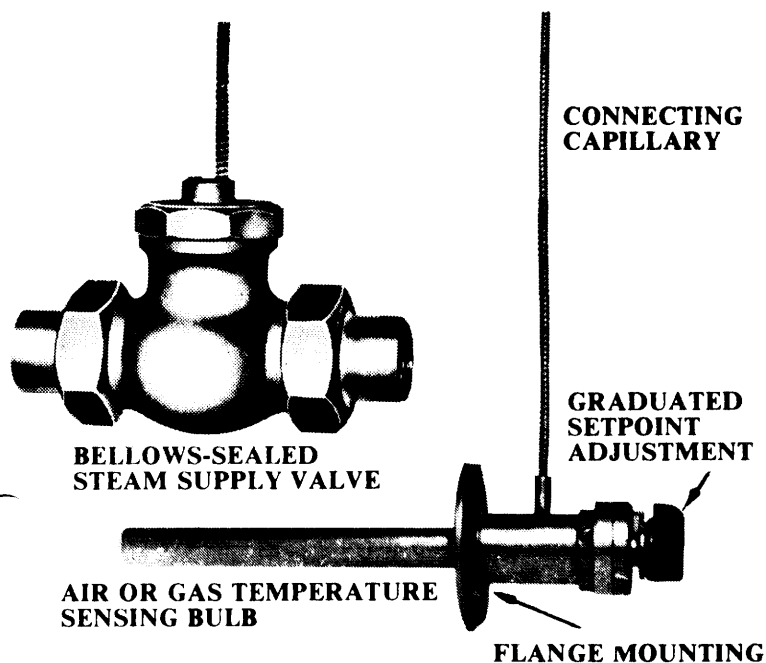


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Temperature Regulators

INSTRUCTIONS FOR INSTALLATION AND OPERATION



Standard Mounting	Optional Mounting
No. RT-220	No. RT-221
No. RT-222	No. RT-223
No. RT-224	

These instructions also apply to earlier model numbers of this regulator series. The table below contains all such corresponding numbers.

Catalog Numbers	Corresponding Dwg. Numbers
RT-220	1041-G
RT-221	1041-H
RT-222	1041-J
RT-223	1041-K
RT-224	1041-L

Note to Installer

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

INSTRUCTION MANUAL NUMBER

P-2044A

July 1991

GENERAL INSTRUCTIONS

No regulator can be satisfactory if improperly installed. Read these instructions carefully before beginning the installation and follow them as outlined below.

While making the installation, handle the regulator with care. Avoid bending the flexible tubing on a radius less than 1 1/2". Do not kink or mash the tubing. Do not lift the regulator in a way that strain will be put on the flexible tubing.

These regulators are suitable for installations where temperatures to be controlled are not in excess of 170oF and the steam pressures do not exceed limits stated below under "Pressure Limits."

OPERATING PRINCIPLE

This type of regulator automatically controls flow of steam passing through its valve in response to temperature changes affecting the bulb of the regulator.

The bulb contains a thermo-sensitive liquid which expands when heated and passes through the connecting tubing to the bellows chamber, being surrounded by steam in the valve, is always hot; and, as the liquid from the thermostat enters the bellows, the liquid quickly vaporizes creating pressure to force the valve poppet toward closed position. A decrease in bulb temperature reverses the process and the poppet moves toward open position; thus the valve will throttle (open or close) just enough to pass the required amount of steam in response to slight temperature changes affecting the bulb.

PRESSURE LIMITS

The RT-220 and RT-221 regulators are suitable for steam pressures up to 15 lbs.; Nos. RT-222, Rt-223 and RT-224 up to 75 lbs. if pressure is reasonably constant. Only the No. RT-224 regulator has balanced poppet construction.

VALVE INSTALLATION

Regulating valves are sized in accordance with demand of the heater or other unit to be controlled and are frequently smaller than the steam supply line.

The regulating valve is to be installed in the steam supply line and as close as possible to the unit to be controlled. Valve sizes 1 1/2" and less may be installed in either a horizontal or vertical run of pipe but horizontal position is preferable. Valve sizes 2" and larger must be installed in horizontal run of pipe. Install valve with bonnet up or to one side of line-never below the line-and so the steam flow is in direction indicated by arrow on valve body. Typical installations shown on page 4.

A safety strainer screen is placed in the inlet union of valve sizes 1 1/2" and smaller but installation of a "Y" strainer ahead of the valve is recommended; and, is required for larger valve sizes.

Provision should be made to drain the 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 of condenser is kept dry.

If the regulator is used to control a heater connected with a trap to gravity return system, a vacuum breaker must be installed between the valve and the heater, otherwise, water hammer will occur. A quick-vent valve of suitable venting capacity, or a check valve installed to open with steam flow, may be used.

