SERVICING STEAM TRAPS

The proper functioning of the traps being such a vital factor in the operation of a steam heating system it is quite common for architects, heating contractors, operating engineers and owners to attribute all the deficiencies and ailments in a system to the improper operation of the traps. Most frequently, however, the difficulties encountered on MEPCO systems are due entirely, or at least in part, to causes entirely foreign to the operation of the traps, so for that reason it is well to outline common sources for trouble in no way caused by the traps.

Such sources for difficulties in steam heating systems can be generally classified into four groups; (1) Faults in the Design of the Heating System, (2) Faults in the Installation of the Heating System, (3) Misapplication, and (4) Abnormal Conditions.

1. Faults in the Design of the Heating System;

(a) Insufficient or improper distribution of radiation.

(b) Inadequate boiler capacity.

(c) Improper chimney design.

(d) Inadequate pipe sizes.

(e) Piping improperly planned.

(f) Improper selection of heating equipment.

2. Faults in the Installation of the Heating System
(a) Water seals, sags, or pockets in the piping.

(b) Lack of air loops in returns over doors or other obstructions.

(c) Improper or insufficient grade in the piping.

(d) Leaks in the system at fittings, valves, between radiator sections, etc.

(e) Direct cross connections between steam and return lines.

(f) Pipe not reamed.

(g) Lack of proper provision for expansion.

(h) Heating appliances or equipment improperly installed.

(i) Improper or lack of insulation on piping run in very cold spaces.

3. Misapplication

(a) Heating appliances or equipment not designed or intended for pressures and/or service on which it is used.

(b) Heating appliances or equipment of improper capacity for the duty expected of it.

4. Abnormal Conditions

(a) Priming boiler.

(b) Poor draft.

(c) Dirt, scale or other foreign matter in the traps and system.

(d) Clogged piping preventing proper flow of steam or condensate.

(e) Corrosion due to the chemical content of the steam.

(f) Superheat.

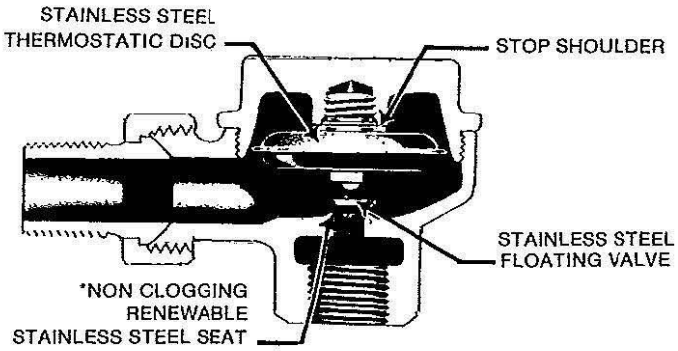
(g) Freezing.

Therefore, before criticizing or condemning the traps on a heating system, the above sources of trouble must be carefully investigated to be sure that they do not at least contribute to the difficuity.

Steam trap, like all other mechanical devices, are subject to wear and tear and will in time require replacement of some parts in order that the system may be continually maintained at its original efficiency. The length of time before such replacements become necessary cannot, of course, be accurately determined as operating conditions vary greatly in different installations. It should be remembered at all times that the life of a trap or any other mechanical device subject to steam pressure tends to decrease as the pressure to which it is normally subjected increases. It is, therefore, always desirable to operate all classes of steam using equipment at the minimum pressure consistent with the result desired. In low pressure heating systems just enough pressure should be used to secure proper circulation. If more than two pounds per square inch pressure is necessary to secure circulation something is wrong, and a thorough check of the system should be made.

