Velan Valves Ltd
Leicester, England

CAGE UNIT CONSTRUCTION

MODELS CST, TS, TSF, SF.

INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

CONTENTS **PAGE**

MODELS CST, TS, TSF, SF.

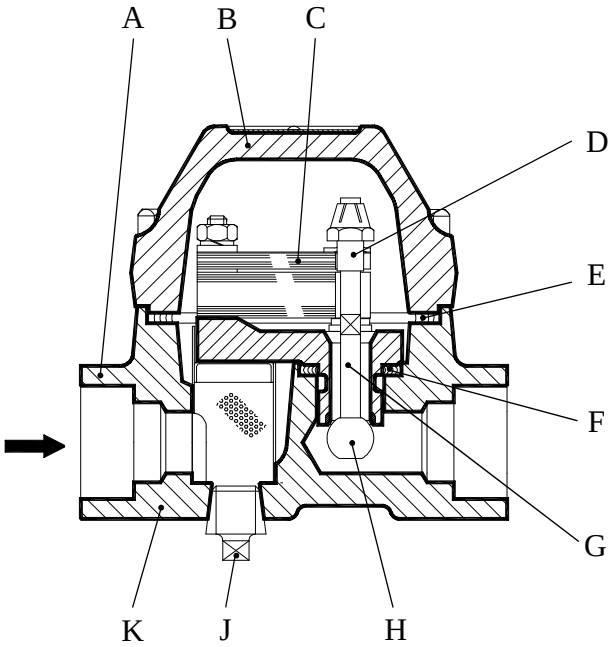
INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

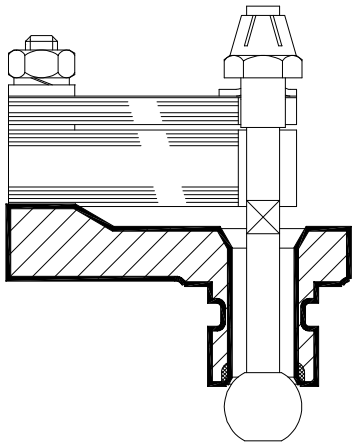
1. FEATURES

This range of Steam traps is particularly suitable for duties such as the draining of steam mains, headers and tracing and instrumentation lines and general industrial process equipment requirements.
In addition to the usual benefits associated with Velan Traps-
Excellent energy conservation, wide opening ranges, long operating life, fast warm up times – the compact cage unit construction allows fast, simple, in line maintenance to be performed, even when traps are welded in the line.
Thus ensuring a minimum of down time.

TS - trap as shown

A. Body : Forged Carbon Steel
B. Cover : Forged Carbon Steel
C. Bimetal Element : Ruflex GB-14
D. Locknut : Stainless Steel
E Cover Gasket : S/S Spiral wound Non-Asbestos filler.
F. Cage Unit Gasket : S/S Spiral wound Non-Asbestos filler.
G. Valve Stem : Stainless Steel
H. Ball : Stainless Steel
J. Plug 3/8 NPT : Carbon Steel
K. Strainer : Stainless Steel





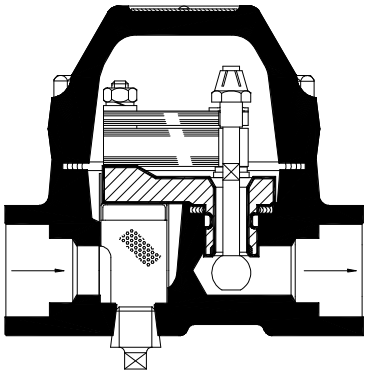
Cage unit

1. All internal working parts in one factory tested cage unit.
2. Quickly replaced in existing trap.
3. No adjusting or checking required
4. Only two screws to remove

1. FEATURES

a. Fast warm up with automatic air venting

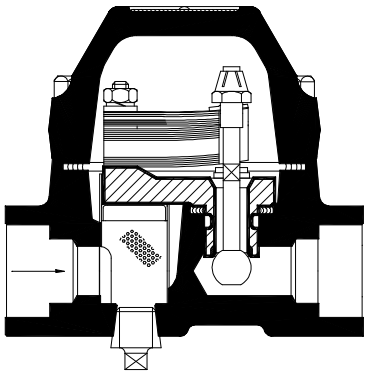
When cold the bi-metal relaxes and the discharge valve is wide open allowing air, gasses and cold water to clear quickly, ensuring no air binding or water logging occurs to delay equipment warm up. Steam wasting by-passes, or other secondary air venting systems are unnecessary.



b. Positive Steam Trapping

i : Saturated Steam

Incoming steam contacting the bimetal element causes the bimetal to deflect and develops thermal power to act on the valve stem, overcoming the line pressure and closing the valve tight. The power of the bimetal element increases or decreases as a function of the relative temperature of saturated steam. The same element operates efficiently at any given pressure within its range.

