INSTRUCTIONS FOR INSTALLATION, OPERATION AND REPAIRING THE CONSOLIDATED SAFETY VALVE

TYPES 1411-1415-1419-1426-1431-1515

Service Manual No. 3

Form No. 250-947

Industrial Valves DRESSER

DRESSER VALVE AND CONTROLS DIVISION
Industrial Valve North American Operations
Alexandria, Louisiana

INSTRUCTIONS FOR INSTALLATION AND REPAIR OF CONSOLIDATED SAFETY VALVES TYPES 1411-1415-1419-1426-1431-1515

INSTALLATION

Safety valves must be connected in a vertical position directly to the boiler or on equal size fittings no longer than the face-to-face dimension of an American Extra Heavy Standard Iron tee. Under no condition should a stop valve or other obstruction be placed between the boiler and the safety valve.

Thoroughly c'ean the inlet of the valve before installation and be sure that the proper gasket is used. Tighten bolts evenly.

The valve at all times should be free from external stresses transmitted from the discharge piping. A slip joint should be provided between the safety valve and discharge piping with ample clearance to take care of thermal expansion movements. Figure 3 illustrates a recommended design. The riser pipe should be large enough to accommodate the full capacity of the valve without causing steam to escape by flowing backward through the drip pan. In no case should the pipe connected to the valve be of a smaller size than the valve outlet.

HYDROSTATIC TESTING

Use a test gag as illustrated in Figure 4 on each valve to hold the feather to the seat when making water pressure tests. Permitting the valve to lift by water pressure only, lifts the feather slightly and may result in leakage caused by foreign matter becoming trapped.

In gagging a safety valve, care must be exercised to avoid overstressing the Spindle and damaging the seating surfaces of the Feather and the Seat Bushing. The screw of the gag should be made only "wrist tight" which is sufficient to keep the valve from leaking when pressure is raised above the popping point.

PRESSURE AND BLOW DOWN ADJUSTMENT

To change the popping pressure of a valve remove the Top Lever and Cap. (See Figure 1.) Loosen the Lock Nut and turn Compression Screw clockwise to increase pressure or anti-clockwise to decrease pressure. Tighten Lock Nut and reassemble Cap and Top Lever. Check to see that Top Lever does not bear against the Release Nut when the Drop Lever is positioned over a Yoke rib. About 1/16" clearance between these parts is desirable.

Raising the popping pressure will increase the blow down and likewise, lowering the popping pressure will decrease the blow down. To correct or to change the amount of blow down, take out the Ring Pin and, using a screwdriver or other pointed tool, turn the Adjusting Ring which is threaded to the Seat Bushing. Turning the ring to the right raises the Adjusting Ring, thereby increasing the blow down. Turning it to the left lowers the ring, thereby decreasing the blow down. If a valve is out of control and will not pop, the ring is probably too low.

It is possible that the first blow of a safety valve on steam may be a few pounds higher than after the valve is completely heated. The effect is somewhat greater with a superheater valve since the steam temperature is higher. Therefore the valve should be popped a couple of times before adjustments are changed.

Caution: The popping point of a *superheater valve should not be checked, or set, by readings taken from a pressure gauge connected to the boiler drum if the boiler is carrying a load* because it does not register the pressure drop through the superheater; instead, use a gauge connected to the superheater outlet with proper allowance being made for waterleg between location of gauge with respect to the valve.

VALVE DIFFICULTIES

Certain troubles may develop through use or damage to working parts. The most common are simmering, leaking, chattering, and hang-up.

Simmering is defined as an audible escape of steam as pressure is raised to near the popping point. A slight simmer is not objectionable and only indicates slight irregularity of the seating surfaces. Larger amounts of simmer indicate seat damage, too wide a seat, or that the Adjusting Ring is too low.

Leaking is the constant escape of steam at normal operating pressure below the closing pressure of the valve. It is caused by either damage to the seating surfaces or to foreign matter being trapped. If hand

lifting, wide open, does not give relief, apply a gag lightly for a few minutes as described under the heading of Hydrostatic Testing. If leaking continues (with the gag removed,) the valve should be repaired at the first opportunity to prevent serious wire drawing of the seats. Other causes of leakage are interference of the lifting gear such as the Spindle Nut riding on the Forked Lever, distortion of the valve body from uneven tightening of the inlet flange bolts, and improper installation of the discharge piping so as to introduce undue strain upon the valve.

Chattering is a hammering action of a vibratory nature of the Feather on the Seat Bushing and must be stopped immediately or the seats will be ruined. To stop chattering, hold the valve open with the Drop Lever until the steam pressure has been reduced several pounds. Chattering is caused by the valve: (1) not having sufficient blow down; (2) excessive back pressure from undersize discharge piping; (3) insufficient steam flow to the valve.

Hang-up occurs upon closing and is defined as leakage from the valve failing to shut off tightly. Too short a blow down or mechanical interference are the two principal causes.