SERVICING LOW PRESSURE THERMOSTATIC TRAPS

The temperature of the water in the return mains in a low pressure steam heating system can be an index of the operating condition of the traps. Return mains will always be hot. Water condensed from steam leaves the radiator at substantially steam temperature. This is 212 degrees Fahrenheit for zero gauge pressure and increases as the pressure increases. The temperature of the condensate will be a few degrees less than this when it enters the return and, of course, there will be a further drop in temperature as it passes along through the return mains. The return water temperature on the average system in good operating condition will approximate 160 degrees Fahrenheit when the steam pressure maintained does not exceed two

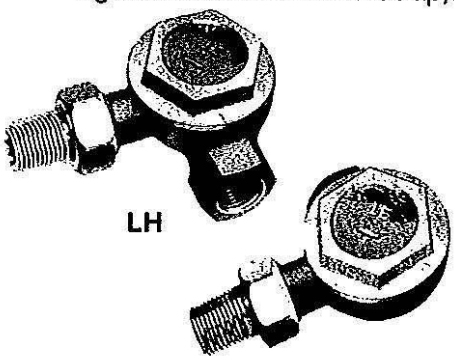


(2) pounds gauge. If higher pressures are carried, the temperature may be higher than this even though the traps are in excellent operating condition. Even with traps in excellent operating condition and the steam pressure maintained at two (2) pounds, it is possible that the temperature of the condensate may exceed 160 degrees Fahrenheit if the returns are covered or if the temperature is taken at or near the discharge connection of a trap. Since the touch cannot distinguish relative temperatures very readily when the temperature exceeds 150 degrees Fahrenheit, it is obvious that nothing can be determined with certainty by the touch except after extended experience and practice, so the use of a thermometer is the reliable way to determine return line temperatures.

A convenient means of determining the condition of the traps on a job is to raise the steam pressure on the system to approximately five to eight pounds and determine the traps which are passing steam by a distinct hissing sound. In some instances a slight water hammer in the return piping is made by leaking traps under such pressure. Or it is possible to locate leaking traps by tracing down the hottest returns, beginning at the vent or drip trap. If the return is relatively cool in places but is found to be hot in one particular spot, it is certain that a trap discharges into the return main somewhere near that location or if not, a "cross connection" or "short circuit" exists between the steam and return mains at that point. By "cross connection" or "short circuit" we mean that some piping connection permits steam to pass directly into the return piping instead of through a trap.

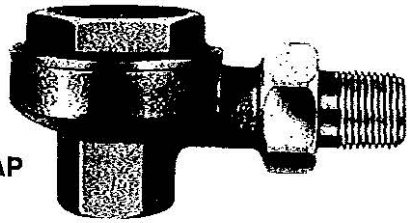
If a building has remained unheated during severe winter weather so the piping, radiation, traps, etc. are at a temperature below freezing, always, before firing up the boiler, close the valve in the steam header if one is there, or if not, close all valves ahead of radiators, unit heaters, etc. Then, raise the boiler pressure to at least five pounds before turning steam into the system or radiators, etc. If this is not done the first puff of vapor reaching the ice cold traps will turn into frost and seal the trap so the condensate which comes into it freezes, resulting in damage to the thermostatic trap disc. Occasionally you will find a job where noise will emanate from the radiator traps. This noise is often characterized as "singing" but the sound ranges from a high-pitched hum to a low pitched "snoring" sound.

This noise is caused by a back flow through the trap. It occurs most frequently when a radiator is shut off or the radiator valve is partly closed, whereby there is a tendency for a high vacuum to form in the radiator, in combination with sags or pockets in the return piping where water can accumulate at or near the outlet of the trap. Under such conditions there is a tendency for the condensate to flow from these sags or pockets in the return piping into the radiator. The condensate is flowing into the outlet side of the trap, which is initially partly open, causes the thermostatic element to expand in an attempt to close the trap. The flow of the condensate through the trap while the disc is attempting to close off more tightly results in the noise.



This condition is aggravated where radiators are closed off and windows opened, as in hotels when guests retire. In this case the vacuum formed in the radiator is increased due to the high condensing action produced.

