



Edward Valves

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*Maintenance Manual for
Edward Pressure-Seal Valves*

V-377 R4

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Introduction

This manual has been prepared to serve as a guide for the maintenance of Edward valves of the pressure-seal bonnet joint construction. It is designed to help you obtain the most satisfactory service from these valves. Although rigid metallurgical, radiographic, physical, and visual inspection is the standard procedure for all Edward products, it is inevitable that some valves, after a period of time, may occasionally require repair. When this happens, this manual will assist you so that your valve may be satisfactorily restored to good working condition with a minimum of time and expense.

Scope

Before starting, it will be helpful to have some understanding of the valve's physical construction. Consequently, the four basic types of pressure-seal constructions are discussed and illustrated first. All Edward pressure-seal valves employ one of these four basic types, or a minor modification thereof. Non-pressure-seal, or bolted bonnet type valves, are not included in this manual.

The next major section of this manual discusses the more common service problems and failures. It identifies the problem and explains the reasons for certain failures. The reason should be understood before work is actually started.

Pressure-seal Valve Figure Numbers

602Y	617Y	970Y	2006Y	2570Y	3917	4006	4092Y	4316Y	4414Y	4514Y	7516
606	692Y	1570Y	2007Y	3902Y	3917Y	4006Y	4094	4317Y	4416Y	4570Y	7516Y
606Y	694	1602Y	2014Y	3906	3948Y	4007	4094Y	4370Y	4417Y	4592Y	7517
607	694Y	1614Y	2016Y	3906Y	3992Y	4007Y	4095	4392Y	4448Y	7502Y	7517Y
607Y	695	1692Y	2017Y	3907	3994	4014Y	4095Y	4394Y	4470Y	7506	7548Y
614Y	695Y	1802Y	2070Y	3907Y	3994Y	4016	4302Y	4395Y	4492Y	7506Y	7592Y
616	702Y	1814Y	2092Y	3914Y	3995	4016Y	4306Y	4402Y	4494Y	7507	7594
616Y	714Y	1892Y	2094Y	3916	3995Y	4017	4307Y	4406Y	4495Y	7507Y	7594Y
617	792Y	2002Y	2095Y	3916Y	4002Y	4017Y	4314Y	4407Y	4502Y	7514Y	7595
											7595Y

Description of Pressure-Seal Bonnet Types – Type I

The procedure to be followed in making the repair is then explained. This includes normal valve maintenance as well as major valve repair. Field repair equipment, available from Edward, is described and illustrated. Valve lubrication and welding rod recommendations are also made. These procedures are adequate for almost any pressure-seal valve repair or maintenance problem that may arise in the field.

Following is the section describing the disassembly procedure for the various valve components; for example, manual of Limitorque operators, valve yokes, and the four basic bonnet types. **It is very important that the Introduction and the paragraphs titled “First Determine the Area of Failure” be read and understood before any disassembly work is begun. Several procedures are described, depending upon the area of failure. Considerable time can often be saved by first selecting the proper disassembly procedure.**

The last major section explains how the various valve constructions are to be reassembled. Information on how to contact Edward for additional advice, if required, and how to order parts is included.

Description of Pressure-Seal Valve Types

Edward pressure-seal valves are built with four basic bonnet arrangements to provide the most suitable designs for the wide range of sizes and pressure classes offered.

Type I is the studded bonnet design as shown. It uses the basic pull-up construction with studs in the bonnet projecting through the retainer for tightening by use of nuts. It is a simplified design employed in moderate pressure applications and certain valve sizes, as shown in the following table.

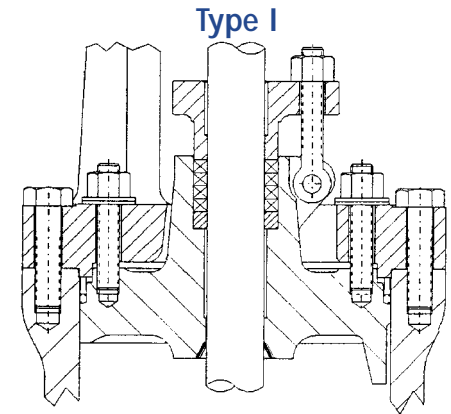


Illustration No. 1
Pressure-Seal Bonnet

Type I

Fig. No.	Pressure Rating	Type of Valve	Size
602Y	600	Flite-Flow Globe Stop-Check (Y-Type)	6-20
606 and 606Y	600	Globe Stop-Check	8-14
607 and 607Y	600	Angle Stop-Check	8-14
614Y	600	Flite-Flow Globe Stop (Y-Type)	6-20
616 and 616Y	600	Globe Stop	8-14
617 and 617Y	600	Angle Stop	8-14
692Y	600	Flite-Flow Check (Y-Type)	16-20
694 and 694Y	600	Horizontal Check	8-14
695 and 695Y	600	Angle Check	8-14
702Y	600-SPL	Flite-Flow Globe Stop-Check (Y-Type)	16-20
714Y	600-SPL	Flite-Flow Globe Stop (Y-Type)	6-20
792Y	600-SPL	Flite-Flow Check (Y-Type)	16-20
1602Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1614Y	Special	Flite-Flow Check Stop (Y-Type)	16-20
1692Y	Special	Flite-Flow Check (Y-Type)	16-20
1802Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1814Y	Special	Flite-Flow Globe Stop (Y-Type)	16-20
1892Y	Special	Flite-Flow Check (Y-Type)	16-20

Description of Pressure-Seal Bonnet Types – Type II

Type II

Fig. No.	Pressure Rating	Type of Valve	Size
2002Y	1500-SPL	Flite-Flow Globe Stop-Check (Y-Type)	3 – 4
2006Y	1500-SPL	Globe Stop-Check	2-1/2 – 4
2007Y	1500-SPL	Angle Stop-Check	2-1/2 – 4
2014Y	1500-SPL	Flite-Flow Globe Stop (Y-Type)	3 – 4
2016Y	1500-SPL	Globe Stop	2-1/2 – 4
2017Y	1500-SPL	Angle Stop	2-1/2 – 4
3902Y	2500	Flite-Flow Globe Stop-Check (Y-Type)	3-24
3906 and 3906Y	2500	Globe Stop-Check	2-1/2 – 12
3907 and 3907Y	2500	Angle Stop-Check	2-1/2 – 22
3914Y	2500	Flite-Flow Globe Stop (Y-Type)	3-24
3916 and 3916Y	2500	Globe Stop-Check	2-1/2 – 12
3917 and 3917Y	2500	Angle Stop-Check	2-1/2 – 22
3948Y	2500	Elbow Down Stop-Check	10-16
4002Y	900	Flite-Flow Globe Stop (Y-Type)	3 – 4
4006 and 4006Y	900	Globe Stop-Check	2-1/2 – 4
4007 and 4007Y	900	Angle Stop-Check	2-1/2 – 4
4014Y	900	Flite-Flow Globe Stop (Y-Type)	3 – 4
4016 and 4016Y	900	Globe Stop	2-1/2 – 4
4017 and 4017Y	900	Angle Stop	2-1/2 – 4
4302Y	900-SPL	Flite-Flow Globe Stop-Check (Y-Type)	3 – 4
4306Y	900-SPL	Globe Stop-Check	2-1/2 – 4
4307Y	900-SPL	Angle Stop-Check	2-1/2 – 4
4314Y	900-SPL	Flite-Flow Globe Stop (Y-Type)	3 – 4
4316Y	900-SPL	Globe Stop	2-1/2 – 4
4317Y	900-SPL	Angle Stop	2-1/2 – 4
4402Y	2500-SPL	Flite-Flow Globe Stop-Check (Y-Type)	3-24
4406Y	2500-SPL	Globe Stop-Check	2-1/2 – 12
4407Y	2500-SPL	Angle Stop-Check	2-1/2 – 22
4414Y	2500-SPL	Flite-Flow Globe Stop (Y-Type)	3-24
4416Y	2500-SPL	Globe Stop	2-1/2 – 12
4417Y	2500-SPL	Angle Stop	2-1/2 – 22
4448Y	2500-SPL	Elbow Down Stop-Check	10-16
4502Y	4500	Flite-Flow Globe Stop-Check (Y-Type)	8-10
4514Y	4500	Flite-Flow Stop (Y-Type)	8-10
4592Y	4500	Flite-Flow Check (Y-Type)	8-10
7502Y	1500	Flite-Flow Globe Stop-Check (Y-Type)	3 – 4
7506 and 7506Y	1500	Globe Stop-Check	2-1/2 – 4
7507 and 7507Y	1500	Angle Stop-Check	2-1/2 – 4
7514Y	1500	Flite-Flow Globe Stop (Y-Type)	3 – 4
7516 and 7516Y	1500	Globe Stop	2-1/2 – 4
7517 and 7517Y	1500	Angle Stop	2-1/2 – 4

Type II is the push-up design in which the bonnet retainer ring is screwed onto the bonnet, and cap screws develop the upward force. This design is employed on both intermediate and high-pressure applications. A three-piece construction is used for the pressure-seal parts.

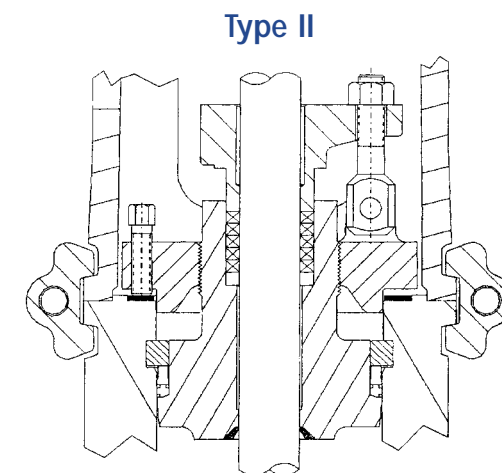


Illustration No. 2
Pressure-Seal Bonnet

Description of Pressure-Seal Bonnet Types – Type III

Type III also uses the three-piece pressure-seal construction but combines it with the basic pull-up bonnet. This design is utilized extensively in the larger valves.

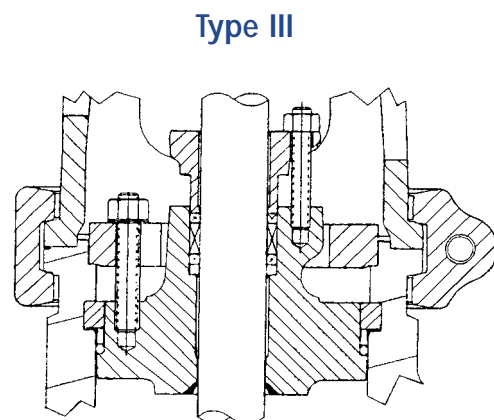


Illustration No. 3
Pressure-Seal Bonnet

Type III

Fig. No.	Pressure Rating	Type of Valve	Size
602Y	600	Flite-Flow Stop-Check (Y-Type)	24-32
607Y	600	Angle Stop-Check	24-30
614Y	600	Flite-Flow Globe Stop (Y-Type)	24-32
617Y	600	Angle Stop	24-30
692Y	600	Flite-Flow Check (Y-Type)	24-32
695Y	600	Angle Check	24-30
702Y	600-SPL	Flite-Flow Globe Stop-Check (Y-Type)	24-32
714Y	600-SPL	Flite-Flow Globe Stop (Y-Type)	24-32
792Y	600-SPL	Flite-Flow Check (Y-Type)	24-32
970Y	900	Tilting Disk Check	2-1/2 – 24
1570Y	1500	Tilting Disk Check	3-24
1602Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	24-32
1614Y	Special	Flite-Flow Globe Stop (Y-Type)	24-32
1692Y	Special	Flite-Flow Check (Y-Type)	24-32
1802Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	24-32
1814Y	Special	Flite-Flow Globe Stop (Y-Type)	24-32
1892Y	Special	Flite-Flow Check (Y-Type)	24-32
2002Y	1500-SPL	Flite-Flow Globe Stop-Check (Y-Type)	6-18
2006Y	1500-SPL	Globe Stop-Check	5-14
2007Y	1500-SPL	Angle Stop-Check	5-24
2014Y	1500-SPL	Flite-Flow Globe	6-18
2016Y	1500-SPL	Globe Stop	5-14
2017Y	1500-SPL	Angle Stop	5-24
2070Y	1500-SPL	Tilting Disk Check	3-24
2092Y	1500-SPL	Flite-Flow Check (Y-Type)	3-18
2094Y	1500-SPL	Horizontal Check	2-1/2 – 14
2095Y	1500-SPL	Angle Check	2-1/2 – 24
2570Y	2500	Tilting Disk Check	3-24
3992Y	2500	Flite-Flow Check (Y-Type)	3-24
3994 and 3994Y	2500	Horizontal Check	2-1/2 – 12
3995 and 3995Y	2500	Angle Check	2-1/2 – 24
4006 and 4006Y	900	Globe Stop-Check	5-14
4007 and 4007Y	900	Angle Stop-Check	5-24
4014Y	900	Flite-Flow Stop (Y-Type)	6-16
4016 and 4016Y	900	Globe Stop	5-14

Description of Pressure-Seal Bonnet Types – Type III and Type IV

Type III (continued)

Fig. No.	Pressure Rating	Type of Valve	Size
4017 and 4017Y	900	Angle Stop	5-24
4092Y	900	Flite-Flow Check (Y-Type)	3-16
4094 and 4094Y	900	Horizontal Check	2-1/2 – 14
4095 and 4095Y	900	Angle Check	2-1/2 – 24
4302Y	900-SPL	Flite-Flow Globe Stop-Check (Y-Type)	5-16
4306Y	900-SPL	Globe Stop-Check	5-14
4307Y	900-SPL	Angle Stop-Check	5-24
4316Y	900-SPL	Globe Stop	5-14
4317Y	900-SPL	Angle Stop	5-24
4392Y	900-SPL	Flite-Flow Check (Y-Type)	3-16
4370Y	900-SPL	Tilting Disk Check	2-1/2 – 20
4394Y	900-SPL	Horizontal Check	2-1/2 – 14
4395Y	900-SPL	Angle Check	2-1/2 – 24
4470Y	2500-SPL	Tilting Disk Check	3-24
4492Y	2500-SPL	Flite-Flow Check (Y-Type)	3-24
4494Y	2500-SPL	Horizontal Check	2-1/2 – 12
4495Y	2500-SPL	Angle Check	2-1/2 – 24
4570Y	4500	Tilting Disk Check	6-10
7502Y	1500	Flite-Flow Globe Stop-Check (Y-Type)	6-18
7506 and 7506Y	1500	Globe Stop-Check	5-14
7507 and 7507Y	1500	Angle Stop-Check	5-24
7514Y	1500	Flite-Flow Globe Stop (Y-Type)	6-18
7516 and 7516Y	1500	Globe Stop	5-14
7517 and 7517Y	1500	Angle Stop	5-24
7548Y	Special	Elbow Down Stop-Check	10-18
7592Y	1500	Flite-Flow Check (Y-Type)	3-18
7594 and 7594Y	1500	Horizontal Check	2-1/2 – 14
7595 and 7595Y	1500	Angle Check	2-1/2 – 24
7598Y	Special	Elbow Down Check	10-18

Type IV design used in the 4500 lb. valve is unique in that the gasket retainer segments are located below the bonnet. The pressure-seal force is derived by pulling the bonnet retainer down.

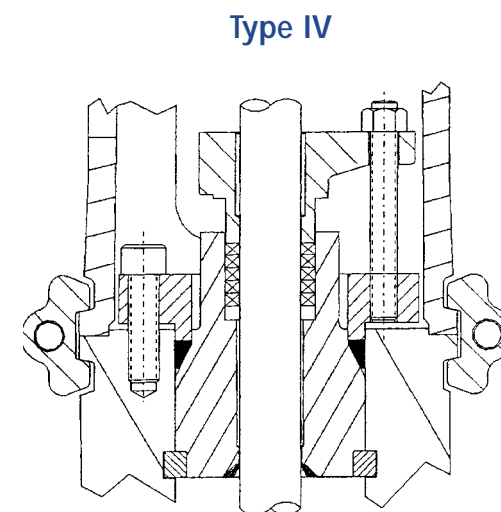


Illustration No. 4
Pressure-Seal Bonnet

Type IV

Fig. No.	Pressure Rating	Type of Valve	Size
4502Y	4500	Flite-Flow Globe Stop-Check (Y-Type)	4-6
4514Y	4500	Flite-Flow Globe Stop (Y-Type)	4-6
4592Y	4500	Flite-Flow Check (Y-Type)	4-6

Service Problems

Packing Chamber Leak

Where moisture appears or actual dripping occurs at the packing chamber around the stem, gland or gland flange, which cannot be eliminated by retorquing the gland bolt, the following points should be considered.

1. The packing may have become hard. Replace the packing.
2. Gland travel has been fully taken up. Repack with new packing.
3. The wrong packing is being used. See *packing recommendations* shown on this page.
4. A stem should be replaced when it has become deeply scratched, burred, or otherwise mutilated from careless handling, or where the stem has worn, tapered or has been bent.
5. The gaps in the rings of split packing have not been staggered around the stem. They should be inserted in this manner.
6. The packing gland may be binding against the packing chamber or stem and does not compress the packing properly. Make certain the gland fits the packing chamber and is tightened down equally on each side.

Packing Recommendations

Edward valves are packed with all-purpose packing sets. This is a combination of packing using braided rings at the top and bottom of the packing chamber and flexible graphite packing in the center section.

Packing glands should be tightened down enough to prevent leakage but not enough to develop excessive operating torque. When the gland has advanced approximately half way into the packing chamber, it is recommended that additional packing rings be added. To obtain best results, the stem should be thoroughly cleaned. Replacement packing should be the same as that originally furnished.

We recommend that replacement packing be purchased from Edward Valves to assure packing with the proper density and corrosion inhibitors are always used.

Important:

Long service life from modern graphitic packing requires that adequate preloads be applied when repacking.

1. All parts should be clean and not scored or pitted, especially the stem.
2. The valve internal parts and bonnet should be assembled prior to installing the packing.