Dropping off of the popping point is many times unjustly charged against the spring losing its "tension". Invariably, however, it is caused by damage to the seats from foreign matter, from chatter, or difference in heat distribution between pops. A reasonable waiting period between pops will give consistent results.

DISASSEMBLING VALVES FOR REPAIR

1. Remove Top Lever and Cap (hand lifting mechanism.)

2. Remove cotter key from Spindle on top of Release Nut.

3. Screw Release Nut down until it engages top of Compression Screw, then lift off the Yoke with the Spindle, Spring, and Feather assembled. This will permit a quick inspection of the seating surfaces of both Feather and Seat Bushing without changing the popping point.

If however, further disassembly of the Spindle, Spring, and Spring Washers is anticipated for inspection or cleaning purposes, the approximate spring compression can be determined by unscrewing the Compression Screw and counting the number of turns necessary to just relieve the compression.

REPAIRING

If only very slight imperfections are found on the seating surfaces they can be readily restored by lapping them together using machine oil mixed with a fine abrasive of about 500 or 600 grain size. Care should be taken to see that the seats as finished are correctly located as shown in Figure 8B or in Figure 9B.

If more extensive reconditioning is required, the Feather should be machined and the seat of the Bushing restored by lapping with a cast iron lap fitted with suitable handle as shown in Figure 6, or by remachining as shown in Figure 5.

In setting-up the Feather for *remachining* make certain that the guiding surfaces of the wings are running true at *both* ends. Carefully follow the dimensions and angles given in Figures 7A or 7B. If a visual inspection of the seat to be remachined reveals that it is of the "STEP" type, then remachine as in Figure 7B. If of the "PLAIN" type, then follow Figure 7A. Take light cuts across the seat and finish as smooth as possible.

To remachine the Seat Bushing, it is advisable to leave it assembled within the body and do the work in a lathe or boring mill. The bore of the Bushing and the Yoke guiding surface should be made to run reasonably true. After cutting the angle of the seat to 45°, remachine the end of the Bushing in accordance with Figure 5.

After turning to the smoothest possible finish, use the lap to remove all traces of tool marks.

GRINDING-IN THE SEATS

Grinding-in is the process of smoothing away tool marks and slight irregularities and broadening the seating-surface contact.

Figures 8A and 9A illustrate the Feather-to-Bushing contact before grinding-in. Figures 8B and 9B show the contact after grinding-in when the surfaces are rubbed together with machine oil only.

A wrench, consisting of threaded shank fitting the thread in the Feather and provided with a tee-handle, should be used for grinding the Feather to the Seat Bushing.

The use of grinding compounds containing coarse and hard-grit abrasives such as silicon carbide and aluminum oxide should be avoided because the metals used in the Feathers and Bushings of wing guided valves are relatively soft and stringiness of the seating surfaces is likely to result. Ground glass mixed with oil, Mulley (soft grit abrasive) mixed with oil, and mixtures containing abrasives of about 500 to 600 grain are suitable grinding materials. All can be obtained from Manning, Maxwell & Moore, Inc.

REASSEMBLING

The Adjusting Ring should be examined to be sure that it can be rotated freely. To free a tight ring, apply penetrating oil or hot water and then rap with a block of hard wood. After loosening and cleaning the threads, reset the Adjusting Ring to its original position.

Lubricate all threads, Spring Washer and Spindle bearings with powdered graphite mixed with penetrating oil.

Spindle-point bearing and Feather-pocket bearing must be smooth and clean and be lubricated with graphite.

Make sure that the Yoke-to-Body joint surfaces are clean. Tighten stud nuts evenly and securely.

Re-establish Spring compression by first turning down the Compression Screw to take out all play and then add the same number of turns that it took to relieve the compression when the valve was disassembled.

In re-assembling the hand lifting gear make sure that the Release Nut clears the top Lever by at least 1/16" when the Drop Lever is positioned over one of the Yoke ribs.

TESTING

To insure that safety valves are maintained in good working order they should be hand lifted or popped at periodic intervals. It is recommended that the valves be popped just prior to a boiler outage as a check to determine whether repair work or readjusting is necessary. Valves should not be lifted by hand unless there is sufficient steam pressure in the boiler to blow foreign matter from within the valve.

REPLACEMENT PARTS

When ordering replacement or spare parts, state serial number, type, size, and set pressure of the valve, and whether used with saturated steam or superheated steam.

Refer to Figure 1 for descriptive names of the parts.

