutton station operate properly? The fan and cylinder motor should start by pushing the "START" Button, and can be stopped by pushing the "STOP" Button. An attempt to open the shell door operates the limit switch which automatically cuts off the motor.

STEAM PIPING.
An adequate steam supply should be available. Live steam at 100 LBS. Gauge pressure at the tumbler is preferable. Use 3/4 inch pipe. However, if steam lines are over 150 feet long it would be better to use 1" or 1 1/4" pipe. The tumbler is provided with an inverted bucket trap connected to the steam drain connection. Piping should be run from the trap to a low pressure waste receiver. Avoid pockets and sharp bends as far as possible.

STEAM LINE OPERATION.
The machine should be properly warmed up before placing a load in the cylinder. The main steam valve should be opened slightly at first, until coils are thoroughly Heated. Immediate full opening of valve will cause Hammering in the Steam lines. The operation of steam trap should be checked. It is advisable to open trap by-pass line for first few minutes. When return pipes are hot enough to "FRY" Water, Main steam valve may be fully opened if the fan is running at proper speed and in the proper direction and the discharge duct is free, proper airflow should automatically result.

LOAD.
A normal load of Garments fills the tumbler cylinder somewhat above the center line.

FAN OPERATION.
As the fan and cylinder operate from the same motor, the fan will be shut down during loading and unloading operations.

STARCHING.
"ROUGH DRY" starched work should be starched a little heavy. It may be tested by trying dried garments with a hand iron.

OPERATING INSTRUCTIONS

HOFFMAN DRYING TUMBLERS

OPEN END TYPE

(CONT.)

DAMPER CONTROL.
A hand operated cold air damper is provided on the front of the tumbler. During ordinary drying operation it should be closed. At the expiration of the drying ~~up~~ time of all loads, the operator should fully open the cold air damper and allow the load to cool.

MAINTENANCE INSTRUCTIONS

HOFFMAN DRYING TUMBLERS

OPEN END TYPE

REFERENCE TO PARTS.
If referring to or ordering parts for this tumbler always give the following information: Part number, Part name, Quantity desired, Model, Type and serial numbers as shown on name plate ot tumbler. If correspondence or order has reference to motor or controls, the serial number shown on name plate of these items should also be given.

FIN COIL.
The fin coils are located at the top of the machine where they are easily accessible. They should be kept free of accumulated lint and dirt for most satisfactory operation. They should be cleaned by compressed air or live steam. The frequency of cleaning is determined by periodic inspection.

LINT REMOVAL.
The tumbler is provided with a lint box through which the air must pass after leaving the tumbler. It is situated between the fan housing and the discharge duct and should be inspected daily. The frequency of cleaning is dependent on the amount and type of work being handled. To remove the lint screen, turn the turnbuttons on the bottom of the lint box and lower the panel with the handle, thus exposing the screen which can easily be removed. The screen should be thoroughly cleaned before replacing. The lint collector below the screen should also be cleaned out. The fan housing and the discharge duct should be inspected weekly. The inspection and cleanout door on the side of the fan housing is removed by removing the screws that fasten it to the housing. An additional lint cleanout door is located in the front of the shell directly below the shell door for inspection and cleaning purposes.

DRIVE MECHANISM.
The drive mechanism is composed of both chain and V-belt drive. The tightness of the V-belt should be checked and, if necessary, adjusted to produce quiet and efficient operation. To adjust V-belt, See DWG. 1250, of ref, loosen bolt "A" and "B" on support arm. The support arm is then pivoted upward to tighten or downward to loosen the V-belt. When adjusted correctly be sure to tighten well bolts "A" and "B".

CONTROLLER SPECIFICATIONS

FOR

HOFFMAN 36X30" OPEN END LAUNDRY TUMBLER

DRIVE MOTOR

1. IDENTIFICATION:

(A) Submitted by — Cutler-Hammer, Inc.
(B) Navy Contract or Shipbuilders order No. — F.S. & D.D. Co. #268-403
(c) For Use — MCC HULLs 668-677
(d) For Use With — 36X30" Laundry Tumbler
(E) Driving Motor Manufactured by — General Electric Co.
(F) Driven Auxiliary Manufactured by — U.S. Hoffman Machinery Corp.
(G) Number of Controllers — One per tumbler.

CONTROLLER SPECIFICATIONS

FOR

HOFFMAN 36X30" OPEN END LAUNDRY TUMBLER

DRIVE MOTOR

(CONT*)

2. REFERENCE DRAWINGS:

The following drawings showing the various construction details, as required by the specifications under "PLANS", form A part of this description:

TITLE OF DRAWING	MANUFACTURERS NO.	BUREAU NO.
Drip Proof D.C. Magnetic Controller	Navy-X-1170,1278,1286 1287A,1288,1558	

3. CONTROLLER CLASSIFICATION AND RATING:

(A) Volts	230
(B) Horsepower	1/2
(C) Degree of Enclosure	Drip Proof, protected
(D) Type of Construction	Magnetic
(E) Duty Rating	Starting
(F) Operation of Control Circuit	Semi-Automatic
(G) Master Switch	Pushbutton
(H) Resistor Classification	Heavy Starting
(I) Low Voltage	Protection
(J) No. of Resistor Starting Steps	Three
(K) Speed Control	NONE
(L) Type of Braking	NONE

4. MANUFACTURER'S IDENTIFICATION:

(A) Manufacturers Type Designation - Bulletin #6842 ½ H.P., 230 Volt, D.C., Serial #B942188, B942252

5. DESCRIPTION OF OPERATION:

The motor is started by pressing the "START" button which energizes the "AR" coil causing the armature to close the four fingers in succession and short out the three steps of armature Resistance. The oil dashpot causes a delay in the movement armature on which the fingers are mounted. This permits the acceleration of the motor up to full speed over a period of 2 to 6 seconds, depending upon the adjustment. An Auxiliary contact is provided to maintain the switch in the closed position. A Thermal overload relay is provided with external reset on the door. To restart Motor after relay has been tripped, reset button must be pressed to reset relay.

The motor can be stopped by pressing the "STOP" button by low voltage or by tripping the overload relay. The "START" button must be pressed for restarting after motor has been stopped.

6. MASTER SWITCH:

(A) Manufacturers Type Designation - Cutler-Hammer, Inc. Bulletin #6960
(B) Description - Two button, one N.O. and one N.C. element. N.O. Element Marked "START". N.C. Element marked "STOP".
(C) Operation - See Section #6 of this specification.
(D) Material - Phenolic
(E) Enclosure - Drip Proof
(F) Insulation - Phenolic
(G) Weight - 3 ½ LBS.

7. OVERLOAD DEVICE:

(A) Manufacturers Type Designation - #307 Overload Relay
(B) Description - This is a Solder Pot Type of Relay. Melting of Thermal Metal Releases the contacts.
(C) Operation - Device functions automatically in connection with control pane. Overload causes Thermal Metal to Melt. After metal has congealed and set, pushbutton in relay is pressed to reset device.

8. LOW-VOLTAGE DEVICE:

(A) Manufacturers Type Designation - Part of contactor.
(B) Description of Equipment - This is a magnetic contactor which has dropout voltage of 10 volts. Operates in conjunction with the overload device and will not re-start on return of voltage

9. BRAKE DATA: (NONE)

10. LIST OF SPARE PARTS: - Spare parts are listed on sheets 3, 4 Drawing 1267B On Pages 78,79

LIST OF SPARE PARTS AND TOOLS

For 36X30" Open End Tumbler — Appliance Tumbler
Reproduced from MFG. Dr.NO. 1250 — Bu.Dr.No.
Shipbuilders Dr. No. — Shipbuilders P.O.NO.268-403
Manufacturer U.S. Hoffman Machinery Corp
Vessels Name and Number

Item No.	No.Of Units Per Ship	Measure of Units	Quantity Per Unit	Name of Part or Tool	Catalog,Serial Or Stock No. Ordering Data	Box No.	PC NO.	DWG NO.
1	1	PC	1	V-Belt	017205		25	1250
2	1	PC	1	Roller Link Chain	08472			
Manufacturer General Electric CO.				Appliance ½ HP Electric Motor				
1	1	SET	2	Ball Bearings				
2	1	SET	2	Field Coils				
3	1	SET	2	Grease Fitting				
4	1	PC	1	Brushholder Complete				
		SET	3	With Extra Springs				
5	6	SET	2	Brushes				
				TOOLS				
6	1	PC	1	Bearing Removal Tool.				
Manufacturer Cutler-Hammer, Inc.				Appliance ½ HP Controller				
				#234 CONTACTOR				
1	1	PC	1	Contact Button	1331-925		12	1288
2	1	SET	4	Contact Finger	640-7		13	1288
3	1	PC	1	Contact Spring	969-7		14	1288
4	1	PC	1	Contact Finger	640-8		31	1288
5	1	PC	1	Coil			35	1288
				#307 OVERLOAD RELAY (OL)				
6	1	PC	1	Contact Lever	34985-if3		11	1286
7	1	PC	1	Contact Lever Spring	69-264		12	1286
8	1	SET	2	Stat.Contact Finger	640-217		8	1286
9	1	PC	1	Reset Button Spring	969-452		-	1286
				REGISTORS				
10	1	SET	2	A-B 800 OHM R3 Unit				
11	1	SET	2	R1-R4 85.8 OHM X37 Unit (Tapped at 43.6 29.5 and 12.7 OHMS)				
				PUSHBUTTON STATION				
1	1	PC	1	N.O.Element	631-186		10	1278
2	1	PC	1	N.C.Element	631-185		9	1278

INSTALLATION, SETTING AND CONNECTION

INSTRUCTIONS

HOFFMAN CYLINDER TYPE FLATWORK IRONER

RETURN APRON

REFER: Hoffman Instruction Book, Laundry Equipment. Page 80-119.

SETTING MACHINE IN PLACE.
The Uncrated Flatwork Ironer should be handled on the skids until lowered into position. Mounting Saddles must be provided to give a rigid level foundation. Before bolting to the mounting saddles the machine must be perfectly leveled in both the transverse and longitudinal directions. Leveling lugs are provided on the end frames for transverse leveling, and the cylinder may be used for longitudinal leveling. Use only metal Shims when shimming is necessary. The Ironer must be bolted to the mounting saddles in such a manner as to insure against loosening of the Hold down bolts.

ELECTRICAL WORK.
The ironer is furnished with an across-the-line starter to be mounted on the wall adjacent to the ironer. The necessary control pushbutton station and limit switch are mounted on the ironer. The control wires from these stations and drive motor are run in conduit to a Junction box mounted in the right hand end Frame. See wiring diagram No. 1558 of reference, for the proper method of connecting starter and wiring terminating in the junction box.

It is suggested that the following checks on the electrical work be,

(1) Does the Motor run in the correct direction?
(2) Does the Motor respond instantly to the "START" and "STOP" Buttons?
(3) Check feed Table safety guard for operation.

STEAM AND DRAIN PIPING.
An adequate steam supply and a discharge drain should be provided. The Ironer is designed to operate satisfactorily with dry saturated steam at 100 LBS. Gauge pressure. Immediately prior to the connection into the steam and drain joint shown on DWG. NO. 1505 of reference There should be provided a steam gauge and a thermometer placed in a readily readable position. The drain or discharge line from the cylinder should be connected to the steam trap equipped with by-pass connections and should be located near the ironer. The Discharge should terminate in a low pressure waste line or receiver.

INSTRUCTIONS FOR OPERATION

HOFFMAN CYLINDER TYPE FLATWORK IRONER

RETURN APRON

STARTING AND STOPPING.
The Ironer cannot be started unless the ironer belt safety guard shown on DWG.NO.1527 of reference is in proper adjustment and position. The ironer may be started by depressing the "START" button located flush in the shelf of the right hand end frame. Depressing the "STOP" button, Momentarily, will automatically stop the Ironer. The ironer may also be stopped by pushing the lower edge of the safety guard.

PREHEATING CYLINDER.
Steam should be admitted slowly to the cylinder so that the heating up process is not too fast or severe. When the cylinder is thoroughly heated the steam supply valve may be fully opened. The ironer is not prepared for further procedure.

Attention should be directed to the valves in the connections by-passing the steam trap. The by-pass valve may be left open for a short period only after opening the inlet steam valve. Be sure the by-pass valve is closed before ironing.

ADJUSTING PRESSURE ROLLS.

The three padded rolls above the cylinder are now brought down into ironing contact with the heated cylinder by means of the hand wheel DWG.No. 1528. Simultaneously this operation will raise the apron release roll into proper position. If greater or less tension on the apron is desirable, adjustment may be effected by means of the take-up Facility shown on DWG.NO. 1528.

SPECIMEN TEST.

A specimen of work may now be placed upon the feed table, fed to the cylinder and allowed to return to the feeding side. When the character of work is satisfactory, and no further adjustment of pressure rolls or apron tension device is necessary, the regular ironing may proceed.

APRON GUIDING.

The apron guiding device shown on DWG.No.1510 has been provided to avoid excessive lateral movement of the apron across the face of the cylinder. This device automatically compensates for a tendency of the apron to shift due to any cause.

SHUTTING DOWN.

(1) The main steam valve should be closed tight.
(2) The by-pass valve around the steam discharge trap may be opened. This will hasten the cooling of the cylinder and contribute to longer clothing life.

RELEASING ROLL PRESSURE AND APRON.

Raise the three padded ironing rolls to the limit of their upper position by means of the hand wheel. This operation will also lower the apron release roll to its lowest position. The padded rolls and the apron will be free of contact with the heated chest and contribute to longer life of the clothing.

MAINTENANCE INSTRUCTIONS

HOFFMAN CYLINDER TYPE FLATWORK IRONER

REFERENCE TO PARTS.

In referring to or ordering parts for this ironer, always give the following information: Part number, Part Name, Quantity desired; Model, Type and serial number shown on name plate of machine. If correspondence or order has reference to motor or controls, the serial number shown on the name Plate of these items should also be given.

GENERAL MAINTENANCE.

It is suggested that the Ironer be inspected regularly and the following checks made:

(1) Excess oil and grease, if any, removed.
(2) All units are properly tightened.
(3) Ironer must be free from accumulation of Lint and Dust.
(4) Cylinder clean and free from starch accumulation.
(5) Steam and Drain connections should be tight. Packing of Steam joint must be checked for excessive steam leakage.

CLEANING THE CYLINDER.

The cylinder must be kept clean and smooth in order to produce satisfactory ironing. A regular application at semi-weekly intervals of a cloth moistened with kerosene or equivalent upon the cool cylinder will suffice. This should be followed immediately with a dry cloth. All traces of odor of cleaner must be removed before proceeding to iron.

Every day or, better, twice a day, a paraffined cloth should be run through the ironer while the cylinder is hot. The cloth must be as wide as the cylinder is long so that the cylinder will be waxed from end to end.

STEAM JOINT.

Drawing No. 1505 of reference shows the steam joint provided on the ironer for admission of steam and removal of condensate from the cylinder. The packing is spring held for automatic adjustment for wear. If joint shows more than a reasonable degree of leakage, the packing must be replaced. The joint is provided with a left hand thread at the point where it screws into the cylinder.

FEED RIBBON TAKE-UP

The idler feed ribbon roll is provided with a Take-up device at either end. Drawing No. 1526 Shows these devices. The roll must be adjusted the dame amount at either end. Excessive adjustment of ribbons will tend to bend either the drive or idler rolls.

PRESSURE ROLL ADJUSTMENTS.

The three padded presxure rolls are provided with a spring pressure adjustment at either end of each roll. Drawing No. 1519 shows the pressure adjustment. The three rolls operate at different pressures. The front roll operates at a higher pres ure than the middle roll, while the middle roll operates with a higher pressure than the rear roll which has theleast tension. Correct pressure may be established by applying more pressure on the spring with the adjusting screw No. 3. Three 6-Inch wide tapes approximately four feet long must be used for testing. With the padded rolls in pressure contact with the cylinder, the tapes are fed under the roll at each end and at center. If pull on all tapes is of approximately the same degree it is an indication that the roll pressure is equal points.

PRESSURE ROLL GROUP ADJUSTMENT.

The three pressure rolls are simultaneously brought into contact with cylinder by means of handwheel and two eccentrics at either end. The connecting link between eccentrics and frame upon which rolls are supported provides for correct leveling of pressure roll group. This level condition should be checked at six month intervals. Drawing No. 1528 shows this device and its parts.

RETURN APRON TENSION DEVICE.

At infrequent intervals it becomes advisable to compensate for the stretch of the return apron. Drawing No. 1528 illustrates this device. An equal number of turns on the adjustment at either end of the take-up roll must be made. Failure to make even adjustment will cause undue strain and operation requirements upon the aprom guide roll.