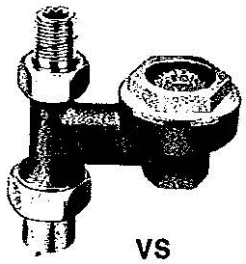
Similarly, in cold weather when radiators are turned off even though windows are not open, steam condenses relatively rapid and consequently the vacuums created are correspondingly increased.


AP

The method of corrections to remove the cause. Since the cause is partly "an induced vacuum in the radiator greater than the vacuum on the outlet of the trap", in combination with piping conditions which enable water to flow backwards, the remedy is to eliminate all pockets in the piping which permit water to accumulate. When a radiator valve is closed off where traps are leaking steam, the back flow of steam, caused by an induced vacuum in the radiator which is greater than the vacuum in the return, will often result in noise. The remedy in such instances is to clean the traps and replace any faulty ones.

We wish to emphasize that "noisy" traps not only occur on systems using MEPCO traps but have and will occur with any other make of thermostatic trap under the conditions outlined above regardless of the style of thermostatic element, shape of the valve, or other construction feature of the trap. When traps are found to be leaking steam, the following steps are to be taken in the order stated:

1. Shut off the steam supply to the radiator, heating unit, or drip trap and permit the trap to cool to prevent possible rupture or distortion of the disc. Then . . .


VS

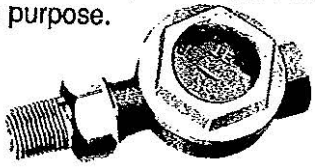
2. Remove the cap and disc assembly from the trap body with a trap wrench or monkey wrench. (DO NOT USE A PIPE WRENCH)

3. Wipe out the trap body with a soft rag moistened in kerosene.

4. Inspect the valve seat in the body, being sure that any accumulation of scale is removed and that the seat is not cut or pitted, as a perfectly smooth seating surface is essential.

5. Wipe off the exposed surface of the thermostatic disc in the cap, but DO NOT REMOVE the disc from the cap nor alter its adjustment.

6. The valve which is attached to the disc by a swivel connection must be free to turn and be smooth and clean. Remove any scale deposit by rubbing the flat surface on a clean leather shoe sole, but DO NOT USE a file or abrasive for this purpose.


SW

7. Inspect for dirt in the nipple connection. Many times it will be found that the above is all that is necessary to permit a trap to function properly as dirt, scale, or other foreign matter is the most prevalent source of trap difficulties.

8. If there is any doubt that the thermostatic disc is functioning properly, the most positive way to determine this is to test it on what is called a "test rack". In fact, the use of a test rack is necessary where it is found advisable to test any quantity of traps on a job. In this regard, if any appreciable number of traps is faulty, all of the traps should be tested at one time, as a few inoperative traps upset the entire system.

9. This test rack should consist of a necessary pipe, fittings, and valves to connect a valved line from a convenient source of low pressure steam, connected into a valved line for cold water, (maximum pressure 15 psi) terminating with a trap body of the size or sizes to fit the caps and discs to be tested. The body for testing purposes must be in perfect condition. A sketch indicating the connections for a test rack is indicated in Form No. 2D-9-1. It must be remembered that a trap functions somewhat as a thermometer, so after turning steam into a cold trap it will pass a slight amount of vapor for a few seconds until the trap comes up to temperature equal to the temperature of the steam. That is, the thermostatic disc will not close immediately. If the disc in the trap was so adjusted that it would close as soon as the steam came in contact with it, it would cause the trap to hold an excessive quantity of water in the radiator or heating unit. After the cap and disc has been tested for steam, close the valve in the steam line and open the valve in the cold water line, and check to be sure the thermostatic disc will contract to pass water freely.

