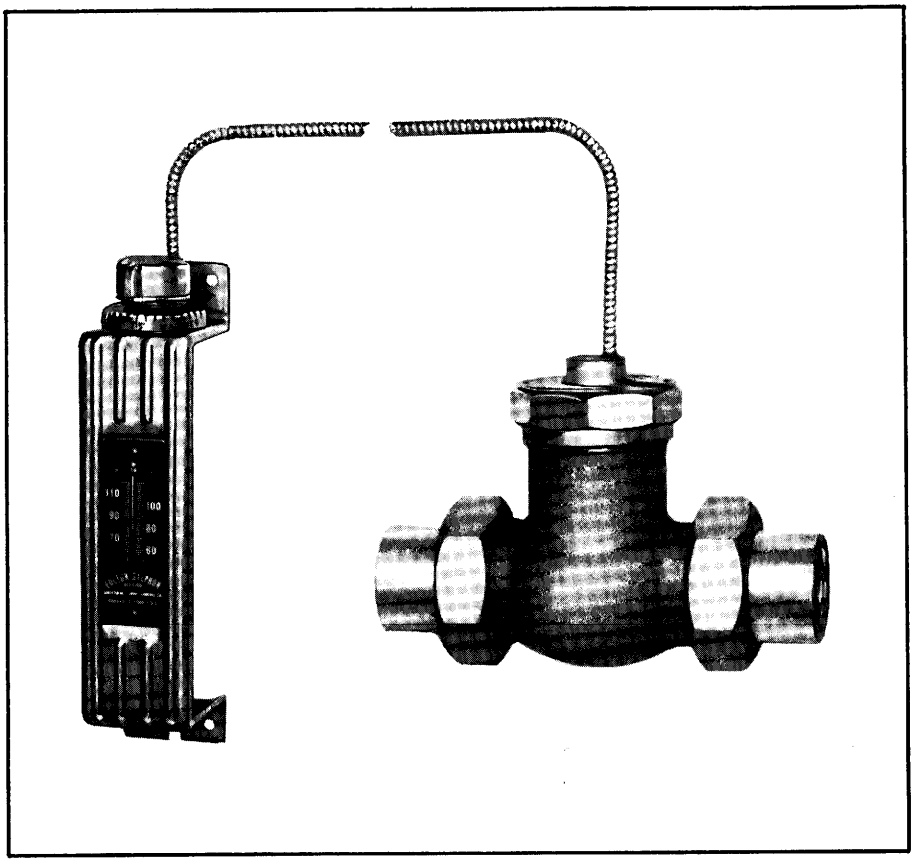


INSTRUCTIONS
FOR
INSTALLATION AND OPERATION
No. RT-207
No. RT-208
No. RT-209
Temperature Regulators

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

Catalog Numbers	Corresponding Model Numbers
RT-207	1040-A, 7-A1, 7-1
RT-208	1040-B, 7-C1, 7-2
RT-209	1040-C, 7-D1, 7-3

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-2024

Rev. A

GENERAL INSTRUCTIONS

No regulator can be satisfactory if improperly installed. Read these instructions carefully before beginning to make 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 of less than 1½" and do not kink or mash the tubing. Do not lift the regulator in a way that strain will be put on the flexible tubing.

If any of the regulators covered by these instructions is used for controlling steam to a unit heater, connected with a trap to gravity return system, a vacuum breaker must be installed between regulating valve and unit heater. A quick-vent valve of suitable venting capacity or a check valve installed to open inwardly, may be used. Ignoring these instructions may result in serious water hammer. If a vacuum return pump is employed, the vacuum breaker is not necessary.

OPERATING PRINCIPLE

This type of regulator automatically controls flow of steam passing through its valve to a direct radiator, unit heater, or duct type heater in response to room temperature changes affecting the bulb of the wall type thermostat.

The bulb contains a thermo-sensitive liquid which expands when heated and passes through the connecting tubing to the bellows chamber in the valve body. This 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 and thus creates 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 or open or close just enough to pass the required amount of steam in response to slight room temperature changes affecting the bulb.

PRESSURE LIMITS

No. RT-207 regulator is suitable for steam pressures up to 15 lbs.; No. RT-208 and No. RT-209 up to 75 lbs. if pressure is reasonably constant. Only No. RT-209 has balanced poppet construction.

VALVE INSTALLATION

Regulating valves are sized in accordance with the 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 (see Fig. 2). Valve sizes 1½" and less may be installed in either a horizontal or vertical run of pipe but horizontal position is preferable.

A strainer should be installed in the inlet line.

Provision should be made to drain the coil or other condenser through a stream 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.

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 quit-vent valve of suitable venting capacity, or a check valve installed to open with steam flow, may be used.

THERMOSTAT INSTALLATION

The correct location of the thermostat is the most important detail of regulator installation. The regulator is responsive to temperature changes of the air surrounding the thermostat and proportions the steam supply in accordance with these temperature changes. If this thermostat is so located that air will be pocketed around it, or where a hot or cold draft will come in contact with it, proper control would not be obtained. Do not install the thermostat on a hot or cold exposed wall. Do no install it in the path of air leaving the heater.

