

Inverted Bucket Traps. In this type of trap, steam, condensate, and air enter the trap under the bell or inverted bucket. Steam floats the inverted bucket and closes the valve. Condensate entering the trap enables the inverted bucket to fall, opening the valve. The condensate then discharges through the open valve until steam again enters and displaces the water contained in the bucket, thus restoring its buoyancy. The steam pressure entering through the open valve discharges the trap. Air is eliminated automatically by passing through the small vent hole located in the top of the inverted bucket.

Inverted bucket traps for use on low-pressure systems, particularly with blast coils or unit heaters, are usually furnished with a large capacity opening equipped with a bimetallic thermostatic element which closes when heated by steam, and opens when cooled by air and condensate, allowing air to escape from the inverted bucket to the trap outlet. Inverted

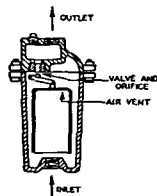


Fig. 39... Inverted Bucket Trap

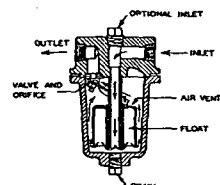


Fig. 40... Inverted Bucket Trap with Central Guide

bucket traps are used for draining condensate and air from blast coils, unit heaters, steam drips, laundry equipment, sterilizers, steam water heaters, and other equipment. They are particularly suited for draining condensate from steam lines or equipment where abnormal amounts of air must be discharged, and where there is also foreign matter such as dirt, sludge, and oil draining to the trap.

The discharge from inverted bucket traps, like that of the upright bucket traps, is intermittent and requires a definite differential pressure between the inlet and the outlet of the trap in order to lift the condensate from the bottom of the trap to the outlet of same. Inverted bucket traps are made in sizes from $\frac{1}{4}$ to 3 in., and for pressures varying from vacuum to 2400 psig. Figs. 39 and 40 illustrate some of the types of inverted bucket traps which are available on the market at the present time.

Flash Traps. These traps depend on the property of condensate at a high pressure and temperature to flash into steam at a lower pressure. Condensate flows freely through the orifice of the trap due to the pressure difference from inlet to outlet of trap until steam enters the inlet chamber and mixes with the remaining condensate, heating the condensate and causing it to flash, thereby choking the flow through the orifice and allowing more condensate to accumulate in the trap.

The discharge from flash-type traps is intermittent. There are no moving parts in this type of trap. The orifice, however, is adjustable for the pressure differential required. A gage glass or float indicates whether the trap is operating.

These traps can be used for draining condensate from steam, water, and oil heaters; blast heaters; unit heaters; dryers; vulcanizers; kitchen equipment; laundry equipment; evaporators; steam lines; and other equipment, where the pressure differential between steam supply and condensate return does not drop below 5 psi. Flash-type traps are made in sizes from $\frac{1}{4}$ to 3 in., and for pressures varying from vacuum to 450 psig. Fig. 41 illustrates a trap of the flash type.

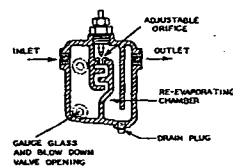


Fig. 41... Flash Trap

Impulse Traps. These traps are a modification of the flash trap, and depend on the same principle of flash for their operation. In the impulse trap the flashing action is utilized to govern the movement of a valve by causing changes in pressure in a control chamber above the valve. A small portion of condensate, called control flow, bypasses continuously through the control chamber. At low and medium temperatures, the discharge through the center orifice reduces control chamber pressure, and the valve opens for free discharge of air and condensate.

When condensate reaches near-steam temperature, part of the control flow flashes into vapor, due to reduced pressure in control chamber. The increased volume of the condensate-vapor mixture restricts the discharge through the center orifice, and therefore the reduced pressure in control chamber builds

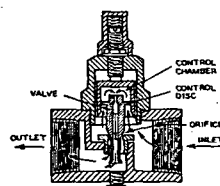


Fig. 42... Impulse Trap

up, closes the valve, and shuts off all discharge of hot condensate, except the small amount flowing through center orifice.

Under normal condensate loads, the valve opens and closes at short intervals. Under heavy loads, the valve opens wide and the discharge is heavy and continuous. Impulse traps can be used for draining condensate from steam mains, unit heaters, laundry equipment, kitchen equipment, oil and water heaters, sterilizers, and other equipment where the pressure at the trap outlet is not greater than 25 percent of the inlet pressure. Impulse traps are made in sizes from $\frac{1}{4}$ to 2 in., and for pressures ranging from 1 to 600 psig. Fig. 42 illustrates a trap of the impulse type.

