INSTRUCTIONS FOR INSTALLATION AND MAINTENANCE of the CONSOLIDATED MAXIFLOW SAFETY VALVE

Service Manual No. 8 A

Form No. 259-1500-B

DRESSER

INDUSTRIAL VALVE & INSTRUMENT DIVISION

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Section I

Introduction

In line with the Consolidated policy of improvement of products, the Maxiflow Safety Valve has undergone a number of changes since 1960. This represents the sum of experience gained on hundreds of field installations at steam pressures as high as 5500 psig and temperatures to 1150°F. The rapid increase in steam pressures and temperatures in the past years has required both the selection of better materials and more rigid control of manufacturing practices. Every effort has been made to provide a design which can readily be serviced in the field. Knowledge of the following design's features will assist the Service Engineer in explaining the construction of the Maxiflow Safety Valve to those persons involved in its use and maintenance. We will endeavor to set forth in this Manual instructions to cover the maintenance of change of design since 1960 to the present.

1. **BODY AND NECK MATERIALS**

   All pressure retaining parts, with the exception of reheat valves rated to 900 psi and lower, are made of forged materials. Welded inlet valves have the Three-piece weld construction; flanged inlet valves have a Top-inserted seal-welded bushing.

2. **SERVICE LIFE**

   For most service conditions, pressure retaining parts and parts subject to mechanical stresses, such as valve necks, yoke rods, etc., are designed for a service life of thirty-five years, equivalent to the boiler and well in excess of the requirements of the Power Boiler Code. The use of ferritic materials in valves for high pressure, high temperature superheater service limits the designed service life under these conditions to the minimum specified by Power Boiler Code.

3. **THERMAL COMPENSATION**

   The yoke rod design, together with proper selection of yoke rod and spindle materials, renders the valve relatively free from changes in setting due to temperature variations. We do not recommend, "Compensating" this valve for temperature by increasing the set point over name plate data.

4. **THERMODISC**

   The Thermodisc design in providing for the rapid equalization of temperature around the valve seat, provides a degree of Tightness far above that offered by competitive valves. Better selection of materials and minor changes providing "Thermal flexibility" rather than "Mechanical flexibility" have reduced or eliminated inherent weakness. Thermodiscs are now giving excellent results at 5500 psi and 1150°F.

5. **BLOWDOWN ADJUSTMENT**

   The blowdown adjustment is designed, and standard spring selections are made, to produce a blowdown in the three to four percent range under most service conditions. Factors such as long inlet necks, entrained water, and high back pressures tend to lengthen the blowdown actually obtained in the field. In cases where short short blowdown is difficult to obtain due to adverse field conditions, it may be possible to improve the valve performance by installing a spring having a slightly different deflection rate. However, this is not recommended unless absolutely necessary.

INSTALLATION

INLET AND EXHAUST PIPING

The details of the installation of any safety valve are governed to a large extent by the ASME Power Boiler Code. Pertinent paragraphs are:

"P-277 — The safety valve or valves shall be connected to the boiler independent of any other steam connection and attached as close as possible to the boiler, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting shall be not longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure under the corresponding American Standard as given in Tables A-6, A-7 and A-8, and shall also comply with Pars. P-12(b) and P-286. Every safety valve shall be connected so as to stand in an upright position, with spindle vertical."

"P-278 — The opening or connection between the boiler and the safety valve shall have at least the area of the valve inlet. No valve of any description shall be placed between the required safety valve or valves and the boiler, nor on the discharge pipe between the safety valve and atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the valve outlet or of the total of the areas of the valve outlets discharging thereinto and shall be as short and straight as possible, and so arranged as to avoid undue stresses on the valve or valves.

"All safety-valve discharges shall be so located or piped as to be carried clear from running boards or platforms. Ample provision for gravity drain shall be made in the discharge pipe at or near each safety valve, and where water of condensation may collect. Each valve shall have an open gravity drain through the casing below the

level of the valve seat. For iron and steel-bodied valves exceeding 2-inch size, the drain hole shall be tapped not less than ⅜-inch pipe size."

"P-279 — If a muffler is used on a safety valve it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler or plates or other devices shall be so constructed as to avoid any possibility of restriction of the steam passages due to deposit.

"When a safety valve is exposed to outdoor elements which may affect operation of the valve, it is permissible to shield the valve with a satisfactory cover. The shield or cover shall be properly vented and arranged to permit servicing and normal operation of the valve."

Exhaust piping must be installed so that it will not impose undue stress on the Safety Valve, as noted in P-278. Stresses set up in the valve body from any source will cause distortion and leakage at pressures below the setpoint. If standard drip pans are used, see Fig. 1, sufficient clearance must be provided to allow for movement of the valve due to expansion and contraction of the drum or header on which it is installed. If blow back around the drip pan occurs, the vent piping is inadequate and its design should be investigated.

Flexible metal hoses, if used to connect safety valve outlets to discharge stacks, must have sufficient length and must be designed and installed in such a manner that they will not become "solid" in any position of the valve. Better results are obtained if the hoses are installed so that they will permit movement by bending, rather than by stretching and compressing along their length.

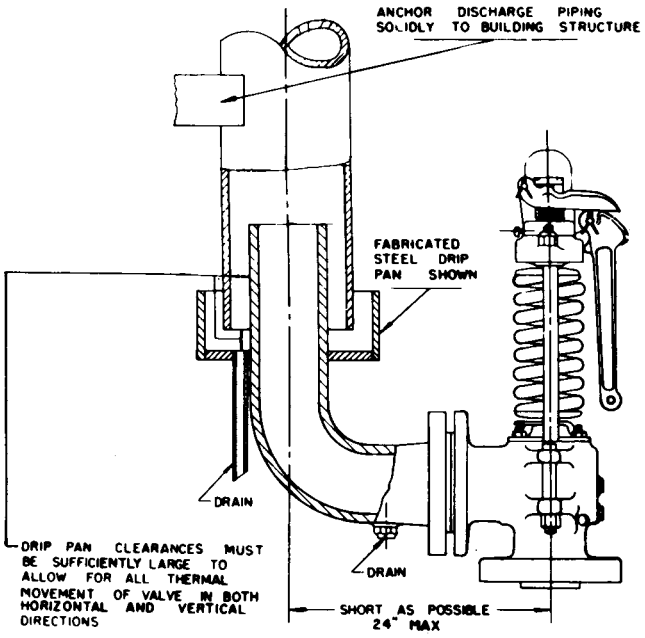


Figure 1

Steam flowing vertically out of the discharge elbow produces a downward reaction on the elbow, depending on the quantity of steam flowing and its velocity.

In large, high capacity valves this force can equal several thousand pounds and can produce severe stresses in the valve necks. The bending stresses are determined by the amount of the reactive force, combined with the movement arm, or horizontal distance between the vertical centerline of the valve and the vertical centerline of the outlet elbow. Maxiflow Safety Valves are designed so that the neck stresses will not exceed ASME Code limits as long as this moment arm does not exceed 24-inches in length from centerline of the valve to the centerline of the vent piping.

When installing flanged inlet valves, the flange bolts must be pulled down evenly in order to prevent body distortion and consequent misalignment and leakage.

HYDROSTATIC TESTING VALVES OVER 1200 PSI REFER TO SECTION II OF THIS MANUAL

Flanged inlet safety valves should be removed from the boiler during hydrostatic tests and the boiler nozzles blanked off.