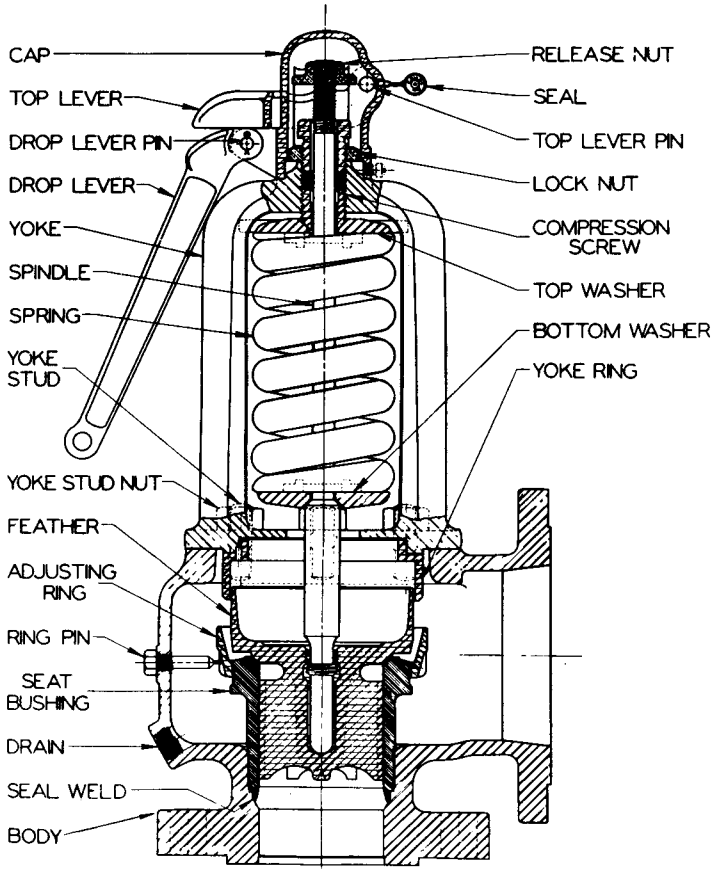


FIG. 1—Nomenclature and Details of Construction
(Illustration Shows Type 1415 Consolidated Safety Valve)