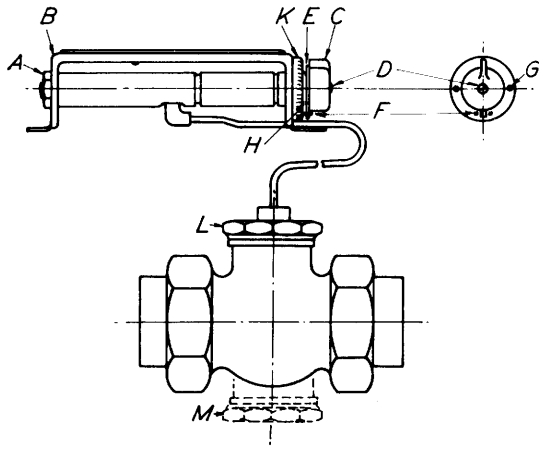
Install the thermostat in a vertical position and locate it about 5 ft. above the floor and on an inside partition or column. The location should provide free circulation or air over and around the thermostat. Fasten the thermostat in place by inserting the screws through the mounting bracket.

Never place the thermostat more than 5 ft. above the valve location unless a special regulator has been ordered for such installation.

When controlling radiation (of any type) or, of convectors distributed along a wall more than 25 or 30 ft. in length, be sure to locate thermostat in approximate center of the control space.

Since these regulators are modulating (gradual opening) type, their use is not recommended for control of pipe coils or continuous convector surface more than 50 ft. in length. For the same reason, the use of orificing is suggested on multiple radiator installations to prevent radiators nearest control valve from taking all the steam on light heating loads.

If necessary to pass the thermostat through a wall or partition, remove thermostat bulb from bracket "B" (Fig. 1) as follows: Remove screw "D" and lift off knob "C," locking ring "E, and tension washer "H." Remove screws "G" and lift off dial plate "K." Remove nut "A." Slip bulb toward adjustment end until it clears bracket and slide out of bracket. Bulb will pass through a 1½" diameter hole. CAUTION—In disassembling, be sure to note position of adjustment parts relative to bracket and reassemble in same position. Do not move adjusting stem after knob "C" is removed.



FLEXIBLE TUBING

Flexible tubing connecting thermostat to valve must not be cut, kinked, mashed or unduly twisted. It may be bent on a 1½" radius or larger. Should this tubing be injured to the extent thermostatic charge is lost, the regulator must be returned to factory for repairs.

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. Not more than 25 ft. of tubing should be exposed to temperatures other than that which is being controlled. The ideal installation is one where the tubing is located wholly within the controlled space.

A small loop of tubing next to the valve is recommended to absorb vibriation occurring in pipe line. Excess tubing should be coiled on reel and fastened.

TEMPERATURE ADJUSTMENT

To raise or lower control point of regulating valve, turn knob "C" (Fig. 1) in direction indicated on dial plate "K." After putting regulator in operation or after any change of thermostatic setting, allow at least five minutes for regulator to assume control. In correcting settings, pointer on knob "C" should be moved only about 1 or 2 degrees at a time (each division of dial "K" represents 1° F.). The regulator is adjustable between the limits of the temperature range.

The temperature adjustment may be locked in position to retain a certain setting and only the person with the proper key to fit the screw "D" (Fig. 1) can change it. To lock the adjustment, remove set screw "D" with wrench provided and lift off knob "C." Leave stem in set position, lift locking ring "E" and replace on splined stem with locking lug on "E" between prongs "F." Replace knob "C" and tighten screw "D."

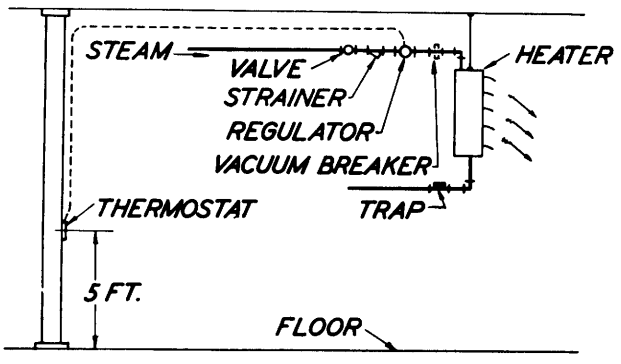
CHECKING OPERATION AND SERVICING

In ordinary checking of regulator operation, make observations with thermometer on the thermostat or one near it. Slowly turn adjusting knob to extreme position in the direction of "cooler" and wait some minutes to allow coils of heater to cool down. Turn knob to extreme "warmer" direction and note whether duct or heater discharge temperature comes up substantially. If both observations are satisfactory, it indicates that the valve will close and open in response to temperature changes at the thermostat. Then reset for the desired temperature by following instructions under "Temperature Adjustment."

If no heat or inadequate heat is obtained with highest adjustment setting, note whether return line is hot and investigate for stoppage or dirt in trap, in inlet strainers, or in air filters or steam coil fins. Then, if necessary, remove cap nut "L" (see "Replacing Thermostatic Motor Union" below) of regulator valve and investigate for a stuck poppet. Failure of temperature regulator would normally produce excess heat.

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 the thermostatic system is damaged and not functioning, in which case, replacement or repair is necessary.

In checking valve operation, it is often convenient to listen at the valve for steam flow as adjusting knob is turned. 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.



