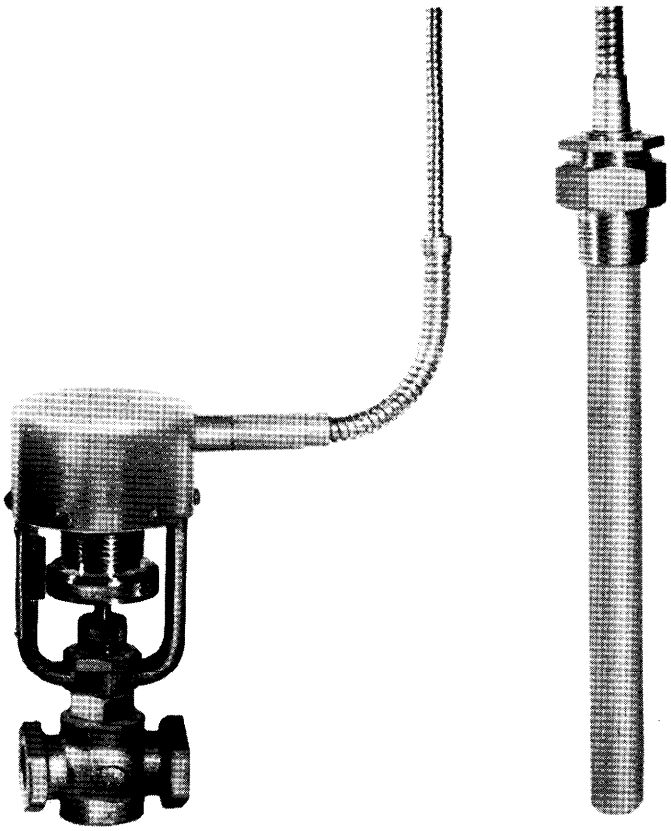

INSTRUCTIONS

FOR

INSTALLATION AND OPERATION

RT-921 Series
RT-1021-A & B
TEMPERATURE REGULATOR

NOTE TO INSTALLER. After installing the regulator, give this instruction folder to operating personnel or see that it is filed for future reference.

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INSTRUCTION MANUAL NUMBER

P-2256

Rev. A

PRINCIPLE OF OPERATION

This regulator automatically controls flow of the medium passing through its valve by responding to temperature changes affecting the bulb. The bulb contains a thermo-sensitive liquid which vaporizes when heated. Vapor pressure thus generated in bulb is transmitted through the capillary tube to the Sylphon bellows which in turn positions valve poppet to control flow of the medium through valve. Movement of bellows is opposed by a spring adjustment.

This regulator is active only within the temperature range stamped on its nameplate and may be adjusted to operate at any point within that range. Action at this is throttling and modulating.

VALVE INSTALLATION

Regulator valves are sized to the demand of heater or other unit to be controlled and are frequently smaller than supply line size.

When making the installation, do not remove valve from the regulator unless absolutely necessary.

The regulating valve should be installed as close as possible to the unit to be controlled and a pipe line strainer should be placed just ahead of the valve. Preferably, the regulator should be installed in the vertical position with the valve below the regulator frame. Regulators sizes 3" and larger should never be installed in horizontal position. Install valve so flow is in direction of arrow on valve body.

When controlling steam, provision should be made to drain coil or other condenser through a steam trap of adequate capacity and, if possible, with a good fall to the trap and no back pressure. Best control is obtained where coil or condenser is kept dry.

When controlling brine in cooling applications, valve should be installed on return end of unit where it is least subject to frosting. See Figure 25.

When controlling the flow of water used for cooling, the valve is usually on the supply end but may be on either end of the unit, depending on the nature of the case, particularly with regard to backing-up full line pressure in the vessel. Figure 20 shows a cooling application where the regulator is installed in the return water line where control is applied to combustion engine jacket cooling.

Cooling control valves are reverse-acting, opening with downward stroke on rise in temperature at the bulb, except on some applications where by-pass control only is utilized, requiring direct-acting valve.

TYPES WA

Particular care must be taken when installing the three-way valve to make sure pipe connections are proper to obtain the control desired. The drawings below show the direction of flow through the valve when used for purposes stated. You can identify the pipe connections on the WA valve by the letters A, B, and C stamped on the valve body.

