SAN/0499-82
MDC G9705

10 MWe Solar Thermal
Central Receiver Pilot Plant
Solar Facilities Design Integration

PLANT MAINTENANCE/TRAINING MANUAL
(RADL ITEM 2-37)
SECTION 4 – VALVES, BOOK 3 of 3

July 1981
Revised September 1982

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
5301 BOLSA AVENUE
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PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
SOLAR ENERGY
UNDER CONTRACT DE-AC03-79SF10499

INSTRUCTIONS

Update for Plant Maintenance/Training Manual (RADL 2-37).

Section 4 - Valves

The material contained in Books 1 and 2 of the July 1981 version of this Section has been updated to make corrections to existing material and to add new valve information that became available after the July 1981 printing. The additional new material has necessitated printing the September 1982 version of Section 5 in 3 books. These documents, as currently published, totally replace the 2 books printed in July of 1981.

Modifications and additions have been made to the following paragraphs in each book:

Book 1

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PREFACE

This document is provided by the McDonnell Douglas Astronautics Company (MDAC) in accordance with Department of Energy Contract Number DE-AC03-79SF10499, Reports and Deliverables List Item 2-37. The material presented here is intended for training and maintenance usage by Southern California Edison Operations Personnel.

Specific notes on the organization and content of the document are as follows:

1. This document is organized in major sections that reflect the top level breakdown of the Master Equipment List as defined in RADL Item 2-19. This is in contrast to the subsystem approach used in designing the plant, however, is consistent with the Southern California Edison operating plant equipment lists.

   - Section 1 - Rotating Apparatus
   - Section 2 - Stationary Apparatus
   - Section 3 - Electrical Apparatus
   - Section 4 - Valves
   - Section 5 - Instrumentation
   - Section 6 - Control and Data Systems
   - Section 7 - Collector System
   - Section 8 - Special Heliostat Instrumentation and Meteorological Measurements Equipment
   - Section 9 - Heating Ventilating and Air Conditioning
   - Section 10 - Facilities

2. Assignments to categories are made on the basis of the lowest level tag numbers. For example, maintenance information for the thermal storage extraction pump skid assembly (SA-309) is not listed in the stationary apparatus section, but broken down to the generic categories as defined by the tag number; i.e., pumps (Section 1.2), air operated stop valves (Section 4.2), pressure transmitter (Section 5.2), etc.

3. The Process Instrumentation Section (Section 5.0) is organized on the basis of sensor type as defined by the first letter of the designating tag number. It contains sensor-related information only. Signal conditioning equipment is treated in Section 6.0.

4. The information on the Collector System, which was provided by the Martin Marietta Corp. (MMC) and the major items of the Electrical Power Generation System equipment, provided by Southern California Edison is not provided herein. However, the various sections were structured for their inclusion where applicable.

Technical questions concerning this RADL Item should be directed to Mr. R. G. Riedesel at (714) 896-3357 or Mr. R. J. Perkins at (714) 896-3073.

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4.6 CHECK AND STOP VALVES

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
V-TO-12-316	Extraction Pump Oil Stop-check Valve	4.6.18	5163145
V-TO-12-318	Superheater Oil Check Valve	4.6.19	5163145
V-TO-13-319	Extraction Pump Oil Stop-check Valve	4.6.18	5163145
V-TO-13-321	Superheater Oil Check Valve	4.6.19	5163145
V-TO-25-326	Boiler Oil Check Valve	4.6.20	5163145
V-TO-26-327	Boiler Oil Check Valve	4.6.20	5163145
V-TO-307-325	Aux. Pump Oil Stop - Check Valve	4.6.21	5163145
V-VT-11-3		4.6.22	5163149
V-VT-(SCE)-3		4.6.23	5163149
V-VT-(SCE)-6		4.6.23	5163149
V-VT-(SCE)-9	Check Valve for PV-640	4.6.24	5163149
(RBWISK-04) thru (RBWISK-21)	Boiler Panel Water Inlet Stop - Check Valve	4.6.26	5163134 thru 5163139
(RPNCK-1)	Preheater Panel Nitrogen Check Valve	4.6.27	5163140
(RPNCK-2)	Preheater Panel Nitrogen Check Valve	4.6.27	5163140
(RMNCK-1)	Downcomer Manifold Nitrogen Check Valve	4.6.28	5163140
(RMNCK-2)	Downcomer Manifold Nitrogen Check Valve	4.6.28	5163140
(TDCCK)	Bootleg Drain Check Valve	4.6.29	5163143
(THSWSK-1)	Condenser Blanket Steam Stop - Check Valve	4.6.30	5163144
(THSWSK-2)	Condenser Blanket Steam Stop - Check Valve	4.6.30	5163144
(TSSBCK-1)	Superheater Steam Bleed Check Valve	4.6.31	5163143
(TSSBCK-2)	Superheater Steam Bleed Check Valve	4.6.31	5163143
(TSSWCK-1)	Superheater Blanket Steam Check Valve	4.6.32	5163146
(TSSWCK-2)	Superheater Blanket Steam Check Valve	4.6.32	5163146
(TDWCK)	Desuperheater Water Check Valve	4.6.33	5163143