MAINTENANCE AND REPAIRS

This regulaor 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 any serious trouble develops, communicate with our nearest representative.

REPLACING THERMOSTATIC MOTOR UNIT

The thermostatic motor unit can be removed from model No. RT-207 (sizes 1½" and smaller) or No. RT-208 by simply loosening cap nut "L" (Fig. 1) and lifting out hot chamber bellows assembly. When replacing, put a small amount of lubricant on threads and sealing surface of valve to prevent galling when bonnet nut is tightened.

To remove the thermostatic motor unit from model No. RT-209, remove bottom cap nut "M", remove balancing bellows by turning counter-clockwise (right hand thread), then loosen cap nut "L" and lift out the hot chamber bellows assembly, the same as on model No. RT-207, as described above.

IDENTIFICATION OF REPLACEMENTS

Nameplate located on top of cap nut "L" shows serial No., pressure, type, tube length, range, poppet and size. In making replacements, these should be checked with those on the replacement parts.

NOTE

In all correspondence to the factory in regard to specific regulators or replacement parts for specific regulators, the serial No. should be referred to for purpose of identification. This serial No. is located on the nameplate on cap nut "L"; or, on older models on the bottom of bulb bracket "B (Fig. 1).

CAPACITIES

No. RT-207 Regulator

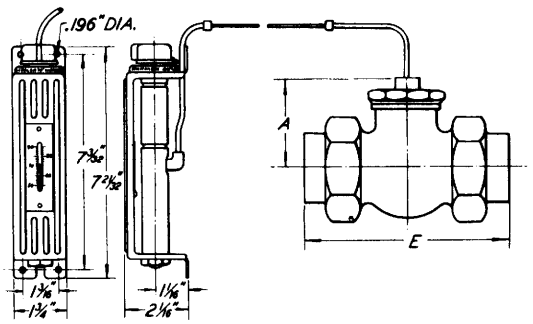
Valve Size Inches	Capacities (Pounds per hour)				Percent Maximum Flow for Temperature Changes				
	Steam Pressure (Pounds per square inch)				Temperature Change on Thermostat—Degrees F.				
					1°	2°	3°	4°	5°
	2	6	10	15	Percent Maximum Flow				
½	100	150	190	240	44	84	95	100	.....
¾	145	225	290	370	39	71	90	97	100
1	160	250	320	410	39	70	87	96	100
1¼	275	435	550	690	27	55	72	84	93
1½	305	485	610	770	25	54	71	81	89

No. RT-208 Regulator

	Steam Pressure (Pounds per square inch)								
	5	10	25	75					
½ thru 1	135	195	320	495	25	48	68	84	94

No. RT-209 Regulator

	Steam Pressure (Pounds per square inch)				Temperature Change on Thermostat—Degrees F.			
	5	10	25	75	1°	2°	3°	5°
					Percent Maximum Flow			
1¼	270	500	940	2000	10	21	30	51
1½	280	510	960	2100	10	21	31	52



DIMENSIONS

Valve Size, Inches			½	¾	1	1¼	1½
Shipping Wt., Lbs.			13	14	15	16	17
Regulator Nos.	RT-207	A	2⅞	2⅞	2⅞	2⅞	2⅞
		E	6 3/16	6 7/16	6⅛	6¼	7 1/16
	RT-208	A	4	4	4	.....	.....
		E	6	6 9/16	6	.....	.....
	RT-209	A	.....	.....	.....	3¾	3¾
		E	.....	.....	.....	6 7/16	6 15/16

TYPICAL INSTALLATIONS

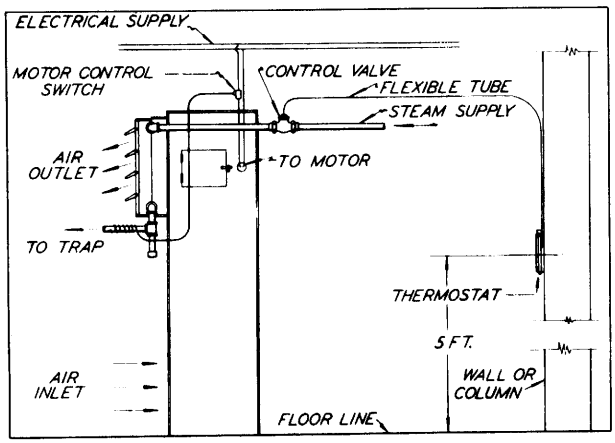


Fig. 4 – A No. RT-207 Regulator controlling low pressure steam supply to a floor type unit heater. Thermostatic switch is shown for stopping motor when steam supply is cut off by regulator or by main steam valve. Motor automatically starts when steam is turned on.

This regulator would be installed on a ceiling type unit heater in the same manner.

Of course, the motor control switch can be omitted, if not desired.