RETURN APRON GUIDE ROLL.

This a device shown on Drawing No. 1510 is provided for purpose of compensating for tendency of the return apron to shift laterally across the face of the cylinder. If all parts of ironer are correctly aligned and uniform work is being fed, there should be little work for this device. A persistent tendency of the apron to shift may be caused by the following:

(1) Feeding too much work to one side of cylinder.
(2) Feeding heavier work at one end than the other.
(3) Takeup roll not parallel with the cylinder.
(4) Release roll not parallel with the cylinder.
(5) Return apron longer on one side than the other.

RELEASE ROLL ADJUSTMENT.

Drawing No. 1528 shows the adjustment provided at each end of this roll. The screw provided facilitates adjustment for leveling of the roll. The screwk lock nut must be tightened after proper adjustment.

FEED RIBBON REPLACEMENT.

When feed ribbons need replacement, A whole new set should be installed so that all ribbons are of even length. Replacement should proceed as follows:

REMOVAL.

(1) Release the feed ribbon roll adjusting screws an equal number of turns. Remove feed table holddown bolts.
(2) Draw feed table outwards until ribbon fingers clear dafety guard and rest table on feed ribbon roll.
(3) Remove holddown bolts from feed ribbon roll bearings.
(4) Prop feed ribbon roll, bearing and feed table so that the end clears right hand frame.
(5) Slide ribcond toward high end. Replace prop and slide ribbons over end of roll and roll bearing.

INSTALLING.

Slide on new feed ribbons and reverse the above operations. Care must be taken that drive chain is properly engaged and that marks of roll bearing correspond to mating marks on bearing adjusting plates. Tighten feed ribbon roll to proper tension. Feed roll must always be parallel to feed ribbon rod attached to rear of feed table.

RETURN APRON REPLACEMENT.

When it becomes necessary to install a new apron, it is suggested that the work proceed as follows:

(1) The release roll must be in downward postiion.

(2) The take-up is reset to its uppermost limit.

(3) The clipper lacing on each side of apron must be properly applied.

(4) The apron must be of correct length and the sides must be of identical length

(5) The clipper laced ends must be square with the ends.

The return apron is next passed over the rolls as shown on drawing No.1512. The ends are laced, the apron release roll is raised and the take-up roll is moved to the desired belt tension.

PRESSURE ROLL PADDING REPLACEMENT.

All pressure rolls must be pepadded at the same time and this work must proceed as follows:

REMOVAL OF OLD PADDING

(1) Raise the pressure rolls and frame to their highest position.

(2) Remove old clothing.

(3) Clean the rolls thoroughly.

(4) Lower Bare Rolls to within 3/8-inch of the cylinder.

APPLICATION OF NEW PADDING.

(1) Apply a coating of glue or water glass, approximately two inches wide, on the full length of the rolls.

(2) Stich one edge of the muslin binder to the glued portion of the roll.

(3) Roll the Binder around the rolls.

(4) Apply the knitted padding to the front roll allowing 12 inches to lap under the binder muslin.

(5) Apply the knitted padding to the middle and rear rolls in the same manner.

(6) Pack down the padded Rolls.

(7) Apply the top cover cloth to the rolls, allowing about 12 inches of cloth to lap under the knitted padding. Cover cloth must be torn (not cut) to length.

CHECKING

THE FOLLOWING CHECKS MUST BE MADE:

(1) Is cover cloth straight without pull, smooth, free from wrinkles?

(2) Is diameter and circumference of rolls uniform? Circumference and diameter must be uniform from end to end of all three rolls. If rolls are not uniform, padding must be removed and rolls repadded.

FINAL OPERATIONS.

When Rolls are finally correctly padded and measurements show uniformity, the Ironer must be operated under slight pressure until padding is packed snugly to the roll. The procedure under "Pressure Roll Adjustment" should be followed before attempting to iron with newly padded rolls.

MOTOR SPECIFICATIONS

FOR

HOFFMAN 16X100" CYLINDER TYPE IRONER

1. IDENTIFICATION:

(A) Manufacturer — The Louis Allis Company
(B) Navy contract or shipbuilder's Order No. F.S. & D.D. CO. #268-403
(C) For — MCC HULLS 668-677
(D) For Driving — 16X100" Flat Work Ironer
(E) Manufacturer of Driven Auxiliary — U.S. Hoffman Machinery Corp.
(F) Number of Motors involved — One Per Ironer

2. REFERENCE DRAWINGS:

The following plans are submitted herewith to show the various construction details and which cannot be suitably covered in the Manufacturers specifications.

TITLE OF DRAWING	MANUFACTURERS NUMBER	BU. SHIPS NO.
Motor Assembly Drip Proof	Navy-X-1539A	

3. Motor Rating:

(A) Volts 230
(B) Amperes 4.5
(C) Horsepower 1
(D) R.P.M. 1750
(E) Duty Continuous
(F) Method of temperature Measurement - thermometer
(G) Temperature Rise 50°C.

4. Motor CLASSIFICATION:

(A) Degree of Enclosure — Drip Proof
(B) Method of cooling — Natural
(C) Speed — Constant
(D) Type of Winding — Shunt
(E) Ambient temperature 40°C.
(F) Manufacturers type and class Type, GNA, Frame 203, Class C.
(G) Mounting - Horizontal.

5. WEIGHTS:

(A) Motor Complete — 70 LBS.
(B) Spare Armature, Complete — 14 LBS.
(C) All spares boxed, including control spares — 60 LBS.

6. EFFICIENCY:

		EFFICIENCY	AMPERES
(A) At Rated Load	4/4	66%	4.9
(B) At 3/4 Load		65%	3.9
(C) At 1/2 Load		60%	2.7
(D) At 1/4 Load		--	--

5. DESCRIPTION OF OPERATION: (See drawing Navy -X-1558)

The motor is started by pressing the #START" button which energizes the "AR" coil. Thus causing the armature to close the four fingers in succession and short out the three steps of armature resistance. The oil dashpot causes a delay in the movement armature on which the fingers are mounted, thereby permitting the acceleration of the motor up to full speed over a period of 2 to 6 minutes depending on the position. A thermal overload relay is provided with external reset on the door. The reset button must be pressed to reset the tripped relay before the motor can be restarted.

The motor can be stopped by pressing the "STOP" button, by low volt age or by tripping of the overload relay. The "START" button must be pressed to restart after the motor has been stopped.

6. MASTER SWITCH.

(A) Manufacturers type designation Bulletin #6960
(B) Description - Two button, one N.O. & one N.C. Element. N.C. Element Marked "STOP" and N.O. Element marked "START".
(C) Operation - See section #6 of this specification
(D) Material - Phenolic
(E) Enclosure - Waterproof
(F) Insulation - Phenolic
(G) Weight - 3 1/2 LBS.

7. OVERLOAD DEVICE.

(A) Manufacturers type designation #307 Overload Relay
(B) Description - This is a solder pot type of relay. Melting of the thermal metal releases the contacts.
(C) Operation - Device functions automatically in connection with control panel. Overload causes thermal metal to melt. After metal has congealed and set, Pushbutton in door is depressed to reset device.

8. LOW-VOLTAGE DEVICE:

(A) Manufacturers Type Designation Part of contactor
(B) Description of equipment - This is a magnetic contactor which has dropout voltage of 15 volts. Operates in conjunction with the overload device and will not re-start on return of voltage.

9. BRAKE DATA: (NONE)

10. LIST OF SPARE PARTS:

Spare parts are listed on sheets 2, 3 Drawing 1553-A on pages 118-119.

14. ARMATURE:

(A) Diameter	4.753"		
(B) Core Length	1.5"		
(C) Winding Data:			
No. of Slots	25	No. of Comm. Segment	75
No. of Single Coils	75	Conductor Copper	#22
Conductor Insulation	SCE	Turns in series per coil	18
Developed length per coil	16	Weight of Copper	3 LBS
Resistance at 25°C.	4.85		

The shunt wound on red paper cell. Two Layers varnished cambric around corners of completed shunt winding. 020" pressboard cell on sides and inside of coil. One (1) layer of half lapped cotton type to complete coil.

INSULATION MATERIAL	
Slot Cell	.022" Composite
Center Wedge	.062" Fibre
Top Wedge	.062" Fibre
Coil Layer Insulation	.010" Varn. Cambric

(D) Impregnation - Preheat Armature four (4) hours at 230°F. Dip in G.E. #458 Varnish and bake 8 hours.

15. COMMUTATOR:

(A) Diameter 2 3/4" (B) Length 3/4"
(C) Wearing Depth 3/8 (D) Flush or undercut Undercut
(D) Insulation between bars - Mica (F) Insulation to ground shaft - MICA

16. BRUSHES.

(A) No. of Studs 4 (B) No. of Brushes per stud 1
(C) Size of Brush
Length 1" Width 1/2" Thickness 1/4"
(D) Navy Grade A
(E) Manufacturer Speer Carbon Company.

17. BRAKE DATA: (NONE)

18. SPARE PARTS:

(A) See spare parts list Page 117
(B) Special tools - See spare parts list Page 117

CONTROLLER SPECIFICATIONS

FOR

DRIVE MOTOR

16X100" CYLINDER TYPE RETURN APRON IRONER

1. IDENTIFICATION:

(A) Submitted by Cutler-Hammer, Inc.
(B) Navy Contract or Shipbuilders Order No. F.S & D.D. Co.#268-403
(C) For use on MCC HULLS 668-677
(D) For use with 16X100" Flat Work Ironer
(E) Driving Motor Manufacturer by Louis Allis Co.
(F) Driven Auxiliary Manufactured by U.S. Hoffman Machinery Corporation
(G) Number of controllers One per Ironer

2. DRAWINGS REFERENCE:

The following drawings showing the various construction details, as required by the specifications under "PLANS", form a part of this description:

TITLE OF DRAWING	MANUFACTURERS NO.	BU. NO.
Drip Proof D.C. Magnetic Controller	Navy-X-1278, 1286, 1287A 1288, 1517, 1558	

3. CONTROLLER CLASSIFICATION AND RATING:

(A) Volts. 230
(B) Horsepower. 1
(C) Degree of Enclosure. . . . . .Drip Proof, Protected.
(D) Type of Construction. . . . . .Magnetic
(E) Duty Rating. . . . . .Starting
(F) Operation of Control Circuit. . . . . .Semi-Automatic
(G) Master Switch. . . . . .Push Button
(H) Resistor Classification. . . . . Heavy Starting
(I) Low Voltage. . . . . Protection
(J) No. of Resistor Starting Steps. . . . . Three
(K) Speed Control. . . . . .NONE
(L) Type of Braking. . . . . .NONE

4. MANUFACTURERS IDENTIFICATION:

(A) Manufacturers type designation Bulletin 6842
1 HP, 230 Volt, D.C. Serial #B942188
#B942252

7. MAIN POLES:

(A) Number 4
(B) Air Gap (Nominal) .048"

8. SHAFT MATERIAL:

(A) Hot Rolled Steel

9. COMMUTATING POLES:

(A) Number 2
(B) Air Gap (Nominal) .048"

10. BEARINGS:

(A) Type A Class A & B Grade 11
Fafnir #305 K or W, M.R.C. #305 S or M on back: Fafnir #205, K or W, M.R.C. #205 S or M on Front. The bearings shown are approved by the Fafnir Bearing Co. and signed by E.R.Carter, C.E., per C.W.K., and approved by Marlin Rockwell Corp. and signed by L.A. Cummings, C.E., per A.W.W.

(B) Lubrication Grease, Navy 14L3a, Grade B

11. SHUNT FIELD WINDINGS:

(A) Winding Data 3400 turns of #28 wire, Enamel covered, developed length per coil - 2520 feet, weighing 1 1/2 LBS. Resistance per coil at 25°C. - 167.5
(B) Insulation Enamel
(C) Impregnation Completed coils are dipped in G.E. #458 Varnish and bake 6 hours. Final spray with air drying varnish.

12. SERIES FIELD WINDING: (NONE)

13. COMMUTATING FIELD WINDINGS:

(A) Winding Data 310 turns of #18 wire, SCE conductor insulation. Developed length - 125 FT., Weighing.9 LBS. Resistance per coil at 25°C.-1.
(B) Insulation - SCE
(C) Impregnation - Coil is dipped in G.E. #458 Varnish and baked for 6 Hours. Final spray with air drying varnish.

LIST OF SPARE PARTS AND TOOLS.

FOR 16X100" FLAT WORK IRONER APPLIANCE 1 HP ELECTRIC MOTOR
REPRODUCED FROM MFG. DR. NO. 1539A BU. DR. NO.
SHIPBUILDERS DR. NO. SHIPBUILDERS P.O. NO. 268-403
MANUFACTURER LOUIS ALLIS CO.
VESSELS NAME AND NUMBER

Item No.	No. of Units Per Ship	Measure of Unit	Quantity Per Unit	NAME OF PART OR TOOL	Catalog, Serial Or Stock No. Ordering Data	Box No	PC NO	DWG NO
1	1	PC	1	Front Ball Bearing	#205		2	1539A
2	1	PC	1	Back Ball Bearing	#305		52	1539A
3	1	PC	1	Grease Cup 1/8" FEM			29	1539A
4	1	PC	1	Grease Cup 1/8" Male			1	1539A
5	6	SET	4	Carbon Brushes			16	1539A
6	1	PC	1	Brush Holder & 3 Extra Springs			13	1539A
7	1	SET	4	Brush Rigging Insul. Bushings			11	1539A
8	1	SET	4	Brush Rigging Insul. Washers			12	1539A
9	1	SET	2	Main Field Coils			50	1539A
10	1	SET	2	Interpole Field Coils			40	1539A
11	3	PC	1	Bearing Lubricant Seal	SK-12360-it.7		33	1539A
12	3	SET	2	Bearing Lubricant Seal	SK-12360-it.10		4	1539A
13	3	SET	2	Bearing Lubricant Seal	SK-12360-it.13		54	1539A
				TOOLS				
14	1	PC	1	Bearing Removal Tool				
15	1	PC	1	Bearing Removal Tool				

LIST OF SPARE PARTS AND TOOLS

FOR 16X100" FLATWORK IRONER APPLIANCE 1 HP CONTROLLER

REPRODUCED FROM MFG. DR. NO. 1286,1287A,1288 BU.DR.NO.

SHIPBUILDERS DR. NO. SHIPBUILDERS P.O.NO. 268-403

MANUFACTURER CUTLER-HAMMER, INC.

VESSELS NAME AND NUMBER

Item No	No of Units Per Ship	Measure of Unit	Quantity Per Unit	NAME OF PART OR TOOL	Catalog, Serial Or Stock no. Ordering Data.	Box No	PC No	DWG No.
				#234 CONTACTOR				
1	1	PC	1	Contact Button	1331-925		12	1288
2	1	SET	4	Contact Finger	640-7		13	1288
3	1	PC	1	Contact Spring	969-4		14	1288
4	1	PC	1	Contact Finger	640-8		31	1288
5	1	PC	1	Coil			35	1288
				#307 OVERLOAD RELAY(OL)				
6	1	PC	1	Contact Lever	34985-IF3		11	1286
7	1	PC	1	Contact Lever Spring	69-264		12	1286
8	1	SET	2	Stat.Contact Finger	640-217		8	1286
9	1	PC	1	Reset Button Spring	969-452		-	1286
				RESISTORS				
10	1	SET	2	A-B 800 OHM S3 Unit				
11	1	PC	1	R1-R4 32.3 OHM X37 Unit (Tapped at 16.7,10.8 & 4.8 OHMS)				

MANUFACTURER CUTLER-HAMMER, INC. APPLIANCE PUSHBUTTON

				PUSHBUTTON STATION				
1	1	PC	1	N.O. Element	631-186		10	1278
2	1	PC	1	N.C. Element	631-185		9	1278
				GUARD INTERLOCK SWITCH				
3	1	PC	1	Element	2790032			1517

INSTALLATION, SETTING AND CONNECTION

INSTRUCTIONS

FOOT OPERATED LAUNDRY PRESSES

REFER: Hoffman Instruction Book, Laundry Equipment, Page 120-127.

SETTING MACHINE IN PLACE.
Mounting saddles must be provided to give a rigid level foundation. Before bolting press to saddle, the machine must be perfectly leveled in both the transverse and longitudinal directions. Press can be transversely leveled across two or three frame feet and longitudinally leveled across frame braces. Use only metal shims when shimming is necessary. The press must be bolted to saddles in such a manner as to insure against loosening of hold down bolts by vibration.