BULB INSTALLATION

The correct location of the regulator bulb is the most important detail of regulator installation. The regulator is responsive to

temperature changes affecting the bulb and proportions the steam supply in accordance with these temperature changes. If the bulb is situated where it will not properly contact the medium being heated by the steam or where other temperatures may affect it, proper control cannot be obtained. When installed in a hot water storage tank or other vessel or tank, the bulb must not be placed where cold inlet water will flow directly over the heating coil-not below or to the side of it-and not closer to coil than 4" .

RT-220, RT-221 and RT-224

These regulators have an air or gas temperature sensing bulb, but also can be used for controlling temperature of liquids. The bulb may be installed either horizontally or vertically but should be placed preferably across air stream-not so air flows from one end of bulb to other. To install the bulb, insert it through the opening (13/16" dia.) previously provided in duct or other location and fasten in position by placing bolts or screws through the bulb flange.

RT-221 and RT-223

These regulators have bulb and adjustment separately mounted, install bulb as above and mount the adjustment at a convenient location. The adjustment should be located where it will not be subjected to large variations in temperature.

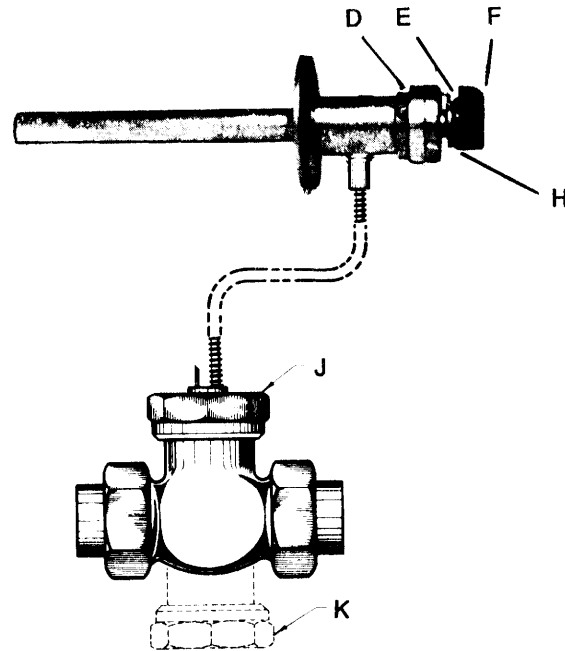


Fig. 1

FLEXIBLE TUBING

Flexible tubing must not be cut, kinked, mashed or unduly twisted. It may be bent on a 1 1/2" radius or larger. Should this tubing be injured to the extent the thermostatic charge is lost, the thermal assembly will need to be replaced. Tubing should be permanently fastened to a rigid location where not subject to rubbing or excessive vibration. It should not be fastened to steam pipes or other locations where subject to extreme temperatures. If the tubing is located in space subject to wide variations in temperature, the regulator will not function properly.

A small loop (about 5" dia.) of tubing next to the valve is recommended to absorb vibration occurring in pipe line.

TEMPERATURE ADJUSTMENT

To raise or lower control point of regulating valve, turn knob "F" (Fig.1) in direction indicated on dial plate. After putting regulator in operation or after change of thermostatic setting, allow at least five minutes for regulator to assume control. In correcting settings, pointer on knob "F" should be waiting to observe effect. Each division on dial equals 10F. The regulator is adjustable between the limits of the temperature range.

CHECKING OPERATION AND SERVICING

In ordinary checking of the regulator operation, make observations, if possible, with a thermometer placed near the regulator bulb and in the medium being heated.

When convenient, a quick way of checking valve operation is to listen for changes in steam flow at the valve. By turning the adjusting knob from one extreme to the other, the flow of steam can be heard to start and stop as the valve opens and closes, providing the regulator is functioning properly. If sufficient time is allowed for steam to condense fully in coils, a sharp point of adjustment setting can be found at which valve opens and closes with slight movement of knob. This is the setting for the temperature existing at the thermostat at the time.

To further check operation, remove the regulator bulb and submerge it alternately in water whose temperature is above and below that of the temperature adjustment setting and listen at the valve for steam flow. With bulb submerged in water above temperature setting, the valve should be closed.

If no heat or inadequate heat is obtained with highest adjustment setting, note whether return line is hot. If not, investigate for stoppage or dirt in trap, strainers, or in steam coils. Then, if necessary, remove cap nut "L" (see "Replacing Thermostatic Motor Unit" below), of regulator valve and investigate for stuck poppet.

If excessive heat is obtained with minimum setting, note first whether return line is cool, which would indicate that excess may come from another source. If steam seems to continue to flow, remove cap nut "L" of regulator valve and investigate seats for dirt. If leakage through dirt on the seat is not located, it is possible that thermostatic system is damaged and not functioning, in which case replacement or repair is necessary.