3. Position split packing rings with the ends of adjacent rings rotated 90°.
4. Install in the following sequence:
 - Bottom Ring** – Braided Ring
 - Center Rings** – Die formed expanded graphite
 - Top Ring** – Braided Ring
5. Clean and lubricate the gland eye-bolts.
6. Carefully seat each individual packing ring before adding the next ring.
7. Apply the recommended torque to the gland nuts evenly without cocking the gland. See *Table A* for recommended torques.
8. Tighten the nuts to the initial values shown, then loosen and retighten to the final torque.
9. Stroke the valve, then recheck the gland nut torques.

NOTE: The torque values given are for sealing full-rated pressure. For line pressures less than the full CWP rating of the valve, the final torques may be reduced by the ratio of P_{actual}/CWP down to a minimum of $P_{\text{actual}} = 1500$ psig. This will reduce packing drag and extend packing life.

Service Problems *(continued)*

Table A
Gland Bolt Torques, ft.-lbs.
Class 600 Valves

Figure Numbers	Size	Initial Torque	Final Torque
604, 605, 606, 607 616, 617, 618, 619 704, 705, 706, 707 716, 717, 718, 719	2.5	27	8
	3	27	8
	4	41	12
	5	55	16
	6	60	17
	8	89	26
	10	143	41
	12	209	60
	14	233	67
602, 614, 702, 714	6	48	14
	8	55	16
	10	62	18
	12	84	24
	14	84	24
	16	353	102
20	571	165	

Table A *(continued)*
Gland Bolt Torques, ft.-lbs.
Class 1500 Valves

Figure Numbers	Size	Initial Torque	Final Torque
7506, 7507, 7516, 7517 2006, 2007, 2016, 2017	2.5	29	21
	3	55	40
	4	78	57
	5	84	61
7502, 7506, 7507, 7514 7516, 7517, 2002, 2006, 2007, 2014, 2016, 2017	6	90	65
	8	200	145
	10	159	114
	12	353	255
7502, 7514	14	353	255
7506, 7507, 7516, 7517 2006, 2007, 2016, 2017	14	378	273
7502, 7507, 7514, 7517 2002, 2007, 2014, 2017	16	672	484
	18	672	484

Table A *(continued)*
Gland Bolt Torques, ft.-lbs.
Class 900 Valves

Figure Numbers	Size	Initial Torque	Final Torque
4002, 4014, 4302, 4314	6	58	25
	8	69	30
	10	115	50
	12	185	80
	14	185	80
	16	206	89
4006, 4007, 4016, 4017 4306, 4307, 4316, 4317	3	55	24
	4	79	34
	5	84	36
	6	89	39
	8	143	62
	10	199	86
12	252	109	
4006, 4016, 4306, 4316	14	266	115
4007, 4017, 4307, 4317	14	252	109
	16	331	143
	20	633	274

Table A *(continued)*
Gland Bolt Torques, ft.-lbs.
Class 2500 Valves

Figure Numbers	Size	Initial Torque	Final Torque
3906, 3507, 3916, 3917 4406, 4407, 4416, 4417	2.5	29	29
	3	51	51
	4	60	60
	5	90	90
3902, 3906, 3907, 3914, 3916, 3917, 4402, 4406, 4407, 4414, 4416, 4417	6	143	143
	8	267	267
	10	286	286
3902, 3907, 3914, 3917 4402, 4407, 4414, 4417	12	473	473
	14	479	479
	16	479	479
	19	269	269
	20	269	269

Service Problems *(continued)*

Pressure-Seal Gasket Leak

Edward valves have been produced with two types of pressure-seal gasket: Earlier valves had metal gaskets, while later designs have composite expanded graphite gaskets. The valves with composite gaskets can be identified by a "B" prefix on the figure number. Assembly and disassembly of the two gasket types are essentially the same except the composite gasket designs may have Belleville spring washers under

Table B
Bonnet/Cover Bolt/Nut Pull-Up
Torques
 (With Valve Under Pressure)

BOLT SIZE	REQUIRED TORQUE, FT-LBS	
	METAL GASKET	COMPOSITE GASKET
3/8	18	5
7/16	30	5
1/2	45	7
9/16	68	10
5/8	90	15
3/4	150	25
7/8	240	35
1	370	55
1-1/8	533	80
1-1/4	750	110
1-3/8	1020	150
1-1/2	1200	170
1-5/8	1650	230
1-3/4	2250	320
1-7/8	3000	420
2	3300	460

the nuts (or capscrews) of the pull-up bolting, and the tightening torque requirements for the pull-up bolting are different.

To guard against leakage, the bolts should be kept tightened at all times.

A torque wrench should be used for tightening the bonnet or cover retainer stud nuts or capscrews, which are used to preload the pressure-seal gasket.

All nuts/capscrews should be tightened in an alternating star pattern to ensure even tightening.

The bolting should be tightened to the torque values shown in Table B while the valve is under full line pressure.

Pressure-Seal Leak

Should the leak fail to stop after tightening, it must be concluded that there is an imperfect pressure-seal, and the valve will have to be opened for examination. **(Note:** Regardless of the cause of failure, opened pressure-seal bonnets should always be reassembled with a new gasket. These are available from stock via Air Express from Raleigh, North Carolina.) Such a leak may result from any of the following causes:

- 1. Incomplete Seal Between Bonnet and Gasket.** An incomplete seal around the gasket seating surface of the bonnet (or cover on check valves) may be caused by corrosion, dirt, chips, or other foreign matter on the mating surfaces of the sealing angle.
- 2. Incomplete Seal Between Body I.D. and Gasket.** An incomplete seal in the area of the gasket and body I.D. contact may be caused by surface

imperfections in the body wall in the form of pin holes, extended cracks, or indentations where the metal has failed sometime after valve installation and use. Such imperfections may be surface indications of deeper flaws in the body casting that may cause a by-pass around the pressure-seal.

Seat and Disk Joint Leak

A leak existing between the seat and disk of a closed valve might be indicated by one of the following: a definite pressure loss in the high-pressure side of the valve; continued flow through an inspection drain on the low-pressure side; or, in hot water or steam lines, a downstream pipe that remains hot beyond the usual length of time and conductivity range.

Such a leak may be the result of a distorted seat caused by uneven welding and stress-relieving temperatures that were present in the body when mounting the valve in the pipe line. It may also develop because of the operator's failure to close the valve tightly. An increased velocity is imparted to a flow forced through a very small opening. This increased velocity subsequently gives rise to the "cutting" of both disk and seat, particularly by particles of line scale or rust in suspension or normal solids in solution; or, in spite of the fact that the stellite hard-facing material on the seat and disk is corrosion and erosion resistant, grooves, pit marks, or other surface irregularities may be formed on the seat and disk joint surfaces when the disk is closed against a foreign body on the seat. This sometimes occurs during the initial start-up of a piping system.

Service Problems *(continued)*

Leakage of steam through a valve that is badly steam-cut has a whistling or sonorous sound. If the valve is only slightly steam-cut, however, leakage is identified by subdued gurgling or weak popping sounds. These sounds can be heard through a stethoscope or by placing one end of a stick against the valve body while holding the other end between the teeth, with hands over the ears.

To check for a properly closed valve, on valves with nonrising type handwheels (non-revolving stem), an indicator is attached to the lower side of the yoke bushing that coincides with a pointer attached to the yoke, when the valve is tightly closed. This can be viewed through one of the yoke windows and it represents the same relative position between the yoke and yoke bushing, as when the valve was hydrostatically seat-tested and found to be tight at the factory. The hydrostatic pressure is stamped on the indicator. It is only natural that the indicator will travel past this mark after repeated closings. Some operators hesitate to force the valve crossarm under the handwheel further than this button, but no harm will be done even if the indicator travels more than an inch past the mark when holding a desired pressure. If a tight seal is not made after repeated impact blows, it must be concluded that the pressure is bypassing either at the seat joint or body diaphragm between the inlet and the outlet passage. Inspection of the interior of the valve now is advisable.

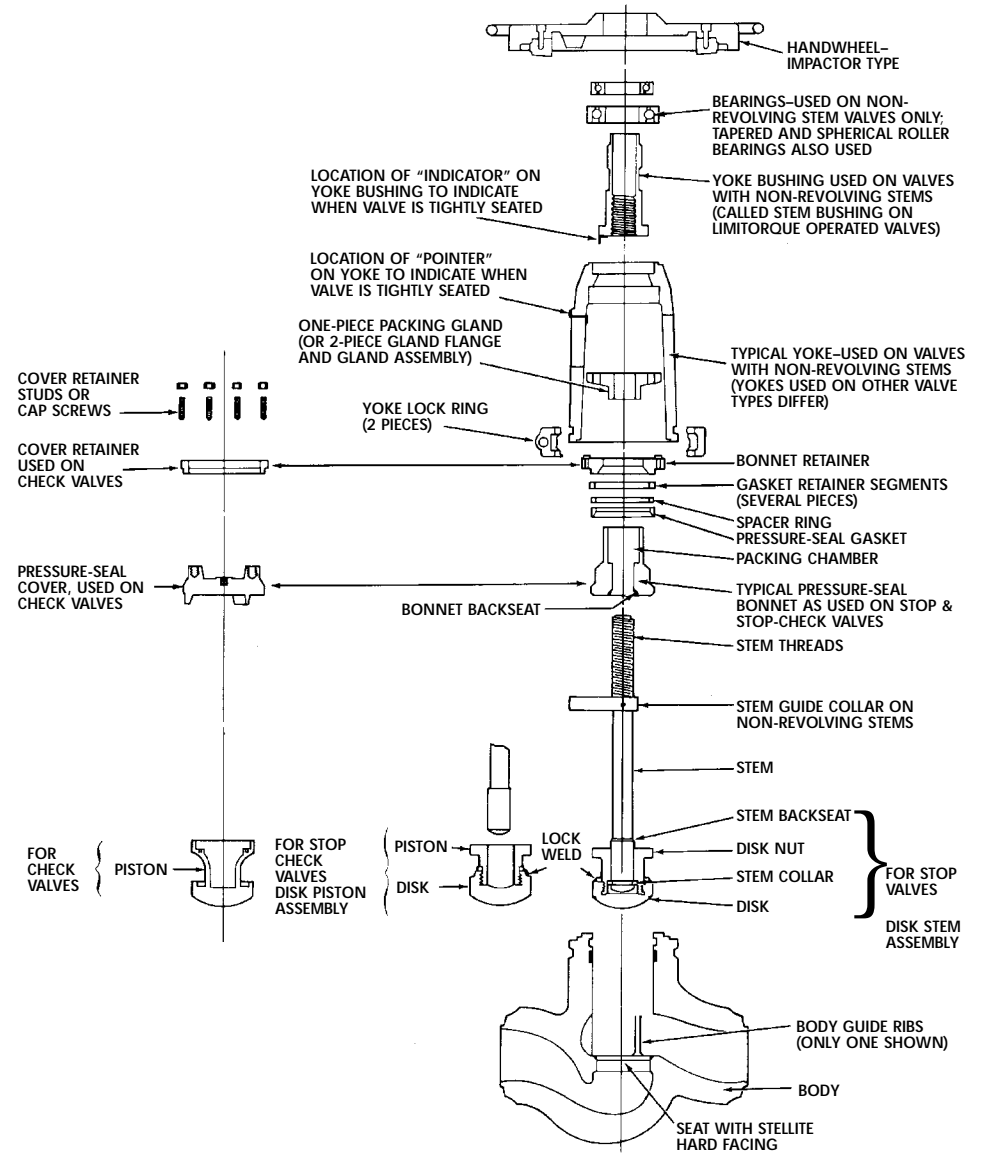


Illustration No. 5
Typical Globe Valve Nomenclature

Service Problems *(continued)*

Body Wall Leak

This is a visual leak through the body wall, welding end or end flanges and may be the result of a shrink cavity or other void in the casting. If small at first, such a leak may go unnoticed for a time, particularly if the valve is heavily insulated and the pipe line at that point is sufficiently warm to keep the insulation dry enough to escape notice.

Objectionable Vibration, Noise or Excessive Pressure Drop

Excessive vibration noise or humming coming from within a stop-check, non-return or check valve indicates the possibility that the disk-piston assembly is wedged inside the body. Such sticking may be caused by uneven body guide rib wear on the downstream side induced by oversizing the valve, or by corrosion, by flakes of line scale, or by particles of weld spatter that may have entered the valve during construction of the piping, and which later washed up into the piston bearing area of the body I.D.

On stop-check and non-return valves, the stem position is indicated by the stem guide collar on non-revolving stems, or by the position of the handwheel on revolving stems; the stem should normally be fully open against the bonnet backseat in order that the disk-piston can lift the full amount. When the disk is not touching the bottom of the stem or the bottom stop lugs on the bonnet (due to a wedged disk-piston or insufficient flow, for example), then the disk assembly is free to move laterally within the body. This motion in most cases causes a slight vibration which can be felt through the body, yoke and handwheel.

Screwing the stem down slowly to contact the disk first increases the intensity of vibration to the hand and to the ear, but further downward, movement of the stem builds sufficient contact pressure and eliminates the vibration. This also tends to dislodge any foreign particles that may have been the initial cause for disk-piston wedging.

The position of the lift indicator on the yoke, where vibration ceased, should be noted and any increase in pressure drop indicated on available gauges recorded. It may be that when the stem is screwed back to the full open position, the disk will again remain in a floating position, which could indicate oversizing of the valve for the flow conditions. It is always recommended that check valve size selection be governed by flow conditions rather than by adjacent piping. Oversizing induces vibration or noise and causes excessive, uneven guide rib wear, giving rise to greater disk-piston assembly clearance on one side of the body.

By means of other valves in the line, it may be possible to vary the rate of flow through a noisy check valve sharply enough (in a short period of time) to dislodge the piston from its wedged position.

Valve Lubrication

In order to obtain full service life, valves require periodic lubrication of the bearings and stem threads, as does any rotating machinery.

On valves where the stem bushing and bearings are in the motor operator, the bearings are lubricated by the operator lube supply, which should be maintained at the recommend level.

Valves that have bearings in the top of the yoke have lube fittings on the valve yoke for convenient relubrication.

Stem threads also require periodic replenishment of the lubricant. Exposed threads should be wiped clean of old grease and accumulated dirt and fresh lubricant applied. This can be most effectively done with the valve in the closed position.

For valves that see frequent operation, the lubricant should be replenished on bearings and stem threads every three months. If extreme service conditions dictate, the plant operating engineer should establish a more frequent relube schedule.

For valves that are operated infrequently, relubrication at least once a year is recommended. The recommended lubrication for both bearings and stem threads is Rykon EP #2, manufactured by The American Oil Company. This is an extreme-pressure, extreme-temperature lubricant of high quality.

Valves equipped with automatic stem lubricators should be maintained in accordance with the above instructions for the bearings and as required to maintain the lube level in the stem lubricator reservoir.

Repair Procedures

VALVE BODY REPAIRS

Body Bore Gasket Seal Area Repair with Metal Gasket Only

Pressure-seal valves made prior to 1952 were made with a 47° bonnet seal angle and the body bore seal was in the parent metal of the body castings. In 1952 the design was changed to a 25° seal angle and the body castings were inlayed with 18-8 stainless at the seal area. When a leak developed on the older valves, the gasket as well as the body bore were wire drawn.

If the depth of defects are .010" or less, the seal area can be honed using a portable Sunnen Hone. This device is adjustable for different bore sizes and can be operated by one man using a portable electric drill of 1/2" to 3/4" capacity. When the defects are greater than .010", welding will be required to cut down the repair time.

First make visual inspection all around this area, noting, if possible, where flaws may occur. Next wash the area with a suitable solvent, drying with clean rags and, if necessary, polishing with a fine grade of emery cloth to remove any undesirable scale or foreign matter that may have been deposited on the area suspected of having flaws. Use a dye penetrant test if cracks are suspected.

Where it is necessary to repair the body inlay by welding, note the following:

1. Prior to any cutting or welding operations being performed on the valve, it is necessary that adequate seat joint protection be provided and some

means of insurance against getting chips, weld spatter or other foreign matter into the pipe line if the valve is permanently mounted. A round piece of sheet metal placed over the seat and taped in place will furnish adequate protection.

2. Chip out the defective area in the body, being careful to remove the affected portion to its end, inside the casting, and to thoroughly clean it away.
3. With a small hand grinder, grind the chipped area smooth.
4. Preheat an area large enough around the imperfection so that during the entire welding operation heat will be retained at approximately 400°F.
5. Use a stainless steel inlay selected from either 18-8 stainless steel rod, Harstain 18-8, Stainlend "K" 18-8, Stainweld 18-8 or equivalent.
6. Lay the weld in thin, even layers, peening each layer before proceeding with the next, and being careful to maintain a temperature above 400°F in the area being repaired. Peening the bead actually stretches it and counteracts its tendency to contract and shrink as it cools. The last layer of weld must overlap onto the sound metal to ensure a weld without an undercut at the edges. The overlapping should be done along this edge by using a welding rod of 1/8" maximum diameter. The last layer should bring the height of the welded

area up to 1/16" above the original surface, as checked with a straight edge along the body bore.

For this type of weld repair, it is recommended that the last layer be pounded while still hot with the flat face of the hammer. Thermal stress relieving is not recommended.

With a hand grinder, rough grind the welded surface to within about .010" of the finished surface. A simple template cut from thin sheet metal and having the same arc as the body bore diameter, and a straight edge laid along the body bore can be used as a guide. A final cut then can be made, using a fixture similar to the one shown in *Illustration No. 9*. Final finishing can be done with the adjustable *Sunnen hone described on page 17*.

After removing all dirt, chips, slag, spatter, and grinding dust from the body, the bore should be polished with fine emery cloth and then thoroughly cleaned before reassembly of the valve.

It is best that a new pressure-seal gasket be used upon reassembly.

Body Bore Guide Rib Repair

Where more than one guide rib is involved, each rib should be preheated and welded before proceeding to the next.

1. Follow steps 1 through 3 of the section titled "*Body Bore Gasket Seal Area Repair*" on this page.

Repair Procedures *(continued)*

2. Heat the body area adjacent to the guide rib to approximately 200°F. This can be done locally with an oxy-acetylene torch.
3. Select the proper welding rod to suit the body material (1/8" maximum size rod is recommended here). See *page 16* for weld rod recommendations. Using the same welding procedure as described for step 6 in the previous section, build up the guide rib at least 1/16" above the original finished surface. The welding should be started at the bottom so as to create a small shelf, and then proceed up the guide rib.