Two end pieces of the work table are removed for shipment. These pieces will be found in a box nailed to the crate. They can be readily attached to the work table assembly.

STEAM PIPING.
Laundry presses are designed to operate with dry saturated steam at 100 LBS. pressure at the machine.

All possible precautions should be taken to keep steam lines free from condensate. Long steam lines should be trapped at end farthest from boiler to prevent filling with condensate. In cases where press is located some distance from boiler, A steam separator should be used in supply line to keep that line free from condensate. All steam lines leading to press should be insulated similar to main steam lines.

Steam-Inlet connection is a 3/8-inch pipe size at right rear of machine. A globe valve should be placed in inlet line at a convenient point near press with a union between valve and press so that machine may be disconnected readily.

Drain connection is a 3/8-inch pipe size at left rear of press. To assure hot machines at all times, trap the drain line of each machine separately.

Drain should be connected to low pressure waste receiver. Trap assembly should be provided with a three valve by-pass.

OPERATING INSTRUCTIONS

FOOT OPERATED LAUNDRY PRESSES

CLEANING HEAD.
No Rust-Preventing coating is applied to pressing surface of aluminumalloy head. It is only necessary to wipe off any accumulation of dirt or dust with a damp cloth before putting press into operation.

STEAM LINE OPERATION.
Steam inlet valve should be opened gradually. By-pass valve of trap assembly should be open. Head and buck should be heated slowly. By-pass valve should be closed. Chests should be thoroughly heated before fully opening the steam valve.

CONTROLS.
The head may be lowered with the handle bar provided. When head touches the padded buck, The main foot lever is depressed to apply pressure.

The head is released by depressing the small release pedal to righo of the main fast lever.

MAINTENANCE INSTRUCTIONS

FOOT OPERATED LAUNDRY PRESSES

PARTS REPLACEMENT.
When ordering parts or referring to these presses always specify the press model, Serial number, Drawing number, item number, Part name and part number and quantity desired.

GENERAL MAINTENANCE.
Inspect entire press at regular intervals to assure that:

(A) Trap is functioning properly.
(B) Padding covers are clean and in good condition.
(C) See that press is thoroughly lubricated and proper lubricants used.

Keep pressing surface of aluminum-alloy head cleaned and polished by wiping with a damp cloth. A thin coating of beeswax applied to pressing surface from time to time while head is hot will aid in producing quality work.

Avoid use od cleaning compounds having a tendency to scratch. Slight abrasions in the smooth, polished pressing surface will cause starched goods to adhere to pressing surface and leave marks on finished work.

SPRING ADJUSTMENT.
Side springs serve to return head to full-open position after pressure has been released. Each spring is equipped with an adjusting screw. Springs must be adjusted just tight enough to overcome resistance offered by snubber. Be sure springs have equal tension after adjusting.

To increase the spring tension remove pin #13 holding the upper end of spring assembly and turn the rod several times in a clockwise direction. Replace pin #37

PRESSURE ADJUSTMENT.
To increase the pressure, loosen the adjusting lock nut, #40 and turn adjusting screw #41, clockwise, one turn at a time. Close the press after each turn, until desired pressure is obtained. Then tighten lock nut #53.

TOGGLE ADJUSTMENT.
The toggle is provided with an adjustment to bring the head to correct position This is set, checked and pinned at the factory and should not be tampered with.

PADDING CARE.
To produce quality work, padding must be kept clean and in good condition.

When double-faced conton flannel becomes hard it may sometimes be fluffed with a steam jet and make pliable by working with the hands.

Muslin covers should be changed at least every two days of normal use. If allowed to remain on press for longer periods, starch and sizing accumulations cause cover to become hard and produce inferior work. Muslin covers, changed every two days and washed in warm, not boiling, water can be used almost indefinitely.

The padding should be applied in following order:
1 Piece -5/8" Knitted cotton padding
2 Pieces -Double faced canton flannel.
1 Piece -#12 Duck.

All replacement padding should be cut to conform to the exact shape of the buck, except the cover. The muslin covers must be so as to carry over the under edge of the pressing surgace and have sufficient material to provide a hem for drawstring.

SANITATION
SECTION-S36

REFERENCES:

DRAWINGS: FEDERAL S/B AND D.D. CO. (ENCLOSED)

1. Drinking and Washing Water System	DWG E-2-2779SH 25 A
2. Washing Water System Transfer Service	DWG E-2-2779SH 25 C
3. Fresh Water filling	DWG E-2-2779SH 25 D
4. Sanitary System	DWG E-2-2779SH 32 C

BOOKLETS (SEPARATE)
1. Heat Transfer Equipment- The Lummus CO.

Note: For information not found in this section refer to the section on the system in which the specific equipment is mainly concerned.
Refer to section S-47 "Pumps" Which gives you a detail description of the Pumps of any specific system Concerned.

FRESH WATER STORAGE HEATER

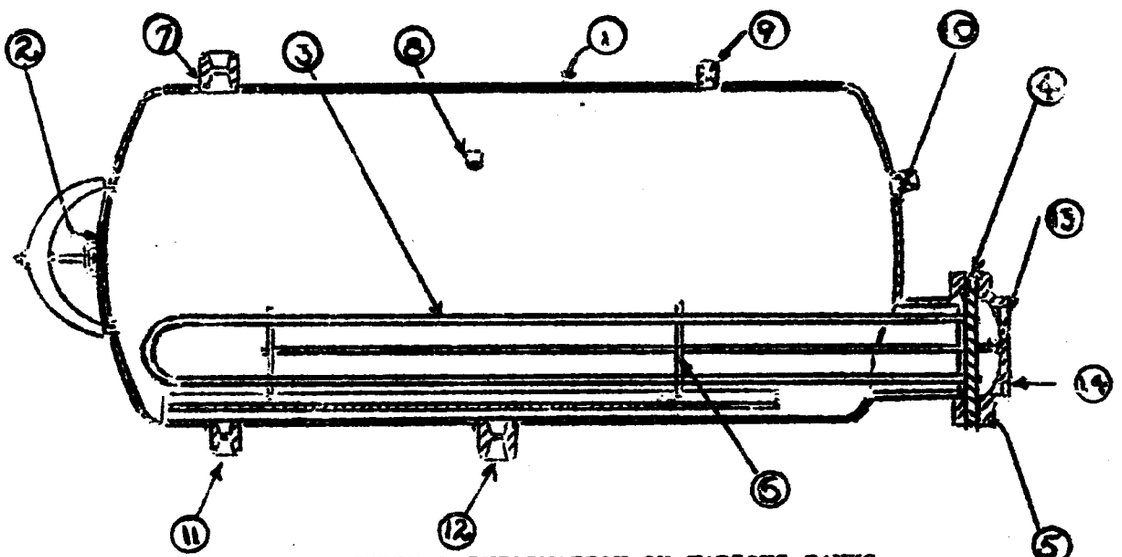
GENERAL DESCRIPTION.
The construction of the storage heater is shown in fig. below.
The heater consists as a horizontal cylindrical shell with a heating tube nest in the bottom of the shell.
The shell is welded steel galvanized on the inside. The U-tubes in the tube nest are aluminum brass, 3/4" O.D., 16 gage, 6' 0" straight length.
Tube nest bonnet is cast iron and tube sheet is Muntz metal, tinned.
A manhole is provided in the end of the shell. Gaskets are asbestos.

OPERATION
The shell is self venting. The only attention the heater will require is an occasional blowdown of the shell- about once a month.
The heater is designed to heat 1,500 gallons per hour of water from 50°F. to 150°F. when supplied with steam at 60 lbs. gage.

SPARE PARTS- 3 U-tubes per ship, One relief valve spring.

PRINCIPAL PARTS

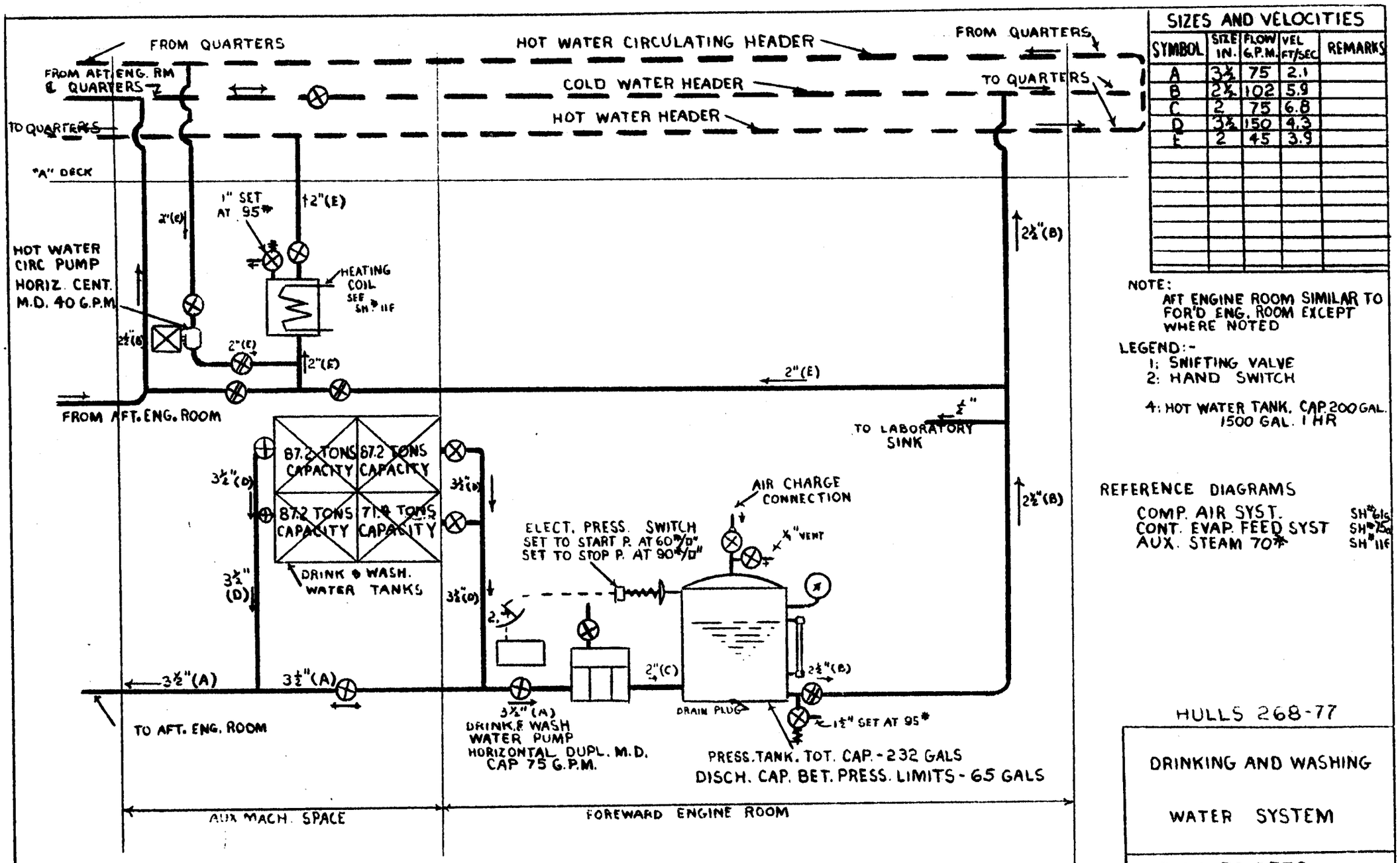
1-Shell
2.Manhole
3.U-tubes
4. Bonnet
5. Tube Sheet
6. Tube supports
7. Water outlet
8. Thermometer connection.
9. Relief valve connection
10. Temperature regulator connection
11. Blowdown connection
12. Water inlet
13. Steam inlet
14. Condensate outlet



GENERAL INFORMATION ON VARIOUS TANKS

* Refer to piping diagram in which tanks are concerned.

1. Drinking and Wash Water Tanks-	326 tons total capacity
2. Washing Water Tanks	1000 " " "
3. Laundry Drain Tank	500 gal capacity 62" X 42" X23"