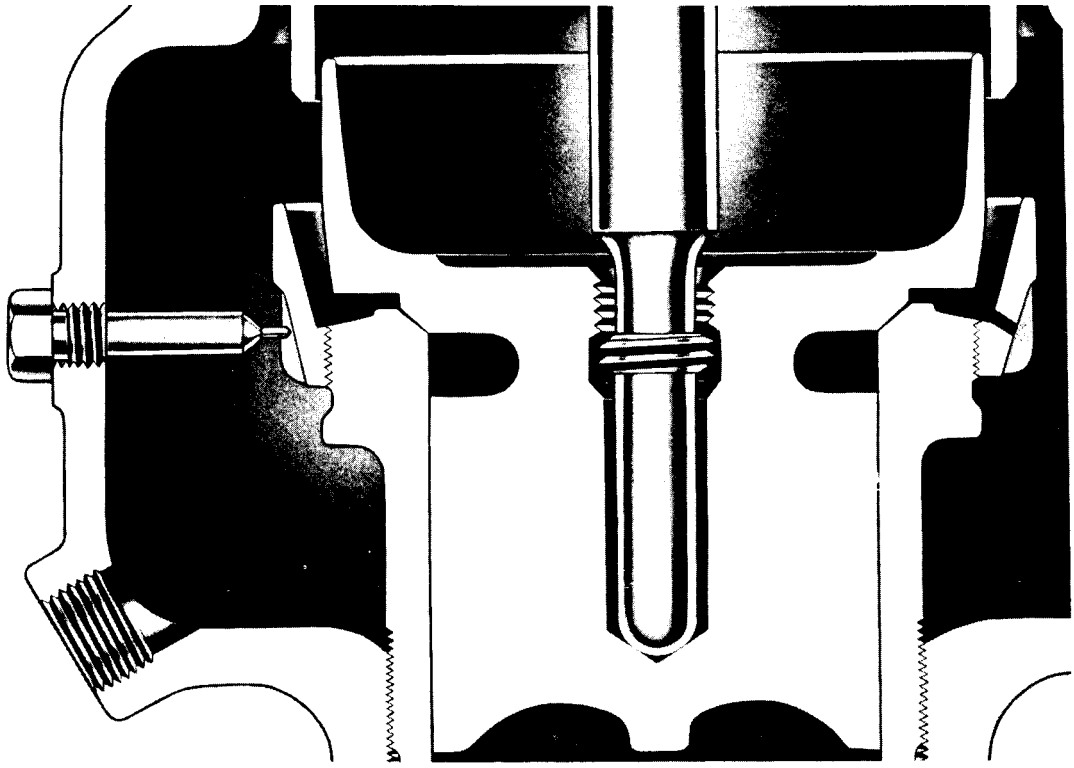


FIG. 2—Detail of Seat and Feather Assembly

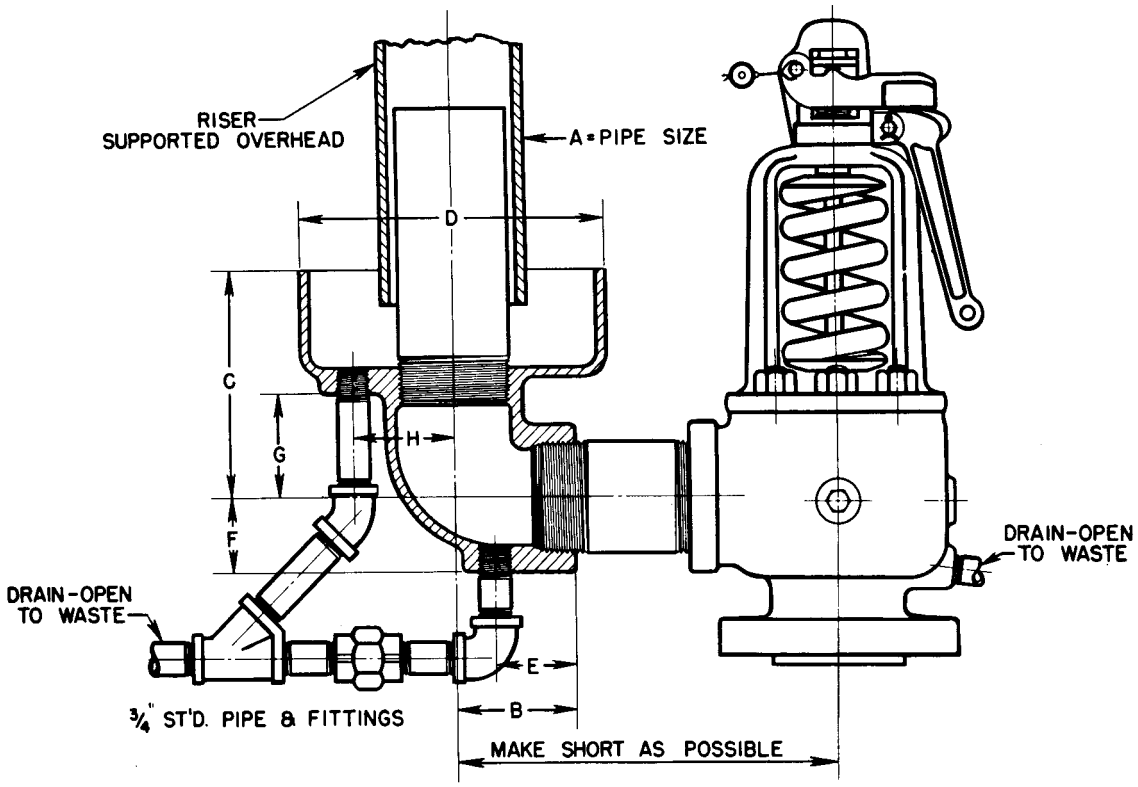


FIG. 3—Recommended Installation for Discharge or Vent Piping

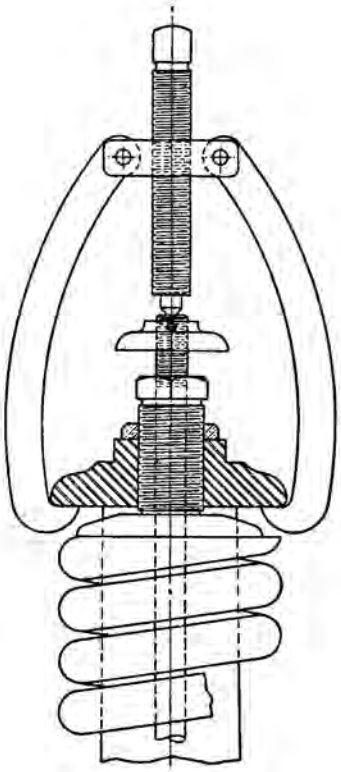


FIG. 4—Test Gag Application

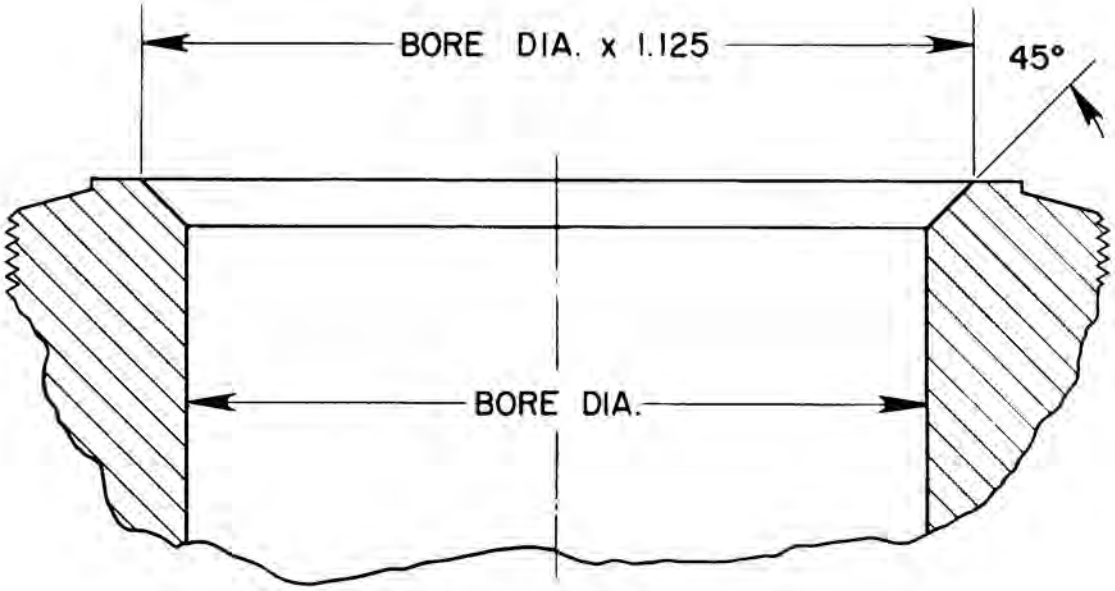


FIG. 5—Bushing Seat

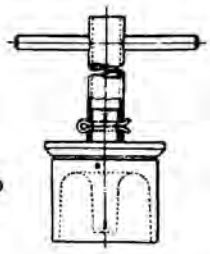


FIG. 6—Bushing Seat Lap

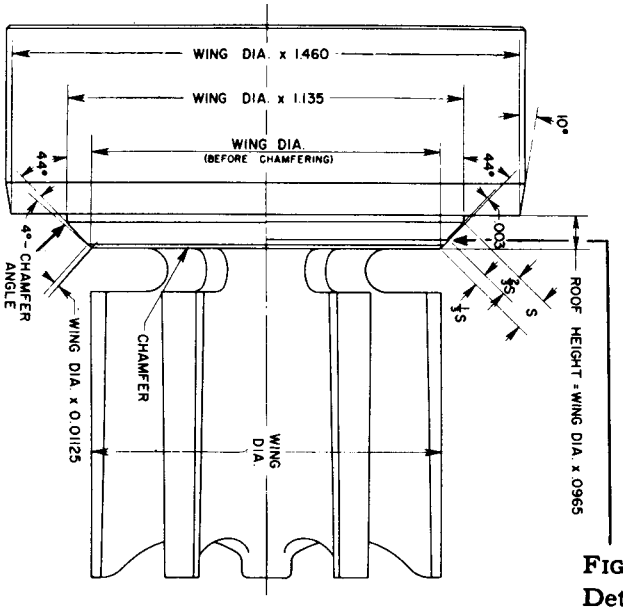


FIG. 7A—Feather Seat Detail for "Plain Seat"