If stainless steel inlay is desired on the guide ribs, use AWS 5.4, E309L stainless electrodes.
4. Finishing after welding is also similar to that described in the previous section and in addition, the edges of the guide ribs should be rounded off smooth. Check the progress of the grinding by using a straight edge and feeler gauges. As the bonnet bore and guide rib approach alignment a light can be placed on one side of the straight edge and the high spots in the guide rib observed on the other. Where a check valve or stop-check (non-return) body is being repaired, the progress of the finishing cuts can also be measured by slipping some long pieces of shim stock between the I.D. of the body guide ribs and the O.D. of the disk-piston assembly, which has been placed centrally in position on the seat joint.

A shim should pass around the disk at all three guide ribs with equal clearance. The original design clearance is .020 to .030 inches on the diameter. The disk-piston assembly should also be moved up and down to make sure that it is free.

It is recommended that where guide rib repairs have been made, the seat and disk joint be checked for distortion and relapped, if necessary.

Seat and Disk Repair

The following description does not apply to tilting-disk check valves. For repair information on these valves, contact your local Edward Sales representative.

A valve seat joint will require repairing in any instance where the seating surface permits a leak because it has been altered from the original state in which it was shipped from the factory; where corrosion has set in to cause pit marks on the seating surfaces of either the body or disk; where the seat has become distorted because of an abnormal heating condition; or, where a groove has been formed on the seat or disk by closing the valve against a foreign body. Verification of such a faulty condition may be obtained by a seat blueing test or by careful visual examination.

The stellite seats in these pressure-seal valves are not easily scored, but where reconditioning is necessary, the following points should be observed:

Where an indentation or pit marks on the valve seat joint are deep (.010 or greater), a cast iron lap with suitable lapping compound will speed up repair. The included angle of the valve seat is 90° and the cast iron lap should be closely guided in the body bore during the lapping.

Lap first with the cast iron lap and finish with the valve disk, which has been reground or relapped, if necessary. For initial lapping, use Clover compound "A." Norton 320 mixed with olive oil or sperm oil to a molasses consistency is also recommended for finish lapping. For rough lapping, Carborundum H20 coarse is recommended.

In the lapping operation, lap against the seat with a small quantity of the lapping compound placed between the mating surfaces. It is important that not too much pressure be applied on the lap or disk against the seat. With the lapping compound in place between the mating surface, the lap or disk should be reciprocally rotated as far as arm movements will permit while standing in one position; the strokes should be light, and the lap or disk should be lifted frequently and turned to a new position circularly around the valve body so that lapping will be rotated over a new area. To make certain the pressure strokes are light, it is necessary on large valves to suspend the disk and stem assembly from a coil spring in such a manner as to allow the disk to bear, but lightly, against the seat. See *Figure A on page 17*; for another type see *Illustration No. 7*.

Repair Procedures *(continued)*

For smaller size valves, a driving handle can be easily made of 3/8" diameter wire bent as per *Fig. B on page 17*. These small assemblies, being much lighter, do not require a supporting spring. Stellite seating faces are hard and lapping time is variable, depending on the extent of flaws on the surface and the position of the valve in the line. If a seat requires machining prior to lapping, a fixture similar to that shown in *Illustrations 8 and 9 on page 17*, can be used.

The disk of stop valves will also require refinishing. When the only defects that can be found on the disk-stem assembly occur on the seating surface, it becomes very convenient to push the stem into a lathe spindle and chuck on the disk nut diameter without taking the assembly apart. (However, if the stem is too large to fit through the lathe spindle, it will have to be taken apart as described in the following paragraph). Hold the disk using a four jaw chuck so that the large O.D. and seating surface run true. Grind the seating surface using a tool post grinder. Just go deep enough to clean the surface. Polish the seating surface with fine emery cloth.

If, when checking the disk-stem assembly, it is found that the assembly is tight or does not swivel freely, it will be necessary to disassemble. Occasionally it is possible to cut the lock welds with a hack saw and unscrew the disk from the disk nut. However, it will usually be found expedient to chuck the disk O.D. in a lathe and cut the lock welds, including the weld that penetrates the first thread. After this weld metal

has been cleaned away, the disk nut will readily unscrew. Repair any damaged surfaces on the stem, disk nut, stem collars or disk. Then proceed to repair the disk seating surface as described above. When finishing the disk in this manner, it will not be necessary to lap it to the seat.

Body Wall Repair

There are five basic steps in repairing a casting defect:

1. Cut out to sound metal. Attempting to weld over the defect will only leave a notch that may reintroduce the defect. Cutting may be done by chipping, grinding or flame gouging. The amount of metal removed should be held to a minimum to avoid distortion during subsequent welding.
2. Preheat, using the minimum temperature specified by the material specification and/or the design code. Use at least 400F on WC9 or C5 material, 300F on WC6. Although cast carbon steels such as WCB or WCC do not require preheat, it may be advantageous to remove any moisture or other contaminants from the area to be welded. This may also identify any leak paths. There are also disadvantages to preheat, especially localized preheat, that must be considered when working in areas of the casting with finish machined dimensions. Distortion may result in more damaging problems than those concerns created by the original defect. Lower preheats and the control of inter-pass temperature are two methods used to minimize distortion.

3. Welding should be done by qualified welders, using qualified procedures and weld material of a chemistry matching the casting (see Table on page 16 for welding rod recommendations). The final weld should be blended into the contour of the casting.
4. Stress relieving is generally recommended. Decisions to not stress-relieve should factor in piping code rules. The temperatures must be based on material specification and piping code recommendations. Again, since temperatures are much higher than those experienced in welding, there are also disadvantages that must be considered. Distortion may result in more damaging problems. Lower temperature post-weld heat treatment is sometimes an option for carbon steels.
5. The final weld should receive any needed nondestructive testing. This should include a visual examination and liquid penetrant or magnetic particle examination. Some major weld repairs could even mandate radiography to ensure a sound weld.

VALVE COMPONENT REPAIR

Disk-Piston Assembly Repair

It is possible that the bearing surfaces on the O.D. of the disk-piston assembly and I.D. of the body can become scored deeply enough to cause a binding or wedging of the piston assembly in a full, or partially, open or closed position. Such scores and resulting burrs may be caused by particles of weld spatter, flakes of hard

Repair Procedures *(continued)*

line scale or other foreign matter that has inadvertently gotten into the line. Upon disassembly, any body and disk-piston assembly burrs must be removed with emery cloth, and the bearing surfaces otherwise made smooth and clean again. Where the burrs on the piston are very large, it may be more convenient to chuck the assembly in an engine lathe and file them off.

Bonnet or Cover Repair

In late 1951 and early 1952 important changes were made in the pressure-seal gasket design. These changes have greatly reduced the likelihood of gasket seal leakage. In any case of gasket or bonnet leakage necessitating repair or replacement, it is strongly recommended that the valve be converted to the new style by replacing the bonnet, or cover, and the pressure-seal gasket.

Where foreign matter of any sort is responsible for a gasket seal leak on the outer angular sealing surface of the bonnet, it is very likely that it has caused an impression in this same sealing surface that must be removed completely before reassembling. This can be done by taking a shaving or

skin cut on the sealing surface. In so doing, it is mandatory that the work be chucked concentric and square to all existing diameters and surfaces and that the angle be remachined at 25°, plus 1/2°, minus 0° as shown in *Illustration No. 6*. For old style valves the angle should be

47°, plus 1/2°, minus 0°. When finished, this surface must be smooth and free from any marks or surface blemishes, and the circumferential point where the largest O.D. meets the angular seal surface must be lightly honed to remove any sharp edges or fins.

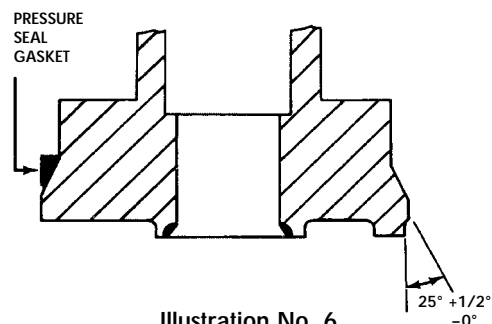


Illustration No. 6
Pressure-Seal Bonnet Seal Angle

Welding Rod Recommendations

Material to be Welded			Weld Rod Recommendations
ASME IX P-Numbers	Material	ASTM Grade	AWS Classification
P-1	Carbon Steel	1. ASTM A216, Grade WCB 2. ASTM A105	AWS 5.1 E7018
P-4	1-1/4% Chromium, 1/2% Molybdenum Low Alloy Steel	1. ASTM A217, Grade WC6 2. ASTM A182, Grade F11	AWS 5.5 E8018-B2
P-5	2-1/4 Chromium, 1% Molybdenum Low-Alloy Steel	1. ASTM A217, Grade WC9 2. ASTM A182, Grade F22	AWS 5.5 E9018-B3
P-8	18% Chromium, 8% Nickel Stainless Steel	1. ASTM A351, Grade CF8M 2. ASTM A182, Grade F316	AWS 5.4 E316
P-8	18% Chromium, 8% Nickel Stainless Steel	1. ASTM A351, Grade CF8C 2. ASTM A182, Grade F347	AWS 5.4 E347

Welding Edward Valves In-Line

When welding a valve in-line, the installer should apply the specific technical rules imposed by the jurisdictional authority of the area where the valve is installed. In the absence of such rules, following are suggested practices for welding Edward Valves in-line:

1. Welding should be done using procedures and personnel qualified in accordance with ASME Section IX. Rules for preheat and postheat are stated in Chapter V of ASME B31.1 (Power Piping).
2. The valve should be welded in-line, one end at a time, in a closed position (approximately a half-turn after the seat in the body comes in contact with the disk). This is suggested to preclude warpage between seating surfaces caused by temperature-induced stresses during welding or subsequent heat treat. It also protects the seat from weld spatter that might coat the lapped seat and disk. When post-weld heat treat is required, each weld end should be heat-treated one at a time, to minimize impact of heat on valve internals. Do not heat treat an Edward Valve with a piping attached as a unit in a furnace, as warpage of parts may occur. After welding, open the valve and flush the line to clean out all foreign matter.

Field Repair Equipment

Available from the Edward Manufacturing plant in Raleigh, N.C., are some basic tools for repairing valves in the field. This equipment was developed for customer use on a rental basis. Of course, an emphasis has been placed on large valve repairs where economics justify extensive repairs in the field rather than removing the valve from the pipe line for return to the factory. Contact your local Edward Valves sales representative for more information. A list of this equipment follows:

1. Lapping equipment for all pressure-seal valves from 2-1/2 to 18" in all pressure classes. See *Figs. A, B and Illustration No. 7 on this page.*
2. Self-centering, lap-guide fixtures for lapping valve seats in valves 8" and up in all pressure classes. See *Figs.*

C, D on this page. This fixture can be used when the valve is installed in any position, and is suggested in place of (1) above, when the stem is horizontal or mounted down.

3. Sunnen Portable Hone for honing pressure-seal bores from 4" to 14-1/2" diameter. (Not illustrated)
4. Van Norman portable boring machine for reboring valves in the field. Grinding attachments are also available to some sizes for grinding seat joints. See *Illustrations No. 8 and No. 9 on this page.*
5. Air-driven portable boring machine for reboring guide ribs and seats of valve bodies in the line. (Not illustrated)

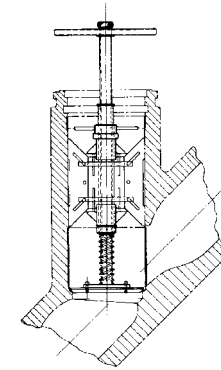
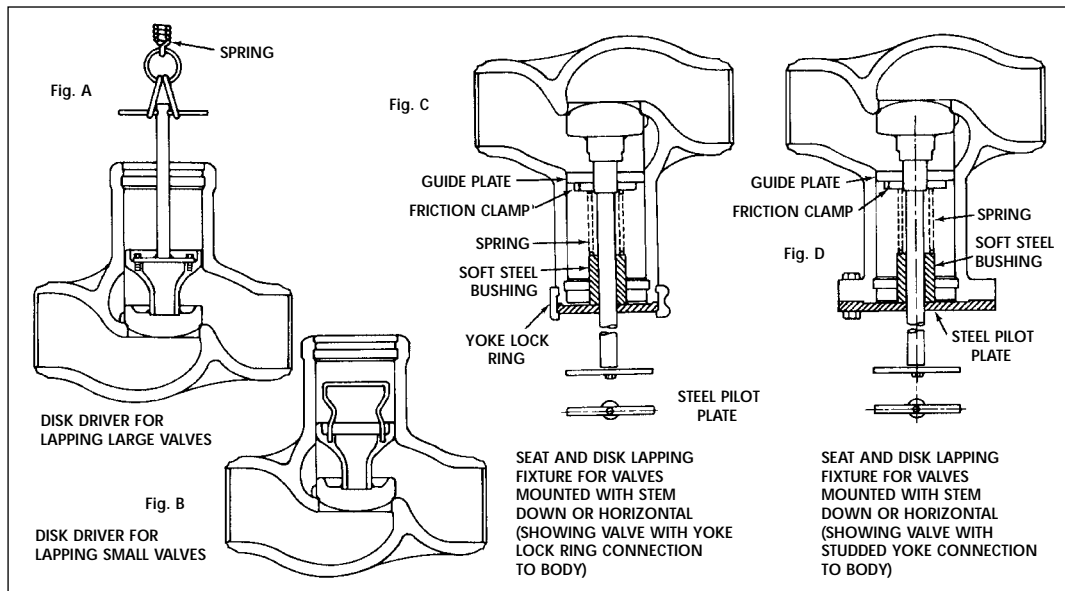


Illustration No. 7
Portable Lapping Tool
for Large Valves

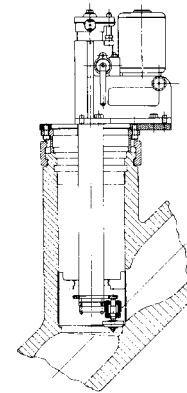


Illustration No. 8
Van Norman
Portable
Grinding Machine

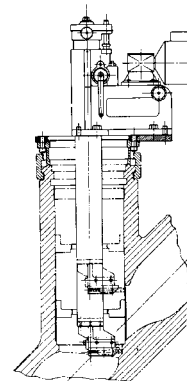


Illustration No. 9
Van Norman
Portable
Boring Machine

Disassembly Procedures for Pressure-Seal Valves

Introduction

Step-by-step disassembly procedures are described for all types of Edward pressure-seal bonnet valves, including those with manual and motor operators. **It is important that the following paragraphs be read and understood before any specific disassembly work is started.**

First Determine the Area of Failure

Failures or maintenance problems, for other than check valves, can be divided into three major areas. The area involved will affect the disassembly procedure to be followed. These areas, in general, are:

Area 1 The impactor Handwheel or Handle, or the Limitorque Operator.

Area 2 The yoke assembly, including the yoke and yoke bushing, and in addition on non-revolving stem valves, the yoke bearings and stem guide collar.

Area 3 The valve internals, including the bonnet, body, stem, disk, disk-nut, gland and seats.

If failure is indicated in Area 1, refer to the applicable section *“Disassembly Procedure for Impactor Handles” on page 19*, or *“Disassembly Procedure for Removing Limitorque Operators from Valve Yokes” on page 20*.

If failure is indicated in Area 2, it will be necessary to first remove the valve operator. Therefore, refer first to the applicable operator disassembly procedure described in the above paragraph. Then proceed to the section *“Disassembly Procedure for Yoke Assemblies” on page 27*, for the actual disassembly of Area 2.

If failure is indicated in Area 3, two methods are available. In method 1, the operator and yoke assembly may be removed from the valve body as a unit. This requires less time but requires adequate clearance area above the valve. Also, large handwheels, say 48” diameter and above, are massive and sometimes difficult to handle when attached to the yoke assembly. For these reasons, the second method is to first remove the operator from the yoke, and then the yoke from the body, in separate steps.

CAUTION

As a general reminder, make sure all pressure is removed from valves, both upstream and downstream, before any disassembly work is started. An exception to this is valves requiring service only on the operator (Area 1) or Yoke Assembly (Area 2), where the valve can remain in service. NOTE: Removal of the yoke assembly under pressure does not apply to revolving stem valves, only non-revolving. The following stem positions should be observed:

1. For service in Area 1:

- a. If pressure is to be maintained in the valve, back seat to the full open position. On Limitorque operated valves, only torque-only operators will permit service in Area 1 under pressure. See definition of “torque-only” units on page 22.

- b. If no pressure is to be maintained in the valve, close the valve fully and open approximately 1/8”.

2. For service in Area 2:

- a. For non-revolving stems only, if pressure is to be maintained in the valve, back seat to the full open position. Never service revolving stem valves in Area 2 while under pressure.
- b. If no pressure is to be maintained in the valve, close the valve fully and open approximately 1/8”.

3. For service in Area 3:

- Close the valve fully and open approximately 1/8”. Service Area 3 only without pressure in the valve.

Disassembly Procedures for Pressure-Seal Valves *(continued)*

For *Method 1*, first remove the operator-yoke assembly combination as described in *“Procedure for Removing Valve Operator and Yoke Assembly as a Unit”* on page 29. Then proceed to the section *“Disassembly Procedure of Bonnet Types”* on page 31, omitting any steps preceded by an asterisk (*) for the actual disassembly of Area 3. On all revolving stem and Type IV bonnets, only method 2, as follows, should be used.

For *Method 2*, first remove the operator by following the applicable section, *“Disassembly Procedure for Impactor Handwheels and Handles”* on page 19, or *“Disassembly Procedure for Removing Operators from Valve Yokes”* on page 22. Then, proceed to the section *“Disassembly Procedure of Bonnet Types”* on page 31, for actual disassembly of Area 3. On Type IV bonnets, reverse this procedure and complete *steps 1 through 9 on pages 39 & 40*, before beginning operator disassembly.

If failures are indicated in any combination of Areas 1, 2, or 3, then each of the respective procedures must be followed. *For check valves without stems or operators, simply use the proper section under “Disassembly Procedure of Bonnet Types” on page 31.*

Disassembly Procedures for Impactogear Handles and Handwheels

(With or Without Impactogear Air Wrench Operators)

AREA 1

Edward pressure-seal valves use several designs of Impactor handles or handwheels, depending upon the valve size and pressure class.