10. Be sure the top edge of the trap body and the bottom surface of the cap flange on all traps inspected are clean, and on traps larger than the No. 1 size, clean out all of the old gasket material and replace the gasket with a new one of proper thickness and diameter. (see Form No. 2D-9-1)

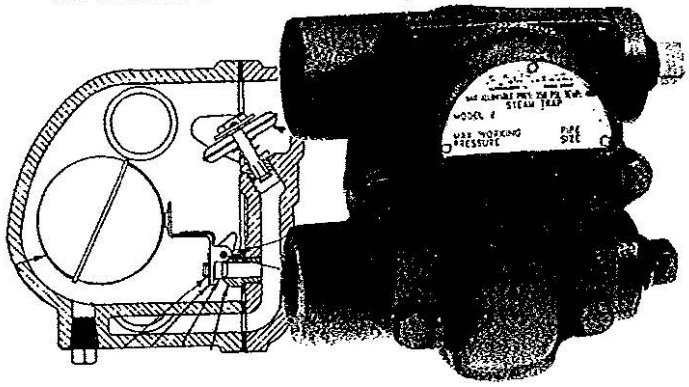
11. Replace the tested cap and disc assembly on the body tightly as far as possible by hand and finally secure a tight contact of the cap flange with the top of the body by tapping the wrench handle with a light hammer.

Occasionally you may find low pressure thermostatic trap bodies in which the seat has become cut or damaged so that the thermostatic disc valve cannot close tightly. If the trap body is of the "removable seat type" the remedy is, install a new seat. If the trap body is of the "standard type", that is, the valve seat is an integral part of the trap body (as in the No. 1, 2, and 3 traps) the seat can be renewed as described in Form No. 2503. Seats in the cast iron body low pressure thermostatic traps (Nos. 4, 4A, 5, 5A, 6 and 7) can only be properly renewed at the factory. In ordering replacement parts, refer to Form No. 2503 for MEPCO (formerly Dunham-Bush) repair parts and Form No. 2508 for genuine Warren Webster repair parts.

SERVICING FLOAT AND THERMOSTATIC TRAPS

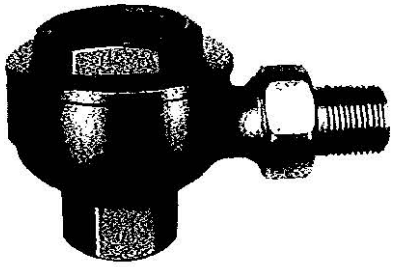
This type of trap, due to the large quantities of water which they handle, will, if they are allowed to become in a state of disrepair, permit large quantities of steam to enter the return piping although are less prone to do so than large thermostatic drip traps due to the float and thermostatic trap having a relatively large float valve and seat sealed in water. Consequently,when checking the traps on a job, start at the drip traps. The thermostatic member or element of the float and thermostatic trap should be examined first. This portion of the trap is serviced the same as the low pressure thermostatic trap. Next remove the cast iron body enclosing the float mechanism and be sure that it is thoroughly free from dirt and sediment. Then, inspect the float mechanism being sure that the float valve and seat are free from scale and have not become worn or pitted. If the seating surfaces are not in perfect condition they should be replaced. If the wear on the valve and seat is slight, many times the sealing surfaces can be "touched up" with valve grinding compound so that they will seat tightly. If the float mechanism linkage is worn or the float ball has been damaged these parts should be replaced. Lubricate the pivot or fulcrum pins of the float mechanism with graphite paste. Before placing the cast iron body of the float and thermostatic trap on the cap be sure that the float valve is on its seat. On the older type of float and thermostatic traps it is possible to reassemble the trap with the float mechanism "locked up" so the float valve cannot seat, and thus steam will pass directly through the trap into the return.

When cleaning traps always be sure that all strainers are cleaned and that all scale pockets are emptied.

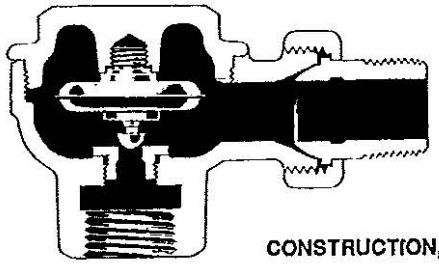


SERVICING MEDIUM PRESSURE THERMOSTATIC TRAPS

The servicing of medium pressure traps is similar to the servicing of low pressure thermostatic traps. However, due to the pressures to which medium pressure traps are normally subjected it is to be expected that they will require more frequent attention than the low pressure thermostatic traps.