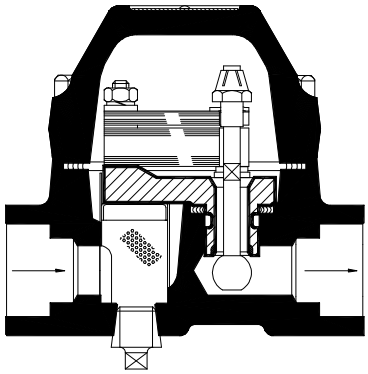


ii : Superheated steam

As for saturated steam, but the higher steam temperature develops more bimetal pull and shuts the valve even tighter.

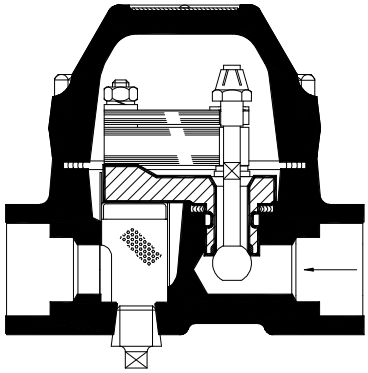
c. Condensate Discharge

Cooler condensate gradually reduces the bimetal force until the unbalanced pressure on the valve cracks the orifice and releases the flow. This is the first stage of the smooth opening. The second stage occurs as the flow is released , the unbalanced pressure acts on the full valve area, increasing its force, fully opening the orifice for maximum capacity flow.



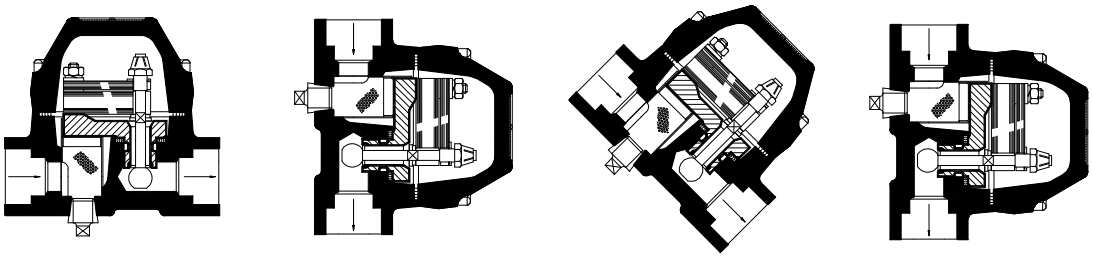
d. Check Valve

For traps installed in a condensate return system, or a multiple collection header, excess back pressure, traps discharging on different cycles, a drop in line pressure or discharge to overhead return lines, can cause a reverse flow of condensate through the trap. Separate check valves are required down-stream of the trap to prevent this occurring.
However the free floating self heating valve inside the Plenty trap will close immediately reverse flow is present and no additional valve is necessary.



2. INSTALLATION AND OPERATION

a. The trap can be installed in any convenient position see fig 5. In the vertical position with the inlet on top, the trap is self-draining and therefore freezeproof, provided the condensate can drain away see fig 6. Direction of flow is indicated by arrows- integrally forged or cast in the body.



Horizontal Vertical Angle Fig.6 Self draining

Fig.5 All position installation

When installing traps with screwed connections using a union will facilitate installation and removal (Fig. 7).

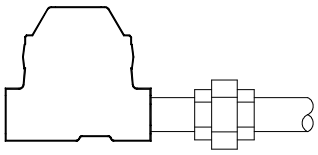


Fig.7 With union for easy dismantling

b. Install the trap 5' - 8' (1.5m - 2.5m) from the equipment drain point when possible. The minimum distance is 18inches (0.5m). This cooling leg acts as a storage chamber improving the trap operation.

Figures 8 and 9 indicate correct methods for collecting condensate from steam mains, ensuring that most of the condensate flowing along the main can be collected.