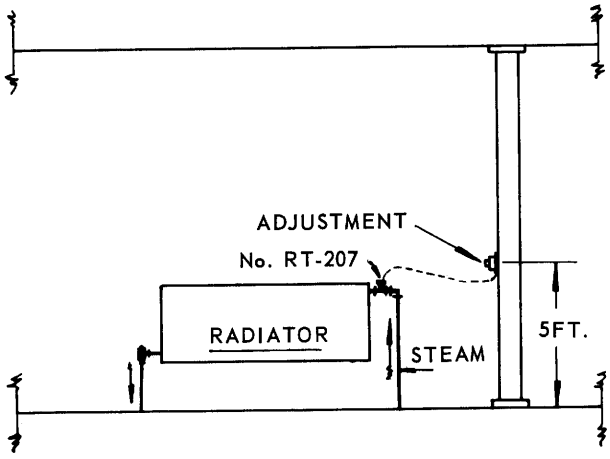


Fig. 4 – The above drawing shows a No. RT-207 regulator controlling low pressure steam to a large radiator of either the wall or ceiling type.

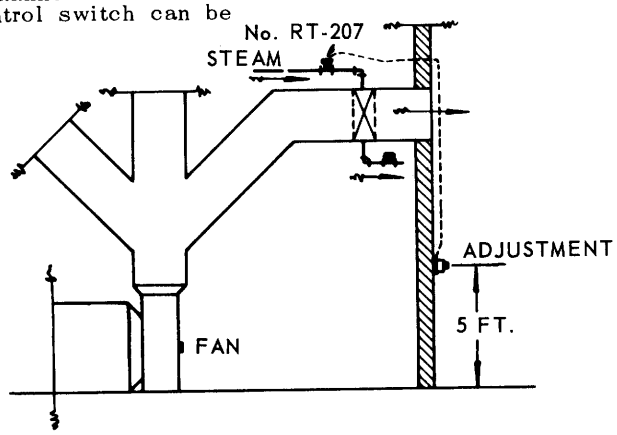
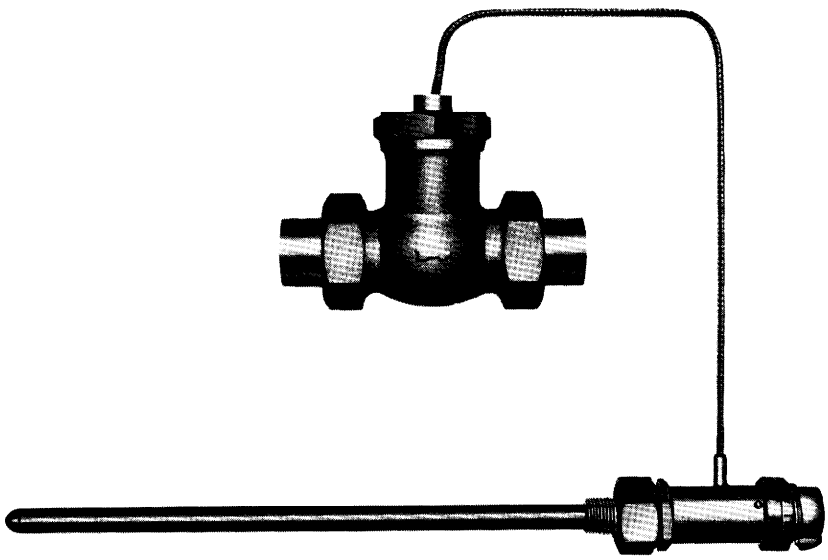


Fig. 5 – Heating and Ventilating. Blast central heating system. No. RT-207 regulator controlling steam supply to booster heater.



Instructions For Installation and Operation

STANDARD MOUNTING

RT-210

RT-212

RT-214

OPTIONAL MOUNTING

RT-213

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

Catalog Numbers	Corresponding Model Numbers
RT-210	1041-A, 928-D1, 928
RT-212	1041-C, 928-F1, 928-2
RT-213	1041-D, 928-F2, 928-2
RT-214	1041-E, 928-G1, 928-3

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-2045

Rev. A

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 1½". 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 the temperatures to be controlled are not in excess of 170°F. 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 in the valve body. This 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; 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-210 regulator is suitable for steam pressures up to 15 lbs., RT-212, RT-213, and RT-214, up to 75 lbs. if pressure is reasonably constant. Only the RT-214 regulator has balanced poppet construction.

VALVE INSTALLATION

Regulating valves are sized in accordance with the demand of the heater or other unit to be controlled. Valve sizes 1½" and less may be installed in either a horizontal or vertical run of pipe but horizontal position is preferable.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.

Installation of a "Y" strainer ahead of the valve is recommended.

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 or 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, the bulb most not be placed where cold inlet water will flow directly over it. The bulb must be placed over the heating coil — not below or to the side of it — and not closer to the coil than 4".

RT-210, RT-212 and RT-214 — these regultors have a tubular bulb and are used to control temperature of liquids. In many vessels an opening is provided for a temperature regulator bulb; in others, a suitable opening must be provided. The bulb may be installed either horizontally or vertically. To install bulb, loosen union plug "C." Be sure the gasket is in place between bulb bushing "B" and plug "C."

RT-213 — 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.