Welded Inlet Valves

When supplied for pressures over 1200 psi, welded inlet safety valves are shipped with hydrostatic test plugs installed. These are steel plugs placed in the bore of the valve, inside the seating surface. Their purpose is two-fold. First, they effect closure at a point differing from the seating surface of the valve so that if the valve is lifted on hydrostatic test, the seating surface will not be as liable to become damaged. Second, by raising the disc of the valve off its seat and increasing spring compression, the set pressure of the valve is increased to a point where the valve will not lift at one and one-half times design boiler pressure. It is not necessary to gag safety valves tightly when hydrostatic plugs are used.

These plugs must, of course, be removed from the valves prior to placing the boiler in service. However, they should be retained and reinstalled whenever a hydrostatic test exceeding the boiler design pressure is to be made. NOTE: Removal of Hydrostatic Plugs.

It is recommended that a Service Engineer of Consolidated Valve Division remove the hydrostatic plugs. If this can not be done, follow the instructions under disassembly and remove the plug taking care to clean the seating surfaces before reassembly, and returning all parts in their proper places.

GAGGING VALVES UNDER 1200 PSI

Probably the most common source of Safety Valve trouble is over-gagging. During hydrostatic testing, and during Safety Valve setting, gags

should be applied only hand tight. During setting, overgagging will, also, cause damage to the seating surface and resultant leakage. In applying gags, remember that the valve spring will hold the valve closed against its set pressure. The additional gag load applied should be only enough to insure that the valves do not lift at the expected overpressure.

Gags should never be applied when the boiler is cold. The spindle of the Safety Valve expands considerably with the temperature increase as pressure is raised. If it is not free to expand with this temperature change it may become seriously bent.

Boiler pressure should be brought up to within 80% of the pressure of the low set valve before applying the gags.

Tighten the gags of drum and superheater valves with only a light force applied to the gag screw head.

Reheat valves require a greater force applied to the gag screw head to hold the valve closed during hydrostatic test.

ADJUSTMENT

All Maxiflow Safety Valves are steam tested at the factory. Every valve is set to have a clean popping action and to reseat tightly. However, because the boiler used in setting the valves has a small capacity compared to the capacities of the Maxiflow type of valves, slight adjustments on the actual installation are necessary to maintain proper action and blowdown.

Popping Point and Adjustment

To change the popping pressure of the valve remove the cap and lever assembly, lossen the lock nut and turn the compression screw clock-wise to increase pressure, or counter clock-wise to decrease pressure. After each adjustment of the compression screw the locknut should be tightened. The arm on top of spring washer should always be free from bearing against the yoke rod. This can be accomplished by holding a screw driver between the arm and the rod to prevent any movement of the top spring washer while adjusting the compression screw.

Ring Adjustment

Always gag the Safety Valve for protection, in case boiler pressure rises while making ring adjustments. (See instructions for gagging.)

The positions of the upper adjusting ring and the lower adjusting ring are locked by means of the upper adjusting ring pin and the lower ring pin respectively. These pins are threaded into the valve body and engage notches which are cut into the rings. To adjust either ring the corresponding ring pin must be removed. A screw driver can be used to turn the rings.

Adjustment of the valve can be best understood by a consideration of the function of the two rings. Together, the rings form a secondary orifice which governs the pressure acting on the disc when the valve is open. The position of the upper ring relative to the seat will vary the degree which the steam changes direction in flowing through the valve and will therefore vary the "reaction" on the lower face of the disc holder. A low position of the upper ring will result in a long blowdown, a high position will result in a short blowdown.

The lower ring is used to obtain a clean popping action and to cushion the closing action of the valve. **(Do not attempt to adjust Blowdown with the lower ring.)**

In detail, the rings should be used as follows in adjusting the valve. The lower ring should be set initially at about one notch below the seat level for every 200 psi of set pressure (10 notches for a 2000 psi valve). The upper ring should be set at about 13 notches above seat level, regardless of pressure.

The lower ring should be moved upward slowly, one notch at a time, to remove simmer. The most ideal position for the lower ring is the lowest position that does not introduce simmer or buzzing. In this connection, it is imperative that extreme care be used in conditioning the seat surfaces, insuring correct alignment, and establishing the proper clearances, so that mechanical causes of simmer will be reduced to a minimum.

In some cases where the valve closes from a low lift, but otherwise operates satisfactorily, the disc, being free to swivel and rock through a small angle, will flutter against the seat damaging the seating surfaces. This produces a characteristic "buzzing sound". It can be corrected by raising the lower ring one or two notches, causing the valve to close from a slightly higher lift. If the lower ring is set at too high a position, the valve will have a long blowdown and may close from a high lift, with possible seat damage.

The upper ring should be raised to reduce the blowdown and lowered to increase the blowdown, five notches at a time being considered a good average change. One notch will produce approximately a two pound change in blowdown throughout the 3% to 4% range.

In attempting to obtain blowdown on the order of 3%, it is important to be sure that the rings are not separated so as to lose control of the valve. The first indication of reaching this condition is a slow up-and-down "hunting" action of the valve immediately before closing. If this action occurs at a blowdown longer than desired, moving both rings downward a small amount will sometimes produce a slightly shorter blowdown. When making this adjustment, move the upper ring twice as many notches as the lower.

Check the ring pins to see that they engage the ring grooves, but without touching the bottom. The pins should not bear against the rings.

DISASSEMBLY

The Maxiflow Safety Valve can be easily disassembled for inspection, reconditioning seats, or replacing internal parts and the spring load can

be maintained after reassembly. Refer to Fig. 7 for nomenclature.

Before starting to disassemble the valve, be sure that there is no steam pressure in the drum or header, then proceed as follows:

Remove the Top Lever Pin and Top Lever. Loosen Cap Set Screw and lift off Cap and Drop Lever assembly. Remove Release Nut and Dust Cover. Remove the two top Yoke Nuts and lift the spring washers. Unscrew the four Stud Nuts and remove the Guide Retaining Plate. Lift the Spindle, Disc and Disc Holder assembly out of the valve.

NOTE: To retain the spring setting of the valve when, and only when, a disc is to be replaced or the seating surfaces are to be touched up, the following procedure should be followed. Remove the Top Lever Pin and Top Lever. Loosen Cap Set Screw and lift off Cap and Drop Lever assembly. Remove the Cotter Pin and the Release Nut and turn the Release Nut down until it is tight against the top of the Compression Screw, then back off ¼ turn. Remove the two Top Yoke Rod Nuts and the four Guide Retaining Plate Stud Nuts, and lift the Spindle, Spring, Spring Washers, Guide Retaining Plate, Disc and Disc Holder assembly out of the valve.