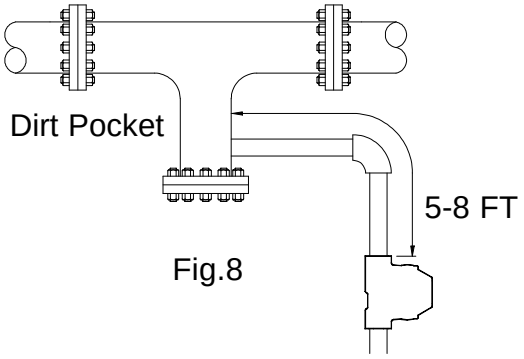


Fig.8

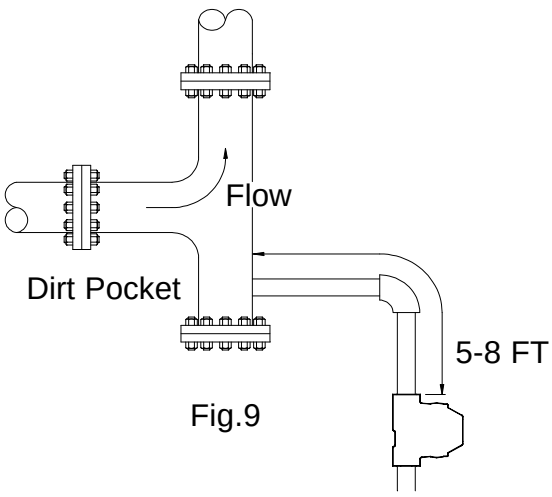
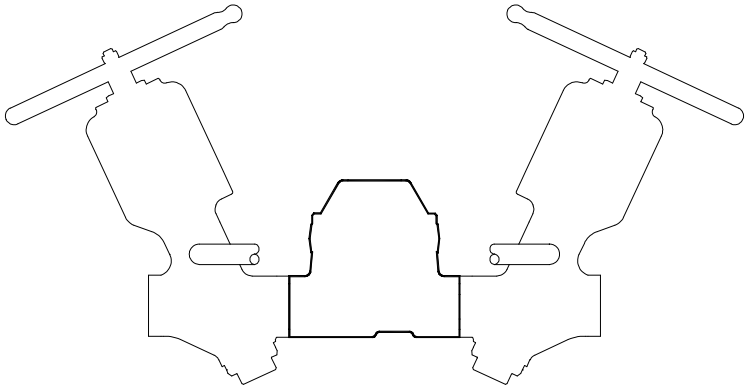


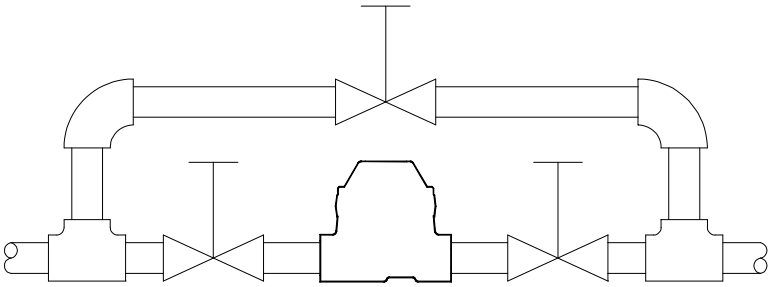
Fig.9

c. Secondary air vents, check valves and strainers are not necessary, these are incorporated in the trap.

d. Where a bypass is required the equivalent piping king should be used. This provides considerable savings in space and construction costs compared to the standard bypass, see fig 10. The piping king unit allows “in line” maintenance.



Plenty Piping King Unit



Standard Bypass Configuration

Fig. 10

e. Blow out the line or unit with air, or steam if possible, before installing the trap, to remove dirt and scale.

f. The trap and at least the last 2 - 3 feet (0.6m - 1.0m) of the cooling leg should not be insulated, otherwise the trap performance will be affected.

g. It is not necessary to disassemble the trap when welding into position. However correct welding procedures must be used without excessive heat input.

h. When operating, the trap will adjust to the quantity and flow condition of the condensate. If intermittent, the trap will discharge intermittently. However if condensate flow is continuous the trap will also discharge continuously.

i. For checking operation of the trap when installed in a closed return system a test valve can be fitted as shown as in fig 11. Alternatively the trap can be supplied with a thermometer fitted to the outlet connection, or a contact temperature recorder used to measure the temperature differential across the trap. Ultrasonic meters must be used with care if the trap is operating in a continuous discharge mode as the results indicated can be misleading.

j. Pressure waves in excess of normal operating pressures (water hammer) will overcome the bimetal closing force, opening the valve and dissipating the excess pressure downstream, preventing damage to the internals.

k. Clean strainers periodically otherwise they may plug up and prevent the free flow of condensate. For efficient, fast and economical cleaning, install a small valve to the strainer blowdown connection (optional) as in Fig 11.