CONNECTIONS FOR TYPE "WA" VALVE

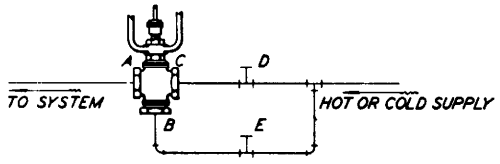


Figure 1. Showing how connections would be made where it is desired to shift from heating service to cooling service by manually opening and closing prop er valves in the supply line.

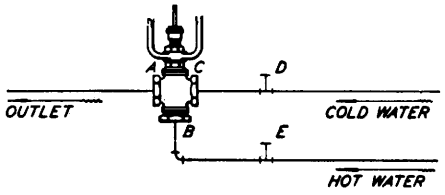


Figure 2. Illustrating a simple means for mixing hot and cold water where a rough mixing is suitable.

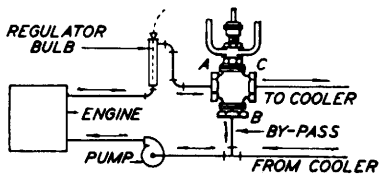


Figure 3. The drawing above illustrates the most widely used method of cooling water control for diesel engines.

BULB INSTALLATION

IMPORTANT

Correct bulb location is the most important detail of regulator installation. Bulb should be installed at a point of true representative temperature and should be in good circulation. If a thermometer is used, it should be placed adjacent to the bulb.

NOTE: The elevation or depression of a regulator bulb with respect to the regulator sometimes has a marked effect on the range of the regulator. This is due to the effect of the column of liquid on a regulator working under "standard condition" (bulb warmer than tube and bellows).

The effect on the temperature range is as follows:

1. Range lowered if the bulb is above the regulator.
2. Range raised if the bulb is below the regulator.

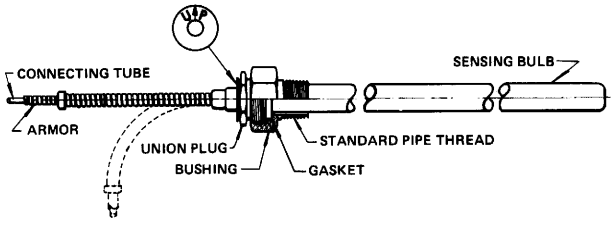


Figure 4. Standard type bulb for temperature control of liquids.

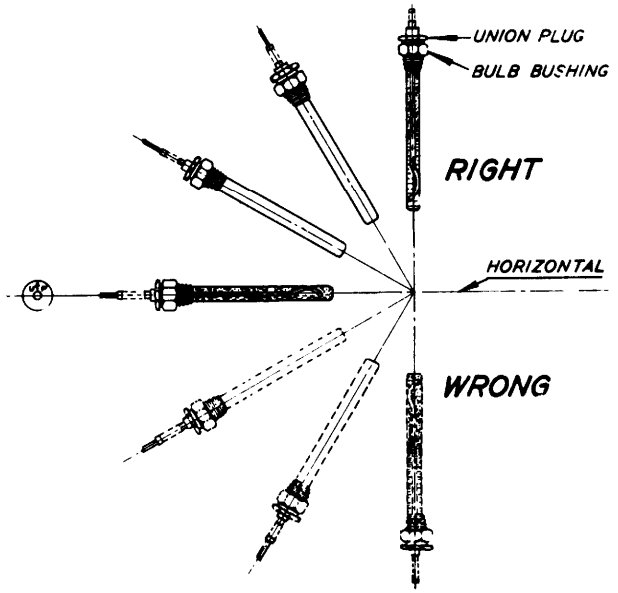


Figure 5. Showing RIGHT and WRONG way to install bulb. Positions from horizontal to vertical, inclusive, are correct if arrow on head plate points UP. For positions below horizontal, marked WRONG, a special bulb must be ordered.

LIQUID CONTROL TYPE 12

The bulb for liquid control is of smooth tubular form with I.P.S. threaded bulb bushing as shown by Figure 4. To install this bulb, loosen union plug until the bulb bushing turns freely on the bulb. Insert bulb and bulb bushing into the selected opening and screw the bulb bushing up tight. Turn bulb until arrow on head plate points UP. Tighten union plug. Bulb bushing can be removed from bulb by screwing union plug all the way out and in like manner bulb may be removed from installed position without disturbing bulb bushing.

The bulb may be installed horizontally or vertically or at any angle between these positions but in all cases, the arrow on head plate must be uppermost. See "RIGHT", Figure 5. Unless specifically ordered for such installation, the bulb should never be installed with the bushing end down or below the horizontal position. See "WRONG".