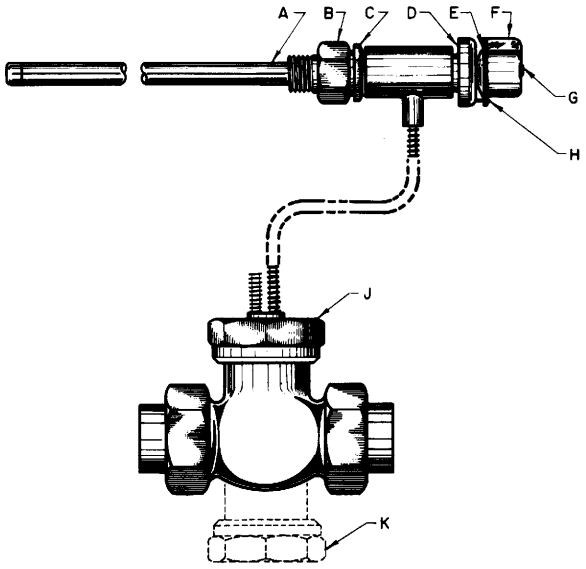


Fig. 1

FLEXIBLE TUBING

Flexible tubing must not be cut, kinked, mashed or unduly twisted. It may be bent on a 1½" radius or larger. Should this tubing be injured to the extent the thermostatic charge is lost, the regulator must be returned to the factory for repairs.

Tubing should be permanently fastened to a rigid location where it is 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 any change of thermostatic setting, allow at least 5 minutes for regulator to assume control. In correcting settings, pointer on knob "F" should be moved only about 1 or 2 degrees at a time and then wait to observe effect. Each division on dial equals 1°F. The regulator is adjustable between the limits of the temperature range.

The temperature adjustment may be locked in position to retain a certain setting and only the person with the proper key to fit the screw "G" (Fig. 1), can change it. To lock the adjustment, remove screw "G" with wrench provided and lift off knob "F." Leave stem in set position, lift locking ring "E" and replace on splined stem with locking lug on "E" between prongs "H." Replace knob and tighten screw "G."

CHECKING, OPERATION & 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 the temperture setting, the valve should be closed.

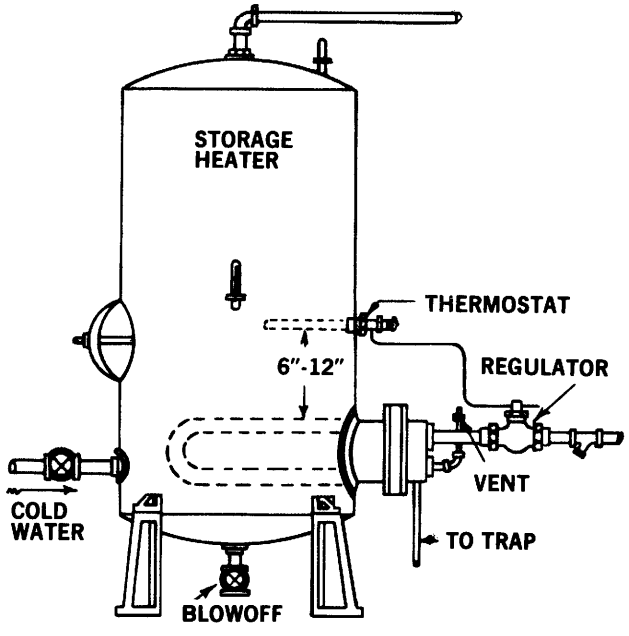


Fig. 2

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 "J" (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 "J" 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 & 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 MOTOR UNIT

The thermostatic motor unit (valve sizes up to 1 ½") can be removed from regulators RT-210, RT-212 or RT-213, 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 motor unit (valve sizes 1 ¼" and 1 ½") from regulator RT-214, 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 RT-210.

IDENTIFICATION OF REPLACEMENTS

The serial number, tube length, operating temperature, poppet and steam pressure are located on a slipring 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.

CAPACITIES

Regulator Number & Valve Size	Capacities (Pounds per hour) Steam Pressure (Pounds per square inch)							Percent Maximum Flow for Temperature Changes on Bulb. Degrees F.						
	2	5	6	10	15	25	75	1°	2°	3°	4°	5°	7°	11°
RT-210														
½"	100	—	150	190	240	—	—	44	84	95	100	—	—	—
¾"	145	—	225	290	370	—	—	39	71	90	97	100	—	—
1"	160	—	250	320	410	—	—	39	70	87	96	100	—	—
1¼"	275	—	435	550	690	—	—	27	55	72	84	93	100	—
1½"	305	—	485	610	770	—	—	25	54	71	81	89	100	—
RT-212, RT-213 ½" thru 1"	—	135	—	195	—	320	495	25	48	68	84	94	—	—
RT-214														
1¼"	—	270	—	500	—	940	2000	10	21	30	—	51	68	100
1½"	—	280	—	510	—	960	2100	10	21	31	—	52	69	100

TYPICAL INSTALLATIONS

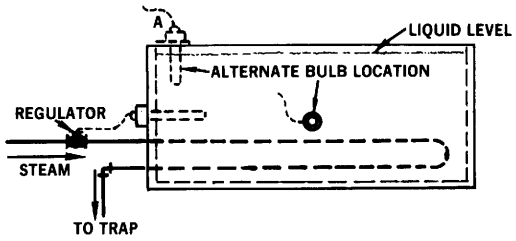


Fig. 3 — Showing regulator installed on open type tank. If bulb is to be installed as shown at "A," an extension type should be used in order to have the active part of the bulb completely submerged.