Handwheels can be removed while the valve is pressurized, but caution must be observed to make certain that it's first in the back-seated or fully opened position. See **“Caution”** on page 18.

Valves equipped with Impactogear air wrench operators do not require disassembly of the Impactogear itself. However, during regular impactor handwheel disassembly, the Impactogear pinion gear and the handwheel gear will be separated.

All of the following handwheel disassembly procedures are arranged in accordance with the *general comments on page 18*. Study these pages carefully before beginning disassembly.

To disassemble, first determine the type of handwheel on the valve by measuring its diameter or referring to the valve dimension drawing. Then select the proper procedure, as listed below.

Disassembly Procedures for Impactor Handles & Handwheels

Non-Ball Bearing Type Impactor Handles and Handwheels

All have 12, 14, 16, 20, 26, or 30 inch diameters. See *Illustrations No. 10, 11, and 12 on this page.*

These handwheels are of relatively simple design and utilize fewer parts than the ball bearing type. (Not to be confused with ball bearings in the valve yoke.) *Not illustrated*, but of similar construction to *Illustration No. 10 on this page*, are Impactor handles. The following instructions apply, in general, to all non-ball bearing types.

1. Remove the handwheel locknut, which is the uppermost part on the top of the valve stem. On some designs, it is a friction device and is merely unscrewed. On others, a roll pin must first be driven out. On another design, a small lock screw must be unscrewed.
2. Mark the relative position of the handwheel and cross arm so the original relationship can be restored when reassembling. If this is not done, the handwheel could be reassembled 180° out of the original position.
3. Lift the handwheel off the valve, using a suitable capacity chain hoist for large handwheels. If the stem of the valve is mounted vertically, position the hoist directly above the handwheel. Otherwise, the hoist should be positioned slightly away from the handwheel in line with the stem.
4. Crossarm Removal: For all valves being serviced in Area 1 or revolving stem valves in Area 2, the crossarm can be removed by tapping lightly with a hammer on the underside. If the crossarm is keyed to the yoke bushing, as in non-revolving stem valves, the handwheel bushing is first removed by unscrewing the cap screws holding the handwheel bushing to the handwheel, and then unscrewing the handwheel bushing from the yoke bushing. The keyed crossarm can now be removed by tapping the underside with a hammer and lifting off.

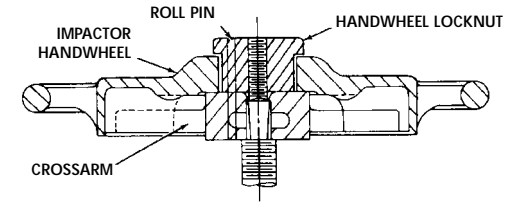


Illustration No. 10
Impactor Handwheel
Non-Ball Bearing Types

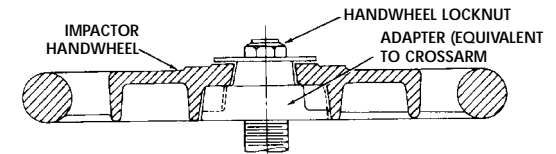


Illustration No. 11
Impactor Handwheel
Non-Ball Bearing Types

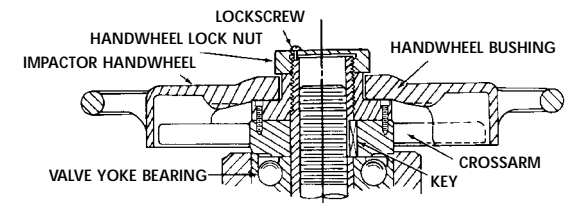


Illustration No. 12
Impactor Handwheel
Non-Ball Bearing Types

Disassembly Procedures for Impactor Handles & Handwheels *(continued)*

Ball Bearing Impactor Handwheels

(With or without Impactogears)

All have 28, 36, 48 or 72" diameters. See *Illustration No. 13 on this page.*

These impactor handwheels differ in diameter and design from the non-bearing type in that the handwheel turns on ball bearings. The following instructions apply to all sizes.

1. Remove the cover plate screws and the cover plate.
2. Back off all of the locking screws.
3. Mark the relative position of the handwheel and crossarm so the original relationship can be restored when reassembling. If this is not done, the handwheel could be reassembled 180° out of the original position.
4. Provide a suitable capacity chain hoist, at least 1500 lb., to remove the handwheel. If the stem of the valve is mounted vertically, position the hoist directly above the handwheel. Otherwise the hoist should be placed slightly away from the handwheel in line with the stem.
 - a. The handwheel bearing nut and handwheel are removed as an assembly.
 - b. Unscrew the handwheel bearing nut using a tool to engage the two drive holes in the top of the nut or a strap wrench on the O.D. To prevent the yoke bushing from turning, hold it with a strap wrench or other suitable tool.
5. Crossarm Removal: For all valves being serviced in Area 1 or revolving stem valves in Area 2, the crossarm can be removed by tapping lightly with a hammer on the underside until it is free of the key(s).
6. If malfunction is indicated within the handwheel bearing, the balls can be removed by unscrewing the filler hole set screw, tipping the handwheel so the hole is down, and 'fishing' out the individual balls. Need for this should be rare, if ever.

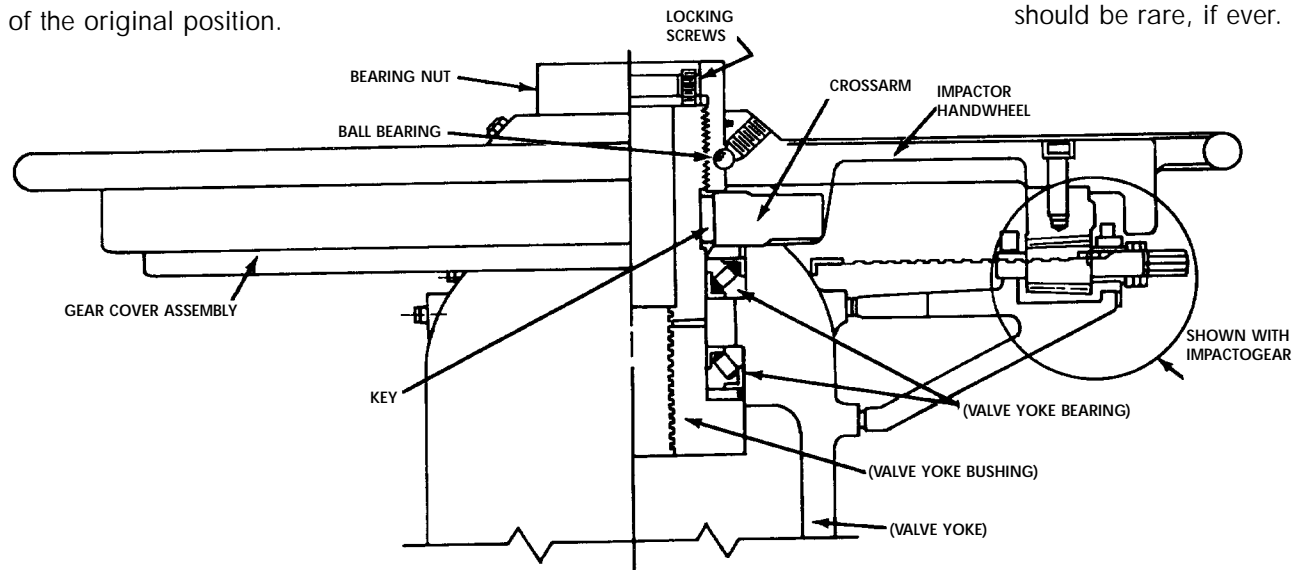


Illustration No. 13

Impactor Handwheel Ball Bearing Type (w/Impactogear)

Procedures for Removing Limitorque Operators from Valve Yokes

Edward pressure-seal valves use various types of Limitorque operators, depending upon the size and pressure class, which determines the torque requirements, whether the stem is revolving or non-revolving, and whether the valve takes the stem thrust (torque-only unit) or the operator takes the stem thrust (torque and thrust unit). The procedures below describe the removal of these various types from the valve yoke. Also included are complete instructions for resetting the torque and limit switches. Disassembly procedures for the Limitorque operators themselves are not included and appropriate instructions should be obtained before starting.

On torque-only Limitorques, the operator can be removed while the valve is pressurized, but caution must be observed to make certain that the valve is first in the back-seated or fully open position. See **“Caution”** on page 18.

All of the following disassembly procedures are arranged in accordance with the general comments on page 18. Study these pages carefully before beginning.

First, determine whether the valve stem is revolving or non-revolving. For non-revolving stem valves, several procedures are shown, depending upon the operator type. Then determine whether the operator is a torque-only or torque and thrust unit.

Revolving Stem Valves or Non-Revolving Stem Valves with Torque-only Units

All revolving stem valves use torque-only units. The operator drive nut is connected to the stem through a key. See *Illustration No. 14*. Non-revolving stem valves using torque-only units, have their drive nut splined to the valve yoke bushing. See *Illustration No. 15*.

1. Disconnect the electrical wiring to the operator.
2. Position a sling on the motor operator and attach a chain hoist of suitable capacity to the sling.
3. Remove the nuts from the underside of the yoke flange.

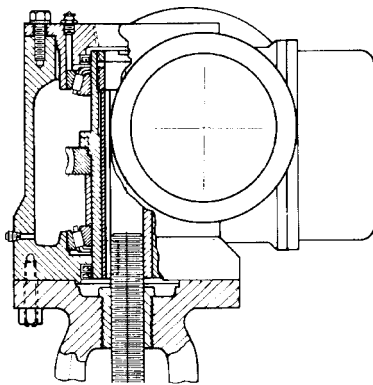


Illustration No. 14
Torque-Only Limitorque Operator on Revolving Stem Valve (SMA or SMB)

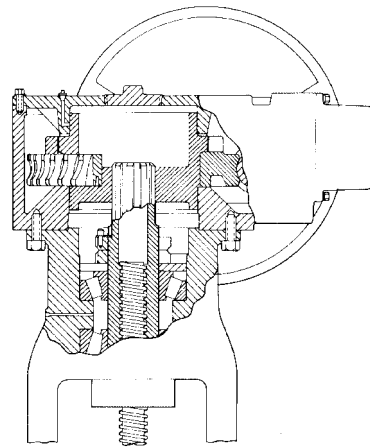


Illustration No. 15
Torque-Only Limitorque Operator on Revolving Stem Valve (SMB-4T or 5T)

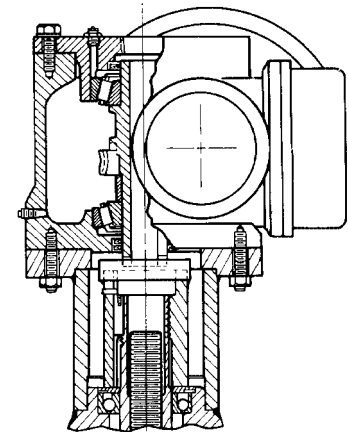


Illustration No. 16
Torque-Only Limitorque Operator on Non-Revolving Stem Valve

Procedures for Removing Limitorque Operators from Valve Yokes *(continued)*

4. Lift the operator up and completely off the stem and stem key or the yoke bushing splines.
5. Position the operator away to a clean area for further disassembly, if required.

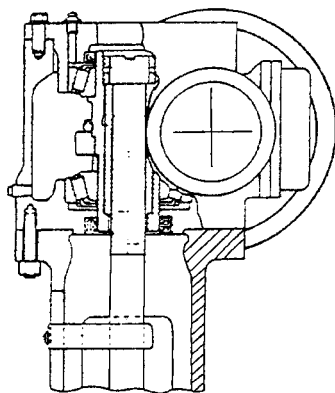
Non-Revolver Stem Valves with Torque and Thrust Units

See *Illustration No. 17* on this page.

1. Disconnect the electrical wiring to the operator.
2. Make certain the packing gland nuts are tight.
3. Position a chain hoist of suitable capacity so the operator is supported in such a manner that the handwheel can still be rotated. If the valve is installed with its stem other than

vertical, the hoist should be positioned slightly away from the handwheel in line with the stem.

4. Remove the nuts from the underside of the yoke flange.
5. Turn the operator handwheel in a direction to close the valve, thus unscrewing the operator from the stem. Try to keep the weight on the hoist as the handwheel is turned.
6. With the hoist, lift the operator clear of the stem and place down on a clean area for further disassembly, if required.



Torque and Thrust Limitorque Operator on Non-Revolver Stem Valve

Procedures for Setting Actuator Torque and Limit Switches

Limiterorque Limit Switch and Torque Switch Setting Procedures

The following descriptions apply only to Limitorque valve controls. If another type valve control is used, the appropriate manual should be consulted to determine the proper setting of the limit switch and torque switch.

Geared Limit Switch

See *Illustration No. 18*.

Numbers in parenthesis () refer to callouts on *Illustration No. 18* on this page.

When reassembling the Limitorque valve control, the rotor type geared limit switch should be reset as follows:

1. Make certain the electric current is off.
2. Open the valve by hand until the valve disk strikes the back seat. Note the direction the intermittent gear shaft (D) is turning. This slotted shaft is extended through the gear case and can be seen just above the rotor connected to the open coil.
3. Back the valve off to allow for coast of the moving parts.
4. With the valve in this position, declutch the drive pinion (A) by inserting a screwdriver in the drive pinion setting rod (B) and turning clockwise until it is tight. The intermittent gear shaft (D) can now be turned by inserting a screwdriver in its slot.
5. a. Turn the intermittent gear shaft (D) in the same direction as noted when the valve was opened until the contact on the rotor (C) connected to the open contactor circuit opens.
b. In the event this contact is already open, turn this shaft in the opposite direction until it closes; then back off on the shaft until the contact opens.
6. Unscrew the drive pinion setting rod (B) until it reaches a firm stop, but do not jam. This train of gears and contacts is now set.

WARNING

SHOULD IT BECOME NECESSARY TO CHANGE THE TORQUE SWITCH SETTING FOR ANY REASON, THE LOCAL EDWARD REPRESENTATIVE SHOULD BE CONTACTED AND HE WILL OBTAIN FROM THE FACTORY THE CORRECT NEW SETTING.

THE TORQUE SWITCH FOR THE MOTOR-OPERATED VALVE IS SET DURING FACTORY ASSEMBLY TO CLOSE THE VALVE AGAINST THE SPECIFIED UNBALANCED PRESSURES AND REQUIRES THE SAME ATTENTION FOR RESETTING.

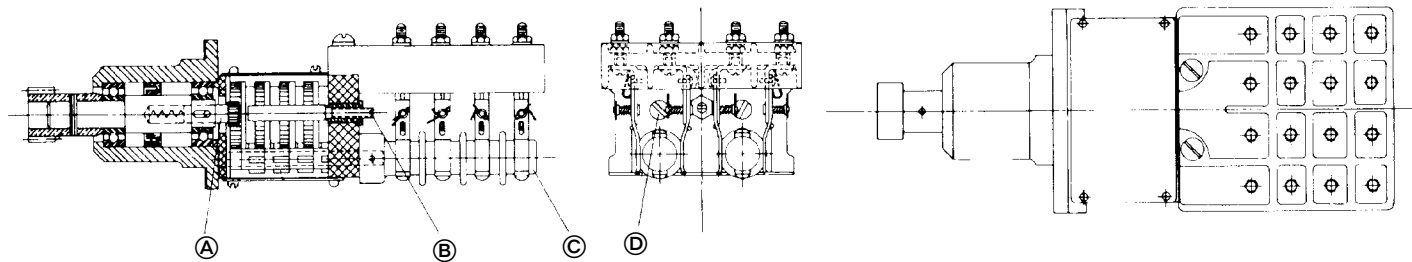


Illustration No. 18
Limitorque Geared Limit Switch Assembly

Procedures for Setting Actuator Torque and Limit Switches *(continued)*

7. Connect the electric current and check this setting as follows:
 - a. Run the valve to mid-position by hand.
 - b. Press the "open" pushbutton - make sure moving the valve is in the "open" direction.
 - c. Allow the limit switch to stop the motor.
 - d. After the motor has stopped, turn the valve by hand to make sure there is sufficient clearance between the valve backseat and the position at which the valve stem comes to rest.
8. To set the position for operation of the indicating light, make sure the torque switch is properly wired into the closing circuit (see *procedure for setting torque switch below*), and run the valve to the closed position. Back the valve off the seat to the desired position and set the "closed" light

contact using the same procedure outlined under steps 4, 5a, 5b, and 6, but use the intermittent gear shaft for the light contacts.

9. When the settings are complete, the setting rod should remain in the position described in step 6.

5. For heavier seating move the adjusting screw (G) out and re-tighten the jam nut.

6. The threaded bushing (E) is intended to limit the maximum setting of this torque switch and is locked in position to limit the output torque to the maximum safe rating for the unit.

Torque Switch

See *Illustration No. 19*.

The procedure for setting the torque switch, both single and double, is as follows:

Single Torque Switch

1. Make sure the electric current is off.
2. Loosen the jam nut (F).
3. Move the socket head adjusting screw (G) in for light seating.
4. Close the valve by the motor and test for tightness of closing. If the valve closes tightly enough, tighten the jam nut.

Double Torque Switch

1. Make sure the electric current is off.
2. Loosen the jam nut (F). Note: The right side of this switch (K) normally limits the torque applied in closing the valve. There are cases of special valve assemblies where the right side of this switch limits the torque in the open direction. In all cases it is recommended that this be checked upon installation.