FIG. 7B—Feather Seat Detail for "Step" Seat

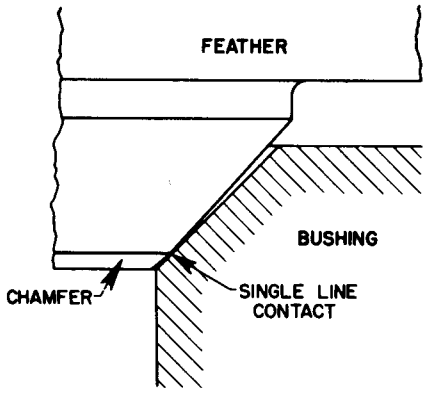


FIG. 8A—"Plain" Seat Before Grinding-in

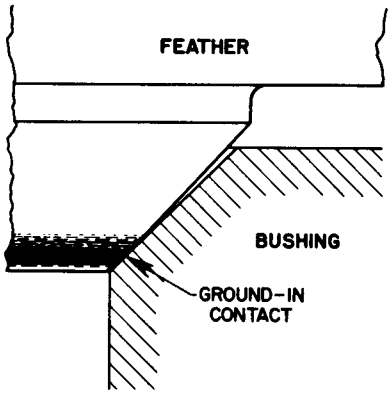


FIG. 8B—"Plain" Seat After Grinding-in

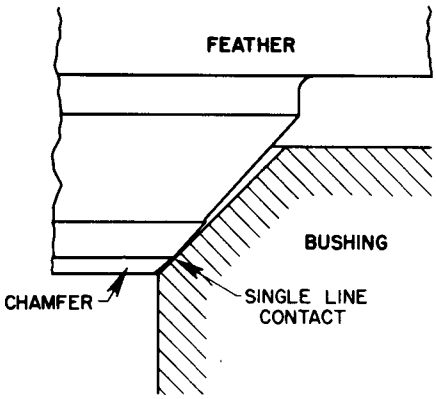


FIG. 9A—"Step" Seat Before Grinding-in

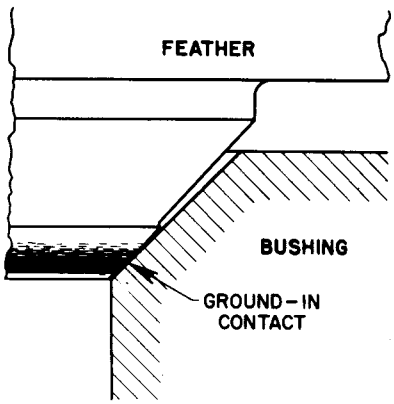


FIG. 9B—"Step" Seat After Grinding-in

1″ 1415F RESTRICTED LIFT VALVE
900, 1500 & 2500 POUND DESIGN

1. DISASSEMBLY

Use instructions on page 3 of Service Manual for disassembly.