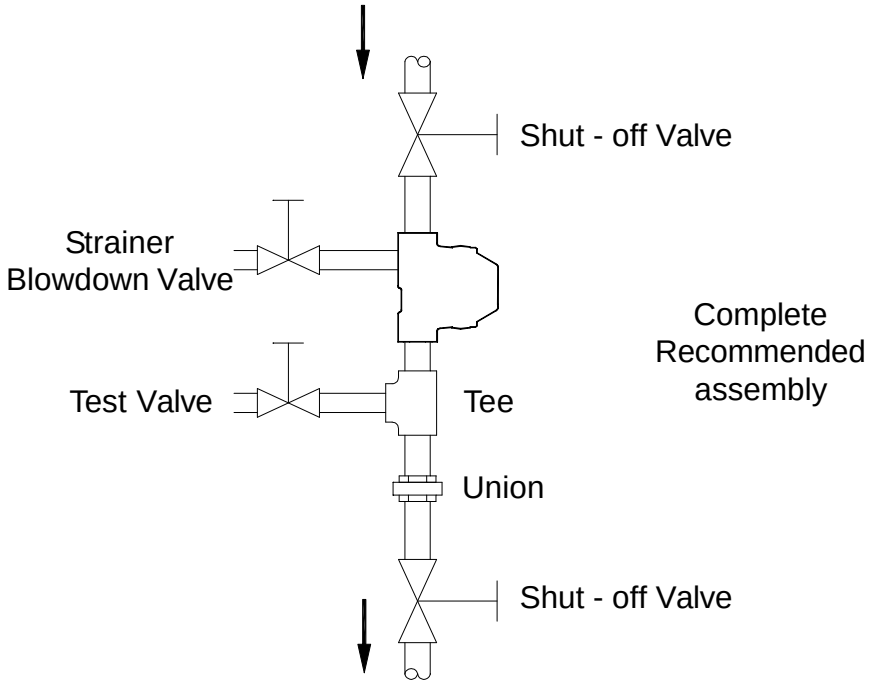


Fig. 11

3. ADJUSTMENT

NOTE: Before undertaking any adjustment or repair work, always ensure that the steam trap is fully isolated from the system. Before removing any covers, loosen bolting and break gasket seal to release any pressurised steam trapped in the body.

a. Bimetal/Valve Clearance

The discharge temperature of condensate is dependent upon the clearance setting ‘ X ‘ Fig.12. Increasing the clearance reduces the force exerted on the valve by the bimetal, allowing a closer to saturation discharge temperature. It will also increase capacity, conversely, reducing this clearance increases the bimetal force requiring an increased amount of sub-cooling before discharge can take place. This will hold back condensate utilising its heat before discharge giving efficient energy utilisation. It will also reduce discharge capacity.

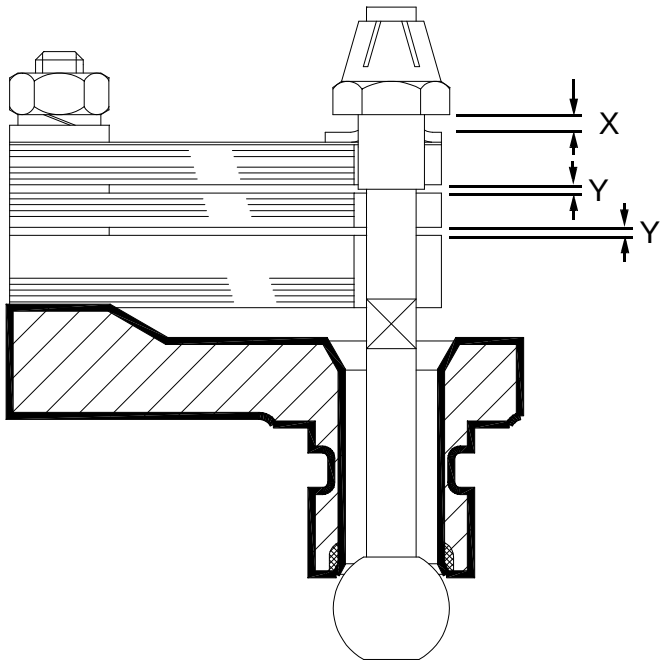


Fig. 12

The clearance is measured at point ‘ X ‘ Fig.12 between the top of the rocker plate and the underside of the adjusting nut. The standard factory setting is made at an ambient temperature of 65 Deg F (18 Deg C) and will allow the valve to commence opening at 15 Deg F (8 Deg C) approx. Below saturation, with full discharge, as shown in the individual capacity diagrams for each model, around 40 Deg F