Failure of temperature regulator would normally produce excess heat since the valve usually fails in open position.

MAINTENANCE AND REPAIRS

This regulator should require very little attention or maintenance but every piece of mechanical equipment deserves some care. The supply line should be kept clear by blowing the line strainer occasionally and cleaning return traps. Valve seats may be cleaned or polished if there are indications of dirt, as above. If serious trouble develops, communicate with our nearest representative.

REPLACING THERMOSTATIC UNIT

The thermostatic unit (valve sizes up to 1-1/2") can be removed from regulators Nos. RT-220, RT-221, RT-222 and RT-223 by simply loosening cap nut "J" (Fig. 1) and lifting out bellows assembly. When replacing, put a small amount of lubricant on threads and sealing surface to prevent galling when cap nut is tightened.

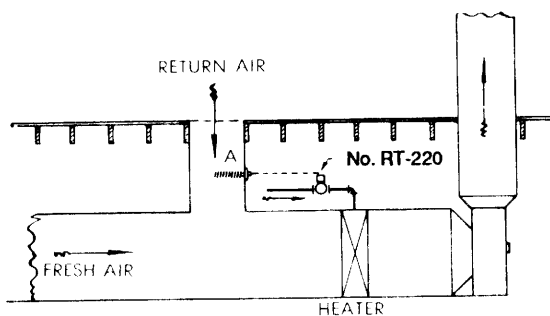
To remove thermostatic unit (valve sizes up to 1 1/2") from regulator No. RT-224 remove cap nut "K" and remove balancing bellows assembly by turning counter-clockwise (right hand thread). Loosen cap nut "J" and lift out bellows assembly as described above for No. RT-220.

IDENTIFICATION OF REPLACEMENTS

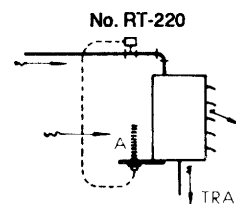
The serial number, tube length, operating temperature, poppet and steam pressure are located on a slip-ring located on top of bonnet "J" (See Fig. 1). In making replacements, these numbers should be checked with those on the replacement parts.

Replacement seat inserts may be identified by comparing port diameters or by fitting to the valve poppet.

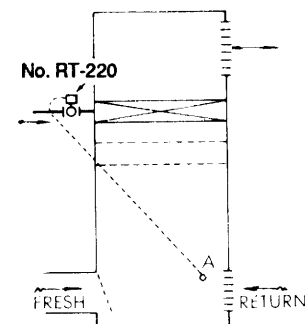
TYPICAL INSTALLATIONS (Other Installations Shown on Page 4)



Central Fan System



Unit Heater Application



Unit Conditioner Application

Fig. 2

TYPICAL INSTALLATIONS

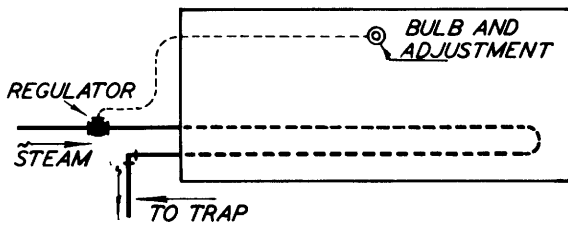


Fig. 3

Where it is desired to have the temperature adjustment outside a drying room or compartment, the control would be installed as above.

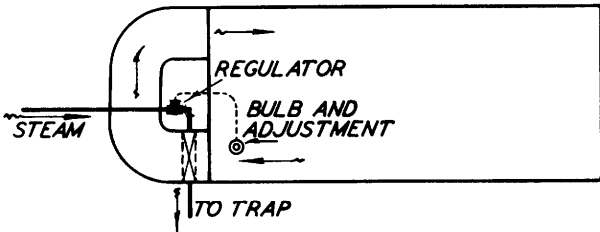


Fig. 4

This drawing shows a regulator controlling temperature of a circulating type dryer.

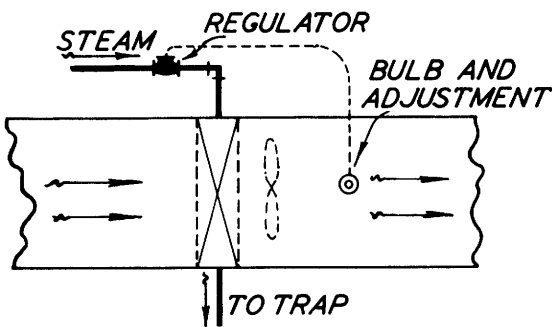


Fig. 5

This is a typical application of regulator to a duct type heater. Preferably, the bulb should be placed about six feet from heater.