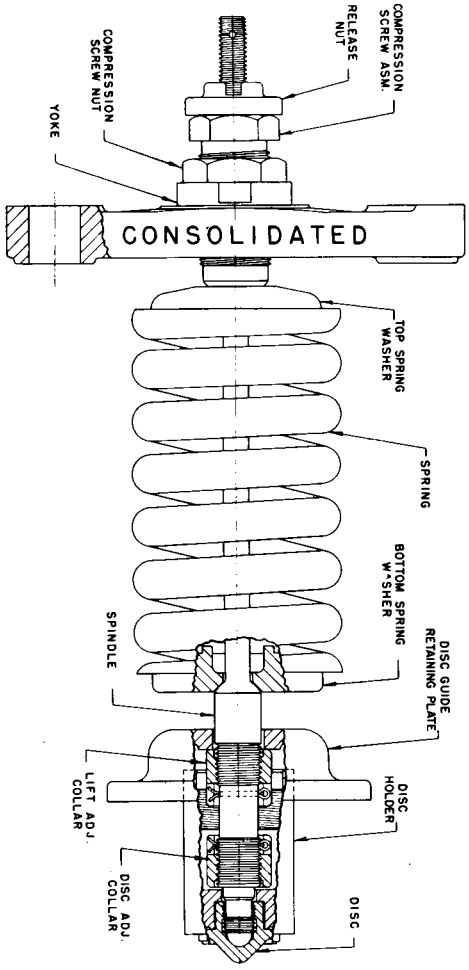


Figure 2

The Disc Guide and Adjusting Ring Assembly can now be removed from the Base by lifting it straight up. In order that the blowdown of the valve will be unchanged, the position of the Upper Adjusting Ring should be marked for reassembly. Make punch marks in a axial line on a tooth of the Upper Adjusting Ring and the outside barrel of the Disc Guide. Then measure the overall height of the Disc Guide and Upper Adjusting Ring assembly and record this information.

Mark the Lower Ring in line with the Lower Ring Pin. Now place a straight edge or a Ring lap across the top of the seat and count the number of notches that the ring is below the seat. Record this information for reassembly.

MAINTENANCE

It is not necessary to remove Maxiflow flanged or welded valves from the boiler for any maintenance. The actual maintenance required is generally confined to touching up seats and occasionally replacing the disc.

The following tools are recommended for this work:

A. Three ring-laps per valve.

B. Flat lapping plate.

C. Grinding compounds (Kwik-Ak-Shun Grade No. 1000).

D. High temperature lubricant.

All of these tools can be procured from the factory, prices on application. It may not be necessary to use all of the ring-laps at any one time, but having a sufficient supply on hand will save the time of reconditioning them during a boiler outage. After the boiler is back on the line, the ring-laps should be reconditioned on the flat lapping plate, or returned to the factory for reconditioning, at a nominal cost, on a special lapping machine. A lap should not be used on more than one valve without being reconditioned.

The following spare parts are recommended:

A. Discs for 50% of each type drum valve, 100% of each type superheater valve and 50% of each type low pressure reheater valve.

B. One set of ring pins for each type valve.

C. One set of adjusting rings for each type superheater valve.

Valves that have been leaking should be disassembled in accordance with prior instructions. Since the position of the adjusting rings has been recorded, the rings can be disassembled for cleaning if necessary. Parts for each valve should be kept together or marked, to make sure that they are replaced in the same valve.

Reconditioning of the seat surfaces of the disc and seat bushing is accomplished by lapping with a flat cast iron-ring-lap coated with Grade No. 1000 Kwik-Ak-Shun silicon-carbide compound, or equivalent.

Lapping Procedure

The following precautions and hints will enable anyone to do a "Professional Job of Lapping" seats:

A. Keep work clean.

B. A lap should not be used on more than one valve without being reconditioned.

C. Apply a very thin layer of compound to the lap, this will prevent rounding off the edges of the seat.

D. Lap using a reciprocating motion in all directions at the same time applying uniform pressure and rotating the Lap slowly. Care should be used not to run off the seating surface with the lap as this will cause the seat to become uneven. When lapping the disc seat the Lap should be held stationary and the disc moved as above with care taken not to strike the cone of the disc as this would cause the seat to be high on the inside.

E. Replace the compound frequently after wiping off the old compound. The greater the pressure put on the lap will speed up the cutting action of the lapping compound.

F. To check the seat, remove all compound from the seat and lap. Then using a dry lap and the same lapping motion as above described the low sections of the seating surface will show up as a shadow in contrast to the shiny portion. If shadows are present, further lapping is necessary.

Only laps known to be flat should be used, as only a few minutes will be required to remove the shadows.

G. When the lapping is completed, any lines appearing as cross scratches can be removed by rotating the Lap which has been wiped clean of compound on the seat about its own axis.

H. To check ring laps for flatness, wipe all compound off the lapping plate and ring lap. Then use a figure 8 motion of the ring lap on the lapping plate. If the lap is flat there will be no shadow; if there is a shadow, coat the lapping plate with compound and lap the ring lap with a figure 8 motion covering the lapping plate to remove the shadow.

I. The seat now shall be thoroughly cleaned, using a lint free cloth or tissue paper.

If extensive lapping of the bushing seat is required, a great deal of time will be saved if a Roto-Lap is used. See instructions for assembling and operating the Consolidated Maxiflow Roto-Lap Machine. Section III.

If the seat bushing is lapped more than .010" it should be remachined to the proper dimensions. For this purpose there is available for use by the MM&M Service Department a "Reseating Machine" which eliminates the need to remove the valve from the unit. This machine is mounted in place of the guide retaining plate and cuts the top face, inside diameter and outside diameter of the bushing to establish the correct height relationships and angles.

In re-machining the bushing seat, the length of the disc holder extending above the disc guide will decrease.

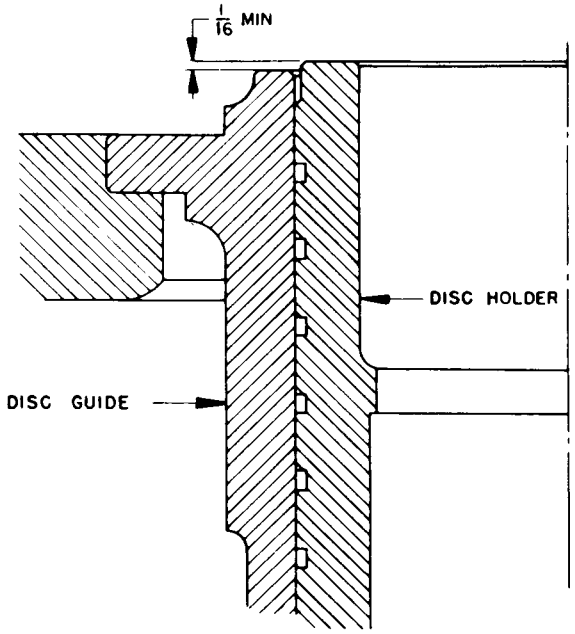


Figure 3

Referring to Fig. 3 the top of the disc guide should be kept to a distance of at least 1/16 in. below the top of the disc holder to facilitate freeing the disc holder in case a deposit of dirt forms in the pocket between the two parts. This dimension is obtained by machining the top of the disc guide.

Spindle Runout

It is important that the spindle be kept very straight in order to transmit the spring force to the disc without lateral binding. Overgagging is one of the common causes of bent spindles. A method to check the essential working surfaces of the spindle is illustrated in Fig. 4.

Clamp a V block (A) made of wood, fiber or other suitable material onto the platform railing. Imbed the ball end of the spindle in a piece of soft wood (B) placed below the threads, at a point where the spindle passes through the compression screw. Clamp a dial indicator onto the railing and locate at point (C). The total indicator reading should not exceed .003 when the spindle is rotated.