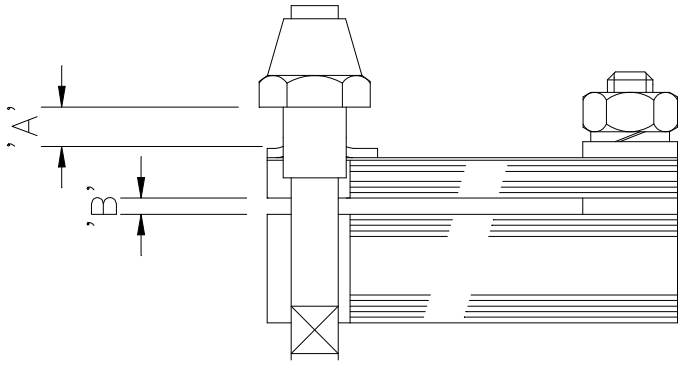
The standard factory setting is made with the bimetal at an ambient temperature of 65 Deg F (18 Deg C). If it is not possible to make the setting at this temperature an alternative setting as shown in the table below should be used, for the appropriate ambient (bimetal) temperature.

BIMETAL PLATES – RUFLEX GB-14

NOTE

A) COLD CLEARANCE GAUGE SHOULD BE A SLIDING FIT BETWEEN THE LOCKNUT AND ROCKER.

B) WHEN CHECKING THE CLEARANCE 'A' WITH THE GAUGE DO NOT REDUCE THE CLEARANCE 'B' BETWEEN THE BIMETAL SEGMENTS, THIS MUST ALWAYS BE EQUAL TO THE SPACER IN THE ELEMENT.



ROOM TEMP		TS CST	TSF	SF
°F	°C			
50	10	.055	.069	.098
55	12.8	.053	.067	.096
60	15.6	.052	.066	.094
65	18.3	.050	.064	.092
70	21.1	.048	.062	.090
75	23.4	.046	.060	.087
80	26.7	.045	.059	.084
85	29.4	.043	.057	.081
90	32.2	.041	.055	.078
95	35	.039	.053	.075
100	37.8	.037	.051	.072

SETTINGS IN INCHES

A standard setting gauge is available – See tool part numbers, or feeler Gauges of the correct amount can be used.

The gauge should be a sliding fit between the locknut and rocker plate, and it is important that the clearance ‘y’ between the bimetal segments is not reduced. This should always be equal to the spacer in the element. Fig.12

For this range of traps a self-locking adjusting nut is used to set the valve clearance. To alter the clearance fit the stem key (see tool part numbers) to the flat on the stem below the bimetal – Fig.13.

Turn the adjusting nut anti-clockwise to increase the clearance or clockwise to reduce.

Do not increase the clearance beyond the point that the trap passes steam, unless setting the trap to operate in ‘Steam lock’ conditions.