Equipment Number	Description	Maintenance Section	P&ID Dwg. Number
NV-625	Extraction Line Non-return Valve - 1st Point	4.6.1	5163149
NV-627	Extraction Line Non-return Valve - 2nd Point	4.6.2	5163149
NV-629A	Extraction Line Non-return Valve - 3rd Point	4.6.3	5163149
NV-629B	Extraction Line Non-return Valve - 3rd Point	4.6.3	5163149
NV-631	Extraction Line Non-return Valve - 4th Point	4.6.4	5163149
V-CO-3-303	Steam Tap Water Check Valve	4.6.5	5163144
V-CO-4-304	Steam Trap Water Check Valve	4.6.5	5163144
V-FP-1-1	CP #9 Furnished Valves	4.6.7	5163161
V-FP-3-5	CP #9 Furnished Valves	4.6.7	5163161
V-FP-7-13	CP #9 Furnished Valves	4.6.7	5163161
V-FW-10-301	Preheater Water Stop - Check Valve	4.6.9	5163146
V-FW-10-302	Preheater Water Stop - Check Valve	4.6.9	5163146
V-FW-200-202	Preheater Panel Feedwater Inlet Check Valve	4.6.10	5163133
V-ST-9-4	CP #9 Furnished Valve	4.6.7	5163149
V-ST-5-301	Superheater Steam Check Valve	4.6.12	5163146
V-ST-5-302	Superheater Steam Check Valve	4.6.12	5163146
V-SW-5-3	Deleted		5163159
V-SW-5-5	Deleted		5163159
V-SW-8-9	Deleted		5163159
V-SW-8-11	Deleted		5163159
V-SW-29-15	Deleted		5163146
V-TO-2-2	Deleted		5163163
V-TO-4-307	Charging Pump Oil Stop-check Valve	4.6.17	5163142
V-TO-5-308	Charging Pump Oil Stop-check Valve	4.6.17	5163142

4.6 Check and Stop Check Valves

4.6.5 Steam Trap Water Check Valves

4.6.5.1 Identification Tag Number — Description

Identification Tag Number	Description
V-CO-3-303	Steam Trap Water Check Valve
V-CO-4-304	Steam Trap Water Check Valve

4.6.5.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 4 inch Figure 4094Y

Specification No.: Rocketdyne Specification SP42-103 (following)

Material: Body: Carbon Steel

Weight: 160 lb

4.6.5.3 Prescribed Service

Water

4.6.5.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.5.5 Special Cautions

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.5.6 Periodic Service

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.5.7 Parts List

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.5.8 Special Tools

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.5.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.5.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-103
J. K. CHENG JC	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS 5-2-80	**Rocketdyne Division**	DATE 4-30-80
E C Spencer 5/5/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 2-14-80
J G Absalom	**SPECIFICATION**	REV. LTR. A
		PAGE 1 of 2

TITLE

STEAM TRAP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TTWCK-1, TTWCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	PISTON
CONNECTIONS:	4 INCH BUTTWELD
PIPE MATERIALS:	ASTM A10G GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	WATER
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	1550 PSIG @ 675°F
Ø CRACK PRESSURE:	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 83 MINIMUM
ANSI RATING:	900 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE

Ø

4.6.5.11 Manufacturers Instructions:

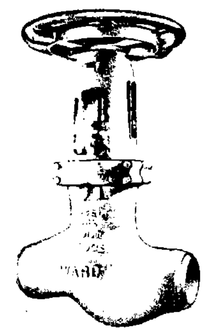
Rockwell Edward Maintenance Manual V-377R1

Rockwell Edward Maintenance Manual V-376

Rockwell Edward Maintenance Manual V-380

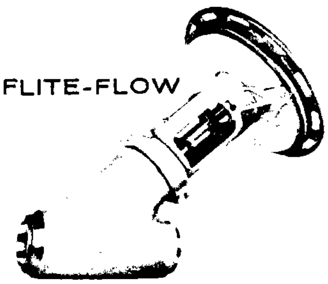
Rockwell Edward Maintenance Manual V-370

V-377 R1



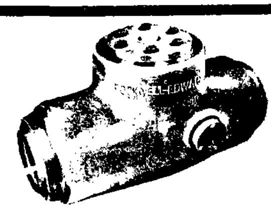
GLOBE STOP

MAINTENANCE MANUAL FOR ROCKWELL-EDWARD PRESSURE-SEAL VALVES

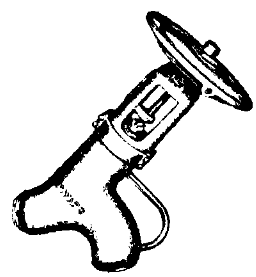


FLITE-FLOW

ANGLE-CHECK



TILTING DISK



ELBOW DOWN

Rockwell

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KEY TO ILLUSTRATIONS

ROCKWELL-EDWARD
PRESSURE SEAL VALVES MAINTENANCE MANUAL

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 in obtaining the most satisfactory service from these valves. Although rigid metallurgical, radiographic, physical and visual inspection is the standard procedure for all Rockwell-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.