THERMOSTATIC TRAP, NO. TH1A

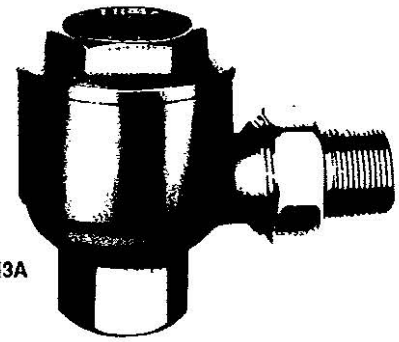


CONSTRUCTION, NO TH1A TRAP

In testing medium pressure thermostatic traps, do not mistake re-evaporation for leaking steam. Steam (whether wet or dry) at atmospheric pressure (zero pounds gauge) has a temperature of 212 degrees Fahrenheit. At three (3) pounds gauge the steam temperature is 222 degrees Fahrenheit. If water, is discharged from an enclosure where this condition of pressure and temperature prevails, into the atmosphere the 222 degrees Fahrenheit water will boil, i.e. turn into steam and this action will continue until the water temperature has been reduced to 212 degrees Fahrenheit. This action of water turning to steam in passing from a higher pressure to a lower pressure is known as "re-evaporation". It follows that the higher

the pressure in the vessel or enclosure the greater the quantity of re-evaporation when discharging into a lower pressure. The maximum working pressure for the MEPCO medium pressure thermostatic trap is 60 lbs. gauge which means that water will leave the trap at approximately 307 degrees Fahrenheit at that pressure so when a medium pressure thermostatic trap discharges to the atmosphere there is bound to be a large quantity of re-evaporation from the water.

All three (3) sizes of the MEPCO medium pressure thermostatic trap have "screw-in" renewable seats and renewable valves on the thermostatic disc. This applies to the old style Nos. 13, 14, and 15 traps. The thermostatic discs in the old style 13, 14 and 15 were attached to the trap cap, similar to the manner in which the discs are attached to the caps on the low pressure thermostatic trap.



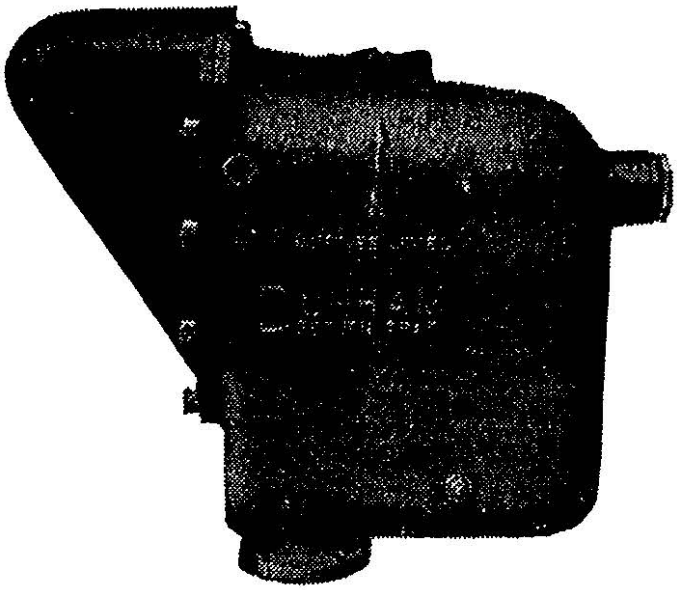
TRAP NOS. TH2A, TH3A

The more recent "TH" Series high pressure thermostatic trap is for pressures 5 to 100 lbs. All three (3) sizes have replaceable stop shoulder type discs and valve seats.

RETURN TRAPS

RETURN TRAPS (These traps are no longer available)

Difficulties with return traps arise from one of three general causes;



1) Those due to the installation.