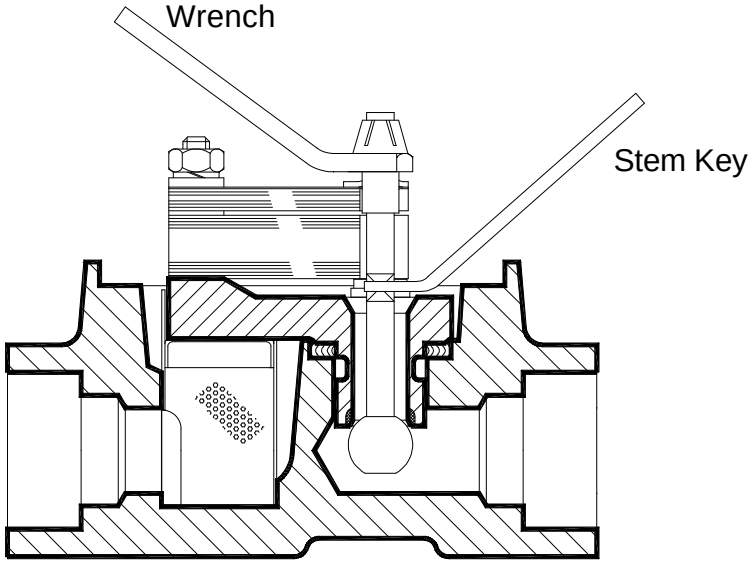


Fig. 13

b. High Back Pressure

The trap will operate against high back pressures, but the discharge temperature and discharge capacity will be correspondingly affected. For effective operation against back pressures in excess of 30%, the clearance should be increased gradually, up to a maximum of one full turn of the locknut approximately, ensuring that the trap continues to close tight on steam.Do not confuse with the discharge of flash steam released by the hot condensate.

4. MAINTENANCE

After completely isolating from live steam alterations can be performed with the trap in line by removing the cover.

The traps are designed for easy servicing and dis-assembly of parts without removing the trap body from the line.

a. Testing of valve seat and gasket.

If the trap still leaks steam after being adjusted according to the instructions, remove the cover and examine the internals for dirt, or obvious signs of damage.
Applying pressure through the outlet connection under the valve, and adding water above the cage unit/valve can test the valve tightness and body/cage unit.
Any leakage will be indicated at points ‘A’ and ‘B’ – Fig.14.

If no provision is available to do this in-line, the trap can be removed to the workshop. To minimise down time, replace the cage unit with a new assembly and body gasket, ensuring that the body gasket face is clean and undamaged, see re-assembly below, and replace the cover. The old cage unit can than be re-examined, and repaired if necessary in the workshop.

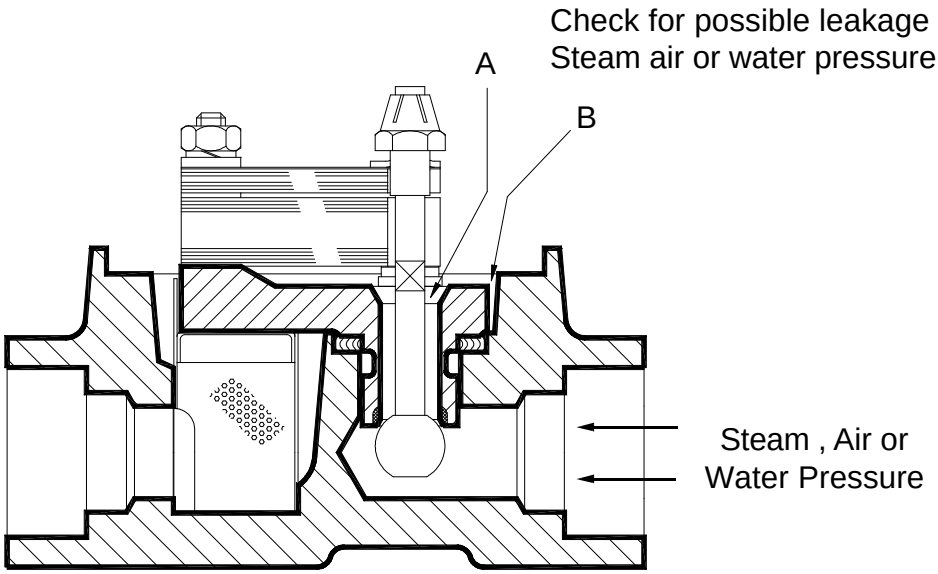


Fig. 14

b. Repair of valve and valve seat

(i). Valve

Slight damage to the valve (which has a hardness of 53Rc, 500 BHN) can be repaired by lapping (grinding) with the valve seat using an appropriate compound. A universal rotary motion should be used (Fig.15) to provide an adequate width of seating area to accommodate any misalignment in the vertical movement of the valve stem.
Do not overlap otherwise the groove formed may prevent satisfactory setting.

If the valve is pitted or eroded, it should be replaced with a new valve assembly.