Bulb in gravity circulation heaters should be above heating surface but not closer than 4" at any point. See Figure 17.

For instantaneous heaters, bulb should be in the heater outlet line and as close as possible to the point where this line connects to the heater. See Figure 18. For such installation, the pipe line should be twice the bulb diameter to obtain free flow around bulb. See Figure 6.

Bulbs should never be installed where cold inlet water will flow directly on it or where it will be otherwise affected by false temperatures. See Figure 17.

TYPE 6 bulb for liquid control is a plain type bulb not provided with a bushing or other means for its support in a vessel in which it is to be placed.

Bulb should be installed vertically below surface of the liquid.

Bulb should be located away from work area inside tank and should be supported in position by suitable means.

NEVER lay bulb on bottom of tank. However, bulb may be installed horizontally if it is securely mounted to side of tank and the word "TOP" on tube end of bulb is up.

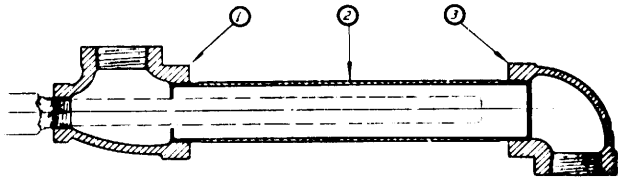


Figure 6. The drawing above shows how the regulator bulb may be installed in the pipe line. The pipe size (detail 2) should be at least twice the bulb diameter so that free flow can be had around the bulb. Where the pipe line is not of sufficient diameter to accommodate the bulb, an enlarged section with proper fittings could be provided.

AIR CONTROL . . . TYPE 54-A, 54-J and 54-K

The bulb is a fin type or coil type for greater sensitivity. Bulb should be installed at right angle to the air movement and at a location where average temperatures are encountered. See Figures 21, 22 and 24. Preferably, the bulb should be installed horizontally but it may be installed vertically or at any angle between these positions providing the tube end is uppermost—never install bulb with tube end down unless specifically ordered for such installation. See Figure 5. Some bulbs have a plate attached (See Figure 4) to the tube end indicating that the bulb should be installed with the arrow pointing upward when the bulb is installed in any position "RIGHT".

WELLS

The well or socket serves as a protection to the bulb and allows the bulb to be removed without disturbing contents of vessel.

To install, insert well into the selected opening and tighten. Insert bulb in well and tighten union plug (Figure 4). Be sure arrow is pointing up as plug is tightened.

CONNECTING TUBING

The flexible tubing connecting the bulb and valve must not be cut, kinked, mashed or unduly twisted. It may be bent on a permanent fashion to a rigid location but not fastened to steam pipes or other locations where subject to extreme temperatures. A small loop of tubing next to the regulator head is recommended to absorb vibrations occurring in pipe line:

TEMPERATURE ADJUSTMENT

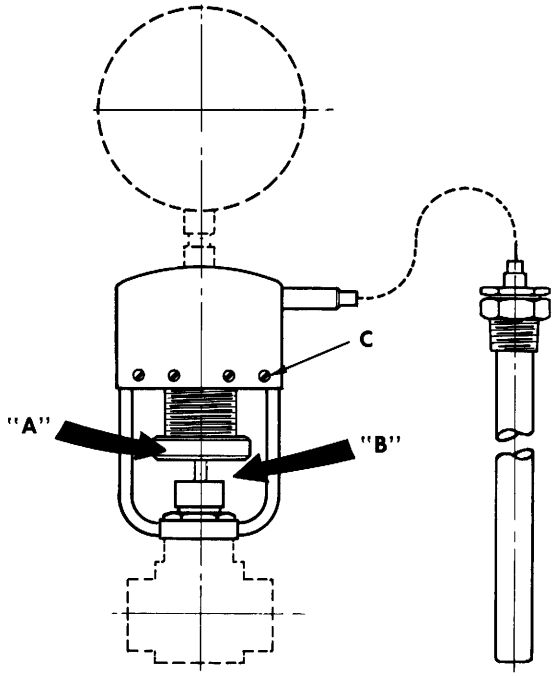


Figure 7

This regulator can be set to control at any temperature within the limits of the temperature range stamped on its nameplate.

After placing the regulator in service, allow about 30 minutes to reach stable operation, then observe temperature. If not correct, change the temperature setting in manner directed below.