2. REPAIRING

If only slight imperfections are found on the seating surfaces they can be readily restored by lapping the bushing with a 45° lap using 1-A Clover Compound until all imperfections are removed.

After thoroughly cleaning the bushing seat, grind in the disc using KWIK-AK-SHUN Grade #1000 Compound. Care should be taken to see that seats as finished are correctly located as shown in Figure 9B of manual.

If more extensive reconditioning is required, the body must be set up in a lathe or boring mill. The bore of the bushing and the yoke guiding surface should be made to run true. After cutting the angle of the seat to 45°, remachine the top of the bushing in accordance with Figure 7. After turning to the smoothest possible finish, use the lap to remove all traces of tool marks.

If the disc is damaged to the point that it cannot be lapped it must be replaced.

3. ASSEMBLY

Use the instructions on page 4 of service manual to reassemble the valve. However, the lift of the valve must be adjusted to the lift specified on the nameplate.

To adjust the lift stop, place disc, spindle, lift stop assembly in valve body. Install bonnet with compression screw and measure lift of spindle with a depth micrometer. To make adjustments, remove bonnet and turn lift stop counter-clockwise to reduce lift and clockwise to increase lift. One notch turn on lift stop changes lift .008. Replace cotter pin after each adjustment.

For nomenclature refer to figures 10 and 11.

4. DIMENSIONS

Refer to pages 6 and 7 of manual Number 3 for location of the following dimensions.

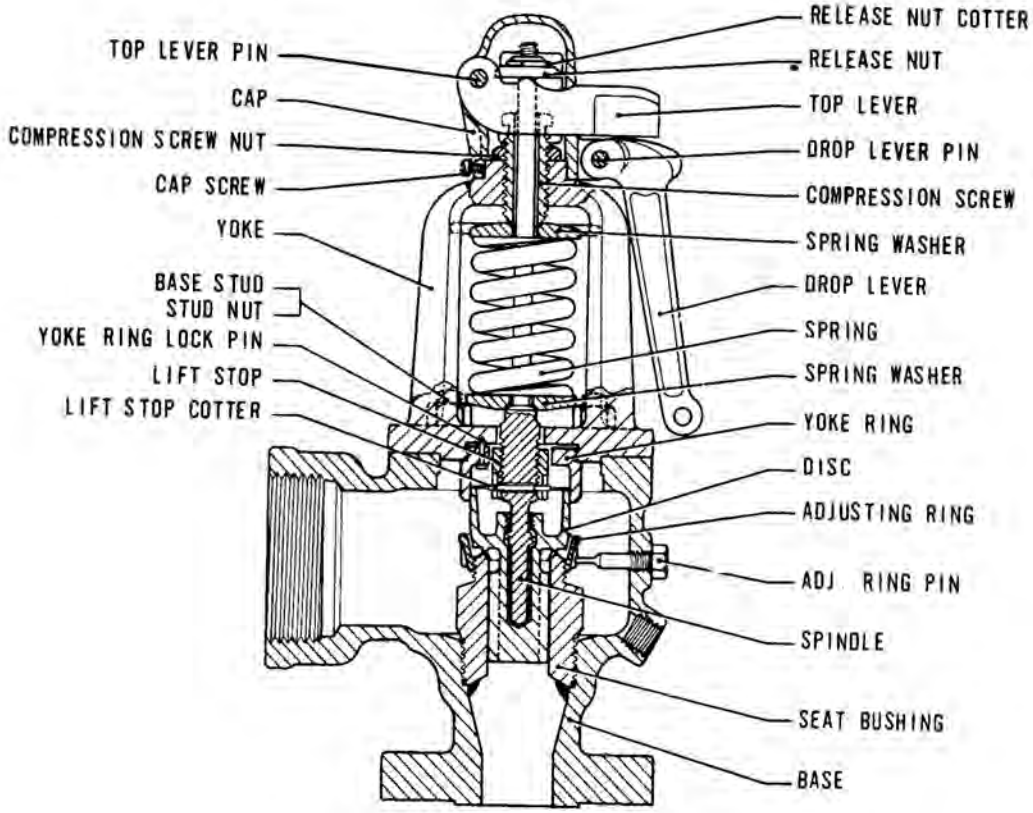


FIG. 10

Size	A	B	C	D	E	F	G	H	J	K
	+.000	+.004	+.004	+.000			+.002			
	−.001	−.000	−.000	−.003	1.945	2.873	−.000		.007	.025
F1	1.245	1.419	1.824	1.930	1.952	2.870	2.875	4⅜	.002	.015

L	M	N & NR	P	Q	R	S	T	U	V
		+.001	+.002	±.002	+.000	+.000	+.003	+.002	±.001
.007		−.000	−.000		−.004	−.006	−.000	−.000	
.006	6½	.033	.042	.014	.121	1.554	1.402	1.250	.015