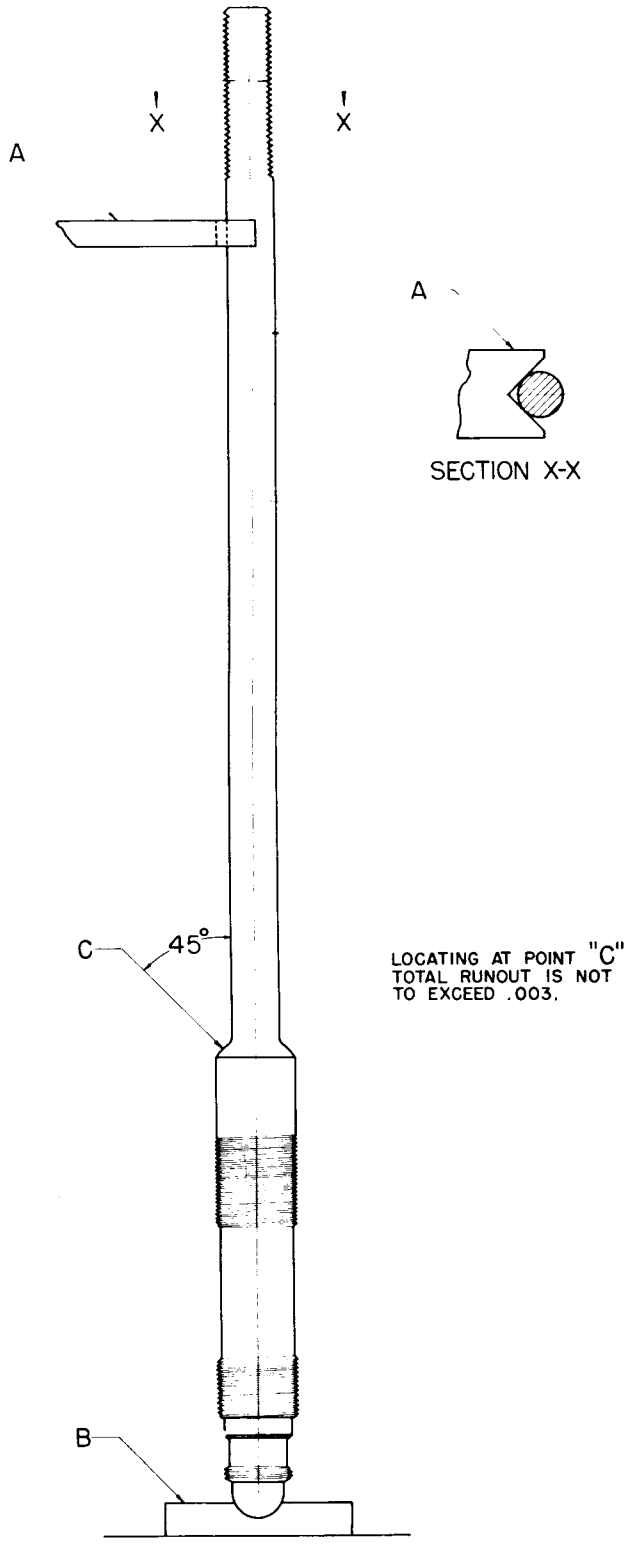


Figure 4

Other parts of the spindle not used as working surfaces may run out considerably more than .003 but this should not be regarded as an indication of crookedness or faulty manufacture.

On new installations, during initial setting of safety valves, there is a possibility of damaging the superheater valve seat due to foreign matter, such as mill scale, weld spatter and beads, etc., being drawn into the steam flow.

This foreign matter batters and cuts the seats of the valve although damage to the bushing seat is usually considerably less than to the disc seat. This type of damage causes the valve to leak quite badly and generally requires that the disc be replaced and the bushing seat relapped.

However, before bringing the boiler down, the leaking valve should be hand-blown at least ten times and held open for a period of one minute each time. This should clean any remaining foreign material out of the superheater and minimize the possibility of damage to the seats after overhaul, although this particular trouble sometimes persists until the boiler has been operating for a considerable period of time.

Drum safety valves do not, generally, draw foreign matter into the steam flow, and no difficulty of this type is to be expected.

To replace the disc, disassemble the valve in accordance with the prior instructions. Then proceed as follows.

NOTE: The bushing seat can be reconditioned by hand lapping as explained under "Lapping Procedure".

The replacement disc has been lapped on our special lapping machine and requires only that the seat be touched up. However, the spindle tip bearing should be re-established by grinding the spindle tip into the disc. This can be done with the removable assembly propped up on the compression screw end. Then remove the old disc by unscrewing it from the coarse right hand thread, on the spindle. Remove the disc holder, apply a layer of grinding compound to the ball end of the spindle and screw the new disc on.

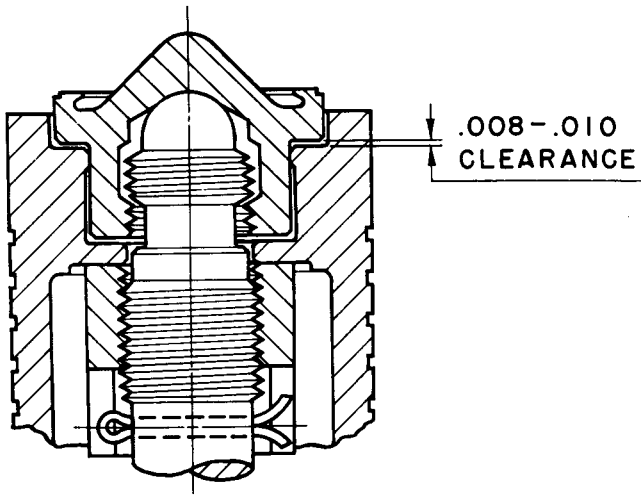


Figure 5

Grind the bearing using a rotary motion. When the bearing is re-established, clean both surfaces with kerosene or light oil. Then apply some Molykote to the spherical surface of the spindle tip and work it into the pores by rotating the disc on the spindle.

First place the disc holder on the spindle, allowing it to rest on the face of the disc adjusting nut. Then assemble the disc holder and new disc. The disc should be free enough to rock on the spindle tip. If there is no freedom, lower the disc adjusting nut until disc is free to rock slightly. Disc adjusting nut should then be lowered one notch and secured with a stainless steel cotter pin. Disc and disc holder should then be assembled. Clearance between disc and disc holder should be .008 to .010. See Fig. 5.

ADJUSTING RINGS: As to the starting position of the rings, this can be determined by the following method:

LOWER RING: Place a straight edge on the seat, bring the ring up to the straight edge then backing off one notchc for each 200 pounds of set pressure, example: a valve at 2000 pounds of set pressure shall be 10 notches below the seat.

UPPER RING: Measure from the top of the guide to the seat, then set the ring using the measurement as the overall length from the top of the guide to the bottom of the ring.

6. SUPERCRITICAL VALVES

The Maxiflow Supercritical Valve is used for steam at pressures of approximately 3200 psia. Its internal design is similar to that used in the Boiler Safety Valves. Due to the demand for various designs of supercritical valves, there has been no standardization of any one valve.

The springs are made from high speed steel, the discs from Inconel "X" and the seating surface of the bushing from Stellite. These materials have been found to work very well under the high temperatures and pressures to which the valve is subjected. A ball thrust bearing is used on the compression screw of some of the valves for better adjustment.