2) Those due to faulty installation of other accessories aside from the return trap.

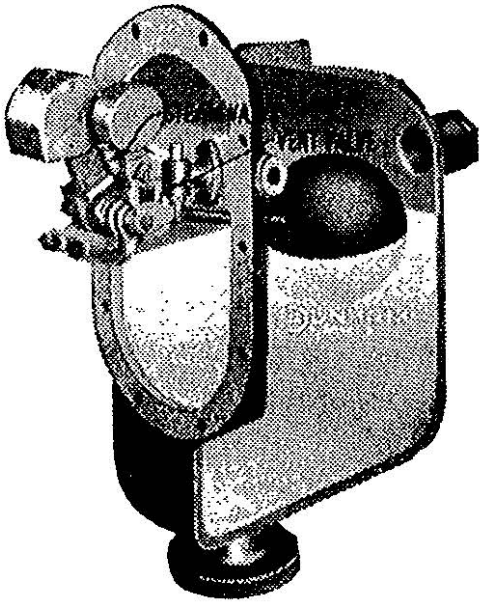
3) Those due to the return trap.

The majority of difficulties encountered will be from the first two (2) causes. Therefore, first of all be sure that the return trap installation has been made in keeping with our standard installation details and has been set level and plumb.

Sometimes a return trap will operate continuously; that is, as soon as it has emptied, it will fill and empty again; this following in rapid succession. When this trouble occurs it is usually caused by a leaky check valve in the discharge line or pipe from the return trap, so the water which was discharged is re--entering the trap through the discharge pipe as the check valve in that line is not seating tightly. In instances where the return trap is working up to its capacity, this should not be mistaken for check valve trouble. Ordinarily, with a little experience, it is not difficult to obtain at least a close approximation of the radiation load on a return trap job and by taking into consideration the height of the trap above the boiler water line and the outside weather conditions determine whether the return trap is operating at more frequent intervals than should be necessary. However, if there is any doubt whether it is a case of a leaky discharge check valve or the trap operating up to capacity, by all means examine this check valve. This can be done by closing the valves on the steam and return lines if there are such valves, or by permitting the system to cool, and draining the boiler to a point below the check valve.

The return trap will not operate until the pressure on the boiler exceeds the static head due to the water column between the water line of the boiler and the return main. Thus, in mild weather when only a low pressure is required, the system may be operated for weeks without the return trap functioning except to release air through it. This operation, is no sign of trouble with the trap.

The steam supply connection to the return trap must always be taken off from the boiler steam header in such a manner that water is not carried into the return trap. Care must also be taken that this line is free from foreign matter.



Return Trap

If water is carried into the steam tapping of the return trap there is greater likelihood of foreign matter being carried into the trap than if only dry steam is taken through the equalizing pipe. The size of this steam supply pipe is important. If it is relatively long it should be one size larger than the tapping, or covering it will normally compensate for it being undersize. Steam always blows from the vent of a return trap immediately after it has emptied.

If a very high steam pressure is being carried on the boiler, vapor will come from the trap continuously during the time the trap is filing with condensate. Under this condition there would be no evidence of any trouble with the system. One way of telling whether the steam is from the return trap or from the heating system is to shut off the gate valve in the steam supply pipe to the trap if there is one in that line. If closing this valve stops the steam it is evident that the steam is coming from some other source in the system.

Occasionally you will find a return trap installation where the customer's only complaint is from the "clattering" or pounding of the flapper in the discharge pipe from the trap. This condition can normally be overcome by the installation of an air chamber in the discharge pipe as shown on our current installation drawings in combination with check valves in which the seat is at an angle of 45 degrees from the horizontal.

This condition can also be eliminated by the installation of a restriction plate in the union between the tap discharge and the boiler. The size of the orifice in this restriction plate, however, will have to be determined on the job making sure that the orifice is large enough to permit the proper return of condensate to the boiler during extreme cold weather.