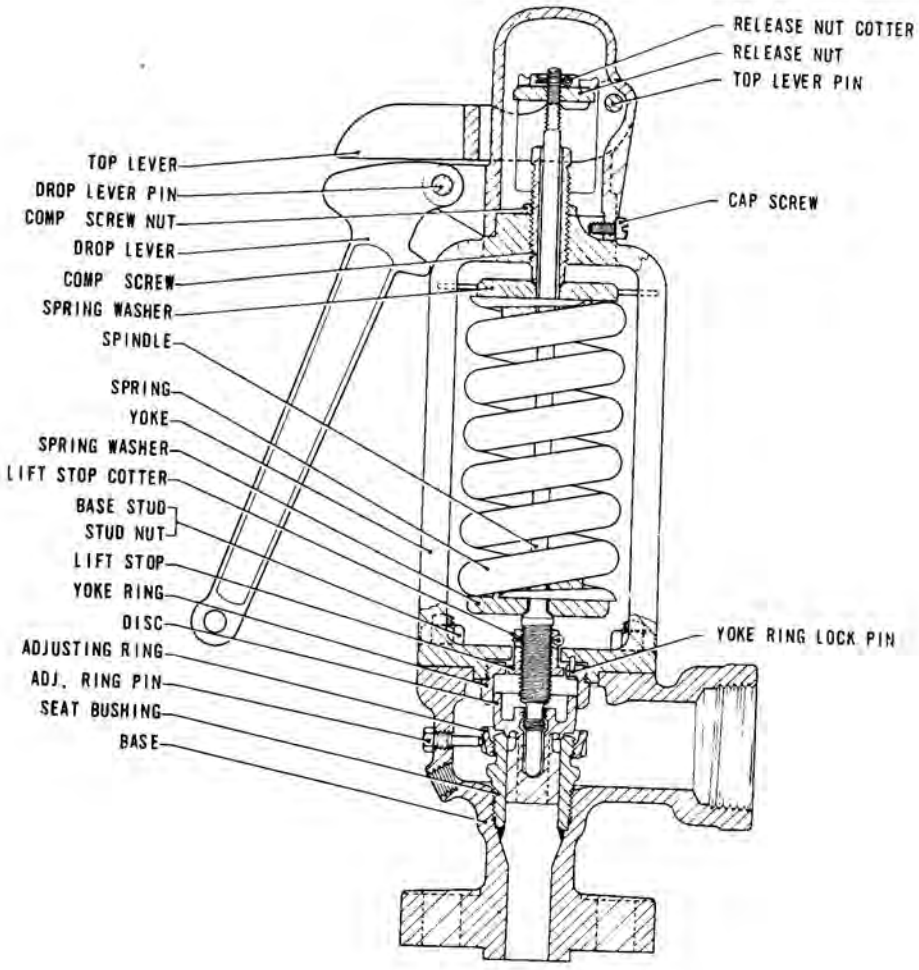
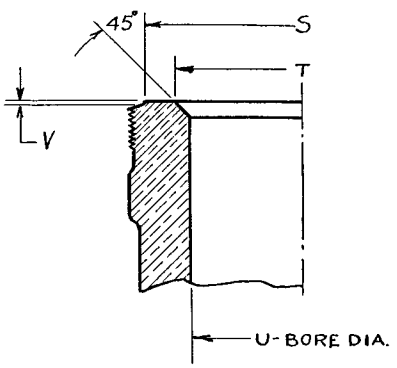
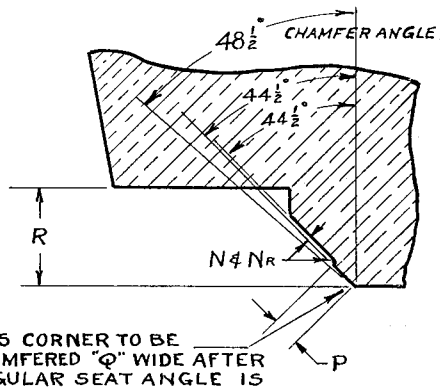