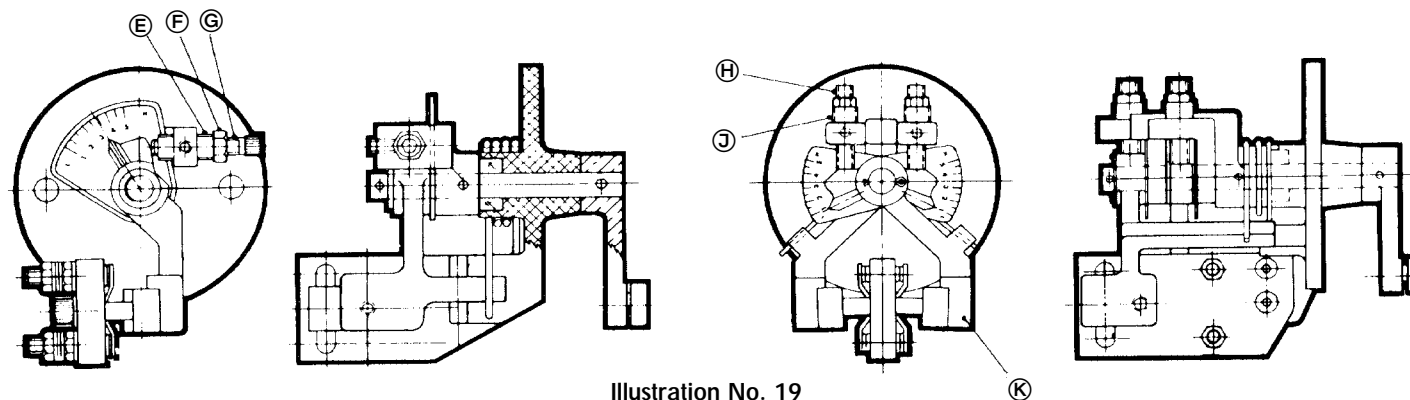


Illustration No. 19
Single & Double Torque Switch Assemblies

Procedures for Setting Actuator Torque and Limit Switches *(continued)*

3. Move the socket head adjusting screw (H) in for light seating.
4. Close the valve by the motor and test for tightness of closing. If the valve closes tightly enough, tighten the jam nut.
5. For heavier seating move the adjusting screw (H) out and retighten the jam nut.
6. For setting the torque switch for the opening direction of valve travel, the same procedure as outlined in steps 2, 3, and 5 is followed, except this adjustment is made on the left side of the switch, using the lower adjusting screw.
7. The threaded bushing (J) is intended to limit the maximum setting of this torque switch and is locked in position to limit the output torque to the maximum safe rating for the unit.

Torque Switch Setting

The procedure outlined for setting torque switches is to be used only on occasions when maintenance on the switch itself or adjacent components require it.

Disassembly Procedure for Yoke Assemblies

AREA 2

This procedure describes the method for:

- 1) Removing the yoke assembly from the valve, after the operator has been removed (procedure described elsewhere), and
- 2) Disassembling the yoke assembly itself.

This procedure should be used if service is required in the yoke assembly itself (Area 2), which includes the yoke and yoke bushing on revolving stem valves, and in addition, on non-revolving stems, the yoke bearings and stem guide collar. All of the following yoke disassembly procedures are arranged in accordance with the *general comments on page 18*. Study these pages carefully before beginning disassembly.

The following is a step-by-step instruction. First determine whether the valve to be serviced has a revolving or a non-revolving stem. Then determine the bonnet type. For a review of bonnet types, see *pages 4, 5, 6 and 7*.

Revolving Stem Valves with Type I Bonnets

See *Illustration No. 20 on this page*.

Due to the construction, it is not practical to remove the yoke assembly separately (without also removing the bonnet) in Type I bonnets. In addition, the basic simplicity minimizes any time savings. Therefore, remove the operator in accordance with *instructions on pages 19 or 22*, and then refer directly to the procedure for Bonnet Disassembly, Type 1.

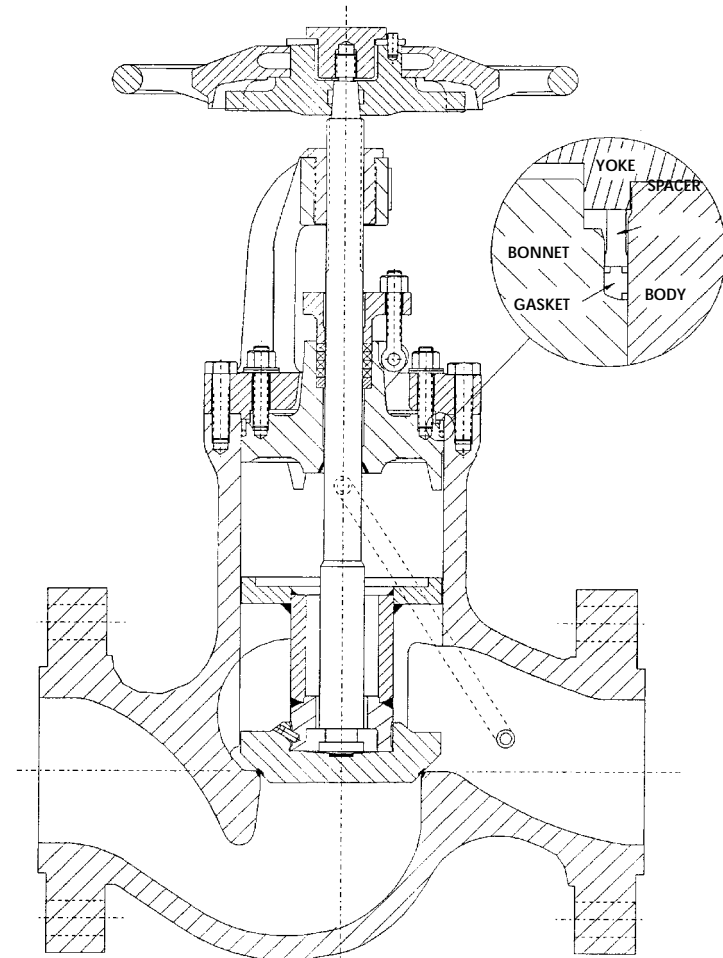


Illustration No. 20
Type I Bonnet on Stop-Check Valve

Disassembly Procedure for Yoke Assemblies *(continued)*

Revolving Stem Valves – Valves with Type II Bonnets

See *Illustration No. 22 on page 30.*

1. The manual or Limitorque operator must first be removed in accordance with *instructions on pages 19 or 22.*
2. Mark the body and yoke with prick punch marks so that the parts are referenced for reassembly.
3. Loosen the gland stud nuts.
4. Remove the yoke stud nuts.
5. Lift the yoke and stem to clear the studs, and spin the yoke completely off the stem.
6. The yoke bushing can be removed from the yoke by breaking the tack welds on the flats and unscrewing.

Non-Revolving Stem Valves – Valves with either Type II or III Bonnets

See *Illustrations No. 23 on page 31, and Illustration No. 24 on page 34.*

1. The manual or Limitorque operator must first be removed in accordance with *instructions on pages 19 or 22.*
2. Mark the body, yoke, and yoke lock ring with prick punch marks so that the parts are referenced for reassembly.
3. Make certain the packing gland nuts are tight.
4. Remove the yoke lock ring studs and nuts.

5. Remove the yoke lock ring using a small pry bar to separate the halves.
6. Loosen the stem guide collar lock nut, back off the stem guide collar lock screw and remove the stem guide collar key. Lift the collar to the top of the stem.
7. Turn the crossarm in a direction to close the valve, thus unscrewing the yoke assembly from the stem.
8. If the valve is installed with its stem other than vertical, a chain hoist will have to be attached to the yoke to allow the parts to turn freely.
9. With the hoist, lift the yoke assembly clear of the stem and body assembly, simultaneously slipping the stem guide collar off of the stem.
10. Set the yoke assembly down on its side and remove the hoist.
11. Disassembly of the yoke assembly itself is as follows:
 - a. Remove the crossarm as explained under *“Disassembly Procedure for Impactor Handles and Hand-wheels,” step 4, on page 20, or step 5 on page 21.* Be careful that the yoke bushing does not drop out of the yoke and bearings.
 - b. Prepare a bed of clean rags or paper for the bearings and yoke bushing.
 - c. While holding the yoke bushing, place a clean wood block over the top and tap to drive the yoke bushing out of the bearings or yoke.
 - d. Remove the bearing washers (if any) and the bearings from the yoke or yoke bushing, being very careful not to contaminate the grease with dirt of any kind. Keep the bearings protected.

Valves with Type IV Bonnets

See *Illustration No. 27 on page 39.*

It is possible to remove the operator and yoke assembly as a unit on Type IV bonnets, but then it is not possible to disassemble the valve bonnet since use of the yoke is required. Therefore, only “Method 2” is recommended for disassembly of Type IV bonnets. See *page 19.*

Procedures for Removing Operator and Yoke Assembly as a Unit

AREA 1 & 2

This procedure describes the method for removing the operator, either handwheel or Limitorque type, and yoke assembly from the valve as a unit.

This procedure should be used to remove the operator and yoke assembly in order to gain access for servicing the valve internals (Area 3), i.e., body, seats, bonnet, disk, etc. It is not suggested if service is required on either the operator (Area 1) or yoke assembly (Area 2) themselves.

It has been arranged in accordance with the *general comments on page 18*, and is specifically referenced in "Method 1." Study this carefully.

Before beginning, first determine if the valve has a revolving or non-revolving stem. Then determine the bonnet type. For a review of bonnet types, see *pages 4, 5, 6 and 7*.

Revolving Stem Valves with Type I Bonnets

See *Illustration No. 20 on page 27*.

Due to the construction of Type I bonnets, it is not practical to remove the yoke without also removing the bonnet. Therefore, refer to *page 19* and use the "Method 2" procedure.

Revolving Stem Valves with Type II Bonnets

See *valve Illustration No. 22 on page 30*. See *operator Illustration No. 14 on page 22*.

Impactor handwheels used on Type II bonnets with revolving stems are not attached to the yoke (only the stem) and the two, therefore, cannot be removed as a unit. Refer to *page 19* and use the "Method 2" procedure.

On Limitorque-operated valves, due to the construction, it is not possible to remove the operator and yoke assembly as a unit. Therefore, refer to *page 19* and use the "Method 2" procedure.

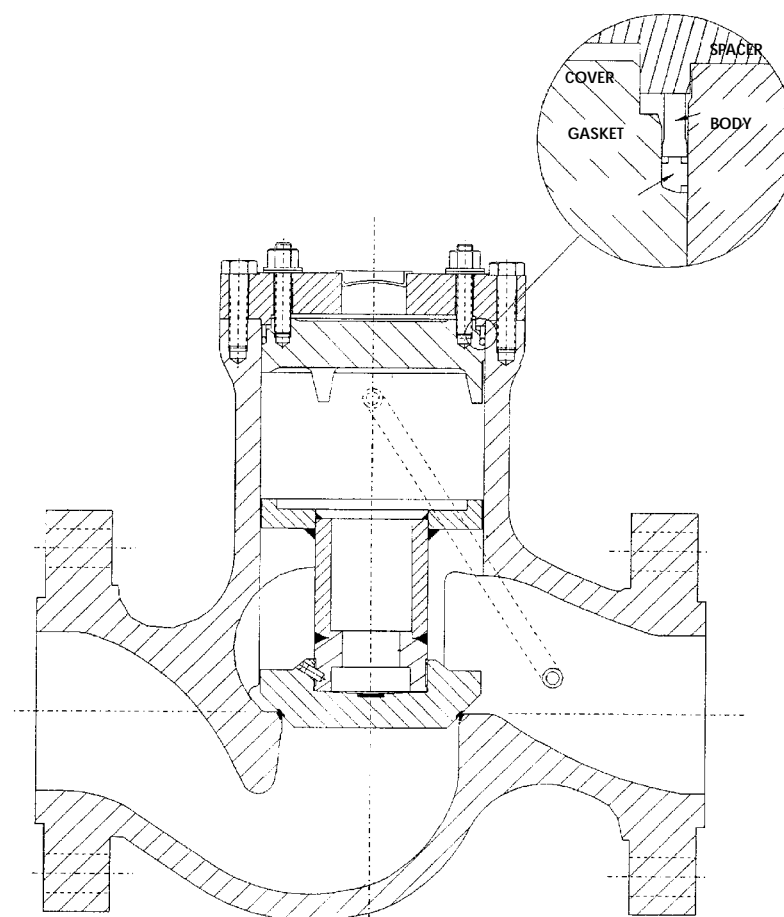


Illustration No. 21

Type I Bonnet on Piston-Lift Check Valve

Procedures for Removing Operator and Yoke Assembly as a Unit *(continued)*

Non-Revolving Stem Valves with Type II, III, or IV Bonnets

See valve Illustrations No. 23 (page 31), No. 24 (page 34) and No. 27 (page 39). See Handwheel Illustrations 10, 11, and 12 on pages 20 and 21. See Limitorque Illustrations No. 16 (page 22) and 17 (page 23).

The following is applicable for Impactor Handwheels and all types of Limitorque operators, including the XT type.

1. Disconnect the electrical wiring to Limitorque-operated valves.
2. Mark the body, yoke and yoke lock ring with prick punch marks so that the parts are referenced for reassembly.
3. Make certain the packing gland nuts are tight.
4. Position a chain hoist of suitable capacity so the operator and yoke assembly are supported in such a way that the handwheel can still be rotated. If the valve is installed with its stem other than vertical, the hoist should be positioned slightly away from the handwheel in line with the stem.
5. Remove the yoke lock ring studs and nuts.
6. Remove the yoke lock ring using a small pry bar to separate the halves.
7. Loosen the stem guide collar nut, back off the stem guide collar lock screw and remove the stem guide collar key. Lift the collar to the top of the stem.
8. Turn the Impactor handwheel or Limitorque handwheel in a direction to close the valve, thus unscrewing the operator yoke assembly from the stem. Keep the weight on the hoist as the handwheel is turned to prevent damage to the stem threads. **This is important.**
9. With the hoist, lift the whole assembly clear of the stem simultaneously slipping the stem guide collar off of the stem.

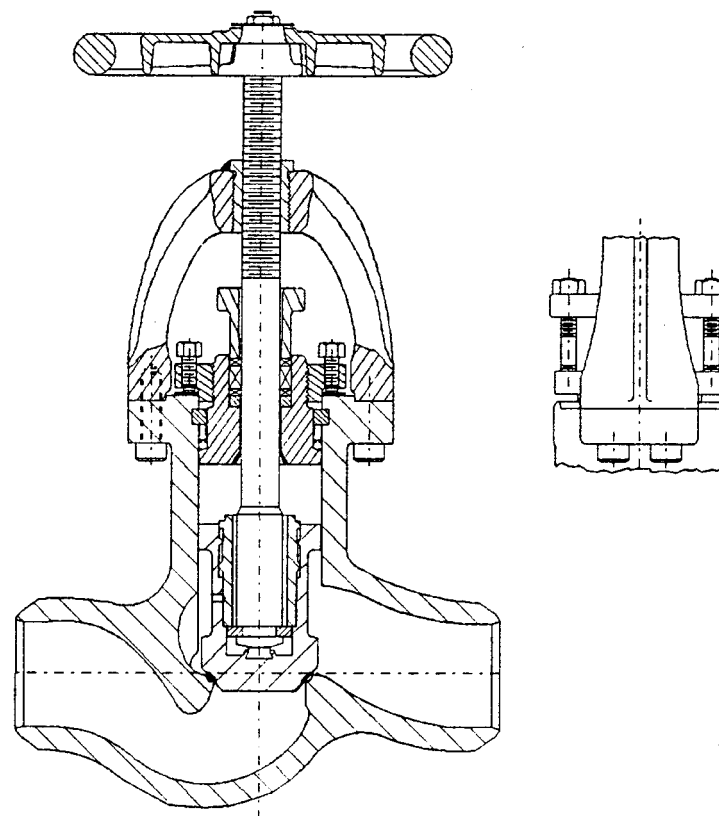


Illustration No. 22

Type II Bonnet on Revolving Stem Stop Valve

Disassembly Procedures for Bonnet Types

AREA 3

(For a definition of Area 3, see page 18)
(See Illustration No. 5 on page 11 for an explanation of valve parts nomenclature.)

Step-by-step disassembly procedures are described for each of the four basic bonnet types. For a review of bonnet types, refer to pages 4, 5, 6 and 7. The procedures for each bonnet type include disassembly instructions for stop, stop-check (non-return), and piston-lift check valves. A section is also included under bonnet Type III for tilting-disk check valves. The applicable instructions should be read thoroughly before the start of disassembly.

All of the following bonnet disassembly procedures are arranged in accordance with the general comments on page 18. Study these pages carefully before beginning.

Type I Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves

See Illustration No. 20 on page 27.

Note: All Type I bonnets have revolving stems.

1. Loosen the gland bolt nuts and tap the gland, which should relieve any pressure that might be trapped in the valve. **This is important.**

Note: Care must be taken in removing the yoke stud nuts, in case the above step has not relieved all pressure that might be trapped in the system. Once the yoke stud nuts are completely removed, the yoke-bonnet-

stem assembly is held only by the friction of the pressure-seal gasket against the body bore. Trapped pressure could cause these parts to be blown out with considerable force. Therefore, care must be taken to break the bonnet and pressure-seal gasket loose before the yoke stud nuts are completely removed.

2. Remove the crossarm by tapping with a hammer on the underside.
3. Carefully remove the yoke stud nuts, observing the *cautionary note in step 1*.
4. Remove half of the bonnet stud nuts, alternating to leave those remaining equally spaced.
5. Remove the gland bolt nuts.

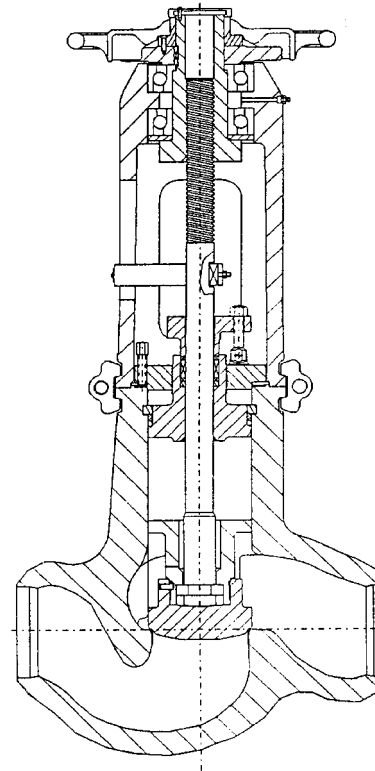


Illustration No. 23

Type II Bonnet on Non-Revolving Stem Stop Valve

Disassembly Procedures for Bonnet Types *(continued)*

6. Partially back off the remaining bonnet stud nuts. Raise the yoke, and insert uniform shims in at least three places between the yoke flange and the body.
7. Raise the pressure-seal gasket by tightening the bonnet stud nuts uniformly a fraction of a turn at a time using a star pattern. It is possible to damage the valve parts by cocking the bonnet, so uniform turning of these nuts is very important. Note that it will only be possible to raise the gasket a distance equal to the thickness of the shims used in step 6. When this point is reached, the nuts should be backed off again, more shims added, and the process repeated until the gasket comes free of the body.
8. Use a chain hoist in line with the stem to lift the stem yoke bonnet assembly out of the body. During this process, mark the body, yoke, bonnet, and pressure-seal gasket at corresponding points (other than sealing surfaces) so that their relative position can be duplicated in reassembly. In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.
9. Unscrew the stem from the yoke bushing.
10. Remove the bonnet stud nuts; separate the yoke and bonnet.
11. On stop valves, the disk and disk-nut

assembly is attached to the stem. On stop-check (non-return) valves, the piston-disk assembly is not attached to the stem and must be removed separately. See step 12.

12. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston can now be lifted from the valve. Occasionally a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, use caution to avoid marring the scaling surface in any way.
13. The bonnet end opening should be kept covered whenever possible.

Type I Pressure-Seal Bonnets Piston-Lift Check Valves

See Illustration No. 21 on page 29.

Piston-lift check valves are constructed with valve bodies similar to the corresponding stop or stop-check (non-return type) valves. Assembly is simplified by the absence of a yoke and stem.

Note: Care must be taken in removing the cover retainer nuts, in case pressure should be trapped in the body (down-stream piping). Check to make certain all down-stream pressure is relieved. Once the cover retainer nuts are completely removed, the cover/cover retainer assembly is held only by the friction of the pressure-seal gasket against the body bore. Trapped pressure could cause these parts to be blown out

with considerable force. **Therefore, care must be taken to relieve all pressure, and break the cover and pressure-seal gasket loose before the cover retainer nuts are completely removed.**

1. Carefully remove the cover retainer nuts, observing the above caution.
2. Remove half of the cover stud nuts, alternating to leave those remaining evenly spaced.
3. Partially back off the remaining bonnet stud nuts or cap screws. Raise the cover retainer and insert uniform shims in at least three places between the cover retainer and body.
4. Raise the pressure-seal gasket by tightening the bonnet stud nuts or cap screws uniformly, a fraction of a turn at a time using a star pattern. It is possible to damage the valve parts by cocking the cover, so uniform turning is very important. Note that it will only be possible to raise the gasket a distance equal to the thickness of the shims used in step 3. When this point is reached, the nuts or cap screws should be backed off again, more shims added, and the process repeated until the gasket comes free of the body.
5. Lift the cover/cover retainer assembly out of the valve. During this process, mark the body, cover/cover retainer, and pressure-seal gasket at corresponding points (but not on sealing surfaces) for reference and reassembly.

Disassembly Procedures for Bonnet Types *(continued)*

In larger sizes where this assembly is too heavy to manhandle, remove the cover/cover retainer and install an eyebolt in the threaded hole in the cover. Use the eyebolt to fasten a chain hoist directly above the valve centerline. In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.

6. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston can now be lifted from the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, use caution to avoid marring the sealing surface in any way.
7. The bonnet end opening should be kept covered whenever possible.

Type II Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves with Revolving Stems

See Illustration No. 22 on page 30.

- *1. Remove the crossarm by tapping with a hammer on the underside.
- *2. Mark the body and yoke with prick punch marks so that the parts can be reassembled in their original position.
- *3. Remove the yoke stud nuts.

4. Remove the gland stud nuts and gland.
- *5. Lift the yoke and stem to clear the studs, and spin the yoke completely off the stem.
6. Mark the bonnet, bonnet retainer ring, and body with adjacent prick punch marks so that their relative position can be duplicated in reassembly.
7. Replace the crossarm and handwheel nut on the stem and with a chain hoist mounted in line with the stem, pull the stem up snugly against the bonnet backseat. On Limitorque-operated valves, thread an eyebolt into the threaded top end of the stem.
8. Loosen the bonnet retainer cap screws.
9. Unscrew the bonnet retainer ring.
10. With clean rags and an air hose, thoroughly clean the bonnet and gasket retainer segments. **This is important.**
11. Slack off the chain hoist slightly. If the bonnet does not drop away from the pressure-seal gasket, tap gently until it does. When the bonnet is free, lower it as far as it will go into the body.
12. With a copper or brass drive pin, or small clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16") in the body.
13. Remove the gasket retainer segments.
14. Lift the bonnet into contact with the pressure-seal gasket, again using the chain hoist.
15. Screw back on the bonnet retainer ring, using shims to provide additional clearance for further upward movement of the bonnet.
16. Use three or four nuts, in a uniform spacing on the bonnet studs, to pull the bonnet and pressure-seal gasket out of the body. All nuts should be turned uniformly, a fraction of a turn at a time using a star pattern. It is possible to damage valve parts by cocking the bonnet, so uniform turning of the nuts is very important.
17. Remove the stem and bonnet assembly. During this process, mark the spacer ring and pressure-seal gasket at points (other than sealing surfaces) corresponding to the previous mark on the body (see *step 6*). In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.
18. On stop valves, the disk and disk-nut assembly is attached to the stem. On stop-check (non-return) valves, the piston-disk assembly is not attached to the stem and must be removed separately. See *step 19*.

Disassembly Procedures for Bonnet Types *(continued)*

19. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston now can be lifted from the valve. Occasionally, a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, use caution to avoid marring the sealing surface in any way.
20. The bonnet end opening should be kept covered whenever possible.

Type II Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves with Non-Revolving Stems

See *Illustration No. 23* on page 31.

- *1. Mark the body, yoke and yoke lock ring with prick punch marks so that the parts can be reassembled in their original position.
- *2. Remove the yoke lock ring studs and nuts.
- *3. Remove the yoke lock ring using a small pry bar to separate the halves.
- *4. Loosen the stem guide collar lock nut, back off the stem guide collar lock screw, and remove the stem guide collar key.
- *5. Turn the crossarm in a direction to close the valve, thus unscrewing the yoke from the stem. The stem must be restrained from turning; a flat tool held in the stem guide collar key slot

is convenient, being careful not to damage the slot.

- *6. If the valve is installed with its stem other than vertical, attach the chain hoist to the yoke in such a manner as to permit rotation of the crossarm.
- *7. With the chain hoist, lift the yoke assembly clear of the stem and body assembly, simultaneously slipping the stem guide collar off the stem.

8. Mark the bonnet, bonnet retainer ring, and body with adjacent prick punch marks so that their relative position can be duplicated in reassembly.
9. Remove the gland bolt nuts and gland.
10. Place an eyebolt in the threaded end of the stem.

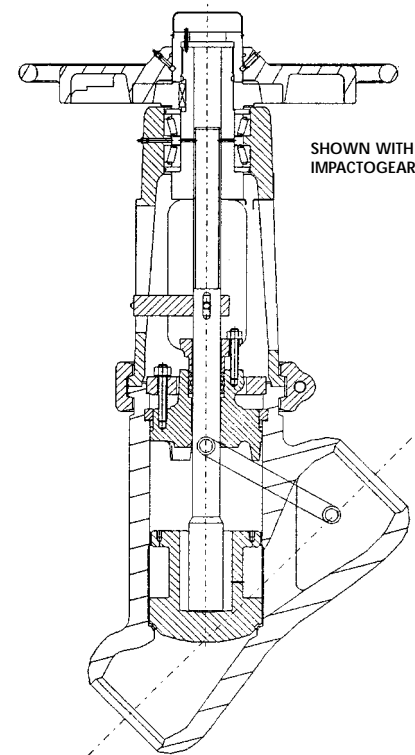


Illustration No. 24
Type III Bonnet on Stop Valve

Disassembly Procedures for Bonnet Types *(continued)*

11. With a chain hoist mounted in line with the stem and fastened to the eyebolt, pull the stem into firm contact at the bonnet backseat.
12. Loosen the bonnet retainer cap screws.
13. Unscrew the bonnet retainer ring.
14. With clean rags and an air hose, thoroughly clean the top of the valve and all exposed surfaces of the bonnet and gasket retainer segments.
This is important.
15. Slack off the chain hoist slightly. If the bonnet does not drop away from the pressure-seal gasket, tap gently until it does. When the bonnet is free, lower it into the body to clear the gasket retainer segments.
16. With a copper or brass drive pin, or a small clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16") in the body.
17. Remove the gasket retainer segments.
18. Lift the bonnet into contact with the pressure-seal gasket, again using the chain hoist.
19. Screw back on the bonnet retainer ring, using shims to provide additional clearance for further upward movement of the bonnet.
20. Use three or four nuts, in a uniform spacing on the bonnet studs, to pull the bonnet and pressure-seal gasket out of the body. All nuts should be turned uniformly, a fraction of a turn

at a time using a star pattern. It is possible to damage the valve parts by cocking the bonnet, so uniform turning of the nuts is very important.

21. Remove the stem and bonnet assembly. During this process, mark the spacer ring and pressure-seal gasket at points (other than sealing surfaces)

corresponding to the previous mark on the body (see *step 8*). In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.

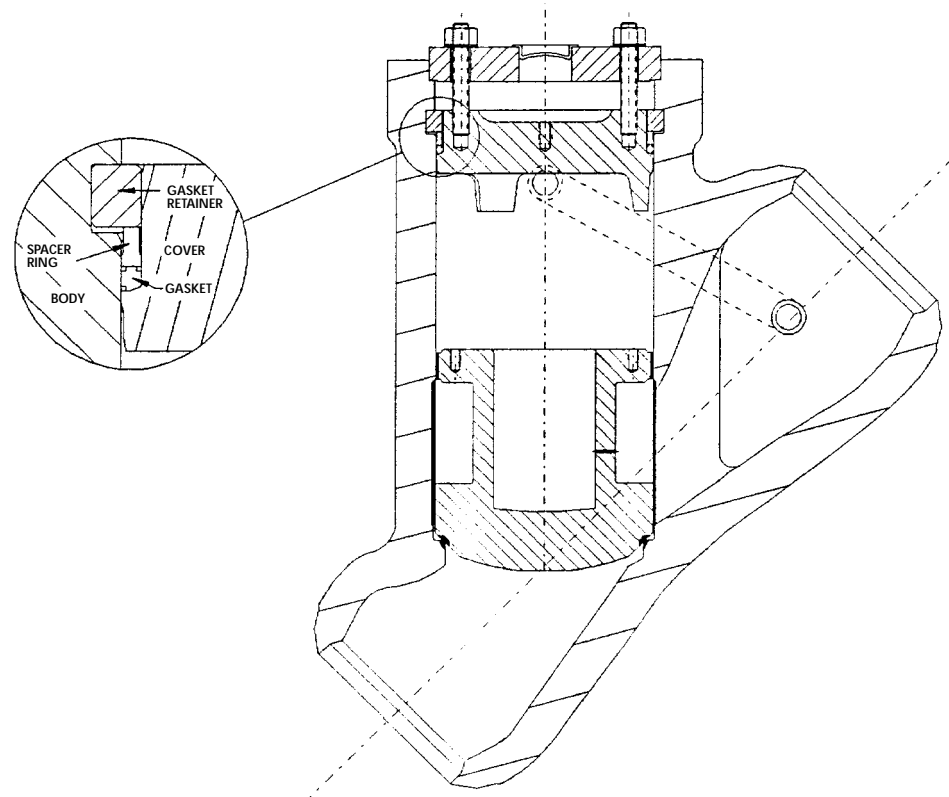


Illustration No. 25

Disassembly Procedures for Bonnet Types *(continued)*

22. On stop valves, the disk and disk-nut assembly is attached to the stem. On stop-check (non-return) valves, the piston-disk assembly is not attached to the stem and must be removed separately. See *step 23*.
23. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston can now be lifted from the valve. Occasionally a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, use caution to avoid marring the sealing surface in any way.
24. The bonnet end opening should be kept covered whenever possible.

Type III Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves

See *Illustration No. 24 on page 34*.

- *1. Mark the body, yoke and yoke lock ring with prick punch marks so the parts can be reassembled in their original position.
- *2. Remove the yoke lock ring studs and nuts.
- *3. Remove the yoke lock ring using a small pry bar to separate the halves.
- *4. Loosen the stem guide collar lock nut, back off the stem guide collar lock screw and remove the stem guide collar key.
- *5. Turn the crossarm in a direction to close the valve, thus unscrewing the yoke from the stem. The stem must be restrained from turning; a flat tool held in the stem guide collar key slot is convenient, being careful not to damage the slot.
- *6. If the valve is installed with its stem other than vertical, attach the chain hoist to the yoke in such a manner as to permit rotation of the crossarm.
- *7. With the chain hoist, lift the yoke assembly clear of the stem and body assembly, simultaneously slipping the stem guide collar off the stem.
8. Mark the bonnet, bonnet retainer ring, and body with adjacent prick punch marks so their relative position can be duplicated in reassembly.
9. Remove the gland bolt nuts and gland.
10. Screw an eyebolt in the threaded end of the stem.
11. With the chain hoist mounted in line with the stem and fastened to the eyebolt, pull the stem into firm contact at the bonnet backseat.
12. Remove the bonnet stud nuts and bonnet retaining ring.
13. With clean rags and air hose, thoroughly clean the top of the valve and all exposed surfaces of the bonnet and gasket retainer segments. **This is important.**
14. Slack off the chain hoist slightly. If the bonnet does not drop away from the pressure-seal gasket, tap gently until it does. When the bonnet is free, lower it as far as it will go into the body.
15. With a copper or brass drive pin, or a clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16") in the body.
16. Remove the gasket retainer segments.
17. Lift the bonnet into contact with the pressure-seal gasket, again using the chain hoist.
18. Replace the bonnet retainer ring, using shims to provide additional clearance for further upward movement of the bonnet.
19. Use three or four nuts in a uniform spacing on the bonnet studs to pull the bonnet and pressure-seal gasket out of the body. All nuts should be turned uniformly, a fraction of a turn at a time using a star pattern. It is possible to damage valve parts by cocking the bonnet, so uniform turning of the nuts is very important.
20. Remove the stem and bonnet assembly. During this process, mark the spacer ring and pressure-seal gasket at points (other than seal-surfaces) corresponding to the previous mark on the body (see *step 8*). In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.

Disassembly Procedures for Bonnet Types *(continued)*

21. On stop valves, the disk and disk-nut assembly is attached to the stem. On stop-check (non-return) valves, the piston-disk assembly is not attached to the stem and must be removed separately. See *step 22*.
 22. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston now can be lifted from the valve. Occasionally, a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, use caution to avoid marring the sealing surface in any way.
 23. The bonnet end opening should be kept covered whenever possible.
- Type III Pressure-Seal Bonnets – Piston-Lift Check Valves**
- See *Illustration No. 25 on page 35*.
1. Remove the cover/cover retainer.
 2. Screw an eyebolt into the tapped hole in the cover.
 3. Fasten a chain hoist to the eyebolt and pull up just enough to eliminate all slack in the hoist.
 4. Remove all cover stud nuts or cap screws.
 5. Remove the cover retainer.
 6. Mark the body, cover and gasket retainer segments with adjacent prick punch marks so that their relative position can be restored on reassembly.
 7. With clean rags and an air hose, thoroughly clean the top of the valve and all exposed surfaces of the cover and gasket retainer segments. **This is important.**
 8. Slack off on the chain hoist to permit the cover to slip down into the valve body. If necessary, tap lightly to loosen. If the cover resists all attempts to force it into the valve body, high-pressure fluid may be trapped in the bonnet cavity (and downstream) of the check valve. The cover will drop easily when this pressure is relieved. Lower the cover until it rests on top of the valve piston.
 9. With a copper or brass drive pin or a clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16") in the body.
 10. Remove the gasket retainer segments.
 11. Lift the cover back into contact with the pressure-seal gasket, again using the chain hoist.
 12. Replace the cover retainer, using shims to provide additional clearance for further upward movement of the cover.
 13. Use three or four nuts in a uniform spacing on the bonnet studs to pull the cover and gasket out of the body. All nuts or screws should be turned uniformly, a fraction of a turn at a time, using a star pattern. It is possible to damage valve parts by cocking the cover, so uniform turning of the nuts is very important.
 14. Lift out the cover assembly. During this process, mark the spacer ring and pressure-seal gasket at points (other than the sealing surfaces) corresponding to previous marks on the body and cover (see *step 6*). In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.
 15. Screw 1/2"-13 bolts (3/8"-16 on sizes 5" and smaller) into the threaded bosses or nuts provided in the piston. The piston can now be lifted from the valve. Occasionally a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston. Since the piston must be removed through the pressure-seal area of the bonnet bore, this must be done very carefully to avoid marring the sealing surface in any way.
 16. The bonnet end opening should be kept covered whenever possible.

Disassembly Procedures for Bonnet Types *(continued)*

Type III Pressure-Seal Bonnets – Tilting Disk Check Valves

Sizes 6" and larger.

See *Illustration No. 26 on page 38.*

As explained under "Seat and Disk Repairs" on page 14, this manual does not include information for repair of the seat and disk of Tilting Disk Check Valves. Consult your Edward Sales Representative.

1. Remove the cover/cover retainer.
2. Screw an eyebolt into the tapped hole in the cover.
3. Fasten a chain hoist to the eyebolt and pull up just enough to eliminate all slack in the hoist.
4. Remove all cover stud nuts or cap screws.
5. Remove the cover retainer.
6. Mark the body, cover and gasket retainer segments with adjacent prick punch marks so that their relative position can be restored on reassembly.
7. With clean rags and an air hose, thoroughly clean the top of the valve and all exposed surfaces of the cover and gasket retainer segments. **This is important.**
8. Slack off on the chain hoist to permit the cover to slip down into the valve body. If necessary, tap lightly to loosen. If the cover resists any reasonable attempts to force it into the valve body, high-pressure fluid may be trapped in the bonnet cavity (and downstream) of the check valve. The cover will drop easily when this pressure is relieved. Lower the cover until it rests on top of the disk.
9. With a copper or brass drive pin or a clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16") in the body.
10. Remove the gasket retainer segments.
11. Lift the cover back into contact with the pressure-seal gasket, again using the chain hoist.
12. Replace the cover retainer, using shims to provide additional clearance for further upward movement of the cover.
13. Use three or four nuts or screws in a uniform spacing on the bonnet studs to pull the cover and gasket out of the body. All nuts or screws should be turned uniformly, a fraction of a turn at a time, using a star pattern. It is possible to damage valve parts by cocking the cover, so uniform turning of the nuts is very important.