SIZES AND VELOCITIES

SYMBOL	SIZE IN.	FLOW G.P.M.	VEL FT/SEC	REMARKS
A	3½	75	2.1	
B	2½	102	5.9	
C	2	75	6.8	
D	3½	150	4.3	
E	2	45	3.9	

NOTE:
AFT ENGINE ROOM SIMILAR TO FOR'D ENG. ROOM EXCEPT WHERE NOTED

LEGEND:-
1: SNIFTING VALVE
2: HAND SWITCH

4: HOT WATER TANK. CAP. 200 GAL. 1500 GAL. 1 HR

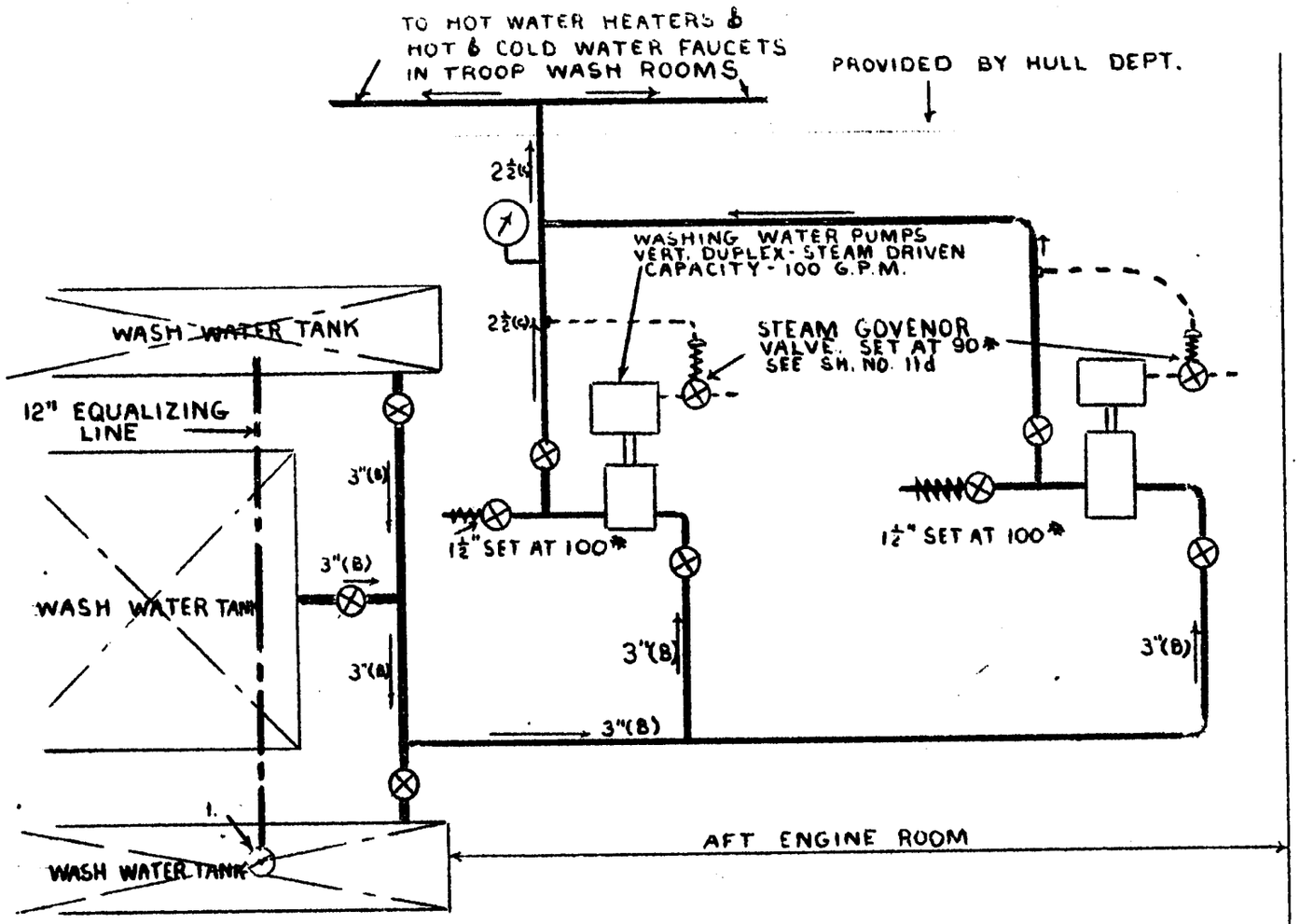
REFERENCE DIAGRAMS

COMP. AIR SYST.	SH°61S
CONT. EVAP. FEED SYST	SH°25a
AUX. STEAM 70#	SH°11F

HULLS 268-77

DRINKING AND WASHING WATER SYSTEM

DR. NO. E2-2779 SH. 25a



SIZES AND VELOCITIES				
SYMBOL	SIZE IN.	FLOW G.P.M.	VEL FT/SEC	REMARKS
B	3	100	4.3	
C	2½	100	6.7	

LEGEND:-

1. HAND OPERATED FROM "A" DECK.

REFERENCE DIAGRAMS

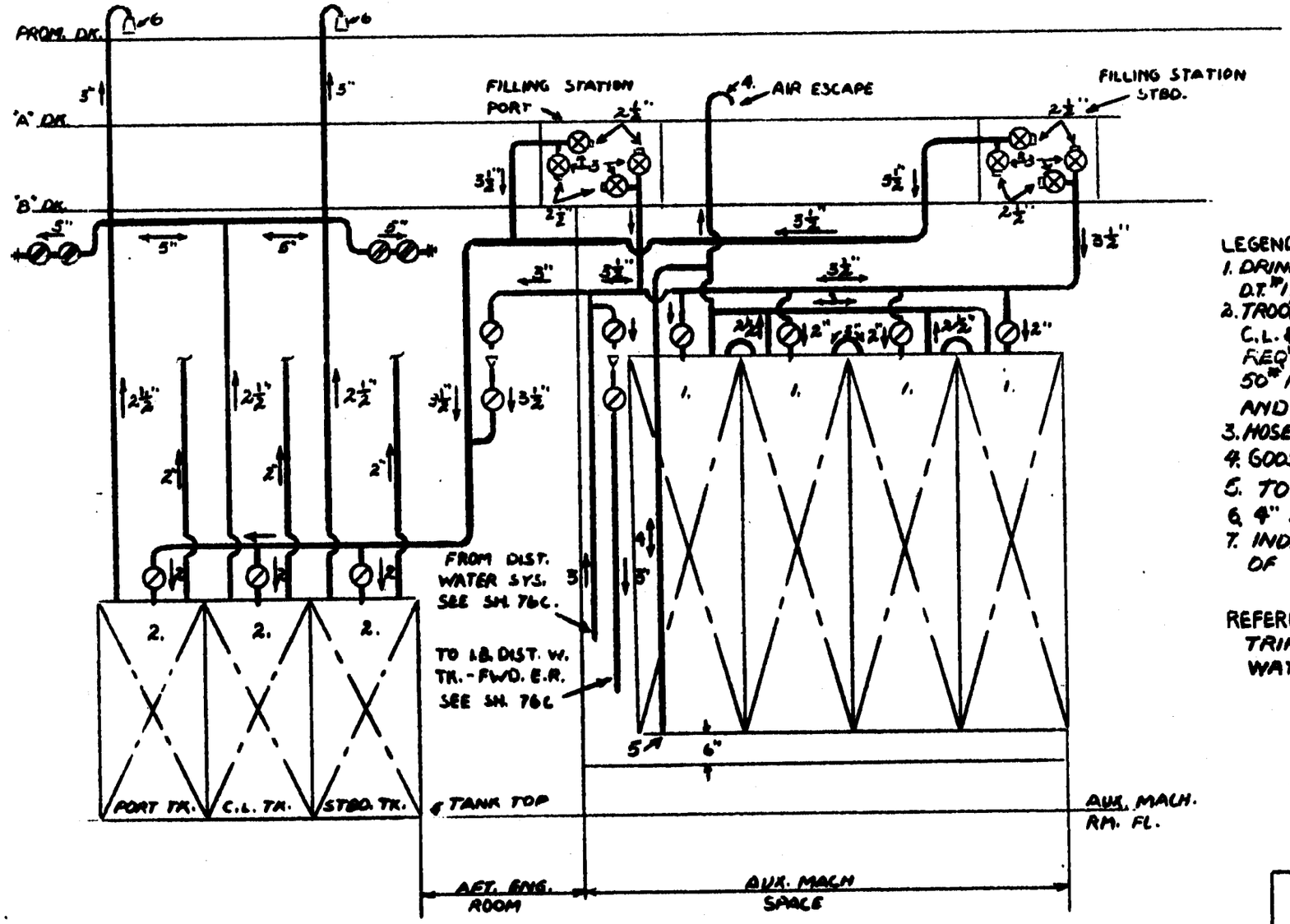
AUXILIARY STEAM 150*	SH. *11d
DRINKING & WASHING SYSTEM	SH. *25a
SANITARY SYSTEM	SH. *32c
FRESH WATER FILLING & TRANSFER	SH. *25d

HULLS 268-77

WASHING WATER SYSTEM

TRANSPORT SERVICE

DR. NO. E2-2779 SH. 25C



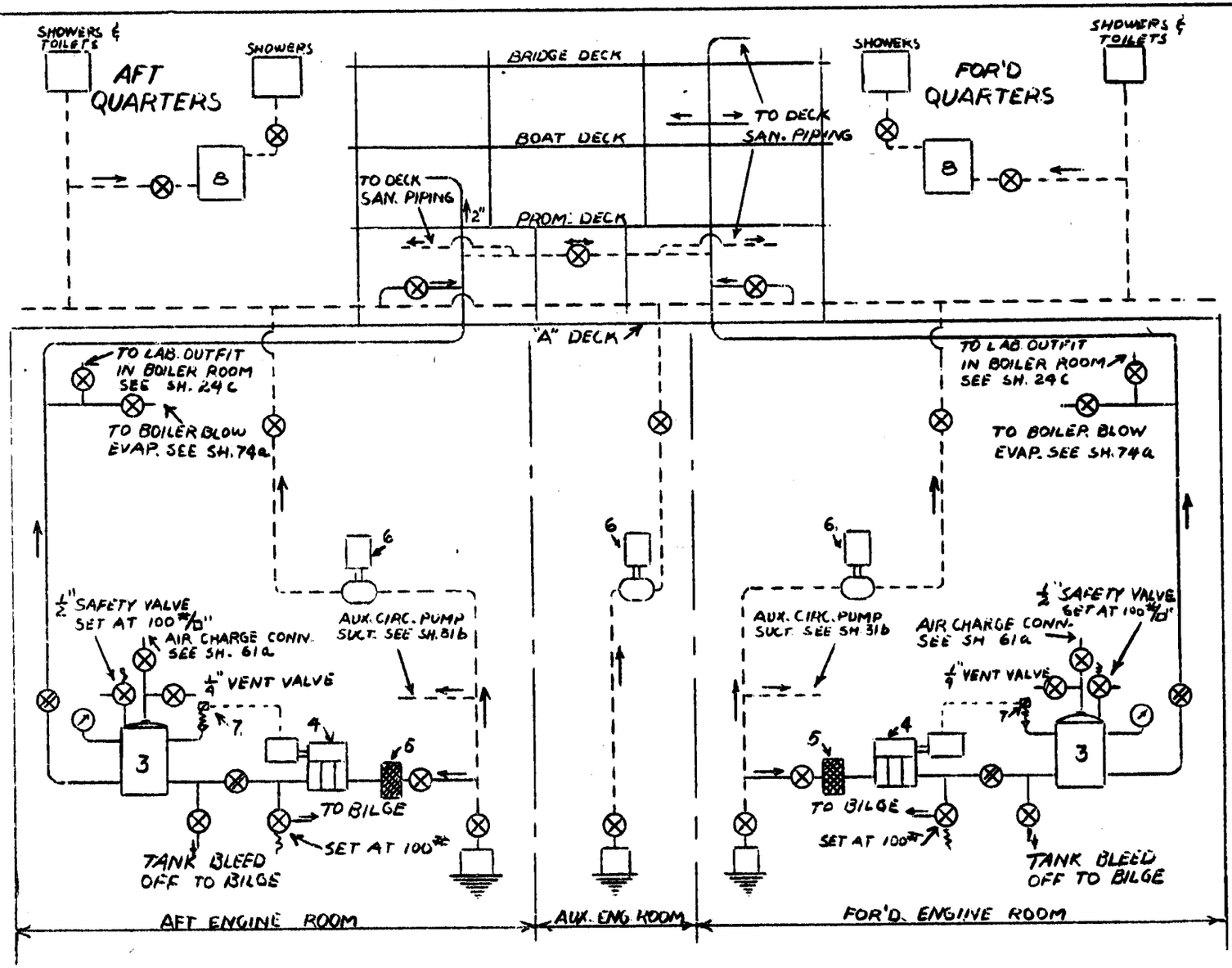
LEGEND:-

1. DRINKING & WASHING WATER TANKS D.T.#1, P.&S. & D.T.#2, P.&S. TOT. CAP. 340 TONS
2. TROOPS WASHING WATER TANKS, D.T.#3, P., C.L. & S. TOTAL CAP. 888 TONS. TIME REQ'D TO FILL TANKS - 6 HRS., BASED ON 50# PRESS. AT FILLING STATION. VENTS AND OVERFLOWS FURN. BY HULL DEPT.
3. HOSE CONN. & LOCKABLE CAP & CHAIN
4. GOOSENECK WITH SCREEN
5. TO BILGE
6. 4" AIR VENT VALVE
7. INDEPENDENT VENTS AT FWD. BHD. OF SHAFT TUNNEL.

REFERENCE DRAWINGS:-
TRIPLE EFFECT S.W. EVAP. & DIST. WATER SYSTEM - - - - - - SH. 76C

FRESH WATER FILLING

DR. NO. E2-2779 SH 25d



LEGEND:-

1. SYS. A - REGULAR SYS. ———
2. SYS. B - FIRE SYS. - - - - -
3. PRESS. TANK - TOT. CAP. 232 GAL. DISCH. CAP. BETW. WORKING LIMITS 61G
4. SANITARY PUMP - HORIZ. M.D. PISTON 100 GPM @ 100# DISCH. PRESS.
5. MACOMB STRAINER
6. FIRE PUMP - M.D. CENT. - 400 GPM
7. ELECTRIC SWITCH - SET TO START PUMP AT 62#/□" - STOP PUMP AT 95#/□"
8. HOT WATER HTRS. TOTAL CAP. 2100 G.P.H.

SANITARY SYSTEM

DR. NO. E2-2779 SH 32 C

VENTILATION AND HEATING SECTION-S38

VENTILATION AND HEATING

REFERENCES:

DRAWINGS FEDERAL S/B & DD Co. (SEPARATE)

1. Ventilation diagram dwg 26877-38010-1

2. Ventilation Troop and Crew Berthing and Stores mechanical Ventilation Hold 5B DK DWG 2727-38010-8

3. Ventilation Berthing Space-Mechanical Ventilation A-B-C DKS Hold #7 DWG 2727-38010-20

DRAWINGS LA-Del Conveyor & MFG CO (Separate)

1. Ventilation Engine Room Ventilation Fans Layout of LA DEL Troller Mod N-1546

DRAWINGS FEDERAL S/B & DD CO (enclosed)

1. Ventilation Main & Aux. Engine Room, and Boiler Rooms DWG E-2-2779 SH 63A

2. Ventilation Main & Aux Machinery Spaces- Plan view DWG F2-2779 SH 63B

3. Steam Heating and Drain System 70# Gen. Diagram DWG E-2-2779 SH 14H

BOOKLETS: La Del Conveyor & MFG Co (separate)

1. Engine Room Ventilating Fans.

DESCRIPTION OF AXILA FLOW MARINE BLOWER

The axial flow blower forms a section of the duct through which it conveys air against pressure. Its outer appearance is essentially that of a piece of such ducting, of round construction, from which it is distinguished only by the presence of a conduit box, electric leads, grease fittings, an inspection door, and heavier attachment lugs than a section of ordinary ducting would require. The round outer casing of the blower, which gives it this appearance, is inserted into the duct, to which it is attached by means of mounting flanges.

Inside the casing is housed, co-axially, an electric motor which drives a rotor. This rotor consists of a round hub attached to the shaft of the motor, a number of blades, and a streamlined nose. The blades are shaped like strongly twisted airplane wing stubs. The blades, while rotating, impart energy to the air moving through the duct, and in cooperation with the straightening vanes enable the air to overcome the resistance of the ductwork.

The electric motor is held in position by a tightly fitting steel ring, the inner fairing. This ring is welded to the curved plates forming the straightening vanes which are also welded to the outer casing, thus simultaneously carrying the motor and properly guiding the air backward. At the end of the motor opposite the rotor, that is, on the down-wind side, a streamlined tail houses the commutator brushes of the motor, and a motor cooling fan, while at the same time creating a smooth air flow away from the moving parts of the blower. The motor cooling fan inside this tail housing sucks air through the motor insuring safe, low temperatures at all critical points of the motor, i.e., at the front and rear bearings, and in the armature and field coils.

The tail cover of the motor has a door connected with the inspection door in the outer casing of the blower so that both open simultaneously and permit ready access to the commutator brushes.

The fan is constructed of steel plate and cast aluminum parts, the aluminum forming the rotor, nose, motor cooling fan, and tail.

OPERATION AND MAINTENANCE

The motor commutator and brushes should be inspected daily. Make sure that no part is loose or badly worn.

Keep commutator clean, wiping it frequently with a clean, lintless canvas cloth. The brushes should fit the commutator, making contact over the entire surface.

OPERATION AND MAINTENANCE

A commutator that is taking on a polish and shows no signs of wear requires no maintenance work, but a rough, new, copper-colored commutator should be smoothed with a piece of sandpaper, or sandstone ground to fit, and then polished with number 00 sandpaper. Always lift brushes when polishing commutator. Do not replace them until all grit has been removed. Never use emery cloth or emery paper on the commutator.

When the fan is removed from the duct, the fan blades should be wiped clean in order to safeguard their efficient operation. Inspect blades for cracks or surface injuries.

The turning speed of the blower should be regulated according to the volume of air desired. In cool weather less air will be required than in hot. The blower may then run at its minimum speed.

B-LUBRICATION:
Motor bearings should be lubricated quarterly. There is one grease fitting and one drain cock for each of the two motor bearings. Always open drain cocks when filling bearings.

Super Service No. 2 grease, or its equivalent should be used for bearing lubrication.

C-REMOVAL OF PARTS:
To remove rotor first remove nose by using a short-handled screwdriver to unscrew cap screws which hold nose to rotor. Next, remove rotor locking nut, and steel washer from end of motor shaft. The rotor can now be removed by hand, tapping the hub slightly with a hammer if necessary.

To remove motor after nose, tail, and rotor have been removed, disconnect rotor end grease leads and remove cap screws.

The motor must be removed from the inner fairing in order to replace field coils.

Use inspection door to inspect commutator and to replace brushes.

The small motor cooling fan in the tail of the blower requires no attention other than an occasional inspection.

Thumb nuts on inspection door should be kept tight to prevent air leakage.

PERFORMANCE OF THE AXIAL FLOW BLOWER

The blades of the blower are shaped so that they deliver a specified volume of air against a specified duct pressure. The blower, Model I-30039-2.75D, is designed to run at a maximum speed of 1750 RPM, and to deliver at this turning speed an air volume of 30,000 CFM at 2.75" water gauge duct pressure. Illustrated the effect of changing duct resistance on the delivery of air, while the turning speed remains at 1750 RPM.

This figure contains curves for pressure, electric input to motor, and set efficiency of the fan as a function of air delivery.

Pressure as shown is the difference measured on a manometer connected to an orifice in the duct behind the fan on the one side, and to an orifice ahead of the fan on the other side.

Electric input is the power delivered to the electric motor.

Set efficiency is the ratio of air horsepower to electric power input, where air horsepower is the product of Volume x Pressure divided by 6345, when Volume is given in CFM and Pressure in inches of manometer water column.

Variation of duct resistance will occur whenever air outlets are being regulated, or when dirt accumulates in the ductwork, etc. It can be seen that with an increase of duct resistance, a decrease of the delivered air will occur. It can furthermore be seen from Figure 5, that with an increase of duct resistance a slight increase in the power consumption of the blower occurs. This increase, however, is limited to a small amount and will, in the normal operating range, not overload or endanger the motor or the electrical system in any way.

PERFORMANCE OF THE AXIAL FLOW BLOWER (CONT.)

Since the static pressure keeps on increasing for a considerable way below the design volume of 30,000 CFM, ample safety is provided against so-called stalling of the blower at which undesirable fluctuation in the air delivery would occur. Only if the static pressure of the duct system should rise above 4.9" will the axial blower, Model I-30039-2.75D, stop delivering air smoothly. Even in this case, however no physical damage of any kind would be done to the blower or the duct system. A sudden, strong increase of noise, and an abrupt falling off of air volume would be the only indications of such a high pressure.

It does not seem likely that such an increase in duct resistance would occur during the normal operation of the air system. If it does occur, removal of obstructions that might have accumulated within the air duct is required. The blower should then immediately resume satisfactory operation.