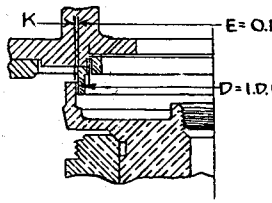
FIG. 11

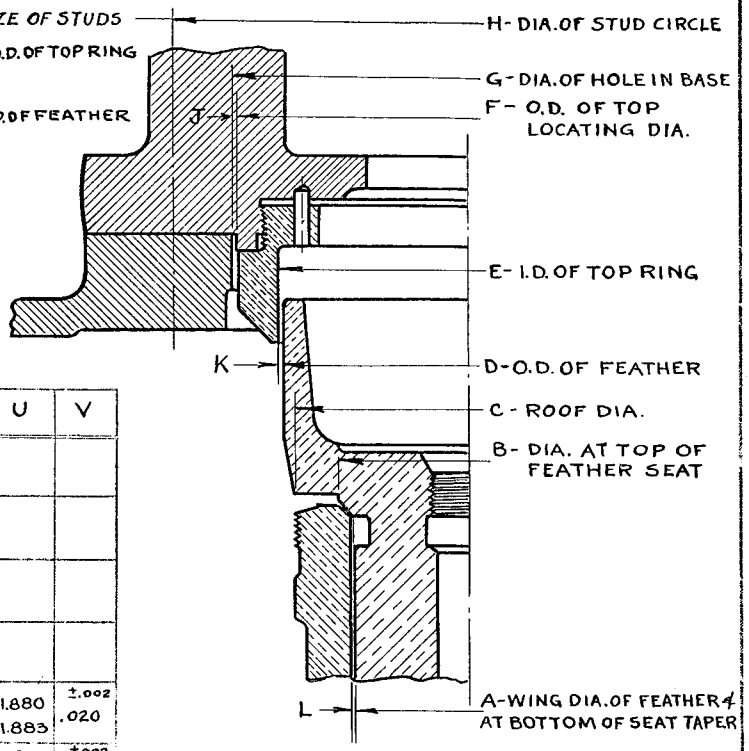
ST2-110

ITEM	QUAN	NAME	MATERIAL	FINISH	PART NO.	PATT. NO.	DWG. NO.









SIZE	A	B	C	D	E	F	G	H	J MAX. MIN.	K MAX. MIN	L MAX. MIN.	M	N & NR	P	Q	R	S	T	U	V
1/2																				
3/4																				
1																				
1 1/4																				
1 1/2 & 2	1.873 1.874	+.004 -.000 2.128	+.004 -.000 2.839	+.002 -.000 2.998	3.010 3.015	3.745 3.748	3.750 3.752	4 3/4	.0035 .001	.0085 .005	.005 .003	6-5/8	+.001 -.000 .003	+.002 -.001 .064	+.003 -.000 .023	+.000 -.004 .196	2.417 2.423	2.107 2.110	1.880 1.883	±.002 .020
2 1/2	2.492 2.493	+.004 -.000 2.838	+.004 -.000 3.648	+.003 -.000 3.872	+.000 -.001 3.897	+.003 -.000 4.996	4.501 4.503	5 7/16	.0035 .001	.0125 .0075	.0055 .0035	6-5/8	+.001 -.000 .003	+.002 -.001 .085	+.005 -.000 .028	+.000 -.004 .242	3.097 3.103	2.801 2.810	2.500 2.503	±.002 .030
3	2.991 2.992	+.004 -.000 3.408	+.004 -.000 4.378	+.003 -.000 4.622	4.643 4.653	5.244 5.248	5.250 5.252	6 1/4	.004 .001	.0155 .009	.006 .004	6-5/8	+.001 -.000 .004	+.002 -.001 .102	+.005 -.000 .034	+.000 -.004 .290	3.717 3.723	3.366 3.370	3.000 3.003	±.002 .040
4	3.990 3.991	+.004 -.000 4.538	+.004 -.000 5.838	+.004 -.000 5.965	+.000 -.010 5.999	+.005 -.000 6.493	6.500 6.502	7 11/16	.0045 .001	.017 .010	.0065 .0045	6-3/4	+.001 -.000 .004	+.002 -.001 .137	+.005 -.000 .045	+.000 -.004 .386	4.957 4.963	4.496 4.500	4.000 4.003	±.003 .049
6 OLD	5.988 5.989	+.008 -.000 6.705	+.010 -.000 9.495	+.010 -.000 9.031	+.000 -.010 9.000	±.005 11.241	11.250 11.253	12 7/8	.0085 .002	.0255 .0155	.0075 .0055	8-7/8	X	X	X	+.000 -.006 .624	8.616 8.622	6.612 6.624	6.000 6.003	±.003 .083
6 1415 Q	6.988 6.989	±.003 7.952	±.005 10.220	±.005 10.834	±.005 10.875	±.003 12.243	±.002 12.251	14 1/8	.0065 .0015	.0255 .0155	.0075 .0055	8-1/8	X	X	X	+.000 -.006 .675	8.677 8.683	7.856 7.868	7.000 7.003	±.003 .084

2	ADDED DIMENSIONS FOR Q VALVES	1-4-54			
1	REVISED AND RETRACED FROM DWG. SAME SIZE & NO.	4-22-49			

TOLERANCE ±.007 ON DECIMAL DIMENSIONS UNLESS OTHERWISE SPECIFIED
TOLERANCE ±1/64 ON FRACTIONAL DIMENSIONS UNLESS OTHERWISE SPECIFIED

CODE OF FINISH MARKS
11 | ROUGH TOOL FINISH || 12 | FINE TOOL FINISH

CHART OF SEAT DIMENSIONS AND STANDARD CLEARANCES FOR TYPE 1415 SAFETY VALVES

MANNING, MAXWELL & MOORE, INC.
AMERICAN INDUSTRIAL INSTRUMENTS
CONSOLIDATED SAFETY VALVES
ASHCROFT GAUGES
SUCCESSOR TO | DIRECTION OF

DRAWN J.N.	DATE 4-22-49	SCALE	DATE 15-1960
CHK'D S.L.S			
APP'D S. L. S	RELEASED 4-22-49	ST2-110	

FORM 87 [illegible]

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