DIMENSIONS

Valve Size, Inches.....		1/2	3/4	1	1 1/4	1 1/2
Shipping Wt., Lbs.		14	16	18	19	20
Regulator Nos.	RT-220	A	2 7/8	2 7/8	2 7/8	2 7/8
	RT-221	H and L	6 5/16	6 7/16	6 1/4	7 1/16
	RT-222	A	4	4	4	.....
	RT-223	H and L	6	6 6/16	6	.....
RT-224	A	.....	.....	.....	3 3/4	3 3/4
	E	.....	.....	.....	6 7/16	6 5/16
	H and L	.....	.....	.....	5 9/16	5 9/16

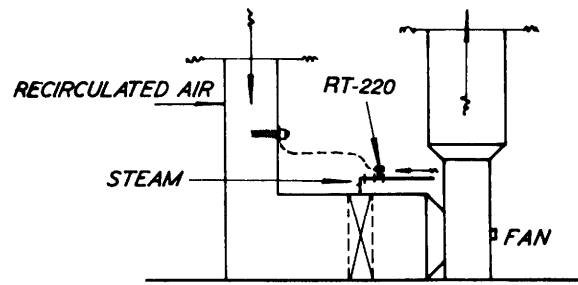
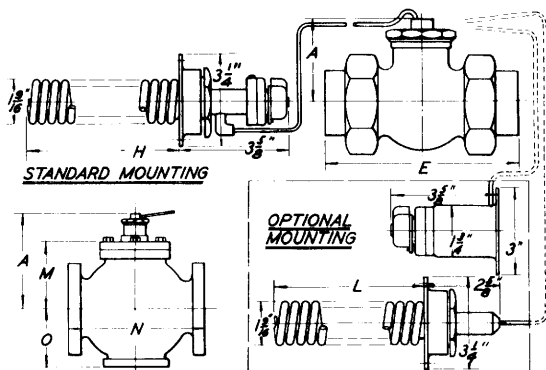


Fig. 6

Showing a duct type heating system with recirculation. Controlling room temperature from recirculated air temperature.

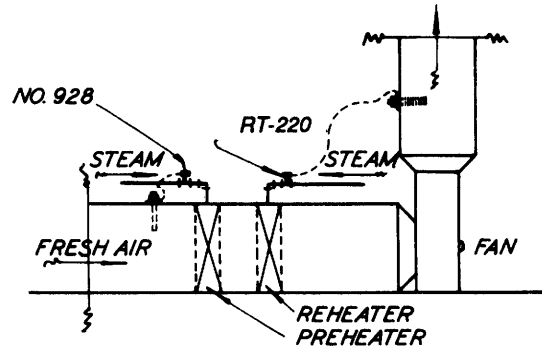


Fig. 7

Ventilating system with preheater and reheater. Providing freezing protection and discharge air temperature control.

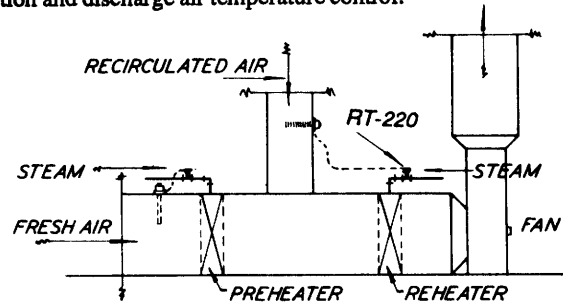


Fig. 8

Heating and ventilating, with preheater. Freezing protection. Room control from recirculated air temperature.

CAPACITIES

Regulator Number and Valve Size	Capacities (Pounds per hour)						Percent Maximum Flow for Temperature Changes on Bulb							
	Steam Pressure (Pounds per square inch)						Degrees F.							
	2	5	6	10	15	25	75	1°	2°	3°	4°	5°	7°	11°
Nos. RT-220, RT-221														
1/2"	100	150	190	240	.....	.....	44	84	95	100	.....	.....	.....	.....
3/4"	145	225	290	370	.....	.....	39	71	90	97	100	.....	.....	.....
1"	160	250	320	410	.....	.....	39	70	87	96	100	.....	.....	.....
1 1/4"	275	435	550	690	.....	.....	27	55	72	84	93	100	.....	.....
1 1/2"	305	485	610	770	.....	.....	25	54	71	81	89	100	.....	.....
Nos. RT-222, RT-223														
1/2" thru 1"	.....	135	195	320	495	25	48	68	84	94	.....	.....	.....	.....
No. RT-224														
1 1/4"	270	.....	500	940	2000	10	21	30	.....	51	68	100	.....	.....
1 1/2"	280	.....	510	960	2100	10	21	31	.....	52	69	100	.....	.....