The speeds of the electric motor used to power the blower (Model I-30039-2.75D), can be continuously varied from 1320 RPM to its maximum speed of 1750 RPM. At constant duct resistance, the volume of air delivered by the blower is directly proportional to its turning speed. The air volume, then, may be varied from approximatley 22,500 CFM at 1320 RPM, to 30,000 CFM at 1750 RPM, by speed variation alone. Any further reduction in air volume must be effected by the regulation of outlets in the various engine rooms.

SPARE PARTS, TOOLS

The La-Del-Troller Marine Blower, Model I-30039-2.75D, is equipped with a 19 H.P., 230 V., D.C., 1750/1320 RPM, Type T, Frame 44-TY-7 electric motor; open type marine 50 degree centigrade ambient, Class A insulation, continuous duty, ball bearing, grease lubricated-manufactured by the Reliance Electric & Engineering Co.

Spare parts for each two (2) of the above motors consist of:

4 Field coils.	1 Ball bearing-front end
4 Bobbins.	1 Ball bearing-rear end
4 Interpoles.	2 Sets Brush stud insulation
4 Interpole washers (top)	1 Brush holder
4 Interpole washers (bottom)	3 Brush holder springs
4 Interpole coils.	4 Carbon brushes

Spare parts for Cutler-Hammer starting equipment for the above motor (for each two (2) units) consists of:

307 Overload Relay (OL)	513 Relay (CR)
1 Contact lever	2 Outer stationary contacts
1 Contact lever spring	2 Inner stationary contacts
2 Stationary contact fingers	1 inner contact spring
1 Reset button spring	2 Contact springs
513 Relay (CR)	2 Outer moveable contacts
3 tail springs	1 Inner moveable contact
1 Condenser	1 Magnet coil spring
1 Locking spring	1 Shunt coil
540 Contactors (1M-2M-1A-2A)	Fuses- 4-10 Ampere, 230 Volt fuses
8 Contact tips	RESISTORS- 1-AB 50,000 Ohm Unit
4 Contact springs	1-BC 1,000 Ohm R unit
4 Magnet coil springs	1-EF 6,000 Ohm R Unit
6 Stationary interlock contacts	2- R1-R2 3.2 Ohm L unit
3 Moveable interlock contacts	2-R2-R3 1 Ohm L unit
3 Moveable interlock contact springs	
3 Interlock lever springs	PUSHBUTTON MASTER- 1-N.O. & N,C, ELEMENT
1 Shunt coil	

THE FOLLOWING TOLLS SHOULD BE AT HAND FOR ROUTINE SERVICE AND REPAIR:

1 Screwdriver (short-handled), 1 Allen head set screw wrench 5/8", 1 Allen head set screw wrench 3/8", 1 Cresent wrench (capacity to 3/4" bolts)

VENTILATION AND HEATING

General descriptions of each of the Ventilating systems would be lengthy and for this reason the data is presented in a tabulor form. The attempt is made to give the complete story in that all charaxteristics of fans, motors, control are given as well as serviced compartments, location of equipment and further references.

To facilitate reading, it-em numbers have been assigned. The pages are arranged in the following order.

Items 1 Thru 52 = Data
" " " " Fans
" " " " Motors and Controls

Items 53 Thru 104 Data
" " " " Fans
" " " " Motors and Controls

In order to read and interpet the tabulated the following code of controls and notes are included as well as sketches showing the specific types of centrifugal fans to which reference is made.

CODE OF CONTROLS

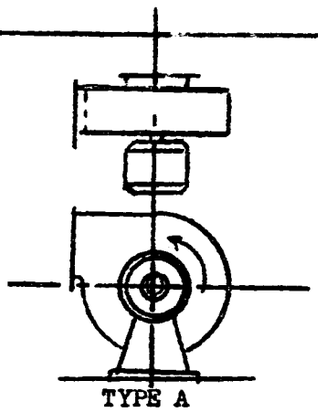
XL	ACROSS THE LINE
AR	~~RESTANCE~~ RESISTANCE STARTING
MAN	MANUAL
W.T.	WATER TIGHT
DP (enclosure)	DRIP PROFF
O.	Thermal overload protection
MAG	Magnetic
LVR	Low voltage RElease
LVP	Low voltage protection
R	Remote Push Button

GENRAL NOTES

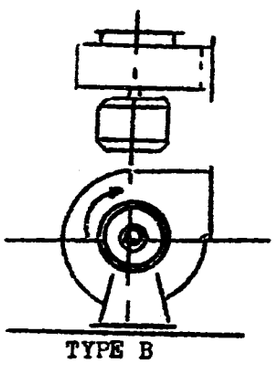
1. Items 1-100 are the ILG electric Ventilating Co. Fans. Items 101 104 are La Del onveyor and MFG CO Fans.

2. All Fan Motors, Unless otherwise noted shall operate at ambient temperature of 40°F.

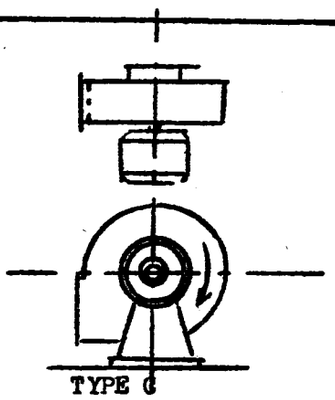
CENTRIFUGAL FANS



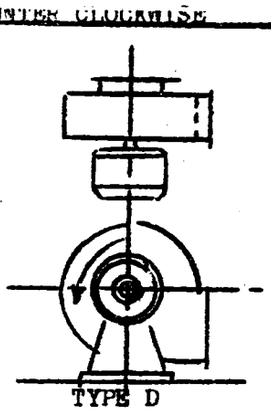
TYPE A
TOP HORIZONTAL
COUNTER CLOCKWISE



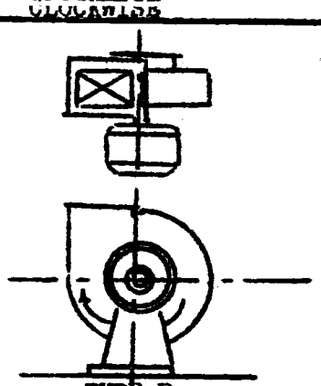
TYPE B
TOP HORIZONTAL
CLOCKWISE



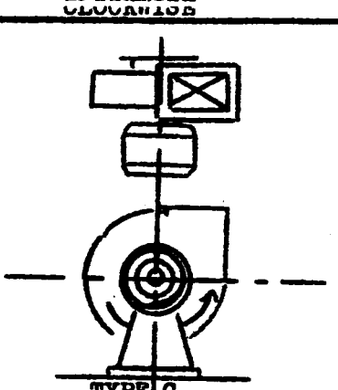
TYPE C
BOTTOM HORIZONTAL
CLOCKWISE



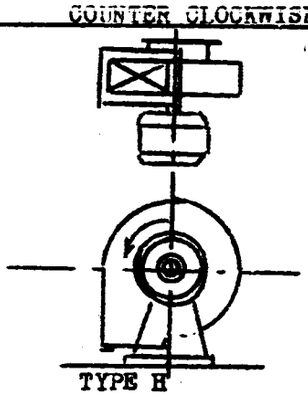
TYPE D
BOTTOM HORIZONTAL
COUNTER CLOCKWISE



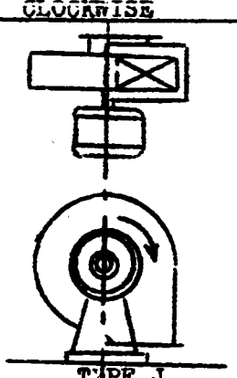
TYPE E
UP BLAST
CLOCKWISE



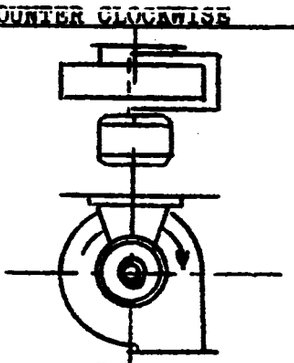
TYPE G
UP BLAST
COUNTER CLOCKWISE



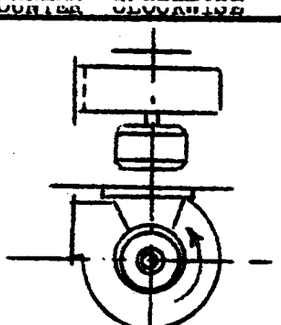
TYPE H
DOWN BLAST
COUNTER CLOCKWISE



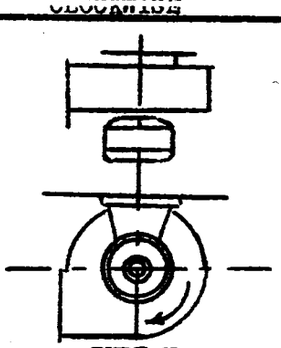
TYPE J
DOWN BLAST
CLOCKWISE



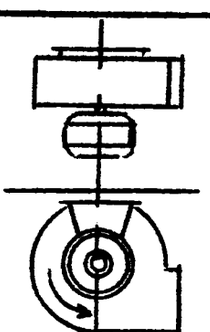
TYPE K
DOWN BLAST
CLOCKWISE



TYPE S
TOP HORIZONTAL
COUNTER CLOCKWISE

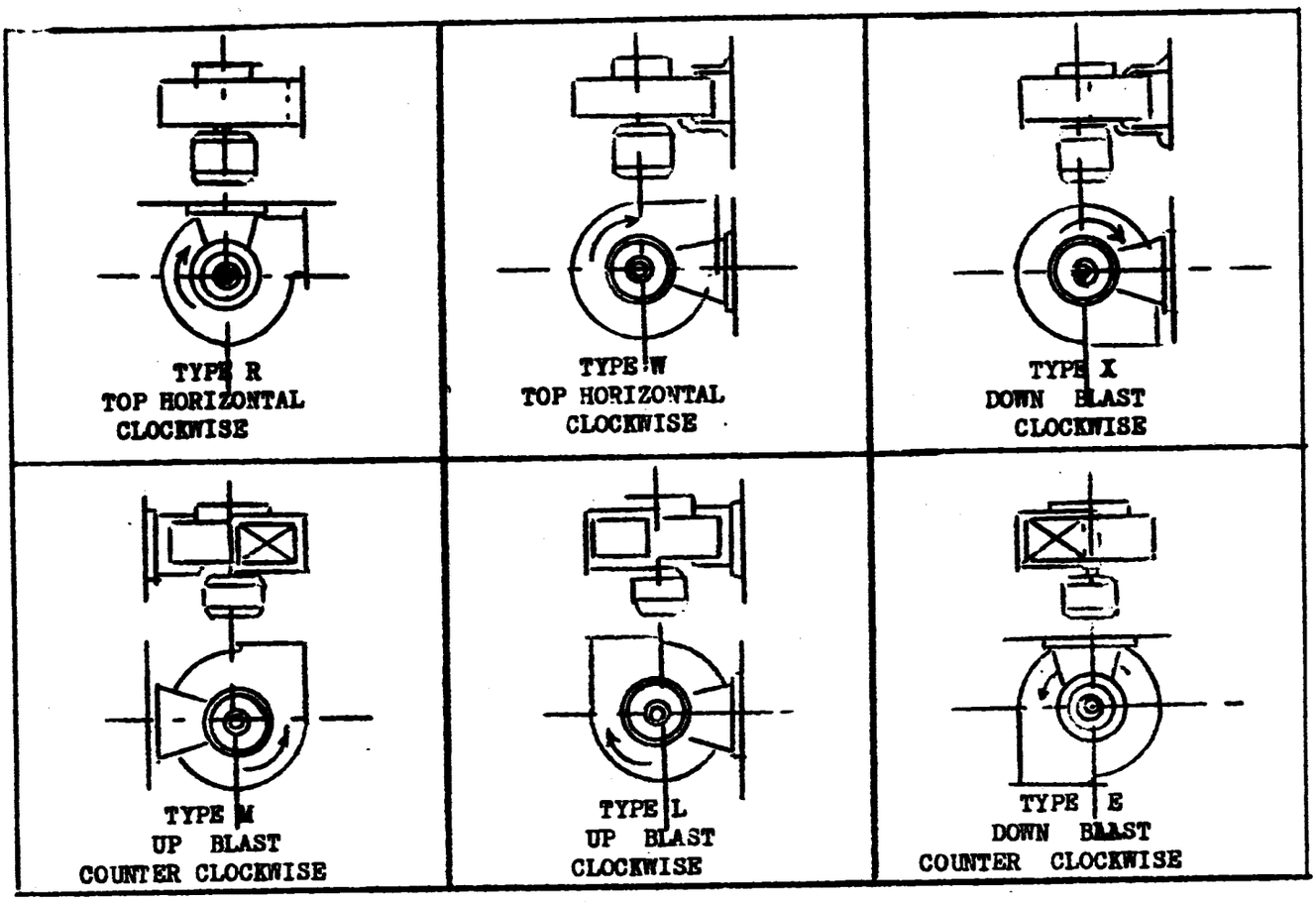


TYPE N
BOTTOM HORIZONTAL
CLOCKWISE



TYPE P
BOTTOM HORIZONTAL
COUNTER CLOCKWISE

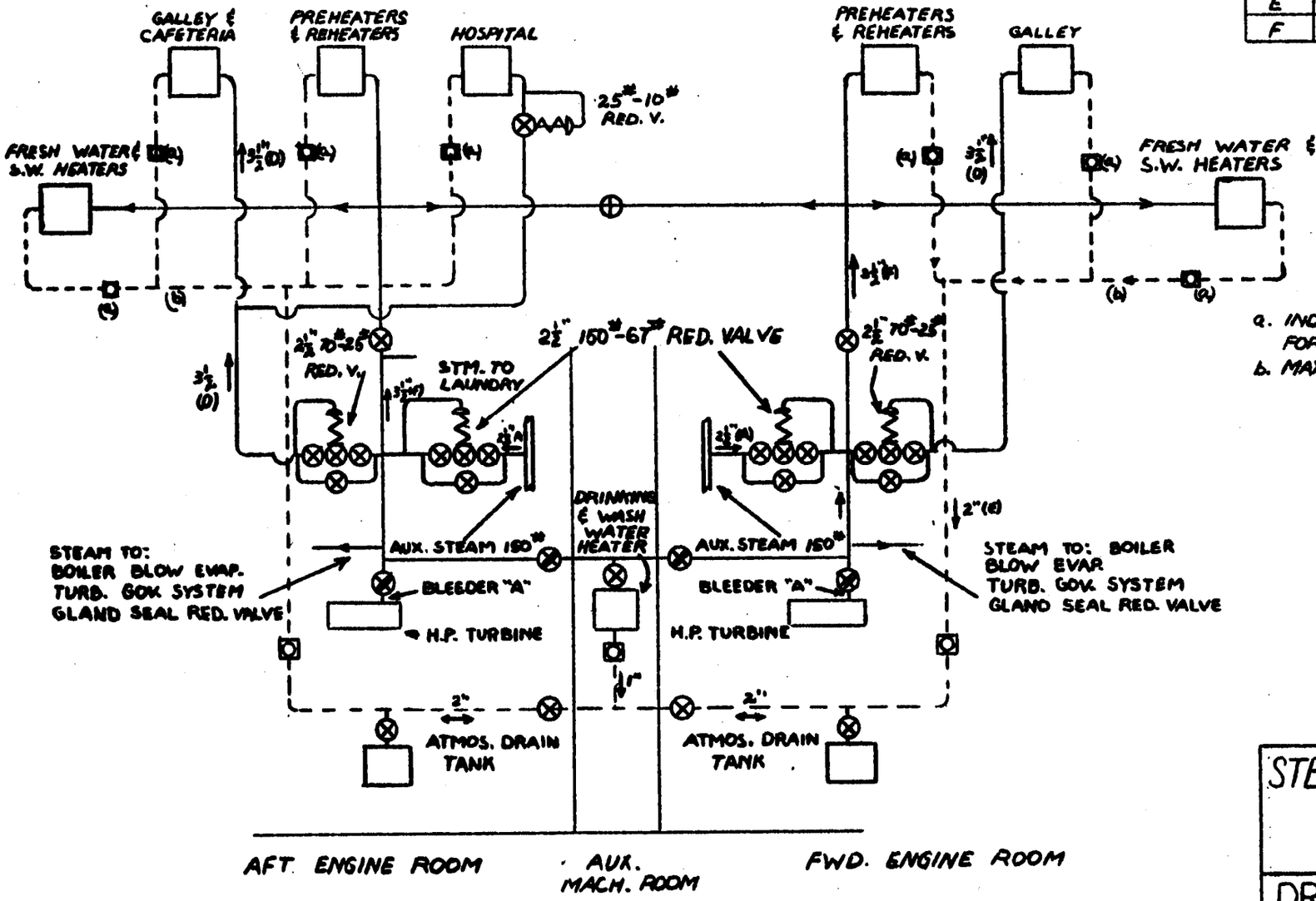
CENTRIFUGAL FANS (cont'd)



MISC. INFORMATION OF EQUIPMENT ON THE VENTILATION SYSTEM.