The gagging arrangement (Fig. 6) on the supercritical valves can be used as either a gag or a lift stop. To gag the valve, the gag should be turned down on top of the spindle wrist tight. In using the gag as a lift stop, the gag can be set at a distance above the top of the spindle equal to the required lift.

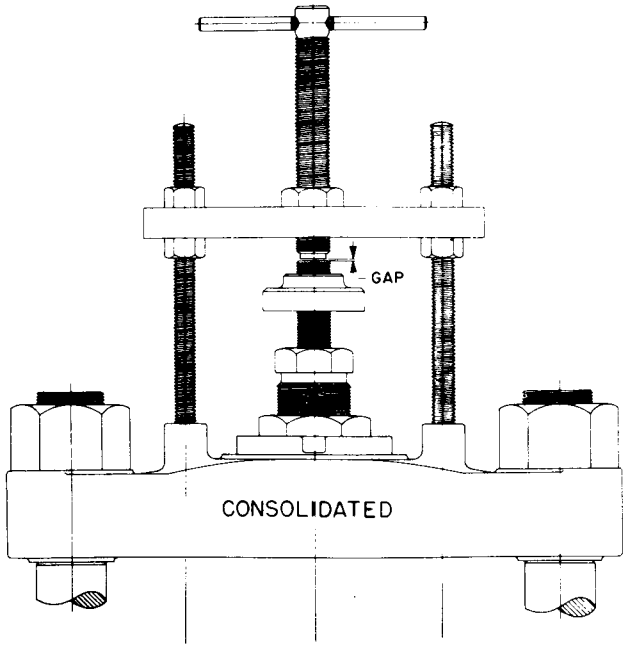


Figure 6 — Gagging Arrangement

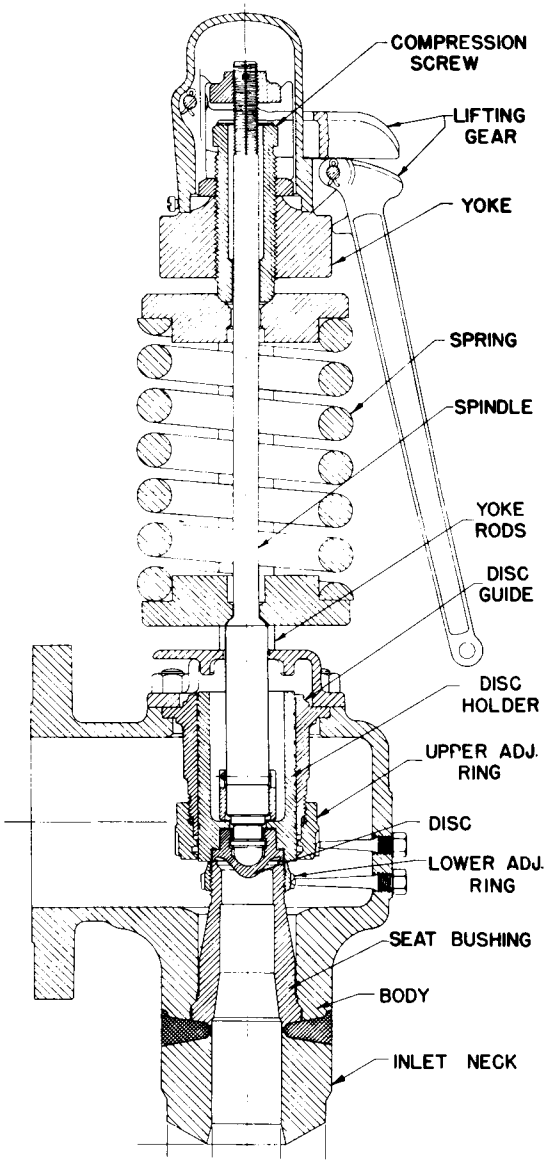


Figure 7 — Parts Nomenclature

SECTION II
HYDROSTATIC TESTING

FLANGED INLET SAFETY VALVES SHOULD BE REMOVED FROM THE BOILER DURING HYDROSTATIC TESTS AND BOILER NOZZLES BLANKED OFF

WELDED INLET VALVES

All welded inlet Consolidated Maxiflow Valves with pressure settings 1200 psi and above are equipped and shipped with internal plugs for use during hydrostatic testing.

Consolidated Maxiflow Safety Valves with internal hydrostatic test plugs installed are identified by a White warning tag with red letters attached to the internal plug by wires extending thru the drain hole in the valve body. This tag reads as follows:

"CAUTION

THIS VALVE IS EQUIPPED WITH AN INTERNAL PLUG FOR HYDROSTATIC TEST. DO NOT ATTEMPT TO STEAM TEST SAFETY VALVES UNTIL PLUGS HAVE BEEN REMOVED. DO NOT REMOVE THIS TAG UNTIL PLUG IS REMOVED."

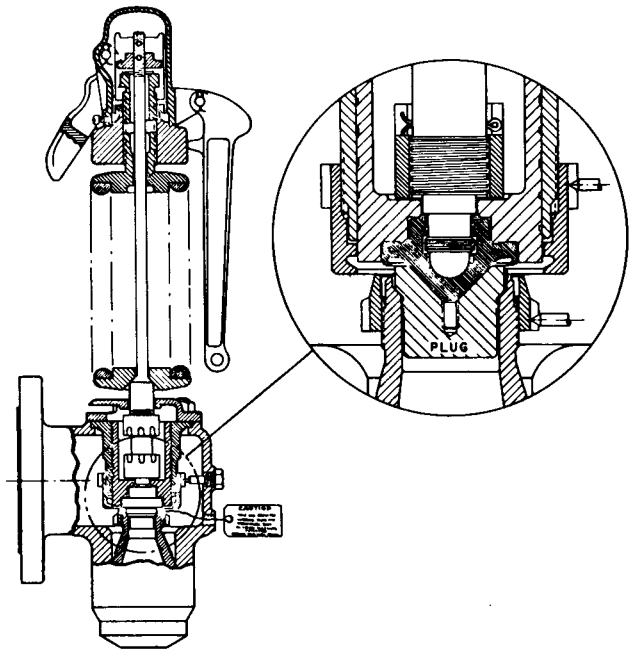


Figure 8
Valve as shipped with Hydrostatic plug in place

Figure 8 shows a typical Maxiflow Valve as shipped with a hydrostatic test plug and a RED caution tag.

For the hydrostatic test of boilers equipped with Maxiflow Valves having internal plugs, proceed as follows:

—TO APPLY TEST GAGS—

1. Refer to Figure 9. Remove CAP (27) with TOP LEVER (29) and DROP LEVER (31) attached. The RELEASE NUT (25) is fixed to SPINDLE (11) by means of a cotter pin. Note that the RELEASE NUT does not quite engage top of COMPRESSION SCREW (23). See Figure 10 for details of RELEASE NUT position.