To RAISE temperature setting, turn adjustment wheel to RIGHT (see arrow "A") (Figure 7).

To LOWER temperature setting, turn adjustment wheel to LEFT (see arrow "B") (Figure 7).

Make new settings as necessary until desired temperature is obtained but allow about 30 minutes between changes.

The regulator has a scale plate to indicate the position of the adjustment. This feature is helpful in resetting the adjustment when frequent changes are necessary. Scale graduations are not in degrees of temperature.

MAINTENANCE

This regulator, if properly installed and used, should require very little attention or maintenance; however, every piece of mechanical equipment deserves some care.

VALVE

If the overall condition of the unit is good, it is recommended that the regulator be returned to the factory for rework when valve replacing, seat regrinding or stem repacking is required. Otherwise a new replacement regulator is recommended.

THERMOSTATIC ELEMENT

The thermostatic element consists of bulb, flexible tubing, and bellows assembly. This unit contains the thermostatic charge. In event this charge is lost as result of damage or otherwise, a new thermostatic unit must be purchased as, and installed as, a complete unit. It is not repairable in the field.

CAUTION – Never remove or install thermostatic unit when temperature of bulb is above lowest temperature of the range stated on nameplate.

To remove thermostatic element follow steps listed below.

1. Remove regulator bulb from its location by screwing union plug (Figure 4) all the way out.
2. If room temperature is above lowest temperature of range stated on nameplate, place bulb in bucket of water, ice or dry ice.
3. Turn adjusting wheel to left (see arrow "B" (Figure 7) until wheel is all the way down.
4. Remove screws "C" (Figure 7) and lift off element.
5. To install thermostatic element, reverse the above operations.

TROUBLE SHOOTING

This regulator is supplied to operate within the temperature stated on the nameplate and the valve has been ground to close tight against line pressure specified on your order. If the regulator does not function properly immediately after completing the installation, and you are unable to correct the trouble, write to the factory and outline your difficulties.

If the regulator has been operating satisfactorily for some time and trouble develops, the following information may be of assistance:

HEATING

If no heat or inadequate heat is obtained with highest temperature setting, make sure that hand valves ahead of the regulating valve are open and that steam of sufficient pressure is passing to the regulator valve. Blow, or otherwise clean the line strainers. Clean all traps and see that they are in working order. If the return line to the trap is cool, the steam coils may be clogged.

In all cases, the packing nut should be only finger-tight. Valve stem must be free to move up and down without undue friction.

The usual cause for overheating is the collection of scale or other foreign matter on the valve seat or seats. Such matter may hold the poppet off seat and in time cause the seat or poppet to become scored. Slightly scored seats or poppets may be reground, but if too badly damaged, valve should be returned to the factory for repairs or else a new valve ordered.

Overheating may be caused by failure of thermostatic unit. See Thermostatic Element below.

COOLING

If the regulator is used for cooling purposes, such as controlling circulation of water or brine, make sure that proper circulation is possible through the cooling circuit if sufficient cooling is not obtained. All lines, strainers, hand valves and passages in heat exchanger should be open. If over-cooling is experienced, scale or other foreign matter may be present on the valve seat or seats, preventing poppet from seating and thus allowing excessive flow of the cooling medium.

In all cases, the packing gland nut should be only finger-tight. Valve stem must be free to move up and down without undue friction.

Regulators controlling circulation of brine should be inspected for frost on valve stem or frozen stem in packing gland.

THERMOSTATIC UNIT

Failure of the thermostatic unit is indicated by failure of the regulator to respond to temperature changes affecting the bulb. With such failure the valve stem would be up and valve open or closed– depending on whether valve is direct or reverse acting.

To test thermostatic unit, remove bulb from its location and observe valve stroke by removing bulb from its location and placing the bulb in a suitable vessel where it can be quickly heated with hot water or steam and cooled with cold water or crushed ice. If thermostat does not readily respond, it has lost its thermostatic charge and a new unit must be installed or damaged one repaired.

NOTE–When writing to the factory be sure to give serial number and other information appearing on the nameplate, and identification disc at tubing end of sensing bulb.

CAUTION

If valve seat leakage can cause a problem or a hazard, the following should be taken into account. Maximum leakage of new valves: single-seated (types A, C,) - 0.05% of full open valve capacity; single-seated, balanced (type MA, MC, or MAS) - 0.01%; double-seated (types FA, etc.) - 0.5%. This leakage will usually increase somewhat as the valve seats wear in service.