In other words, the boiler should be fired at what is considered the maximum operating pressure and timing the rate at which the condensate fills the trap and also the time required to completely empty the trap, making sure that the emptying time is less than that of the filling time. In the event that the trap fails to discharge the water to the boiler, this condition could be caused by a water logged float ball which can be easily detected either by the weight of the float or by shaking it.

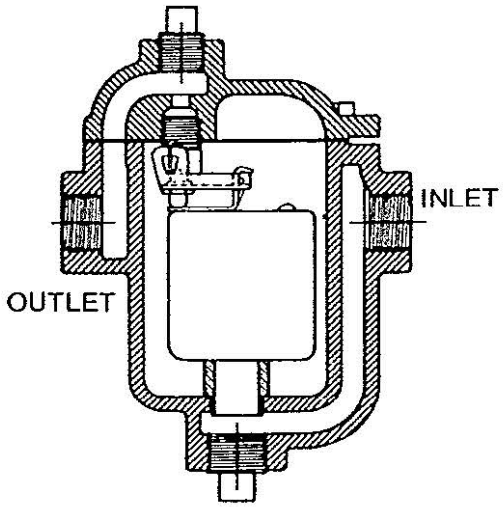
In an emergency, this condition can be remedied by punching a hole in the float to release the water, and then by blowing through this hole it will be possible to detect where the leak occurs. The float can then be soldered at the hole which you have punched and also where the original leak occurred.

Of course, it is best to replace a leaky float ball and not rely on one that has been soldered. This condition can also be due to an improperly installed or undersized steam connection or equalizing pipe to the trap.

In the event a return trap refuses to operate without being jarred or thumped, unless it is merely a case of removing dirt or other foreign matter from the mechanism and lubricating the moving parts with graphite paste, or a case where the valve have only become slightly worn and can be ground in using valve grinding compound without spending a great deal of time we recommend that the mechanism be replaced with a new system. No repairs are available for the old style No. 9 return trap (made prior to 1925) and the old No. 11 and 12 return traps (made prior to 1923). In cases where these old return traps are encountered and found to be unrepairable, replace the entire trap. Substitute with a *Guardian®* condensate pump. (An accumulator tank with electric pump, actuated with a float switch mechanism).

SERVICING BUCKET TRAPS

In servicing a bucket trap first be sure that it is installed in accordance with our standard installation details and practice. Second, be sure that the seat in the bucket trap has the proper size orifice for the maximum operating pressure to which the trap is subjected. For example, a 1/2" Type "OB" bucket trap used on steam pressures up to 40 pounds should have an "E" seat.



If the seat is not of the proper size replace it. In starting up bucket traps for the first time be sure to blow out the lines at full steam pressure before the traps are installed in order to free the lines of pipe cuttings, pipe joint cement, scale and other dirt. This will eliminate a great deal of trouble due to particles of dirt that are too large to go through the seat of the trap. Ordinarily enough condensate will accumulate in the line when the steam is first turned on to fill the trap but if not, it is a simple matter to remove the cover and pour water into it to "prime" the trap. Or, open the valve immediately ahead of the trap a fraction of a turn and wait a few minutes so the trap can become "primed". Then, turn the valve ahead of the trap to the wide open position so the condensate initially entering the trap will not be blown directly through the trap into the return.

As mentioned in the paragraph under "Medium Pressure Thermostatic Traps", the steam pressures under which bucket traps operate require that they be inspected periodically. This is to assure that the valve and seat are free from foreign matter which is quite prevalent in high pressure steam and to see that the valves and seats are in good condition. The valve and seat in both the Type "OB" and "OBS" bucket traps are easily renewed. The seat is screwed in the cover and the valve is held on the hinge. Here again, in checking bucket traps, re-evaporation must not be mistaken for steam leakage.

3695 44th Street SE Grand Rapids, MI 49512 - (P) 616-971-3420 (F) 616-971-3421 - www.mepcollc.com