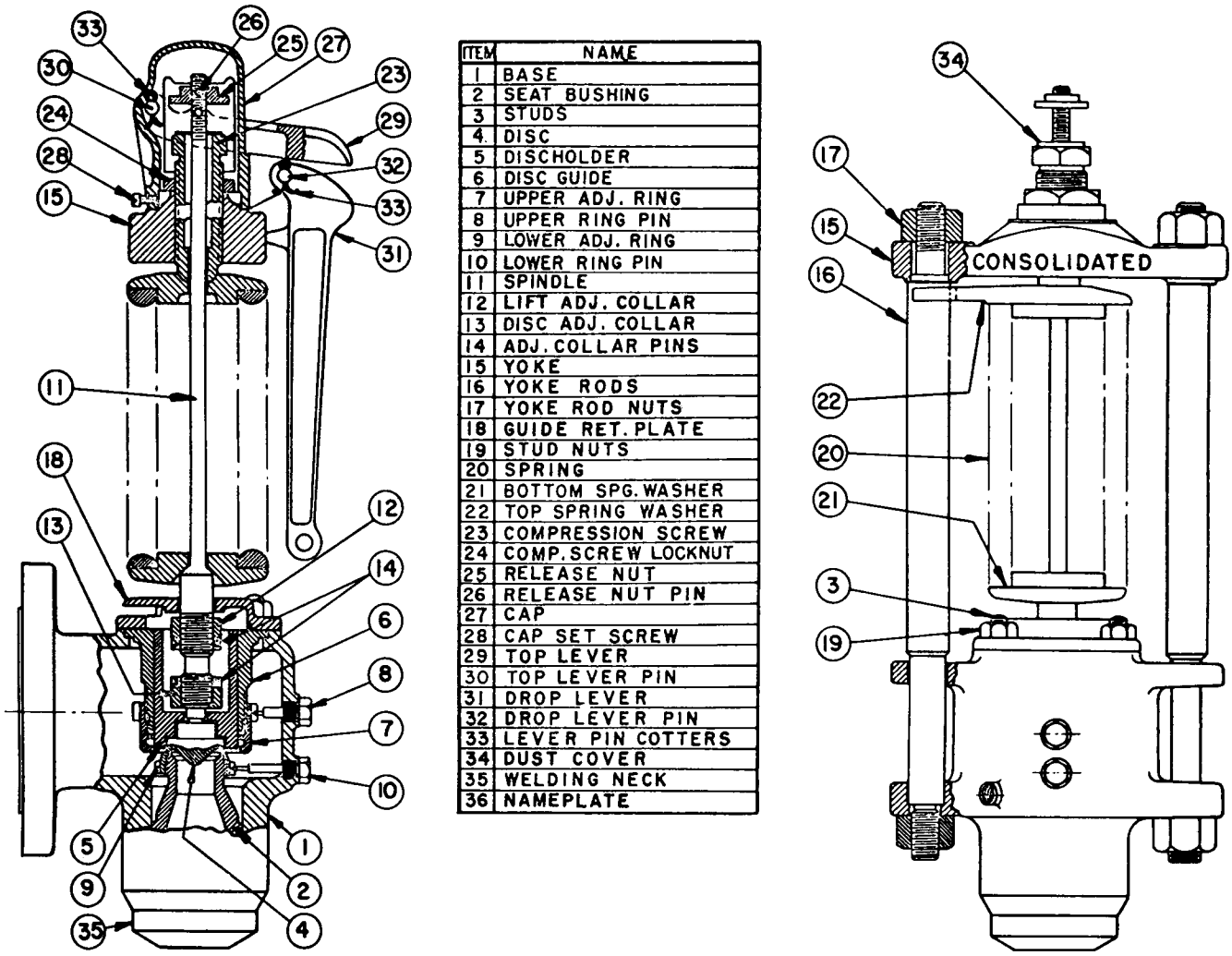
2. Center the test gag screw in the exposed end of the SPINDLE (11) and hook the legs of gag under the sides of the YOKE as shown in Figure 10.

   DO NOT APPLY THE GAG LOAD UNTIL THE BOILER HYDROSTATIC PRESSURE IS EQUAL TO 85% TO 90% OF THE PRESSURE TO WHICH THE LOW SET VALVE IS ADJUSTED. When applying the test gag, note that the spring compression on the valve is already in excess of that required for the name plate set pressure as the result of the installed hydrostatic test plug and it is sufficient to hold valve closed up to approximately 125% of the name plate set pressure. Therefore, the additional loadings to be applied by the gag should only be enough to prevent the valve from opening at maximum hydrostatic test pressure.

3. Apply the gag load by turning the gag screw clockwise.

   If the gag on any valve has not been tightened sufficiently, the valve will leak and sometimes the leakage is accompanied by a "sizzling" sound.

   IF THIS OCCURS, THE HYDROSTATIC TEST PRESSURE SHOULD BE REDUCED UNTIL THE VALVE COMES TIGHT AND THEN THE GAG SHOULD BE TIGHTENED STILL FURTHER.



ITEM	NAME
1	BASE
2	SEAT BUSHING
3	STUDS
4	DISC
5	DISCHOLDER
6	DISC GUIDE
7	UPPER ADJ. RING
8	UPPER RING PIN
9	LOWER ADJ. RING
10	LOWER RING PIN
11	SPINDLE
12	LIFT ADJ. COLLAR
13	DISC ADJ. COLLAR
14	ADJ. COLLAR PINS
15	YOKE
16	YOKE RODS
17	YOKE ROD NUTS
18	GUIDE RET. PLATE
19	STUD NUTS
20	SPRING
21	BOTTOM SPG. WASHER
22	TOP SPRING WASHER
23	COMPRESSION SCREW
24	COMP. SCREW LOCKNUT
25	RELEASE NUT
26	RELEASE NUT PIN
27	CAP
28	CAP SET SCREW
29	TOP LEVER
30	TOP LEVER PIN
31	DROP LEVER
32	DROP LEVER PIN
33	LEVER PIN COTTERS
34	DUST COVER
35	WELDING NECK
36	NAMEPLATE

Figure 9
Parts Nomenclature
SK-6372

This procedure must be followed exactly since it is very difficult to stop the leak by additional gagging once it has started. Any attempt to pinch off the leakage thru the valve without first lowering the hydrostatic pressure is liable to result in damage to the valve seats.

4. After the hydrostatic test is completed, the gags should be removed when the hydrostatic pressure has been reduced to 85% to 90% of the pressure of the low set valve.

   UNDER NO CIRCUMSTANCES SHOULD THE GAGS BE LEFT ON VALVES WITH NO HYDROSTATIC PRESSURE ON THE SYSTEM.

TO REMOVE THE HYDROSTATIC TEST PLUG

1. Remove the four GUIDE RETAINING PLATE STUD NUTS (19).

2. Back off the two YOKE ROD NUTS (17) uniformly until top of COMPRESSION SCREW (23) engages RELEASE NUT (25).
   Completely remove YOKE ROD NUTS.