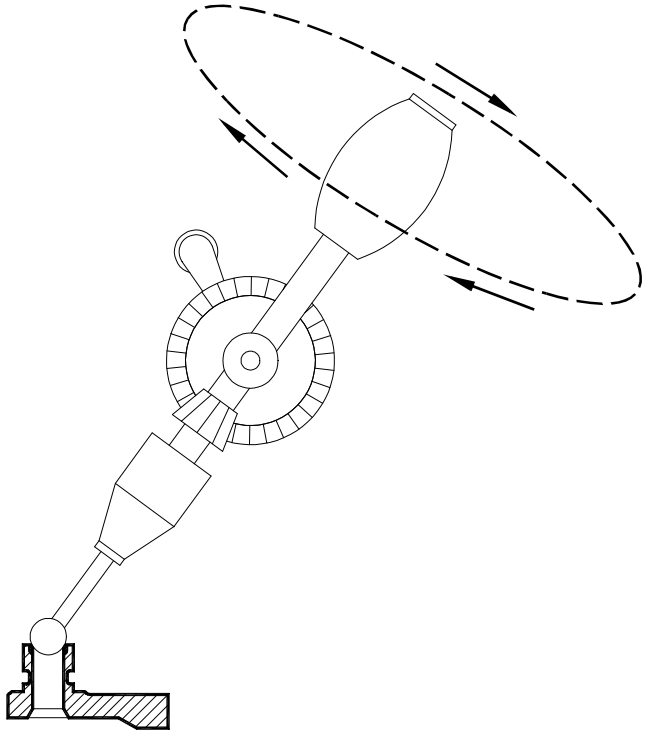


Fig.15

(ii). Valve Seat

The heavy stellite deposit ensures a long trouble free operating life under normal operating conditions. Minor damage can be repaired by re-lapping, using a hand drill – Fig.15, or if in the workshop, a hand held air tool. Final lapping should be completed by hand with the valve in its correct operating position.

Because of the thickness of the stellite deposit, pits and grooves up to 1/64” (0.4mm) may be removed with a drill point, or small grinding point. For more severe damage, replace the cage unit.

(iii). Body/cage Unit Gasket Face

If leakage has occurred under the spiral – wound gasket; examine the seating faces for damage. If the body seating face is ‘cut’ or eroded, the body must be replaced. After re-assembly, check for valve and gasket tightness as section D.1. If leakage still occurs check for:

i. Dirt on seating faces.
ii. Valve stem is not fouling side of bimetal slot, or rocker plate.
iii. The rocker plate fits correctly in its holder, with free rotational movement, but no lateral movement.
iv. Valve stem too long and fouling the cover.

c. Dis-assembly

c1. TS/TSF Models (SF built from Nov 95)

Fig.16 indicates how to disassemble the traps.

i. Remove cover and spiral wound gasket.
ii. Unscrew cage unit allan screws.
iii. Remove cage unit and spiral wound gasket. Lift out strainer screen

c2. Other models (SF built prior to Nov 95)

These models are fitted with a separate strainer cover on the underside of the body, allowing access to the strainer screen.

Remove the strainer cover and gasket, then the strainer screen.

Remainder of dis-assembly as section 3a.