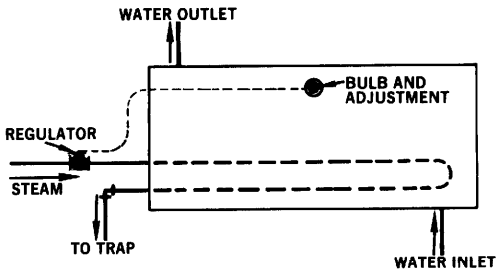
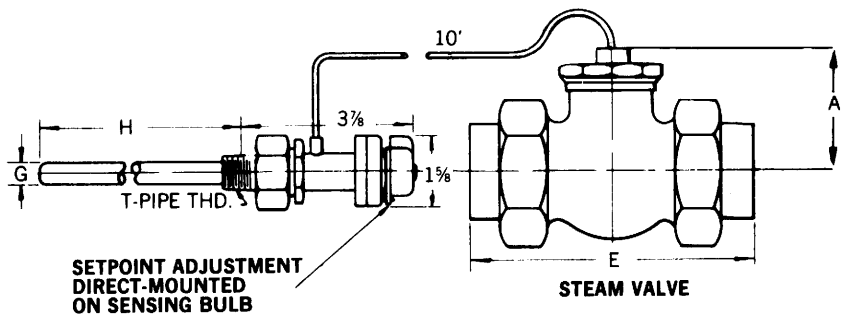


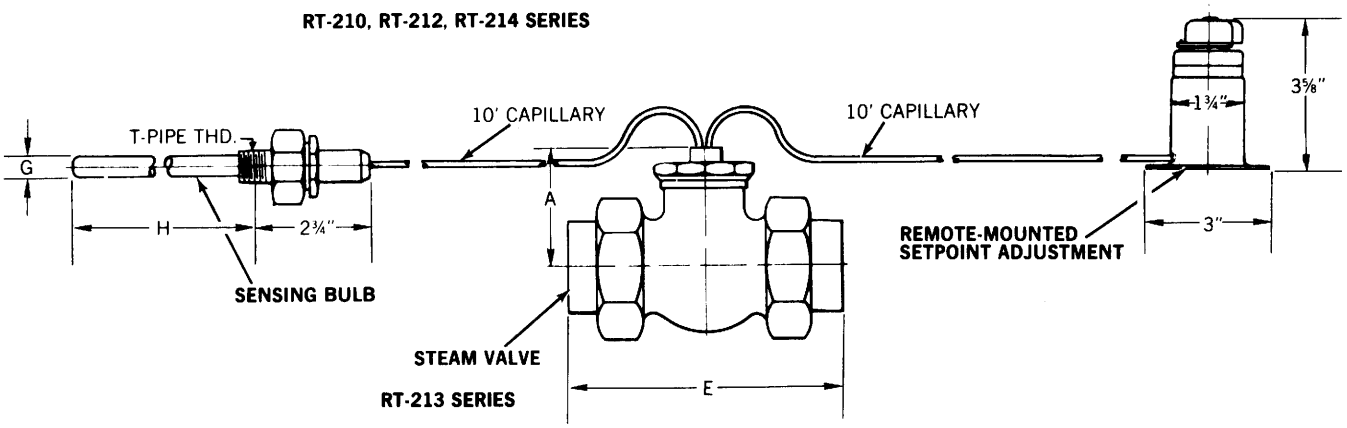
Fig. 4 — This drawing shows a regulator controlling steam supply to a closed tank or storage type water heater. Instantaneous type heater could be controlled by placing bulb in hot water outlet line and close up to heater.

DIMENSIONS



RT-210, RT-212, RT-214 SERIES

Valve Size, Inches			½	¾	1	1¼	1½
Shipping Wt., Lbs.			14	14	15	17	20
Regulator Nos.	RT-210	A	2-7/8	2-7/8	2-7/8	2-7/8	2-7/8
		E	6-3/16	6-7/16	6-1/8	6-1/4	7-1/16
		G	1/2	1/2	1/2	1/2	1/2
		H	14 1/2	14 1/2	14 1/2	14 1/2	14 1/2
	RT-212 RT-213	A	4	4	4	—	—
		E	6	6-9/16	6	—	—
		G	1/2	1/2	1/2	—	—
		H	14 1/2	14 1/2	14 1/2	—	—
	RT-214	A	—	—	—	3-3/4	3-3/4
		E	—	—	—	6-7/16	6-15/16
		G	—	—	—	1/2	1/2
		H	—	—	—	14 1/2	14 1/2



RT-213 SERIES

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Industrial Products Division