3. Remove YOKE and SPRING ASSEMBLY from valve, **being careful** not to damage the DISC.

4. Remove hydrostatic test plug from SEAT BUSHING.

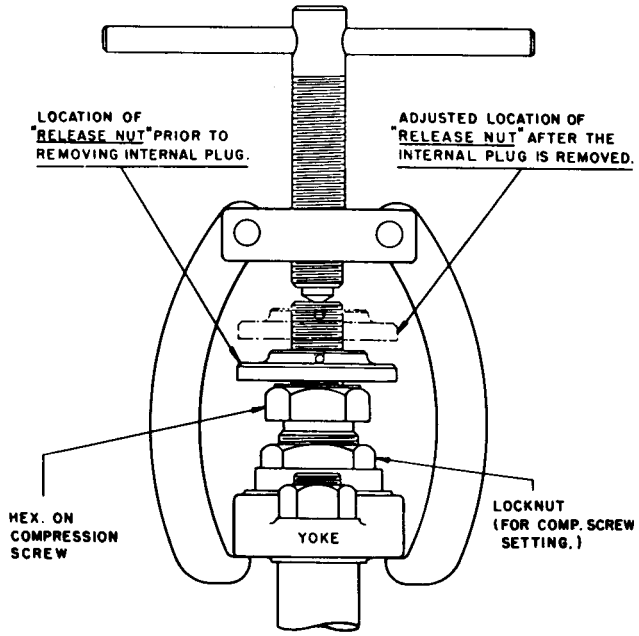


Figure 10
Application of Test Gag

TO REASSEMBLE VALVE

1. Always be certain that all parts are clean and free of dirt and foreign material. Dirt trapped on seating surfaces or in nozzle when valve is reassembled will invariably damage seats.

2. Reassemble YOKE and SPRING ASSEMBLY into BASE **being careful not to damage the DISC.** Locate the GUIDE RETAINING PLATE (18) so that the opening faces the valve outlet. The lugs on the TOP SPRING WASHER (22) should be on the right side of the valve when facing the outlet.

3. Replace the two YOKE ROD NUTS (17) and the four GUIDE RETAINING STUD NUTS (19). Tighten the YOKE ROD NUTS (17) and just snug up the four GUIDE RETAINING STUD NUTS (19).

4. Remove cotter pin from RELEASE NUT (25). Turn the RELEASE NUT counter clockwise and return RELEASE NUT to position at top of SPINDLE (11) so that cotter pin can be re-inserted in a hole drilled in the SPINDLE at that location. See Figure 10. The valve setting is now approximately equal to the setting stamped on valve name plate.

5. Visually center GUIDE RETAINING PLATE (18) around SPINDLE (11) and tighten the four GUIDE RETAINING STUD NUTS (19).

6. Replace CAP (27) and locate DROP LEVER (31) vertically on center line of valve.

7. Remove TOP LEVER (29) from CAP (27) and reassemble in position in accordance with Figure 9. If properly positioned, TOP LEVER should have a small amount of vertical movement prior to engaging bottom surface of RELEASE NUT.

8. Valve is now ready for the initial field test on steam to check valve set point and blowdown.

SECTION III

INSTRUCTIONS FOR ASSEMBLING & OPERATING THE CONSOLIDATED MAXIFLOW ROTO-LAP MACHINE

GENERAL DESCRIPTION

The Consolidated Maxiflow Roto-Lap Machine is a hand operated tool for refinishing damaged or worn nozzle seats in Consolidated Maxiflow Safety Valves. It has been expressly developed for the purpose of generating a flat surface and its use materially reduces lapping time.

The Roto-Lap will not correct a seating surface which is out of square with the valve center line, nor will it reshape the original dimensions of the nozzle seat. For either of these purposes, a special reseating machine is required or the valve must be removed from the boiler and the base and bushing assembly remachined.

GENERAL NOTES

The Maxiflow Roto-Lap Machine is made up of parts as shown in Fig. 11. A duplicate Bill of Material is also pasted inside the cover of the carrying case.

A Mounting Flange, Item 6, fabricated with three sets of four holes on three diameters is provided for use on all valves with orifice sizes #1 thru #5. Kits for #1 and #2 orifice valves include two sets of four Laps each, Item 10. Kits for #3 and #4 and #5 orifice valves include one set of four Laps, Item 10, and one set of four larger or alternate Laps, Item 11.

ASSEMBLY

Proper assembly of the Roto-Lap can be accomplished by referring to Fig. 11. The mounting Flange, Item 6, has three sets of four holes each; the inner set marked 1-2; the center set marked 3; and the outer set marked 4-5. First select the set of marked holes corresponding to the size of the orifice to be lapped and insert the Shoulder Screws, Item 7, downward through these holes.

The orifice size can be identified by referring to the valve type number stamped on the valve name plate.

The third digit in the type number is the valve orifice size or number. As an example, if the valve is Type 1747WA, the third digit, #4, is the orifice size or number and the Shoulder Screws would be inserted in the set of holes marked "4-5" on the Mounting Flange.

Next assemble the four Lap Gear Washers, Item 8, four Lap Gears, Item 9, Center Gear, Item 5, and Laps, Item 10, in this order. The shoulders on the Shoulder Screws should seat against the recesses in the top surfaces of the Laps. An Allen Set Screw wrench is provided for tightening the Shoulder Screw to the Lap. Each Lap, Lap Gear and Shoulder Screw assembly should rotate freely in the Mounting Flange.

The **Center Gear** must engage in all four Lap Gears and must be in place before the Laps are assembled to the Shoulder Screws. When properly assembled, the Center Gear should "float" in the space between the Laps and the Mounting Flange.

Attach the Handle Assembly to point "Y" on the Mounting Flange spud by means of the Allen Set Screw provided.

Place the Bore Guide, Item 2, inside the bore of the safety valve seat bushing or nozzle and push it down as far as it will go. The top of the flange, point "R" **must** be below the seating surface of the nozzle. A small amount of light oil on the "O" Ring, Item 3, will assist in getting the guide into this position.

USE

Where two different sizes of Laps are provided, the larger set will cut faster than the smaller and should be used for removing nicks and other severe damage. The smaller set of Laps cuts slower and is better for finishing the seat surface.

Apply lapping compound to the lower face of each of the Laps. Normally 1000 grit grinding compound similar to KWIK-AK-SHUN Grade #1000, should be used. However, a heavier grit compound

may be used where necessary. A small amount of oil placed on the Laps with the compound will produce a better finish.

Drop the Mounting Flange Assembly over the Bore Guide extension shaft so that the shaft passes through the Center Gear and into the center hole in the Mounting Flange. TURN THE HANDLE CLOCKWISE slowly until the Key, Item 4, engages in the keyway in the Center Gear and prevents its further rotation. At this point, the Laps will drop onto the seating surface. Further rotation of the handle causes the Laps to move in a planetary fashion, rotating as they travel around the seat. Lap by turning CLOCKWISE until the desired finish is produced.

You will note that the Mounting Flange Assembly lifts off easily for periodic inspection of the seat as lapping progresses, and is easily replaced for further lapping if necessary. Also, the Bore Guide, remaining in the bore throughout the entire operation, prevents foreign material from falling into the boiler.

After the removal of nicks, etc., the surface finish can be improved if the surplus compound is wiped away from both the nozzle seat and the laps and the lapping continued with a minimum amount of compound. Final finishing should be done with a new hand lap, using 1000 grit compound to insure minimum deviation from a perfectly flat surface. Ring laps are provided in the Roto-Lap Kit for this purpose.