Lifting Traps. This type of trap is an adaptation of the up-

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right bucket trap. It has the added feature of an auxiliary pressure inlet through which steam is introduced at a pressure higher than that of the trap inlet pressure. This high-pressure steam forces the condensate to a point above the trap, and against a back pressure higher than that which is possible with normal steam pressure. Lifting traps are made in sizes from 1 to 3 in., and for pressures ranging from vacuum to 150 psig. Fig. 43 illustrates a trap of the lifting type.

Boiler Return Trap or Alternating Receiver. This device is not actually a steam trap in that it is not used to trap or hold steam, but is an adaptation of the lifting trap. It is used for returning condensate to a low-pressure boiler, when due to excess pressure, the condensate cannot flow to the boiler by gravity without flooding the return mains, and endangering the boiler by permitting it to go dry. The boiler return trap is a vessel (vented to the atmosphere) in which condensate collects until a float-operated mechanism equalizes the boiler and

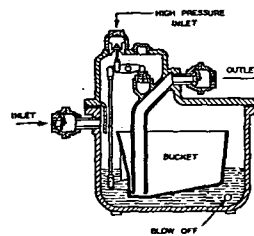


Fig. 43... Lifting Trap

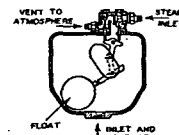


Fig. 44... Boiler Return Trap or Alternating Receiver

trap pressure to enable the water in the trap to flow with the boiler by gravity.

These traps are available in sizes from $1\frac{1}{4}$ to $2\frac{1}{2}$ in., and for pressures varying from 0 to 100 psig. A typical boiler return trap is shown in Fig. 44, and a typical connection to a low-pressure heating system in Fig. 14.

Steam Trap Installations

The following general rules should govern the installation of traps of all types:

1. A vertical drip, as long as possible, and a strainer should be installed between the trap and the apparatus it drains. Exceptions to this rule are the installation of thermostatic traps in radiators, convectors, and pipe coils. These, in general, are attached directly to the units without strainers.

2. Whenever it is necessary to maintain, in continuous service, apparatus which is to be drained, it is advisable to install a gate valve on each side of the trap, and a valved bypass around the trap, so that the trap may be removed and re-

paired and condensate drained through the throttled bypass valve.

3. Whenever it is necessary to install traps for lift service, as when the condensate must be discharged to a main located above the trap, or where the trap must discharge against a definite back pressure, a check valve and a gate valve should be installed on the discharge side of the trap, the check valve to prevent continuous pressure on the discharge side of the valve, and the gate valve to shut off pressure in case the trap is removed for service or repair.

DRIPS

A steam main in any type of steam heating system may be dropped to a lower level without dripping if the pitch is downward with the direction of steam flow. The steam main in any heating system can be elevated if dripped. Fig. 45 shows a connection where the steam main is raised and is drained to a wet-return. If the elevation of the low point

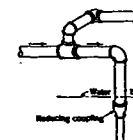


Fig. 45... Dripping Main Where It Rises to Higher Level

is above a dry-return, it may be drained through a trap to the dry-return in two-pipe vapor, vacuum and subatmospheric systems. Horizontal steam pipes may also be run over obstructions without a change in level, if a small pipe is carried below the obstruction to care for the condensate (Fig. 46). Horizontal return pipes may be carried past doorways and other obstructions by using the scheme illustrated in Fig. 47. It will be noted that the large pipe, in this case, runs below the obstruction, and the smaller one over it.

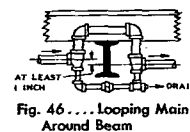


Fig. 46... Looping Main Around Beam

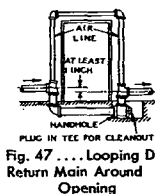


Fig. 47... Looping Dry Return Main Around Opening

Offsets in steam and return piping should preferably be made with 90-deg. elbows, but occasionally fittings of other angles are used, and in such cases the length of the diagonal offset will be found as shown in Fig. 48.

Dirt pockets, desirable on all systems employing thermostatic traps, should be so located as to protect the traps from scale and sludge which will interfere with their operation. Dirt pockets are usually made 8 in. to 12 in. deep, and serve as receivers for foreign matter which otherwise would be carried into the trap.

On vapor systems where the end of the steam main is