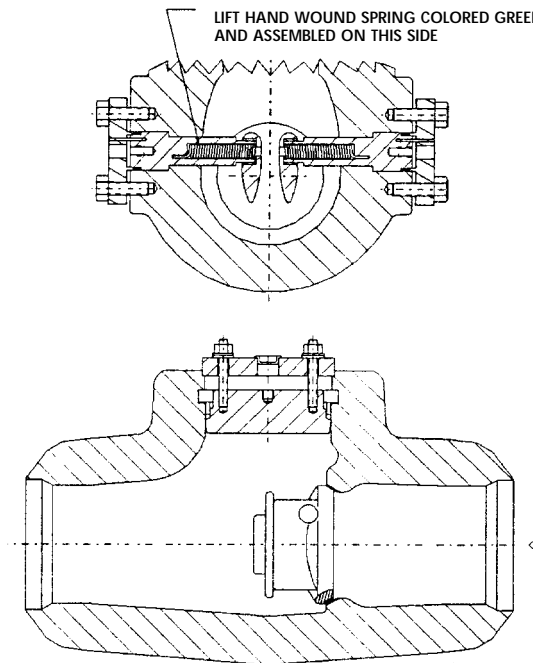


Illustration No. 26

Type III Bonnet on Tilting Disk Check Valve

Disassembly Procedures for Bonnet Types *(continued)*

14. Lift out the cover assembly. During this process, mark the spacer ring and pressure-seal gasket at points (other than the sealing surfaces) corresponding to the previous marks on the body and cover (see *step 6*). In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.
15. Inspection of the seat and hinge pins can be made without further disassembly.
16. If removal of the disk is necessary, proceed as follows:

NOTE: Pressure may be trapped in the valve even though the system is down, and care must be taken in removing the hinge pin retainer. Once the retainer bolts are completely removed, the hinge pins are held only by the friction of the pressure-seal gasket against the hinge pin bore. Trapped pressure could cause the retainer and hinge pin to be blown out with considerable force. Therefore, care must be taken to break the hinge pin and hinge pin pressure-seal gasket loose before the three retainer bolts are completely removed.

- a. Carefully loosen, but do not remove, the hinge pin retainer bolts.
- b. Place a suitable spacer between the hinge pin retainer and the body. Insert a threaded stud (same thread as the retainer bolts)

through the center hole of the hinge pin retainer and thread into the puller hole in the hinge pin.

- c. Support the disk inside the body; thread a nut onto the stud, and tighten the nut until the pressure-seal gasket and hinge pin is loose and any pressure that may be trapped in the valve is relieved. If the hinge pin will not move, heat the body boss (not more than 300° F) with an acetylene torch.
 - d. Remove the hinge pin retainer bolts, hinge pin retainer, roll pin, hinge pin, pressure-seal gasket and torsion spring. During this process, mark the position of the hinge pin relative to the body with prick punch marks. Tag each hinge pin and torsion spring so that each may be replaced on the proper side of the valve. The torsion springs are wound counter to each other to provide a slight restraint to valve opening and assist in valve closing, making it extremely important to reassemble them correctly.
 - e. Remove the other hinge pin.
 - f. The disk can now be removed from the body. Use caution not to damage any machined or seating surfaces. In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid damage.
17. The cover end opening should be kept covered whenever possible.

Type IV Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves

See *Illustration No. 27*.

NOTE: All Type III Bonnets have non-revolving stems.

1. Mark the body, yoke and yoke lock ring with prick punch marks so that the parts can be reassembled in their original position.
2. Loosen the gland bolt nuts and tap the gland, which should relieve any pressure that might be trapped in the valve. **This is important.**

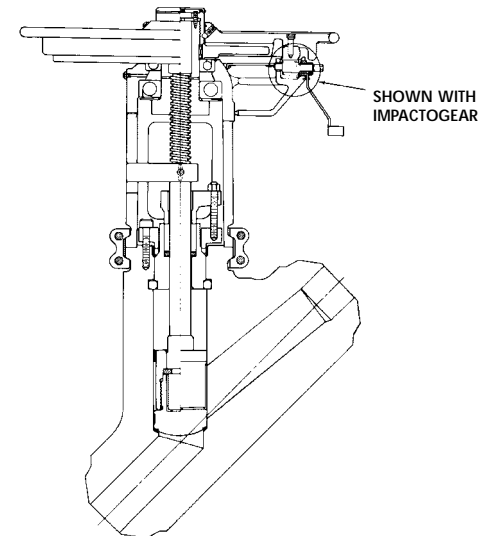


Illustration No. 27

Type IV Bonnet on Stop-Check Valve

Disassembly Procedures for Bonnet Types *(continued)*

3. Remove the bonnet retainer ring cap screws. Due to space limitations, a special tool may have to be used. Make it from a standard Allen socket wrench.
4. Open the valve fully so the stem is back-seated on the bonnet and impact with the handwheel several times to break the pressure-seal gasket loose from the body. Once the gasket is free, discontinue turning the handwheel.
5. Remove the yoke lock ring studs and nuts.
6. Remove the yoke lock ring using a small pry bar to separate the halves.
7. To make certain the pressure-seal gasket is free in the body, attach a chain hoist to the handwheel and lift the yoke and bonnet assembly up a maximum of 1/4". Do this with a hoist of at least 1000 lb. capacity. If the stem of the valve is not mounted vertically, position the hoist slightly away from the handwheel in line with the stem.
8. Lower the hoist and valve assembly back to a slack position.
9. Loosen the stem guide collar lock nut, back off the stem guide collar lock screw and remove the stem guide collar key.
10. Turn the crossarm in a direction to close the valve thus unscrewing the yoke from the stem. The stem must be restrained from turning; a flat tool held in the stem guide collar key slot is convenient, being careful not damage the slot.
11. The hoist may have to be used for step 10, if the stem is not vertical, to allow the parts to turn freely.
12. Lift the yoke assembly clear of the stem and body assembly, simultaneously slipping the stem guide collar off of the stem.
13. Mark the bonnet, bonnet retainer ring and body with adjacent prick punch marks so that their relative position can be duplicated in reassembly.
14. Remove the gland bolt nuts and gland.
15. Remove the bonnet retainer ring.
16. With clean rags and air hose, thoroughly clean the top of the valve and all exposed surfaces of the bonnet and pressure-seal gasket. **This is important.**
17. Mark the pressure-seal gasket at a point (other than seal surfaces) corresponding to the previous mark on the body (see *step 13*).
18. Screw an eyebolt in the threaded end of the stem.
19. For Stop Valves:
 - a. With the chain hoist mounted in line with the stem and fastened to the eyebolt, pull the stem, bonnet and pressure-seal gasket out of the valve so the disk nut contacts the gasket retainer segments. Back off 1/8".
 - b. Slide the bonnet, spacer ring (if used) and pressure-seal gasket up to the top of the stem and fasten in place by wrapping the stem with electrical tape, or other suitable means.
20. For Stop-Check (non-return) Valves: With the chain hoist mounted in line with the stem and fastened to the eyebolt, pull the stem, bonnet, spacer ring (if used), and pressure-seal gasket completely out of the valve. In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface, particularly any seating and sealing surfaces.
21. With a copper or brass drift pin, or a clean hardwood block, tap the gasket retainer segments to free them in the body retainer groove. (Note that they cannot be driven downward in Type IV construction.)
22. Remove the gasket retainer segments using two pieces of approximately 3/32 diameter wire bent 90°, half an inch from the end. Insert the bent end into the 1/8" holes provided for this, removing each segment one at a time.
23. For stop valves, remove the stem and disk assembly from the valve, and lay it down carefully as explained in step 20.
24. For stop-check (non-return) valves, the piston-disk assembly is not attached to the stem and must be removed separately. Reach down into the body

Disassembly Procedures for Bonnet Types *(continued)*

bore and lift out the piston, being careful not to mar any sealing surfaces such as the body pressure-seal area or piston seating surface. Occasionally a vacuum may be formed by the cooling fluid in the pipe line below the valve. Until relieved, this vacuum will prevent removal of the piston.

25. The bonnet end opening should be kept covered whenever possible.

Type IV Pressure-Seal Bonnets – Piston-Lift Check Valves

See *Illustration No. 28*.

1. If used, remove the cover/cover retainer.
2. **NOTE: Make certain all pressure is relieved in the valve body (downstream piping). Once the cover retainer bolts or nuts are completely removed, the cover/cover retainer assembly is held against the body bore only by the friction of the pressure-seal gasket. Trapped pressure could cause the cover/cover retainer assembly to be blown out with considerable force. Therefore, care must be taken to break the cover and pressure-seal gasket loose before the cover retainer bolts or nuts are completely removed.**
3. Carefully loosen, but do not remove, the cover retainer bolts or nuts. If used, loosen the large bolt in the center of the cover retainer.
4. Mark the body and cover retainer at corresponding points for reference and reassembly.
5. Place a suitable spacer between the cover retainer and the body. Unless already equipped, insert a threaded stud through the center hole of the cover retainer and thread into the puller hole in the cover.
6. Place a heavy washer over the stud to bridge the cover retainer hole and thread a nut onto the stud. Tighten the nut (or the large center bolt) until the pressure-seal gasket and cover is loose and any pressure is relieved.
7. Remove the cover retainer bolts or nuts and draw the cover/cover retainer assembly out of the body. An eyebolt may be inserted in the threaded cover hole and the assembly lifted out with a chain hoist, if desired. In laying the parts aside for inspection, it is imperative that they be placed carefully on a bed of rags or other soft material to avoid marring any machined surface.
8. Before disassembling the cover/cover retainer assembly, mark the cover and pressure-seal gasket at points (other than sealing surfaces) corresponding to the previous mark on the cover retainer (see *step 4*).
9. With a copper or brass drift pin or a clean hardwood block, tap the gasket retainer to free them in the body retainer groove. (Note that they cannot be driven downward in Type IV construction.)
10. Remove the gasket retainer segments using two pieces of approximately 3/32 diameter wire bent 90°, half an inch from the end. Insert the bent end into the 1/8" holes provided for this, removing each segment one at a time.
11. Remove the piston by reaching down into the body bore and lifting out, being careful not to mar any sealing or seating surfaces such as the body pressure-seal area or piston seating surface. Occasionally a vacuum may be formed by the cooling fluid in the pipeline below the valve. Until relieved, this vacuum will prevent removal of the piston.
12. The bonnet end opening should be kept covered whenever possible.

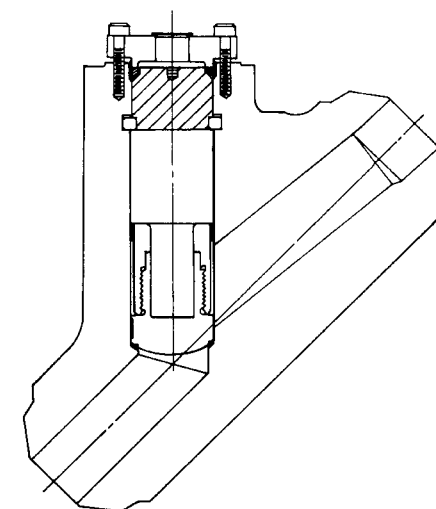


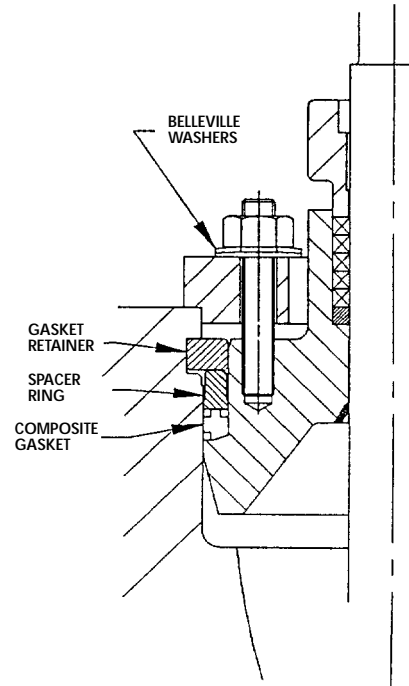
Illustration No. 28
Type IV Bonnet or Piston-Lift Check Valve

Assembly of Composite Pressure-Seal Gaskets

It is important to determine that the new composite pressure-seal gasket, the bonnet and the body sealing area are in satisfactory condition before installation. The following steps will help ensure superior performance of the gasket.

1. Carefully inspect the body bore and bonnet O.D. sealing surfaces. Remove any raised metal from the entry chambers and gasket chamber regions. Repair any gouges in the sealing region in accordance with the instructions on page 10.
2. Inspect the new composite gasket. **Note:** All composite gaskets have cracks and wrinkles in the flexible graphite. This is a normal result of the forming process and will not affect gasket performance.
3. Be sure the anti-extrusion rings are tightly bonded to the graphitic gasket, so they will not touch the body during assembly. If any of the anti-extrusion rings are loose, carefully scrape away all flexible graphite left on the anti-extrusion ring surface and re-bond to the graphite surface using Loctite 454 or other suitable contact cement. The ends of the outer rings should touch after bonding. There should be an approximate $.020 \pm .005$ " gap at the ends of the inner ring.
4. Place the gasket on the bonnet with the two anti-extrusion rings facing up as shown in the illustration. The gasket should fit snugly around the bonnet, and the gasket O.D. should not

exceed the O.D. of the bonnet. This will ensure that the gasket does not catch on the body and "energize" prematurely.



5. Install the spacer ring on the bonnet as shown with the wide end toward the gasket. Now the valve may be reassembled using the assembly procedures described in the following sections for different types of bonnets, except that special torquing procedures are required as described in the following:

IMPORTANT: The composite pressure-seal must remain dry until fully compacted for proper sealing!

6. Once the bonnet and bonnet retainer holes have been aligned, lightly lubricate the fasteners with high-temperature anti-seize lubricant. Assemble the Belleville washers under the nuts or capscrews. Assemble remaining parts as described in previous sections.
7. Preload the bonnet by pulling up with a well-centered crane load or with come-alongs.

Table C

Composite Gasket Bonnet/Cover Bolt/Nut Pull-Up Torques (For Initial Pull-Up)

Bolt Size	Required Torque ft.-lbs.
3/8	30
7/16	45
1/2	70
9/16	100
5/8	135
3/4	220
7/8	350
1	540
1-1/8	770
1-1/4	1100
1-3/8	1500
1-1/2	1700
1-5/8	2300
1-3/4	3200
1-7/8	4200
2	4600

Assembly of Composite Pressure-Seal Gaskets *(continued)*

8. Initially compress the pressure-seal gasket, making sure that the bonnet does not cock in the body.
9. While maintaining the pull-up load, torque the bonnet/cover bolts evenly using a varying star pattern, until the fastener torques reach a value of 2/3 or the torque given in *Table C on page 42*.
10. After reaching 2/3 of the torque value given in *Table C on page 42*, torque the bonnet nuts in small torque increments, with no more than 1/16 turn per tightening round, using a varying star pattern, until the full torque value given in *Table C on page 42*, is reached.
11. Re-torque the bolts at the final torque value several times, until the gasket no longer compresses. This step is necessary due to the high resilience of the graphitic gasket.
12. Complete remaining valve assembly in accordance with the appropriate preceding section of this manual.
13. When the valve is next under pressure, either during system hydrostatic test or when put in service, re-torque the bolts to the torque values given in *Table B on page 10*.

CAUTION

Do not use the torque values in *Table C on page 42* while the valve is under pressure.

Reassembly Procedures for Metal Pressure-Seal Valves

Introduction

The reassembly procedures in this manual are not as detailed as the disassembly instructions since, in many cases, just a reverse procedure is used. However, step by step instructions are provided for each of the four bonnet types. In addition, the following general points should be considered.

1. The most important consideration in the reassembly of pressure-seal valves is cleanliness. All flaky scales should be removed with a wire brush, emery cloth, or acid solvent. Oil and grease should be removed from all parts with a suitable solvent to prevent any foreign matter from collecting on sealing and seating surfaces.
2. Unless it is impossible to do so, use a new pressure-seal gasket when reassembling a bonnet that has been disassembled, whether it was leaking or not.
3. When reassembling valve bonnets, always examine the stem packing and replace if necessary.
4. Observe all of the reference marks or prick punch marks assigned during disassembly so that the original part relationships can be maintained.
5. Reassemble stud nuts and cap screws using the torque values given in *Table B on page 10*.
6. When reassembling the bearings in the yoke assembly of non-revolving stem valves, use the following procedure to obtain the proper bearing preload:

Handwheel Operated Valves

 - a. Close the valve hand tight.
 - b. Impact the handwheel.
 - 1) Two men, one blow for valves with spherical roller bearings.
 - 2) One man, one blow for valves with tapered roller bearings.
 - c. Tighten the handwheel bearing nut, using a tool to engage the two drive holes in the top or a strap

Reassembly Procedures for Metal Pressure-Seal Valves *(continued)*

wrench on the O.D. Use a reasonable length of bar stock, or adequate size strap wrench, so the nut is firmed up well.

- d. Tighten the set screws in the handwheel bearing nut against the yoke bushing. This completes the preloading of the lower bearing.
- e. If desired, the valve can now be closed tightly for a seat joint test.
- f. To preload the upper bearing, open the valve fully to the bonnet backseat so it is hand tight.
- g. Repeat step b.
- h. Loosen the set screws in the handwheel bearing nut.
- i. Repeat step c. Attempt to line up the existing set screw holes in the handwheel bearing nut with those in the yoke bushing. This will duplicate the original factory preload. However, it is important that the preloading be performed as described above and if the holes cannot be lined up, new ones should be drilled and tapped. When drilling, be careful that no chips enter the yoke bushing-stem threads.
- j. Refasten the safety wire.

Limitorque Motor-Operated Valves

This preloading procedure applies only to the yoke bearings (on non-revolving stem valves) on valves using operators of the 'torque-only' type. Valves using torque and thrust units

do not have bearings (they are in the operator instead). For an explanation of the various operator types, refer to the section "Procedure for Removing Limitorque Operators from Valve Yokes" on page 22.