Machy Vent. Fans Supply	LaDel	Propeller M.D.
Ventilating fans	ILG	Cent. M,D,
Ventilating Fans	ILG	Disc. M.D.
Vent. Preheater coils	Amer.Blower	Copper Fin Tubes
" Reheater "	" "	" " "
Vent Heaters	" "	" " "
Dryer Dehydrating Fan	Garden City	Cent. MD
Hold upply & Recirc.Fans.	La Del	Propeller MD
Air Coolers	Young Radiators	Fin. tube
Air Heater	" "	Fin. tube- Steam Heater

SIZES AND VELOCITES				
SYMBOL	SIZE IN.	FLOW LBS/HR	VEL. FT/SEC.	REMARKS
A	2½	7755	181	MAX.
		6410	133	NORM.
B	3½	7758	176	MAX.
		5610	123	NORM.
C	2½	2500	119	MAX.
		1250	60	NORM.
D	3½	2500	115	MAX.
		1260	58	NORM.
E	2	1149 GAM	1.9	MAX.
F	3½	5970	135	MAX.
		3625	82	NORM.



a. INDIVIDUAL TRAPS WILL BE FITTED FOR EACH UNIT SERVED.
b. MAX. PRESSURE IN DRAIN HEADER=42#

STEAM HEATING AND DRAIN SYSTEM- 70 LBS. GENERAL DIAGRAM

DR. NO. E2-2779 SH 14h

VENTILATION

MAIN & AUX. ENGINE ROOMS AND BOILER ROOMS

(ADENDA TO) DR. NO. E2-2779 SH63A

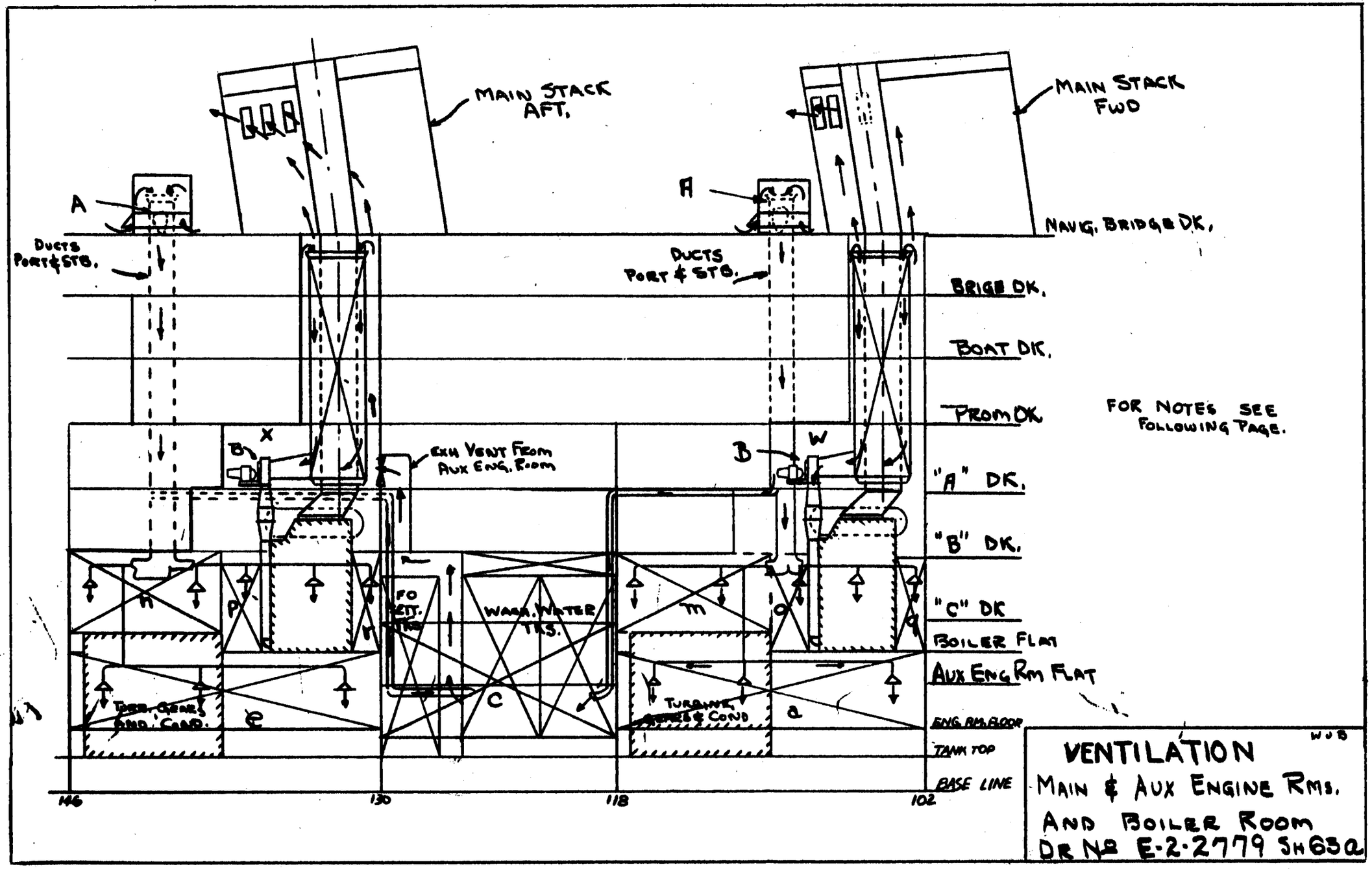
	COMPARTMENT	VOLUME CU. FEET
a	For'd Eng. Room Floor - Port	17000
b	For'd Eng. Room Floor - Stb'd	14000
c	Aux. Engine Room - Port	12000
d	Aux. Engine Room - Stb'd	12000
e	Aft Eng Room Floor- - Port	14000
f	Aft Eng Room Floor - Stb'd	16900
g	Generator Flat For'd Eng. Room	7500
h	Generator Flat Aft Eng Room	6500
k	Operating Platform-For'd eng room	3400
l	Operating Platform-Aft eng room	3400
m	Above Main Turbines For'd eng room	8200
n	Above Main Turbines Aft eng room	8200
o	Boiler Operating Space.For'd B'L'R RM	3000
p	Boiler Operating Space.Aft B'L'R RM	3000
q	Behind Boilers-For'd Boiler RM	2130
r	Behind Boilers-Aft Boiler RM	2130
s	For'd Boiler RM Flat-Port Side	1850
t	For'd Boiler RM Flat-Stb'd side	6370
u	Aft Boiler RM Flat-Port Side	6370
v	Aft Boiler RM Flat-Stb'd side	1770
w	Above Boilers-For'd B'L'R RM	21400
x	Above Boilers-Aft B'L'R RM	21400
y	Workshop-For'd	2300
z	Workshop-Aft	3100

NOTES:
A - 4 Ventilation fans, capacity each.....30,000 C.F.M.
B - 4 F.D. Fans for Boilers, Normal capacity each.....10,000 C.F.M.
Max. Discharge Velocity:
In ducts-50ft. per sec.
at outlets-25 Ft. per sec.

REFERENCE DRAWINGS:

Ventilation-Plan Views--------E2-2779 SH #63B

Machy. space vent. Statement---ELE-3581-38A



WJB

VENTILATION

MAIN & AUX ENGINE RMS. AND BOILER ROOM

DR NO E-2-2779 SH 63a

VENTILATION

MAIN & AUX. MACHINERY SPACES PLAN VIEWS

(Refer to the following 3 plates)

(Adenda to Dr. No. E2-2779 SH 63B)

NOTES:

For compartment volumes, see diagram SH 63A

Volume of Machinery Space:

Ford Eng Room----------50,100 Cu Ft.

Aux. Eng Room----------24,000 Cu Ft.

Aft Eng. Room----------49,000 Cu Ft.

Volume of Boiler Space:

For'd Boiler Room-------34,750 Cu Ft.

Aft Boiler Room--------34,670 Cu Ft.

Volume of Workshop Space:

For'd Workshop----------2300 Cu Ft.

Aft Workshop----------3100 Cu Ft.

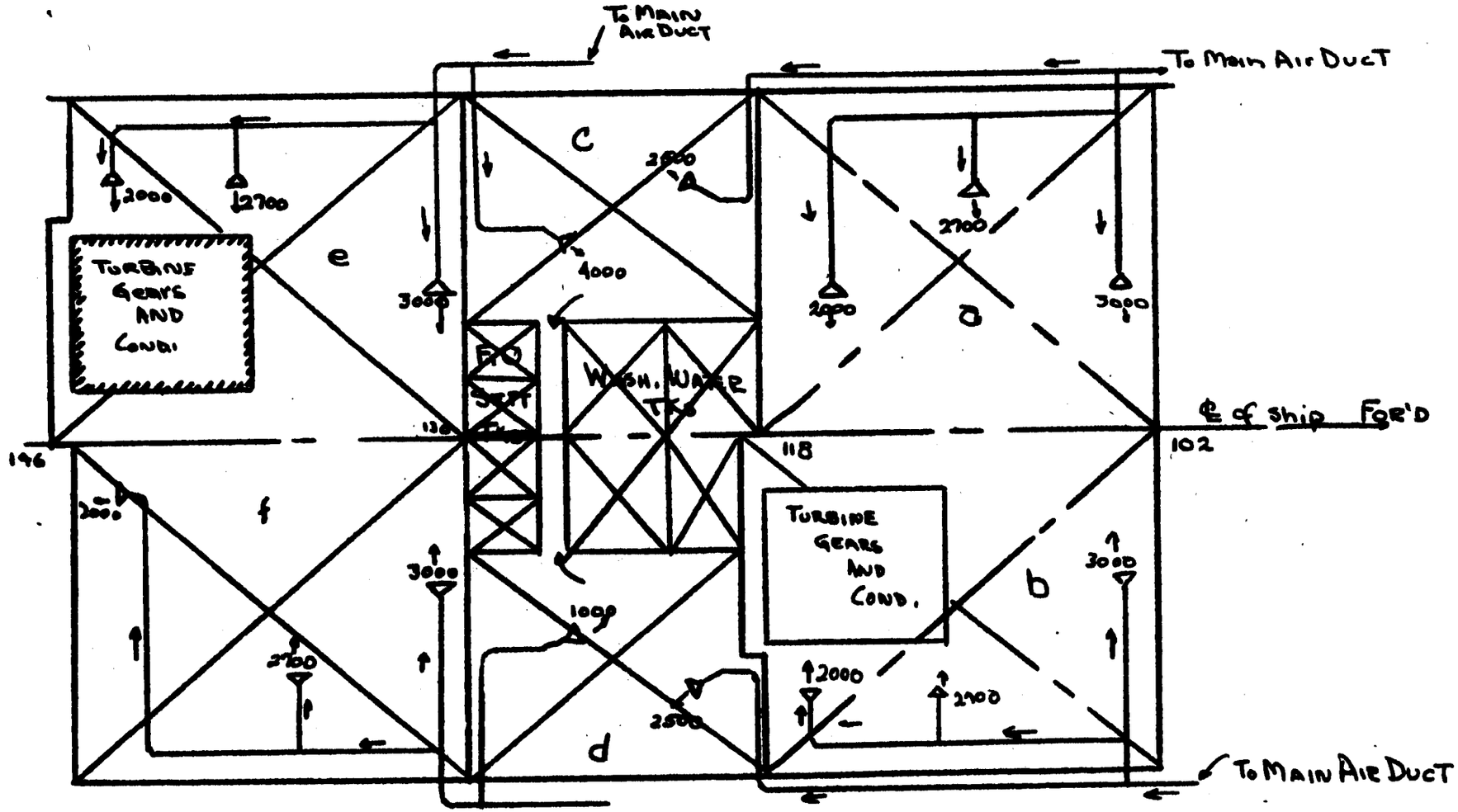
REFERENCE DRAWINGS:

Machy. Space Vent. Statement-------ELE-3581-38A

Ventilation Diagram----------SH#63A

Note:- (a) - CU. Feet per Min.

Plate 1

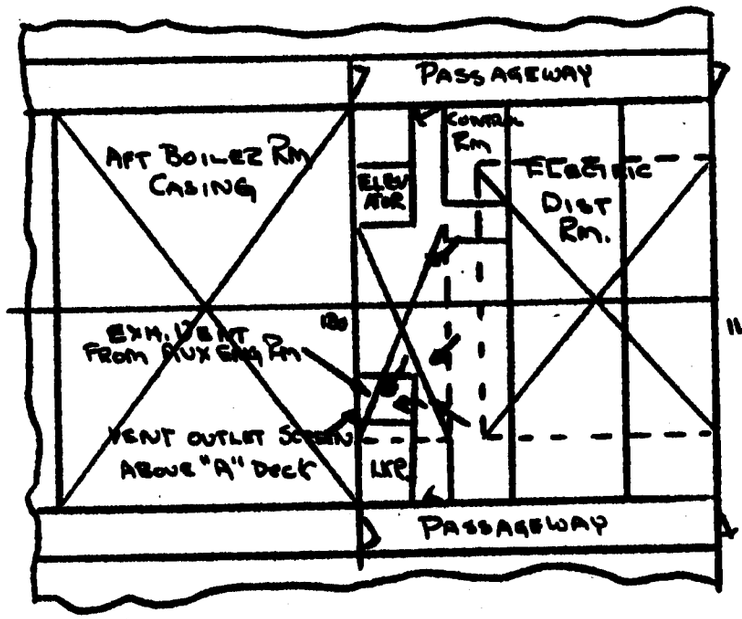


PLAN AT ENG. RM FLOOR

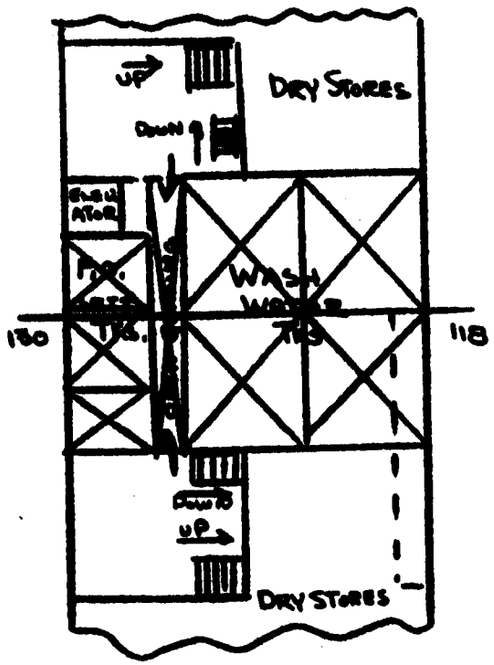
For. Notes See Previous Page

E-2-2779 SH 63b

PLATE 2.