Damage to or failure of the thermal element with loss of charge will ordinarily result in the regulator going to the "cold" position. The valve stem moves "up" (toward the bellows) - thus a "direct-acting" valve will fully open and a "reverse-acting" valve will close.

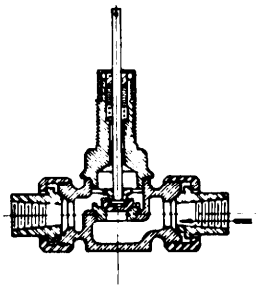


Figure 8
Type "A" Valve
Direct Acting
¼"–1"

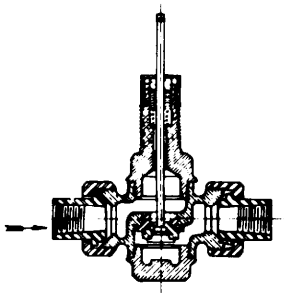


Figure 9
Type "A" Valve
Reverse Acting
¼"–1"

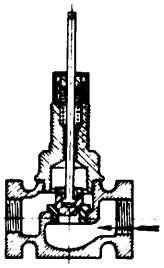


Figure 10
Type "C" Valve
Direct Acting
¼"–½"

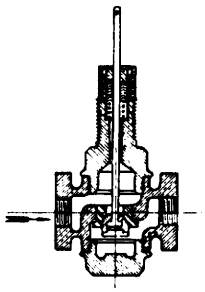


Figure 11
Type "C" Valve
Reverse Ac ting
¼"–½"