TYPE TS

TYPE SF

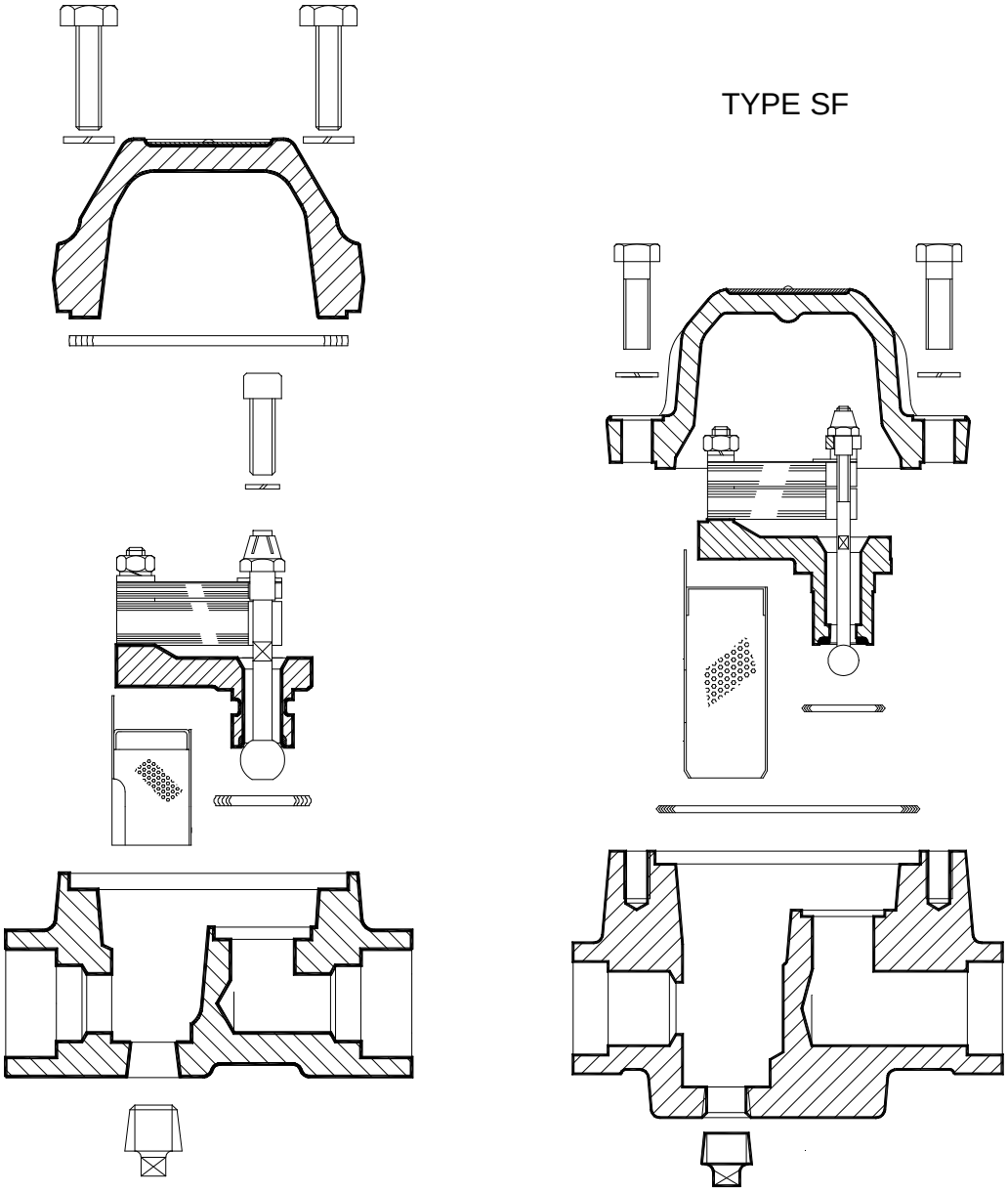


Fig. 16

d. Re-assembly

Re-assembly is the reverse of dis-assembly: Ensure,

i. All gasket and valve seating faces are clean and undamaged

ii. Bimetal element is clean with no dirt lodging between the segments.

iii. Valve steam is centrally aligned with the rocker, bimetal slot. Valve seat axis, and all bimetal plates are concentric and in line with each other. If they have moved, a liner bar is available (see tool part numbers below) for re-alignment to take place. Remove valve assembly, slightly loosen bimetal holding nuts, insert liner bar through the seat orifice, bimetal slot and rocker plate. Tighten holding nuts and remove liner bar. Replace and reset valve assembly.

The cage unit is supplied with bimetal assembled, and this should not be removed from the cage unit holder. Any plates out of square may interfere with the free movement of the valve, and bimetal plates fitted upside down will exert a negative force. Markings on the underside, and on the rear edge indicate whether plates are assembled correctly.

iv. Ensure strainer screen is clean and undamaged. The tab on top of the screen must locate behind the rear side of the cage unit holder and bimetal.

v. When fitting a spiral wound gasket into its recess, it is important to ensure that the inner ring is fully supported for 100% of its periphery. If any part of this first ring is not enclosed by both gasket faces, leakage may occur.

Tighten cover bolts by small equal amounts moving diagonally across the cover.

e. Traps fitted with a temperature controller

Models CST,TSF, and SF may be fitted with a temperature controller if required.
To remove the temperature controller, it is first necessary to remove the cage unit from the body. Conversely the controller must be fitted correctly into the body before the cage unit is refitted.

5. TOOL PART NUMBERS

MODEL	STEM KEY	SETTING GAUGE	LINER BAR
CST	L99001	L99004/A1	L99021
TS	L99001	L99004/A1	L99053-5/16
			L99053-3/8
TSF	L99001	L99004/A2	L99020-1/4
			L99019-5/16
SF	L99001	L99005/B1	L99042-5/16
			L99006-3/8
			L99007-1/2

6. BOLTING TORQUE

MODEL	COVERS		CAGE UNIT	
	Ft.lb	Nm	Ft.lb	Nm
CST	24	33	9	13
SF	30	41	15	21
TS	30	41	9	13
TSF	56	76	12	17