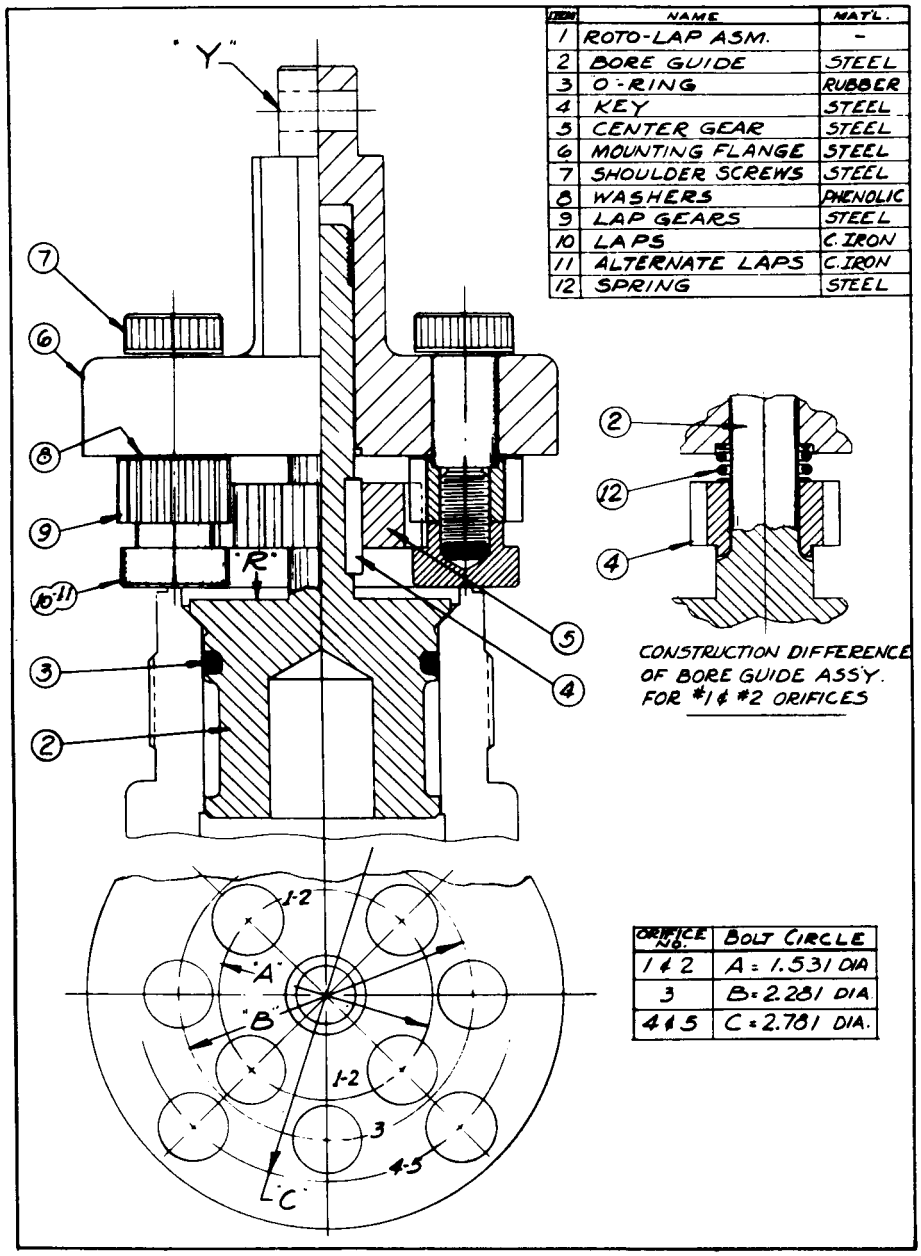
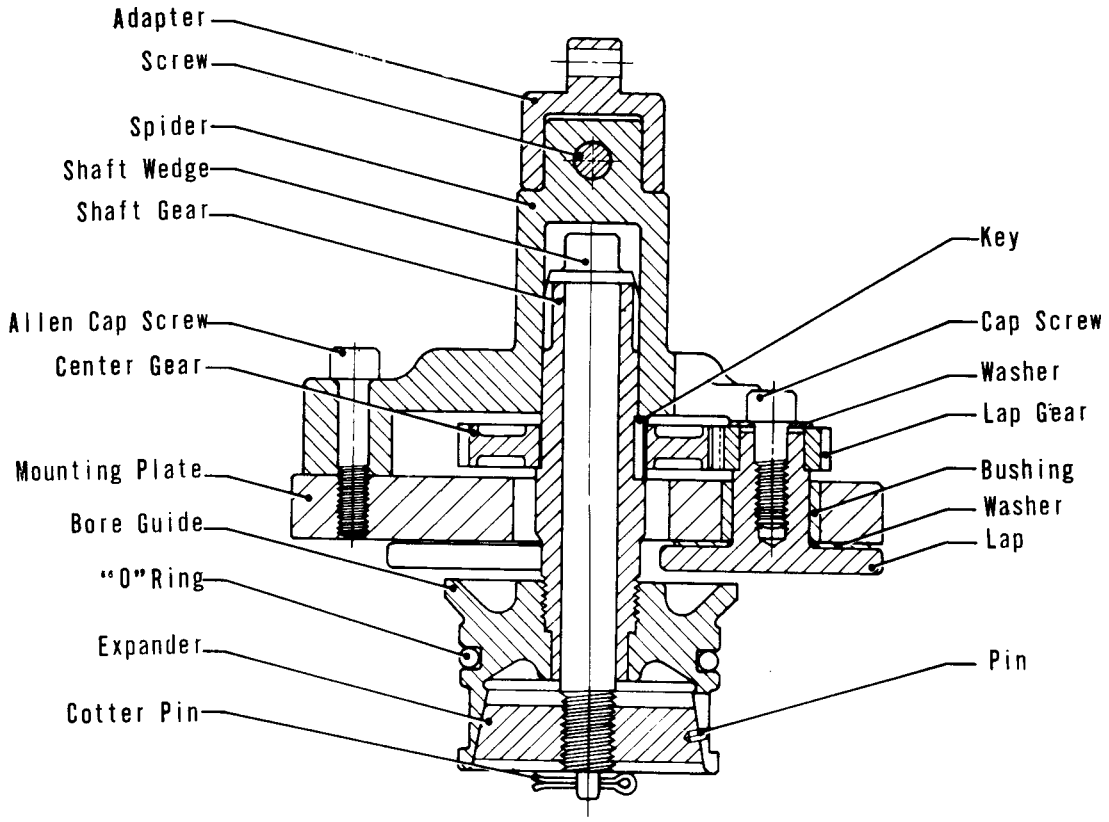


Figure 11



ORIFICES 6 THROUGH "R"

ROTO-LAP FOR REHEAT VALVES

The Roto-Lap machine for the larger reheater valves, Orifices #6 through R is somewhat different than that described for Orifices #1 through #5 in that the mounting plate consists of two parts, the spider and the plate. The mounting plate has two sets of three holes each the inner set of which is used on the #6 and #7 orifice valves. The outer set is used for the #8 and "R" orifice valves.

As an example, if the valve is Type 1777WA, the third digit #7 is the orifice size, and the cap screws would be inserted in the inner set of three holes on the mounting plate.

Next assemble the three Lap Gear Washers, Item 16; three lap gears, Item 8; center gear, Item 9; and laps, Item 6 in this order, and tighten the cap screws into the laps with the Allen wrench provided.

Next install the bore guide, Item 2, with its Expander 4 and Shaft Wedge 11 into the bore of the valve, and tighten shaft wedge to expand bore guide.