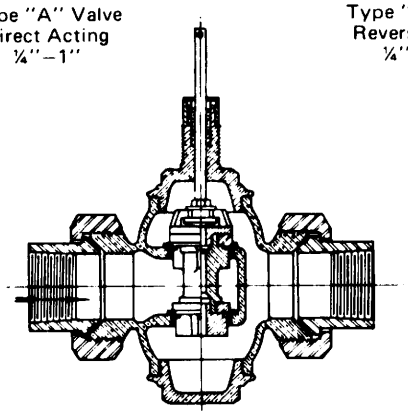


Figure 12
Type "FA" Valve
Direct Acting
¾"–2"*
*2" Size is Flanged

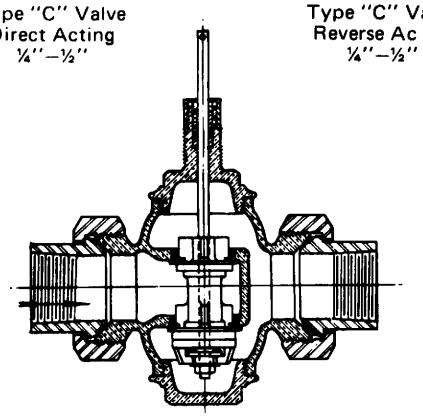


Figure 13
Type "FA" Valve
Reverse Acting
¾"–2"*
*2" Size is Flanged

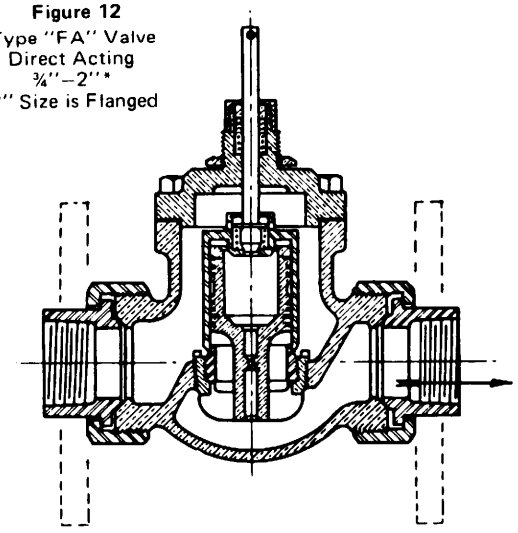


Figure 14
Type "MA" Valve
Size ¾" & 1" Screwed Ends

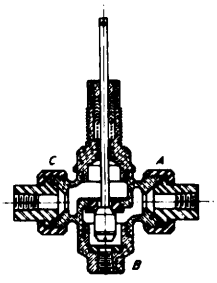
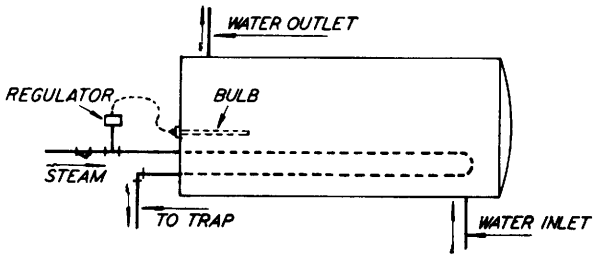
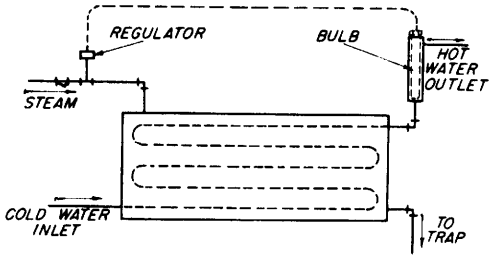


Figure 15
Type "WA" Valve
¼"–1"



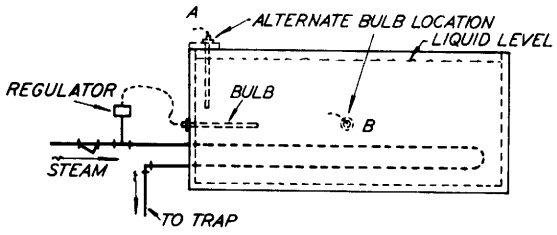
CLOSED TANK OR STORAGE WATER HEATER

Figure 16



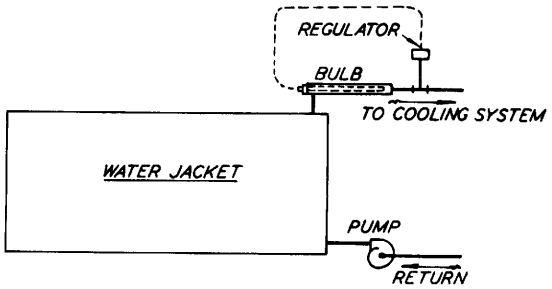
INSTANTANEOUS HEATER

Figure 17



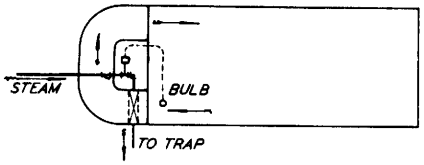
OPEN TYPE TANK

Figure 18



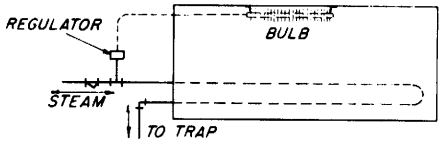
ENGINE JACKET COOLING

Figure 19



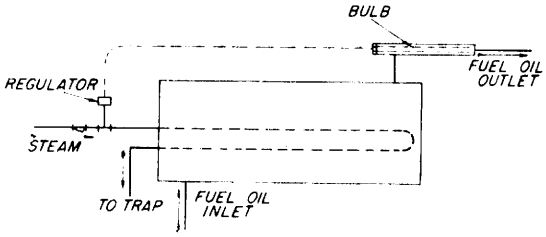
CIRCULATING DRYER

Figure 20



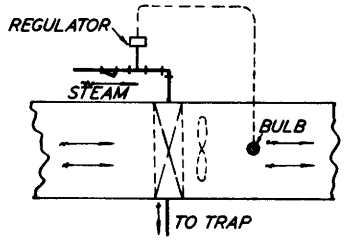
DRY ROOM

Figure 21



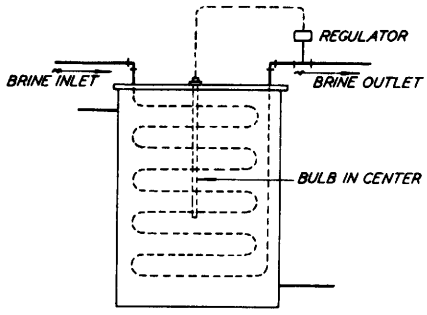
FUEL OIL PREHEATER

Figure 22



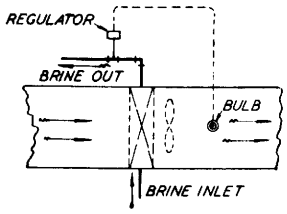
HEATING DUCT

Figure 23



LIQUID COOLER

Figure 24



COOLING DUCT

Figure 25

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