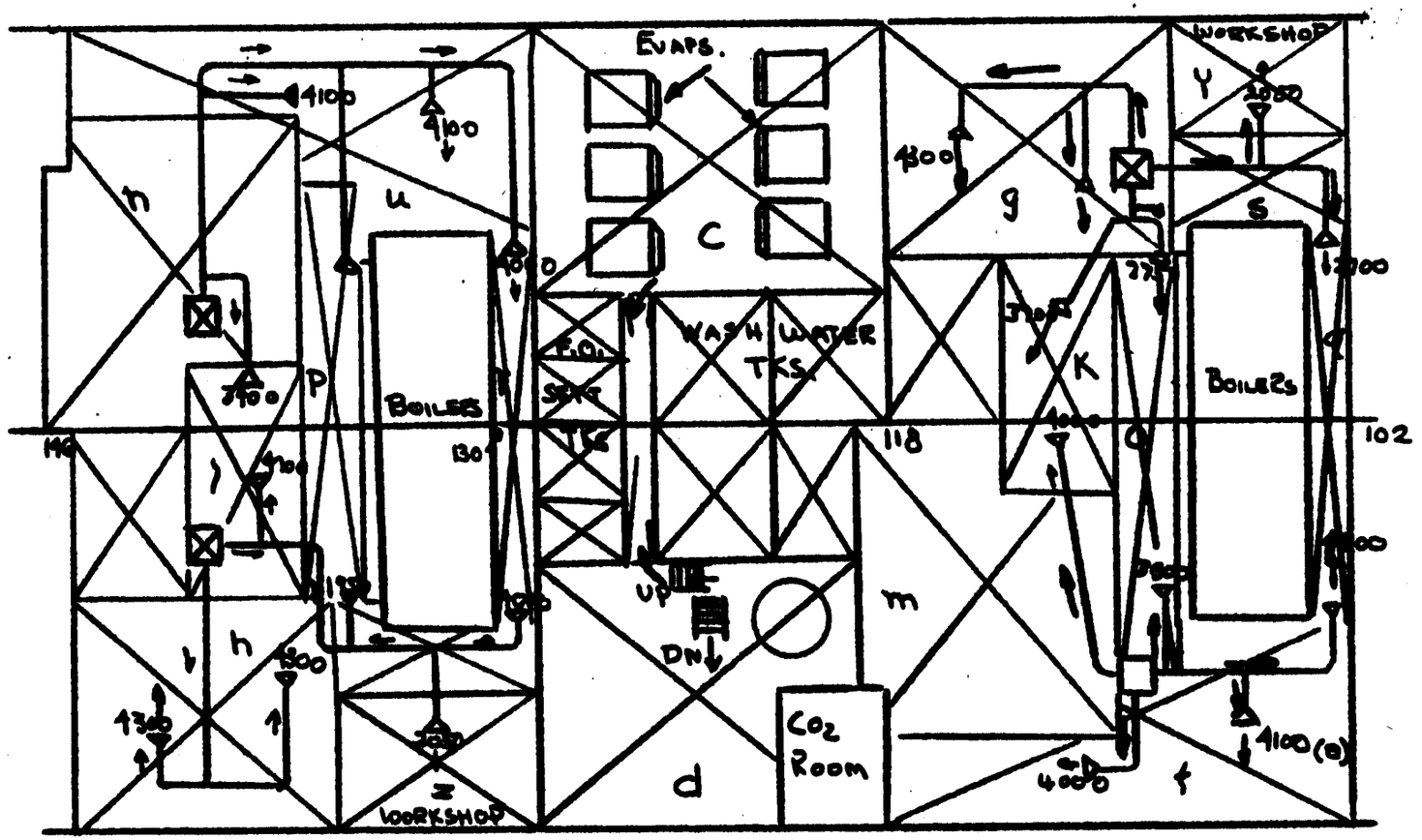
PLAN AT "B" DECK



PLAN AT "C" DECK

See Previous Sheet for Notes

DR E 2-2779 SH 63b



PLAN AT BOILER & AUX ENG RM FLATS

See Previous Page for Notes
DR E2-2179 Sh 65 b
WJB

PUMPS
SECTION-S47

PUMPS

CONTENTS:

PUMP CONNECTIONS

The following is a list of the pumps aboard each of the ships; AP 110 to 119 inclusive. This list gives the number, type, use, size, suction from discharge to, suction size, discharge size of each pump and makes reference to another section of this book. The other sections will show piping diagrams in which the pumps are concerned. In some cases reference is made to this section (S-47) which will contain the piping diagrams in which the pumps are concerned.

SUBJECT: PUMP CONNECTIONS - HULLS 268-77. (Revised to date 1-7-43): DR. E2-2780.

NO OF PUMPS	NAME OF PUMP	SIZE	TYPE	SUC. INS.	SUCTION FROM	DISCH INS.	DISCHARGE TO
2	L. O PURIFIER (suction and discharge pump attached) (Refer S-45)	350 Gals per hour Motor H.P. 2	Cent Motor Driven	1	MN. Turb. sump. tank	1	MN. Turb. sump. tank.
				1	Each turbo-gen sump	1	L.O. Settling tank.
				2	L.O. settling tank	1½	L.O. Gravity tank.
				1½	L.O. gravity tank	1	L.O. Storage tank.
				2	L.O. Storage tank	1½	Bilge well aft.
2	MAIN AIR EJECTOR (Refer S-46-7-8)	51# dry air/hour 28½" HG Vac. 102# air and vapor/hr	Twin 2 stage mounted on inter cond.	6	Main condenser	3	After condenser.
				3½	Aux. condenser	3	Atmos. via escape pipe.
2	AUX. AIR EJECTOR (Refer S-46-7-8)	14# dry air/hour 28½" HG Vac. 45# air and vapor/hr	Single 2 stage mounted on aux inter cond	3½	Aux. condenser	2½	After condenser
						3	Atmosphere via escape pipe.
2	S.W. EVAP. AIR EJECT. (Refer S-46-7-8)	40# dry aif/hour 26½" HG vac. 126# air and vapor/hr	Single stage mounted on after cond.	2½	3rd Effect Evaporator	2½	Evap. after cond.
2	MAIN CONDENSER CIRCULATING (Refer S-46-7-8)	GPM. Max 13000; Norm 12000 11½# total pressure Motor HP 100	Vert. Centrif. M. D.	20	Sea (low suction)	20	Main cond and overboard
						10	Aux. cond. circ. system.
				16	Sea (high suction)	5	Mn. L.O. cooler and overboard
						2	Water service to B'R'Gs for aft eng rm sht.
				14	Independent bilge	2½	For fore eng rm. sht.
1a b	DIESEL OIL PURIFIER (Suct. and disch. pumps attached) (Refer S-47)	500 gals per hour. Motor H.P. 2	Cent motor driven	1	D.B. Diesel oil storage tank.	1	Purified D.O. tank.
						1½	Bilge well aft.
2	AUX. COND. CIRC. (Refer S-46-7-8)	GPM. Max 2600 Norm. 1300. -13 total preasure. Mtr HP 25	Vert. Centrif. M.D.	10	Sea.	8	Ea aux cond and overboard.
						2½	Water serv-fore eng shaft
						1¼	Ea gen L.O. cooler and overb'd.
						2	Water serv-aft eng shaft.
						10	Mn cond circ system
2	FIRE (Refer S-93)	400 GPM. 127# total pressure Motor H.P. 50	Vert cent. M.D. 2 stage.	6	Sea.	4	Fire main.
						6	Mn and aux circ system.
						2½	Sanitary system via main (midship service)

NO OF PUMPS	NAME OF PUMP	SIZE	TYPE	SUC. INS.	SUCTION FROM	DISCH. INS.	DISCHARGE TO
2	AUX. CONDENSATE (Refer Same as above)	GPM Max 40 Norm 20 90# total pressure Motor HP 5	Vent Cent 2 Stage M.D.	3	Each Aux. Condenser	2	L.P. Feed line via aux intercondenser.
2	DISTILLER COND. (Refer S-58)	38 GPM. Suct 26" vac. Disch 10# G Mtr HP 1.3	Horiz cent M.D.	4"	Flash chamber	2	Condenser Cooler and Test tank.
2	CONT. WATER EVAP FD (Refer S-58)	20 GPM. 75# tot press. 3"-2 3/4" - 3".	Horiz duplex. steam	1¼ 1¼	Cont water evap drain tank Drink & wash water tanks.	1	Cont water evap
1	REFRIG. COND. CR. (Refer S-59) (AP only)	125 GPM. 30# tot pres. HP of mtr. 5	Vert. Cent. M.D.	3½	Sea	3	Refrig. cond.
2	L. O. SERVICE (Refer S-45)	325 GPM. 40# tot pres. Motor HP 15.	Vert Rotary M.D.	6	Mn Turbine Sump tank.	2 5 2"	Deck Gravity tk via cooler. Storage tank.
2	L.O. STANDBY (Refer S-45)	325 GPM. 40# Tot pres. 8"x10"x24	Vert simplex steam	6	Mn turbine sump xtank.	2 5 2	Deck Gravity tk via cooler. Storage tank.
1	DILSEL F.O. TRANS. (Refer S-47) Frd E.R. only.	1oo GPM.62-95# total pressure. 3"x2"x3".	Horiz duplex stm.	1	Diesel oil D.B. tank	1 1	Emerg. Gen. F.O. tank. Galley F.O. tank.
4	F.O. SERVICE (Refer S-55)	6.5 GPM. 450# disch pres. Mtr. HP 5.	Vert Rotary MD.	2½ 2½	F.O. Settling tank. F.O. Transf. System.	1¼	F. O. Heaters.
2	F. O. STANDBY (Refer S-55)	6.5 GPM. 450# disch pres. 5¼x2¼x5.	Vert. Duplex. Steam.	2½ 2½	F.O. Settling tanks. F.O. Transf. System.	1¼ 1¼	F.O. Heaters. Overb'd via oil & wat separ.
2	F.O. TRANS. & DIRTY BAL. (Refer S-55)	300 GPM. 50# disch pres. 10X9X12.	Vert Duplex Steam	6 4 8 6	Sea (blanked off). F.O. Settling tanks. Filling line. F.O. Transf. & Dirty bal syst.	4 4 4 4 4	Overb'd direct. F.O. settling tanks. F.O. transf.& dir.bal. syst. Deck via filling line (aft engine room only) Overb'd via O&W separator.
2	SANITARY (Refer S-36)	100 GPM. 62-95# disch press. Mtr HP 6.9	Horiz Duplex M. D.	3½	Sea.	3 1	Sanitary syst via press. tank. Boiler blow evap(blanked off).
1	HOT WATER CIRC. (Refer S-36	100 GPM. 90# disch press. 6x6x6	Horiz Cent MD	2	Recir. hot water line.	2	Hot water heating coil.
2	WASHING WATER. (Refer S-36)(AP only)	100 GPM. 90# disch press. 6x6x6.	Vert Duplex steam	3	Washing water tanks aft.	2½	Waashing water syst (AP servic)
2	D. W. DISTRIBUTION. (Refer S-58)	50 GPM. 15# total pressure.Mtr HP 3/4	Horiz cent MD	2½	Test tank	2 2 2	Bilge. I.B. Distilbd water. tanks. Fresh water fill & trans syst.
2	TUBE NEST DR. (Refer S-58)	20 GPM. Suct. 15" vac Disch 50#G. Mtr HP 3.	Horiz cent MD	2	1st Effect tube nest.	1¼ 1¼	D.C. Heat FWD E.R. Mn & Aux cond in FWD E.R.

NO OF PUMPS	NAME OF PUMP	SIZE	TYPE	SUCT INS.	SUCTION FROM	DISCH INS.	DISCHARGE TO
1	STANDBY FIRE (Refer S-93)	400 GPM 127# total pressure Motor HP 50	Vert Cent M.D. 2 Stage.	6	Sea	4 3	Fire main. Cargo refrig. circ. syst.
1	SUBMERSIBLE BILGE (Refer S-47)	500 GPM 25# total pressure Motor HP 15	Vert cent M.D. Self priming.	6 6 3	Bilge main. Aux mach sp under bilge Bilge drain well	5	Overboard direct.
2	BILGE (Refer S-47)	500 GPM 25# total pressure Motor HP 15	Vert cent M.D.	6 6 3 3 6 6 6	Bilge main Eng rm indep bilge Cofferdam Drain well Clean ballast mn (a)(b) Sea F.O. transfer syst (a)(d)	5 5 5 6 5	Overboard direct. Overboard via oil and water separator. F.O. trans and oily bal (a)(d) Clean ballast Mn (a)(b) Mn and aux circ system in particular eng rm.
2	CLEAN BALLAST AND DISTILLER CIRC. (Refer S-47)	500 GPM 25# Total pressure. Motor HP 15	Vert cent M.D.	4 6 6	Fore and aft peak tanks via clean ballast mn Sea. Bilge main.	5 6 5	Overboard direct. Fore and aft peak tanks via cln ball mn. Triple effect evap.
2(e)(f)	CARGO DIESEL OIL TRANSFER (Refer S-47)	40 GPM 75# total pressure 6"x4"x6"	Horiz duplex steam	2 2	Purified D.O.Tank. D.B. Diesel Oil storage tank (a)	2	Deck filling and discharge hose connections.
2(a)	REFRIG COND CIRC (Refer S-59)	250 GPM 25# total pressure. Motor HP 7½	Vert cent M.D.	4 4	Sea Ballast tanks.	4	Refrig condenser circ system.
2	SALT WATER EVAP F.D.	115 GPM 15# total pressure Comb mot HP 4½	Combined Unit Vert Cent M.D.	3	Disch from s.w. side of distiller and dr. cooler	3	Third effect S.W. evaporators
	S.W. EVAP. BRINE	78 GPM 23# total pressure		4	Third effect S.W. evap	3½	Overboard.
REFERENCES: (a) Blanked off. (b) Conns. for one pump only as standby for clean ballast pump (aft e.r.). (c) Omit on transport installation. (d) In forward engine room only. (e) Transport only. (f) Aft. E.R. only.							
2	PRIMING (Refer S-47)	55.5 C.F.F.A. at 15# vac. Mtr. H.P. 2	Hydraulic vac. M.D.	1¼	Bilge pump suct.	1¼	Bilge or atmosphere.
2	DRINKING AND WASHING WATER (Refer S-36)	7tGPM 91# total pres. Mtr. H.P. 4.9	Horiz Duplex M.D.	2½ 2½	Drink and wash water tanks Eng rm interconn.	2	Pressure tank.
4	MAIN FEED (Refer S-46-7-8-&51)	GPM Max 90; nor 80; total pres max 525 nor 500; Mtr HP 35	Horiz triplex M.D. Variable stroke	4 3½ 3	Direct con feed water heater D.B. distilled water tank Mn feed pump suct manifold	2½ 1	Boiler. For desuperheating main steam
2	AUXILIARY FEED (Refer same as above)	GPM max90;norm80; Tot pr max525;nor500 3½x6"x18".	Vert simplex steam	3 3½ 1½	D.C.Feed water heater. D.B.Distilled water tank Boiler Blow system	1½ 1½ 2½	D.B. dist water tank (a) Condenser test. Boiler via mn feed line.
4	MAIN CONDENSATE (two acting as standby)Refer same as above)	GPM max170;nor140 90# tot pressure; Mtr H.P. 20.	Vert cent 2 Stage MD	6 3	Main condenser Aux Condenser	3½	L.P. feed line.
	REFERENCE: (a) Portable pipe connection - normally removed.						

MOTOR DRIVEN MARINE PUMPS FURNISHED BY INGERSALL RAND,(DRIVEN BY WESTINGHOUSE MOTORS)

REFERENCES.

Booklet.(Separate)

1. Ingersall Rand- Marine Pump Instructions IB 2925
2. Westinghouse E & M CO Marine Motors and Controllers IB-8585-2.

DRAWINGS.(SEPARATE) 2

1. Fed. Ship Bldg. & D.D. CO. Priming Syst. for Bilge Pump Aft Eng. DWG E-42431
2. Ingersall Rand Co Brine Pump Overboard DWG-W-15VAM500X2
3. " " " Main Circulating Pump DWG W-20VCM500X1
4. " " " Hot Water Circ. Pump DWG W-IRVNL500X4
5. " " " Tube Nest Drain Pump DWG WIRVNL500X5
6. " " " Standby Fire Pump DWG W-3VFM500X9
7. " " " Clean Ballast and Dist. Circ Pump DWG W-5 VCM
8. " " " Refrig. Cond. Circ Pump DWG W-2VBM 500X8
9. " " " Fire Pump. DWG W-3VFM 500X8.
10. " " " Distiller Condensate Pump DWG W-IRVN 500X2
11. " " " Bilge Pumps DWG W-5VCM 500X4
12. " " " Main Condensate Pump DWG W-2VHM 500X15
13. " " " Auxillary Condensate Pump DWG W-1VHM 500X6
14. " " " Distilled Water Dist. Pump DWG W-IRVN 500X1
15. " " " Aux. Cond. Pump DWG W-IOVCM 500X3

Note...Refer to specific section in which the pumps are concerned for piping diagrams in which the pumps figure.

The general design of these pumps can best be seen from cross sectional prints which are shown in Ingersall Rands IB-2925 "Marine Pump instructions. They are vertical pumps, which are coupled to their drivers with rigid type couplings. The casings are valute type vertically split for easy access to the rotating elements without disturbing the piping, in other words it makes for easy maintenance. The pumps are hydraulically balanced and the weight of the rotors, and any slight thrust due to sudden load changes is carried by the driver thrust bearings. The radial bearings are of the grease lubricated sleeve type. These pumps are driven by Westinghouse Elect. and Mfg Co. Type SK, Direct Current Shunt Wound Motors.