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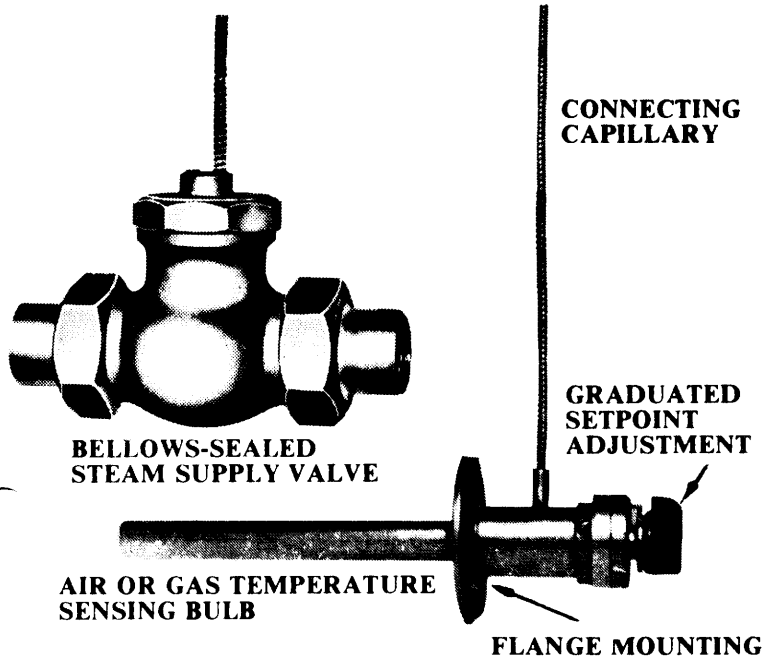
Q-3519 (3/83) **Printed in U.S.A.**

Robertshaw

Temperature Regulators

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INSTRUCTIONS FOR INSTALLATION AND OPERATION



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

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

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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 seperately 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.

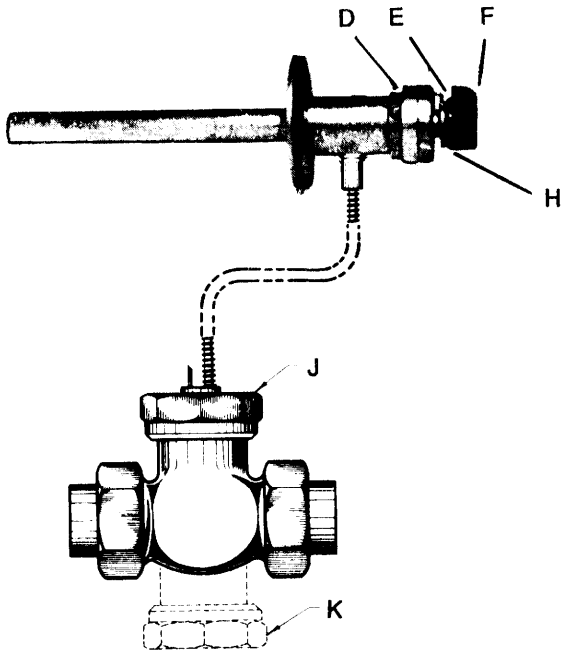


Fig. 1

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 occuring 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 1oF. 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 thr 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.

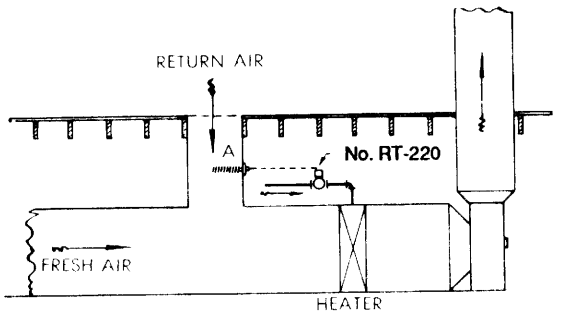
IDENTIFICATION OF REPLACEMENTS

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.

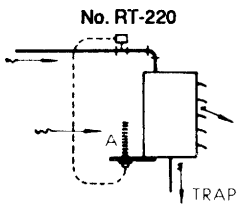
Replacement seat inserts may be identified by comparing port diameters or by fitting to the valve poppet.

TYPICAL INSTALLATIONS

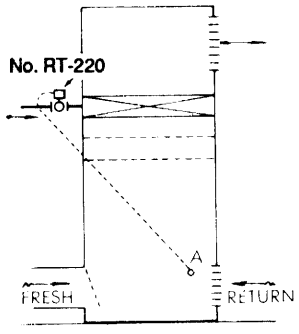
(Other Installations Shown on Page 4)