- a. Turn the manual handwheel on the Limitorque operator to apply 10% of the handwheel torque required to seat the valve against maximum pressure.
 - b. Tighten the yoke bushing nut so the keyways in the yoke bushing and the nut line up, and insert the key. This completes the preloading of the lower bearing.
 - c. If desired, the valve can now be closed tightly for seat joint test.
 - d. To preload the upper bearing, open the valve full to the bonnet backseat.
 - e. Repeat step a.
 - f. Remove the key, retighten the yoke bushing nut and reinsert the key, as in b.
 - g. Drive the rollpin into the yoke bushing nut to fix the position of the key.
7. When threading a yoke bushing back onto the stem threads, particularly on non-revolving stem valves with heavy operators attached to the yoke assembly, use caution in order to not damage the threads. Start the stem threads by rotating the handwheel and keeping the weight on the hoist.

8. When reassembling handwheels with Impactogears, make certain that the pinion gear meshes properly with the large gear on the underside of the handwheel before tightening the bearing nut. After the bearing nut is properly tightened, in accordance with *Step 6 above*, retighten the locking screws and install the safety wire.

Type I Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return Valves)

See *Illustration No. 20* on page 27.

1. Insert the disk, disk-nut, stem assembly, or the disk-piston and stem, lowering carefully until they rest on the valve seat. Hold the stem centrally in the valve bore.
2. Install a new pressure-seal gasket on the bonnet and lower this assembly carefully into the body until it rests on top of the stem back seat or disk-piston.
3. Lower the yoke into position, rotating the stem the amount necessary to engage the yoke bushing threads.
4. Turning the stem in a direction to open the valve, raise the bonnet and pressure-seal gasket up into contact with the yoke.
5. Install and tighten the yoke stud nuts using the torque values on *page 10*.

Reassembly Procedures for Metal Pressure-Seal Valves *(continued)*

6. Open valve to the backseat with the bonnet studs loose. Use the hand-wheel to back-seat the valve 2 or 3 light taps. This will align the bonnet with the other parts.
7. Install and tighten the bonnet stud nuts in accordance with the torque values shown on *page 10*. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet.
8. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type I Pressure-Seal Bonnets – Piston-Lift Check Valves

See *Illustration No. 21 on page 29*.

1. Insert the disk-piston, lowering it carefully until it rests on the valve seat.
2. Reassemble the cover, pressure-seal gasket, and cover retainer, leaving the parts loose and using a new gasket.
3. Lower the cover, gasket, and cover retainer assembly carefully into the valve.
4. Install and tighten the cover retainer stud nuts using the torque values on *page 10*.
5. Install and tighten the cover stud nuts in accordance with the torque values shown on *page 10*. All nuts should be tightened uniformly in a star pattern to avoid cocking the cover.

Type II Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves with Revolving Stems

See *Illustration No. 22 on page 30*.

1. Insert the disk, disk-nut, stem assembly, or the disk-piston and stem, lowering carefully until they rest on the valve seat. Hold the stem centrally in the valve bore.
2. Install a new pressure-seal gasket and the spacer ring on the bonnet. Lower this assembly carefully into the body until it rests on top of the stem back-seat or disk-piston.
3. Insert the gasket retainer segments in the body groove.
4. Install the bonnet retainer screw thrust washer on the body.
5. Lower the bonnet retainer ring over the stem.
6. Lift the stem, pulling the bonnet, pressure-seal gasket, and spacer ring assembly up to the gasket retainer segments.
7. Screw the bonnet retainer ring onto the bonnet to the position marked in the disassembly.
8. Tighten the bonnet retainer cap screws in accordance with the torque values shown on *page 10*. All screws must be tightened uniformly in a star pattern to avoid cocking the bonnet. The stem can now be lowered to the closed position.

9. Retrace *disassembly steps 5, 4, 3, and 1 on page 33*.
10. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type II Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves with Non-Revolving Stems

See *Illustration No. 23 on page 31*.

1. Insert the disk, disk-nut, stem assembly, or the disk-piston and stem, lowering carefully until they rest on the valve seat. Hold the stem centrally in the valve bore.
2. Install a new pressure-seal gasket and the spacer ring on the bonnet. Lower this assembly carefully into the body until it rests on top of the stem back-seat or disk-piston.
3. Insert the gasket retainer segments in the body groove.
4. Install the bonnet retainer screw thrust washer on the body.
5. Lower the bonnet retainer ring over the stem.
6. Lift the stem, pulling the bonnet, pressure-seal gasket, and spacer ring assembly up to the gasket retainer segments.
7. Screw the bonnet retainer ring onto the bonnet to the position marked in disassembly.

Reassembly Procedures for Metal Pressure-Seal Valves *(continued)*

8. Retighten the bonnet retainer cap screws in accordance with the torque values shown on *page 10*. All screws must be tightened uniformly in a star pattern to avoid cocking the bonnet. The stem can now be lowered to the closed position.
9. Retrace *disassembly steps 9, 7, 6, 5, 4, 3, and 2 on page 34*.
10. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type III Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves

See *Illustration No. 24 on page 34*.

1. Insert the disk, disk-nut, stem assembly, or the disk-piston and stem, lowering carefully until they rest on the valve seat. Hold the stem centrally in the valve bore.
2. Install a new pressure-seal gasket and spacer ring on the bonnet. Lower this assembly carefully into the body until it rests on top of the stem backseat or disk-piston.
3. Insert the gasket retainer segments in the body groove.
4. Lower the bonnet retainer over the stem.
5. Lift the stem, pulling the bonnet and pressure-seal gasket spacer ring assembly into contact with the gasket retainer segments. Assemble the bonnet retainer nuts on the bonnet studs.

6. Tighten the bonnet retainer nuts in accordance with the torque values shown on *page 10*. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet. The stem can now be lowered to the closed position.
7. Retrace *disassembly steps 9, 7, 6, 5, 4, 3, and 2 on page 36*.
8. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type III Pressure-Seal Bonnets – Piston-Lift Check Valve

See *Illustration No. 25 on page 35*.

1. Insert the piston into the body, lowering carefully until it rests on the valve seat.
2. Install a new pressure-seal gasket and spacer ring on the cover and lower the assembly carefully into the body until it rests on top of the piston.
3. Insert the gasket retainer segments into the body groove.
4. Install the cover retainer.
5. Lift the cover, pressure-seal gasket, and spacer ring assembly into contact with the gasket retainer segments. Install the cover stud nuts.
6. Tighten the cover stud nuts in accordance with the torque values shown on *page 10*. All nuts should be tightened uniformly in a star pattern to avoid cocking the cover.
7. Replace the cover/cover retainer.

Type III Pressure-Seal Bonnets – Tilting Disk Check Valves

See *Illustration No. 26 on page 38*.

1. Insert the disk through the cover end of the body and hold it against the valve seat.
2. Checking the tags or parts, place the proper torsion spring in each hinge pin so the tang end enters the small hole in the bottom of the hinge pins.
3. Observing the relative position of the parts as marked (*disassembly step 16d on page 39*), insert the hinge pin and torsion spring through the body and into the disk. The other extended tang of the spring must slip into the hole at the base of the hinge pin bearing hole in the disk.
4. Install a new pressure-seal gasket on the hinge pin.
5. Position the hinge pin retainer so the roll pin enters the hole in the hinge pin and the projecting diameter is against the pressure-seal gasket. The hinge pin retainer must be rotated about 20° *in the direction of spring wind* to line up with the holes for the cap screws.
6. Tighten the retainer cap screws in 10 ft.-lbs. increments to the torque value shown on *page 10*.
7. Install a new pressure-seal bonnet gasket and spacer ring on the cover and lower the assembly carefully into the body until it rests on top of the disk.

Reassembly Procedures for Metal Pressure-Seal Valves (continued)

8. Insert the gasket retainer segments in the body groove.
9. Install the cover retainer.
10. Lift the cover, pressure-seal gasket, and spacer ring assembly into contact with the gasket retainer segments. Install the cover stud nuts.
11. Tighten the cover stud nuts in accordance with the torque values shown on *page 10*. All nuts must be tightened uniformly in a star pattern to avoid cocking the cover.
12. Replace the cover/cover retainer.

Type IV Pressure-Seal Bonnets – Stop and Stop-Check (Non-Return) Valves

See *Illustration No. 27 on page 39*.

1. Insert the disk, disk-nut, stem assembly, or the disk-piston and stem, lowering carefully until they rest on the valve seat. Hold the stem centrally in the valve bore.
2. Insert the gasket retainer segments in the body groove.
3. Install a new pressure-seal gasket on the bonnet. Lower this assembly carefully into the body until it rests on the gasket retainer segments.
4. If used, slip the spacer ring over the bonnet and down on to the pressure-seal gasket.
5. Lower the bonnet retainer over the stem.
6. Install the bonnet retainer cap screws in accordance with the torque values shown on *page 10*. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet.
7. Retrace *disassembly steps 14, 12, 11, 10, 9, 6, and 5 on page 40*.
8. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type IV Pressure-Seal Bonnets – Piston-Lift Check Valves

See *Illustration No. 28 on page 41*.

1. Insert the piston in the body, lowering carefully until it rests on the valve seat.
2. Insert the gasket retainer segments in the body groove.
3. Install a new pressure-seal gasket on the bonnet. Lower this assembly carefully into the body until it rests on the gasket retainer segments.
4. If used, slip the spacer ring over the bonnet and down on to the pressure-seal gasket.
5. Install the bonnet retainer.
6. Screw in the bonnet retainer cap screws in accordance with the torque values shown on *page 10*. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet.
7. Replace the large center bolt, inserting it through the cover retainer and threading it into the cover.

General Information

WARNING

Edward valves are not provided with a pressure relief device. A pressure relief device must be provided elsewhere in the piping system to prevent the piping system pressure from exceeding the maximum rated pressure of the valve.

Welding Valves Into Piping

Welding is outside the scope of this manual, but Edward recommends you consult the appropriate welding procedure in ASME/ANSI B31, or whatever other codes apply to your system. When welding valves into piping, make sure there is no foreign material on the seat joint, then close the valve tightly to avoid distorting the seats. During subsequent stress relief of the welds, leave the valve closed to avoid distorting the valve seat. Also, during stress relief, assure that the valve upperstructure is not overheated. After welding and stress relief, open the valve and flush the line to clean out all foreign matter.

Piping Support

Piping should be supported sufficiently to preclude excessive end loads on the valve.

Valve Installation Guidelines

Except as noted below, Edward stop valves can be installed in any position. Installed positions with the valve cover or bonnet below horizontal, where dirt and scale can accumulate in the valve neck, should be avoided. The orientation limits shown in Figures 1-4 must not be exceeded for

Edward Stop-Check valves and Check valves. The limitations given for line inclination and bonnet roll angle should not be combined.

All Check and Stop-Check valves should be installed with 10 or more diameters of straight pipe upstream of the valve to minimize flow disturbances. For additional information, refer to the "Technical" section of the Edward Valves Catalog, Publication No. EV-100.

Notes on Valve Operation

Valves equipped with electric motor actuators have special tags attached which indicate the correct torque switch setting for the valve. Exceeding these torque switch settings can cause damage to the valve. Never use an electric motor actuator to back-seat a valve. This can result in damage to the valve stem and bonnet backseat.

Notes on Valve Maintenance

When replacing the bonnet gasket in Edward valves, follow the torque requirements closely. Failure to torque the bonnet bolting properly will result in gasket failure. When replacing the valve stem packing, never machine the packing chamber oversize. This will result in blowout of the packing.

Lubrication

In order to obtain full service life, valves require periodic lubrication of the stem threads. Exposed threads should be wiped

clean of old grease and accumulated dirt. Fresh lubricant should then be applied. This is most effectively done with the valve in the closed position. For valves that see frequent operation, such as motor actuated valves, the lubricant should be replenished every three months. If extreme service conditions dictate, a more frequent relube schedule is recommended. The recommended lubricant for all stem threads is Rykon EP #2, manufactured by the American Oil Company. This is an extreme pressure, extreme temperature lubricant of high quality. For valves that are operated infrequently, relubrication should be at least once a year.

General Information

Seat and Disk Joint Leaks

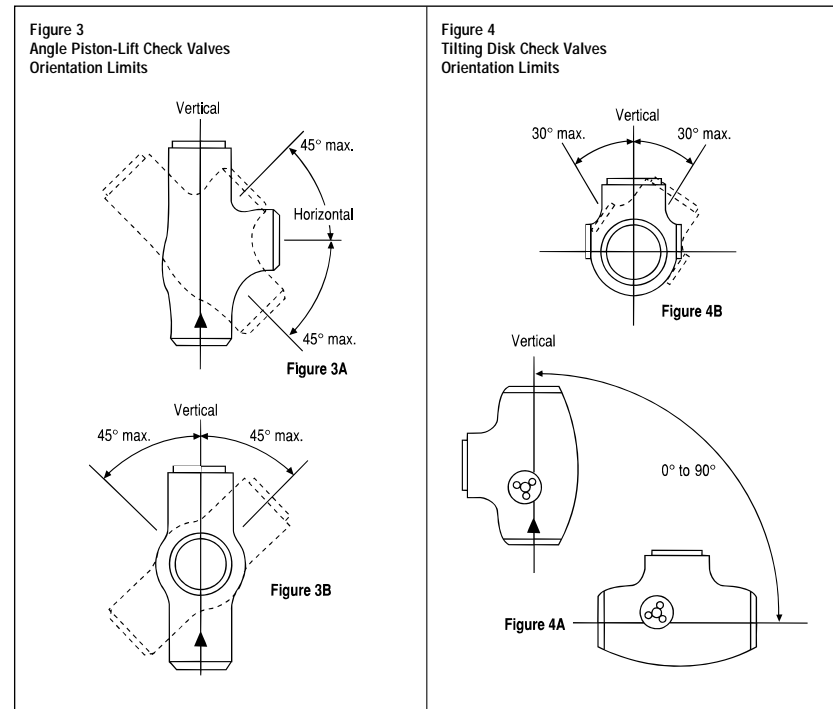
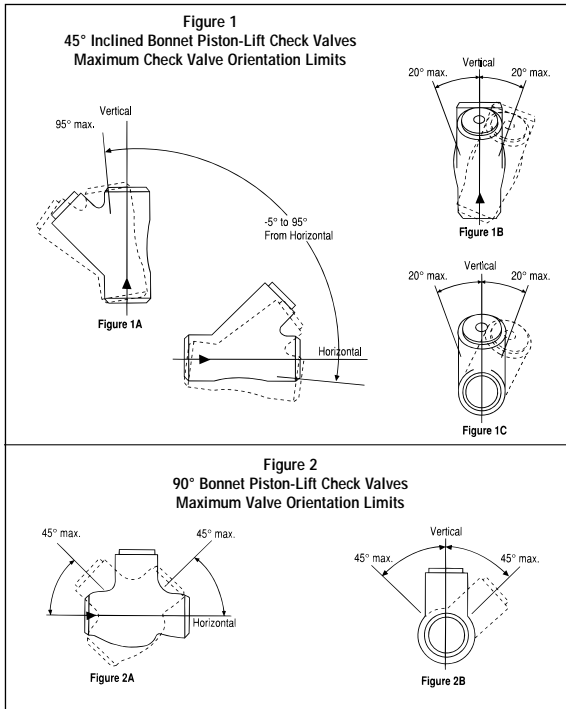
A leak existing between the seat and disk of a closed valve might be indicated by one of the following: a definite pressure loss in the high-pressure side of the valve; continued flow through an inspection drain on the low-pressure side; or, in hot water or steam lines, a downstream pipe that remains hot beyond the usual length of time and conductivity range. Such a leak may be the result of closing on dirt, scale or other foreign matter in the line. It may also develop because of the operator's failure to close the valve tightly. An increased velocity is imparted to a flow forced through a very small opening. This increased velocity subsequently gives rise to the "cutting" of both disk

and seat, particularly by particles of line scale or rust in suspension or normal solids in solution. In spite of the fact that the hard surfaced material on the seat and disk is corrosion and erosion resistant, grooves, pit marks, or other surface irregularities may be formed on the seat and disk joint surfaces when the disk is closed against a foreign body on the seat. This sometimes occurs during the initial start up of a piping system. Leakage of steam through a valve which is badly steam cut has a whistling or sonorous sound. If the valve is only slightly steam cut, however, leakage is identified by subdued gurgling or weakly popping sounds. These sounds can be heard through a stethoscope or by placing one end of a stick against the

valve body while holding the other end between the teeth, with hands over the ears.

How to Order Parts

During normal working hours, call 800-225-6989 or 919-832-0525. To assure the correct parts for your valve, include the valve size, the figure number - including any prefix and/or suffixes and if available, the B/M number. All nuclear valves require the B/M number to properly identify your valve. This information is located on the valve nameplate. The nameplate is attached to a yoke leg via a cable. If the nameplate is inaccessible, you can use your Edward sales drawing; please include the drawing number as well.



Supplementary Repair Information

In analyzing valve trouble in the field, it is important to consider the following factors:

1. Size of the valve.
2. Figure number of the valve.
3. Type of service (water, oil, gas, superheated steam, etc.)
4. Operating pressures and temperature.
5. Direction of flow through stop valves (inlet pressure above the disk or below the disk).
6. Rate of flow through the valve (lbs. per hour or gallons per minute).
7. What pressure temperature or flow rate at which the reported trouble occurs.
8. Pressure drop across the valve.

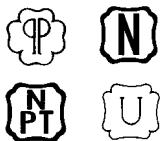
Ordering Parts

All requests for replacement parts for cast steel valves should be forwarded to the Edward business unit in Raleigh, North Carolina. Specify shipment requirements (Air Express, Area Express, etc.)

Edward Valves designs and manufactures all valves for 40 years' service. That means not just building a reliable product, but one that is easy to maintain and service. It also means providing a team of experienced, dedicated professionals to keep your Edward valves operating at peak performance. Something we have been doing since 1904.

Information Request

If the maintenance problem looks particularly difficult, it is suggested that you contact your local Edward Valves representative. They are familiar with these maintenance instructions and has a variety of engineering data sheets. In all communications with your local representative concerning service difficulties, mention the valve size, figure number, registration number (if one is given) and as many of the eight conditions listed above as possible. Some of this information is found on the nameplate fastened to the valve yoke.





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