PUMP DATA

SERVICE	Fig. No.*	PUMP SIZE	PUMP RATING gpm	t.h.	rpm	DRIVER type	hp
Main Circulating Pump	1	20VCM	12000	19'	485-645	MOtor MR	100
Auxillary Cir. Pump	1	10VCM	1300	20'	833-1190	MOTOR	25
Main Condensate Pump	2	2VHM	140	187' 205'	1310 1750	MOTOR	20
Auxiliary Cond. Pump	2	1 VHM	20	201	2100 2800	MOTOR	5
Fire Pump	3	3 VFM	400	276'	1310-1750	MOTOR	50
Standby Fire Pump	3	3 VFM	400	276'	1310-1750	MOTOR	50
Bilge Pump	4	5 VCM	600	56'	1310-1750	MOTOR	15
Refrigeration Condenser Cir. Pump	5	2 VBM	225	79'	1425-	MOTOR	5
Clean ballast & Distiller Cir. Pump	4	5 VCM	600	56'	1310-1750	MOTOR	15
Evaporator Feed Pump	6	1½ VAM	115	34'	1310	MOTOR	5
Brine Overboard Pump	6		78	51'	1750	MOTOR	5
Distilled Water Distribution Pump	7	1 RVN	50	33.5	2300	MOTOR	3/4
Distiller Con. Pump	7	1 RVN	38	53'	2600	MOTOR	1-1/2
Tube Nest Drain Pump	8	1 RVNL	20	133	2585 3450	MOTOR	3
Hot Water Cir. Pump	8	1 RVNL	40	69	2700	MOTOR	1-1/2

* Figure No referes to Ingersall Rand IB-2925 (separate)

MAINTENANCE & REPAIR

SLEEVE BEARINGS.
The sleeve bearings are lubricated from external grease cups. The grease-cup handles should be given a few turns daily to insure lubrication to the bearing. Use a calcium soap grease, having minimum soap content, which is insoluble in water. Do not use ordinary ball bearing grease.
To tell whether grease is sodium-base or calcium-base place a small quantity in a container filled with water, and note whether it repels the water or mixes with it. A sodiumbase grease will dissolve in water leaving a cloudy appearance and is not suitable for this service.

BALL BEARINGS.
The most common cause of overheated ball bearings is an excess amount of grease in the bearing housing. When installing a new bearing fill the spaces between the balls with grease, using the fingers or a knife blade to work it in. The housing should be filled from one-third to one-half full. If the bearing runs hot, remove the drain plug at the bottom of the housing and let the excess grease run out.
The lubrication schedule depends on the service, and the following schedule may be used as a guide for regreasing:

SERVICE	AMBIENT TEMPERATURES	GREASING INTERVAL
8 HOur Day		
7 Day Week	LOW	6 Months
7 Day Week	High	3 Months
24 HOur Day		
7 Day Week	LOW	6 Weeks
7 Day Week	High	3 Weeks

When greasing ball bearings the following procedure is recommended: (1) Remove the plugs from the inlet hole at the top of the housing and drain hole at the top of the housing and drain hole at the bottom. (2) With the pump running, add grease with a hand gun until new grease begins to come out of the drain hole. This tends to purge the housing of old grease. (3) Allow the pump to run for several minutes with the drain plug out so that any excess grease will be expelled. (4) Replace the housing plugs.
We recommend that ball-bearing grease conform to the following specification as determined by ASTM Standard Methods:
A. The grease must be a sodium-soap grease, carrying not less that 82 per cent of a high-grade, filtered mineral oil of a saybolt viscosity of not less than 150 seconds at 100°F.
B. The grease must not separate on standing or when heated below its melting point.
C. It must not gum, harden, or decompose.
D. It must not corrode any type of ball bearing.
E. It must be free from resin, mineral salts, and abrasives such as sand, free lime, etc.
F. It must have a melting point of not less than 300 degree F. and a penetration at 77°F. of 275 to 330.
Ball bearings are a light tap fit on the shaft, which means .0001" to .0002" tight. The fit in the housing is a "push" or "sucking" fit. If the shaft is worn so that the bearing slips on and off easily, do not install the bearing because trouble will develop. A new shaft should be used. Worn housings should also be replaced. When removing or installing a bearing never press or hit against the outer race, balls, or ball cage. This will damage the balls or races and cause early bearing failure.

DISMANTLING AND ASSEMBLY

To dismantle the pumps remove the coupling bolts, bearing end-cover and casing cover. After removing the coupling bolts the rotor will drop far enough to clear the counterbore in the coupling halves, and can be removed as a unit. When necessary to remove any parts from the rotating elements, measure and record the distance from a reference point on the part to the soupling end of the shaft. This insures proper placing of the part on the rotor when reassembling. To reassemble place rotor in the casing making sure the parts are properly seated. Replace the casing cover and draw up the bolts evenly.

DISMANTLING AND ASSEMBLY (CONT.)

The halves of the rigid couplings are counterbored and secured to the tapered pump and motor shafts with coupling nuts. During manufacture the complete coupling is line reamed as a unit to insure perfect alignment. Therefore, it is impoetant when bolting up the coupling to match the scribed marks on the coupling rims. When the rotating element is properly placed in the casing and raised, the counterbores in the coupling halves will match. Insert the coupling bolts and tighten. Turn the rotor by hand and if it turns freely, replace end cover and prepare pump for operation as previously described.

CASING GASKET.

If the casing cover is removed for any length of time, the casing gasket should be kept moistened to prevent drying and cracking. If it is necessary to replace a gasket use Hydroil or equal gasket material 1/32" (.031") thick. The casings are bored with metal shims between the halves, and this shim thickness is stamped on the casing parting flange. Note the stamping when removing an old gasket. This will serve as a guide in pulling down the casing cover after a new gasket has been installed.

Assembly and dismantling procedure on the close coupled units will be apparent from studying figures 7 and 8, of the I.R. IB 2925. The shaft nut holding the impeller in place has a left-hand thread.

When replacement parts are required, they should be ordered from the working drawings filed in the chief engineers office. They should not be ordered from this book.

RECOMMENDED SPARE PARTS

The following spare parts are recommended for each pump.

1. Set of impellers
1 Shaft
1 Set bearing bushings
1 Set casing rings
1 Stuffing-Box bushing
1 Shaft nut
1 Water-Seal cage (where required)
1 Shaft Sleeve
1 Channel Ring (where required)
1 Intermediate Sleeve (where required)
1 Set Ball Bearings (horizontal pumps)
1 Set Packing

SPECIAL TOOLS FURNISHED

The following special tools are supplied.

Wrench for shaft nut
Spanner Wrench for Shaft Sleeve Nut
Spanner Wrench for coupling Nut
Socket Wrench for coupling bolts
Allen Wrench for Coupling Nut
Allen Wrench for Shaft Nut
Allen Wrench for End Vover Bolts
Packing Hook
Seal Cage Hook

SERVICE

Service may be obtained for the pumps at any of the branches of Ingersoll-Rand Company listed below:

Boston, Mass: 285 Columbus Ave.
Los Angeles, Calif: 1460 E. Fourth St.
Newark, N.J. 899 Frelinghuyseen Ave.
New Orleans, La: 410 Camp St.
New York, N.Y.: 11 Broadway
Philadelphia, Pa: 1600 Arch St.
Sanfrancisco, Calif: 350 Branan St.
Seattle, Wash: 526 First Ave., Sputh.
Washington, D.C: 1627 K ST., N.W.

OPERATION

PIPING.
All piping should be independently supported and must not be drawn into position with the flange bolts, which results in casing strain.

BEARINGS
The grease-lubricated sleeve bearings must be filled with grease before starting, by emptying several full cups of grease into bearings and then refilling the grease cups. The grease-lubricated ball bearings are packed with grease at the factory and should not require attention for several weeks.

ROTATION
Before starting a unit for the first time or after any electrical circuits have been changed, check the direction of motor rotation which must coincide with the direction arrow on the pump.

PACKING
The pumps are shipped with shaft packing in separate packages and the stuffing boxes must be packed before the units are put in service. Dip each ring of packing in cylinder oil and put one ring in the stuffing box at a time, seating it well in place. The joints of succeeding rings must be staggered. When the last ring is in place, assemble the stuffing box gland and draw up the gland nuts evenly until snug. The gland nuts should then be backed off and drawn up finger tight. On units using external sealing water, measure the depth of the box to determine the location of the seal ring. The box must be packed so that the injection hole lines up with the seal ring. Slight leakage through the box will cool and lubricate the packing. The gland should be kept as loose as possible to prevent excess shaft and packing wear.

PACKING SIZES

SERVICE	FIG NO.*	SIZE SQUARE	NO RINGS	DIA SHAFT	PUMP
Main Circulating Pump	1	1/2"	7	2-7/8	20VCM
Auxiliary Circulating Pump	1	1/2"	4	1-1/2	10VCM
Main Condensate Pump	2	3/8"	5	2-1/16	2VHM
Auxiliary Condensate Pump	2	5/16"	5	1-1/8	1VHM
Fire Pump	3	3/8	7	1-5/8	3VFM
Standby Fire Pump	3	3/8	7	1-5/8	3VFM
Bilge Pump	4	3/8	5	1-1/4	5VCM
Refrigeration Condenser Cir. Pump	5	3/8	5	1-5/8	2VBM
Clean Ballast & Distiller Cir. Pump	4	3/8	5	1-1/4	5VCM
Evaporator Feed and Brine Overboard Pump	6	5/16	7	1-1/8	1½VAM
Distilled Water Distributing Pump	7	5/16	5	1-1/8	1RVN
Distiller Condensate Pump	7	5/16	5	1-1/8	1RVN
Tube Nest Drain Pump	8	5/16	6	1-1/8	1RVNL
Hot Water Circulating Pump	8	5/16	6	1-1/8	1RVNL

* Fig. No. refers to Ingersall Rand IB 2825

PRIMING

On units equipped for ixternal stuffing-box sealing, turn on the sealing-water supply before priming the pumps. Before starting any centrifugal pump the casing and suction line must be completely filled with liquid. Failure to fully prime the unit will result in seizure of the rotating parts.

STARTING

With the discharge valve closed and pump fully primed start the unit. As soon as the pump comes up to speed and pressure open the discharge valve. The pumps should never be operated for long periods with the discharge valve closed, and the suction should never be throttled. After the pump has been in operation for a few minutes check the bearings and stuffing boxes for excessive heating. If the stuffing box overheats, stop and start the unit a few times until lubricating leakage breaks through the packing. If the packing fails to respond to this treatment, the box has been packed too tight and must be repacked. To take a unit out of service simply close the discharge valve, stop the motor, close the suction valve, and turn off the sealing water supply.

GENERAL INFORMATION CONCERNING WESTINGHOUSE TYPE SK MOTORS WHICH ARE USED TO DRIVE VARIOUS PUMPS.

(Reference - Westinghouse IB-85852-Marine Motors and Controllers)

A. The small horizontal motor (underdeck) has solid covers on top and screened covers on the bottom of the bracket.openings. The Commutator end covers are held by thumb screws for easy access to the brushes and commutator. The motor has pressure type grease fittings for easy greasing. The H.P. ratings of this motor is usually 1 H.P. and below (fractional H.P.)

B. Large Horizontal Motor (Underdeck) does not differ much in construction from the smaller motor. It has a slightly different bearing construction and brush support. A fan is used which takes cooling air in the driving end and exhaust it out the commutator end. Besides pump drive this motor is used for driving small generators. The H.P. ratings range from 1 to 100 H.P. in marine auxilliary use.

C. The small vertical motors (Underdeck) have an internal construction the same as that of the horizontal motors. The motor mounts on the auxilliary through a fit on the lower bracket. Lower type covers permit the exist of the cooling. The grease fittings are similar to those used on the horizontal motors and are kept accessible on the lower bracket through the use of pipes. A steadying brace is used to steady the frame. Similiarly the H.P. ratings of the small vertical motor are 1 H.P. and below (fractional H.P.)

D. The large vertical motor (Underdeck) with Ring Base is mounted on the driven auxiliary by a solid ring which is integral with the frame and lower bracket. In general construction it is similar to the samller motor. It differs in the construction of the frame and lower bracket being integral instead of separate with units. The H.P. ratings range from 1 - 100 H.P.

E. The large vertical motor (Underdeck) with horseshoe base is the same at the above except the frame and support extends just below the shaft extension and it is cut away in one quarter to provede access to the coupling. H.P. ratings same as above.

OPERATION OF MOTORS

The operation of motors normally consists of merely pushing the start or stop button or manipulation of the master switch. Never attempt to operate any motor with the control "shorted out" as the motor will draw dangerous currents and probably flush over and cause severe damage to the commutator and brush rigging.

If motor fails to start properly or doesn't come up to normal speed investigate immediately. Usual causes for failure to start are - blow fuse or open knife switch, frozen bearing, broken wire, trouble in starting switch. If motor does not come up to speed check: loading, there may be an overload, tight bearing, accelerating contacts may be sticking, field rheostat may be set for slow speed.

While the motor is running occasionally check the temperature to be sure motor doesn't overheat. The nameplate gives the rise (above room air) for the motor. In case of doubt about temperature use a thermometer. The bearings should especially be examined frequently.

Also check the brushes and the commutator while the motor operates. There should be practically no sparking - small blue pin sparks are not harmful. In normal operation the commutator will take on a dark color but will become highly polished. In general disregard any coloration of the commutator just be sure it takes on a highly polished and smooth surface. If it does become rough have the commutator smoothed up, often a piece of sandpaper is sufficient.

Usual causes of poor performance are:

Poor Commutation - incorrect brush position, poorly fitted or worn out brushes, rough commutator, short circuit in armature.

Overheating - overload, short circuit, frozen or dry bearing.

Hot Bearing - ben shaft - misalignment, lack of grease or too much grease, broken bearing or dirt in bearing.

When motor is stopped be sure all switches are left open. Check to be sure motor stops when stop button is pushed as switch may be faulty. While motor is at rest be sure it is kept dry and clean; if excess moisture is around motor take steps to reduce it.

If motors have been idle for a long period (several months) or have been submerged

they should be carefully inspected if they have been submerged it is best to call one of our service men who can best advise proper procedure to recondition the motors.

MAINTENANCE OF MOTORS

General:

The most important item in maintenance of electrical equipment is cleanliness. Always keep the equipment clean, dry and free of foreign materials. Covers are provided to protect the equipment and should always be kept in place and securely fastened. Never leave loose metallic pieces around machine, especially magnetic parts as they may be attracted by the field of the machine and become wedged in the air gap and damage the armature or field coil insulation.

Occasionally blow out machine using an air blast (15 pounds pressure)

If machine becomes wet with water (such as submerged be sure it is thoroughly dried out before starting again.

When replacing with same new part use the spare parts provided for each application and be sure the new part is place in same position the old part was in. For example, whenn replacing field coils be sure it is connected in same position so polarity is right and replace all lines behind each pole so as to obtain same air gap as before.

If machines are kept clean and properly lubricated they will require very little attention and care.

Insulation:

Megger Test. Occasionally check the insulation of all machines by using a megger. The insulation resistance will vary from machine to machine and an exact measurement does not alwaysprovide a true indication; however, if the tests are conducted regularly and under similar conditions, the valves should not vary too greatly on the particular machine. The advantage of the megger test is to indicate a marked change. If the megger reading for a particular machine is abnormally low or is reduced from a previous reading it indicates a check should be made. As much as possible make the test while machine is still warm, preferably just after it has been shut down. The reading "cold" will in general be higher than the hot reading. In any case, the cold resistance should not be less than one megohm (taken with motor disconnected from line.) If it is too low some means should be used to dry out machine. (A lamp bulb is good source of heat if machine is not too damp.)

Care of Insulation. Always be careful of the insulation around any motor or generator. Occasionaly inspect the coils and armature. Keep coils clean and especially free of oil and salty water. If oil or salt scale appears on any winding, clean them with a dry rag (moisten slightly if salt scale is hard) If abnormal amount of oil is present investigate its cause and try to prevent it as oil on the commutator is especially bad.

Never use a sharp instrument on any coils as it is very easy to damage the insulation.

After machines have been in operation several years it is good practice to apply a coat of baking varnish. (Baking varnish is much superior to air-drying varnish). Varnish is much superior to airdrying varnish. Varnish can be obtained from the nearest Westinghouse service shops or dealers. Westinghouse service shops are equipped to bake machines.

Ball and Roller Bearings: Quitness and life of ball and roller bearings depends largely on cleanliness and proper lubrication.

Inspection: Never open the bearing housing under conditions which would permit entrance of dirt.

External inspection of the bearings is usually suffieient at the time of greasing. Check to see if housing is exceptionally hot (much higher temperature than neighboring parts of bracket and frame). If bearing is nosiy it should be investigated. (Noise is usually accompanied by overheating and the same remedy will satisfy both - See Note 3 under Mechanical Damage)