Central Fan System



Unit Heater Application



Unit Conditioner Applicaton

Fig. 2

TYPICAL INSTALLATIONS

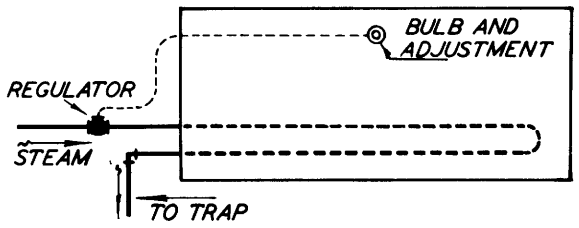


Fig. 3

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

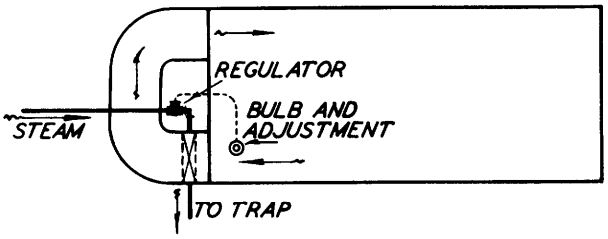


Fig. 4

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

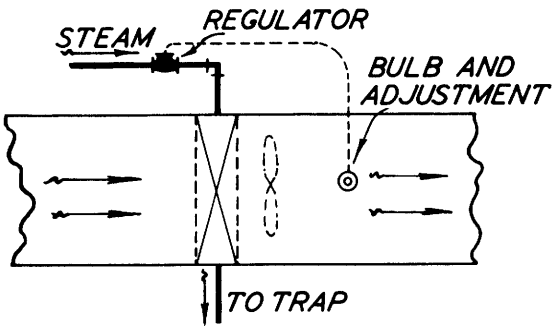
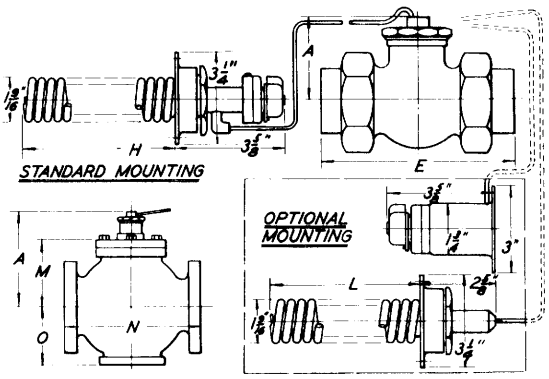


Fig. 5

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			½	¾	1	1¼	1½
Shipping Wt., Lbs.			14	16	18	19	20
Regulator Nos.	RT-220 RT-221	A	2⅞	2⅞	2⅞	2⅞	2⅞
		E	6 3/16	6 7/16	6⅛	6¼	7 1/16
		H and L	5 9/16	5 9/16	5 9/16	5 9/16	5 9/16
	RT-222 RT-223	A	4	4	4	.....	.....
		E	6	6 9/16	6	.....	.....
		H and L	5 9/16	5 9/16	5 9/16	.....	.....
	RT-224	A	.....	.....	.....	3¾	3¾
		E	.....	.....	.....	6 7/16	6 15/16
		H and L	.....	.....	.....	5 9/16	5 9/16



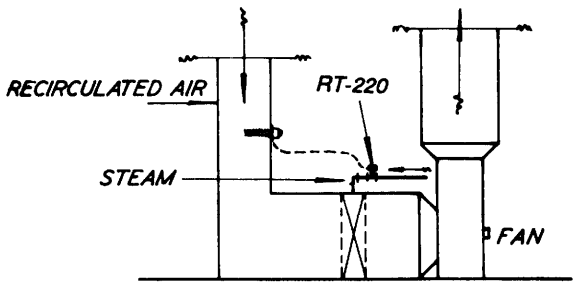


Fig. 6

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

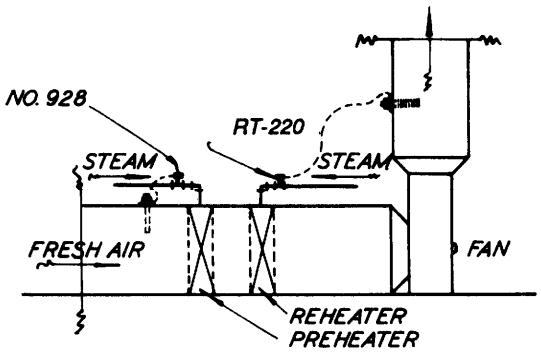


Fig. 7

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

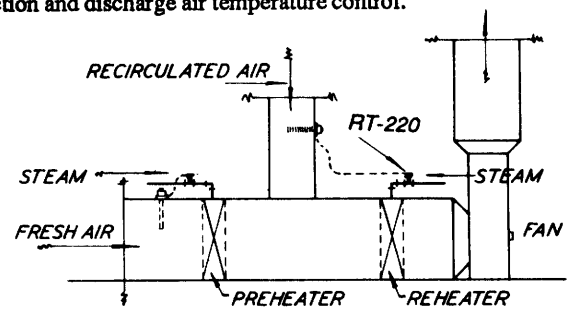


Fig. 8

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

CAPACITIES

Regulator Number and Valve Size	Capacities (Pounds per hour) Steam Pressure (Pounds per square inch)							Percent Maximum Flow for Temperature Changes on Bulb Degrees F.						
	2	5	6	10	15	25	75	1°	2°	3°	4°	5°	7°	11°
Nos. RT-220, RT-221														
½"	100	.....	150	190	240	.....	.....	44	84	95	100	.....	.....	.....
¾"	145	.....	225	290	370	.....	.....	39	71	90	97	100	.....	.....
1"	160	.....	250	320	410	.....	.....	39	70	87	96	100	.....	.....
1¼"	275	.....	435	550	690	.....	.....	27	55	72	84	93	100	.....
1½"	305	.....	485	610	770	.....	.....	25	54	71	81	89	100	.....
Nos. RT-222, RT-223														
½" thru 1"	.....	135	.....	195	.....	320	495	25	48	68	84	94	.....	.....
No. RT-224														
1¼"	270	.....	.....	500	.....	940	2000	10	21	30	.....	51	68	100
1½"	280	.....	.....	510	.....	960	2100	10	21	31	.....	52	69	100

Q-3909 (7/91)