Then the procedure to be followed in making the repair is explained. This includes normal valve maintenance as well as major valve repair. Field repair equipment, available from Rockwell-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 procedures for the various valve components; for example, manual or 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 Rockwell-Edward for additional advice, if required, and how to order parts is included.

FIGURE NUMBERS OF ROCKWELL-EDWARD PRESSURE SEAL VALVES DESCRIBED IN THIS MANUAL

602Y	694Y	1560Y	2007Y	3902Y	3946Y	4007Y	4095Y	4416Y	4570Y	7542Y
606	695	1561	2014Y	3906	3947	4016	4306Y	4417Y	4592Y	7546
606Y	695Y	1561Y	2016Y	3906Y	3947Y	4016Y	4307Y	4442Y	7502Y	7546Y
607	702Y	1570Y	2017Y	3907	3948Y	4017	4316Y	4446Y	7506	7547
607Y	714Y	1602Y	2042Y	3907Y	3992Y	4017Y	4317Y	4447Y	7506Y	7547Y
614Y	792Y	1614Y	2046Y	3914Y	3994	4046	4370Y	4448Y	7507	7548Y
616	960	1692Y	2047Y	3916	3994Y	4046Y	4394Y	4470Y	7507Y	7592Y
616Y	960Y	1802Y	2070Y	3916Y	3995	4047	4395Y	4492Y	7514Y	7594
617	961	1814Y	2092Y	3917	3995Y	4047Y	4402Y	4494Y	7516	7594Y
617Y	961Y	1892Y	2094Y	3917Y	4006	4094	4406Y	4495Y	7516Y	7595
692Y	970Y	2002Y	2095Y	3942Y	4006Y	4094Y	4407Y	4502Y	7517	7595Y
694	1560	2006Y	2570Y	3946	4007	4095	4414Y	4514Y	7517Y	

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 table at right.

TYPE I

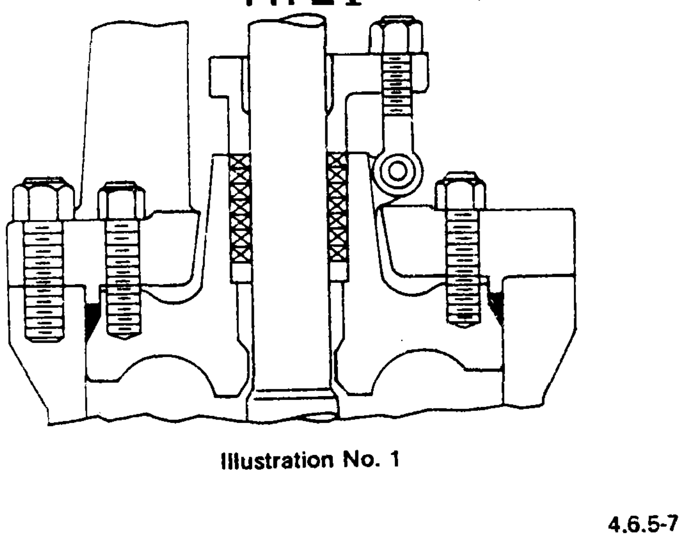


Illustration No. 1

Fig. No.	Pressure Rating	Type of Valve	Size
602Y	600	Flite-Flow Globe Stop-Check (Y-Type)	16-20
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)	16-20
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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	16-20
714Y	600-SP-66	Flite-Flow Globe Stop (Y-Type)	16-20
792Y	600-SP-66	Flite-Flow Check (Y-Type)	16-20
1602Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1614Y	Special	Flite-Flow Globe Stop (Y-Type)	16-20
1692Y	Special	Flite-Flow Check (Y-Type)	16-20
1802Y	Special-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1814Y	Special-SP-66	Flite-Flow Globe Stop (Y-Type)	16-20
1892Y	Special-SP-66	Flite-Flow Check (Y-Type)	16-2C

TYPE II is the push-up design in which the bonnet retainer ring is screwed on to 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.

Fig. No.	Pressure Rating	Type of Valve	Size
2006Y	1500-SP-66	Globe Stop-Check	2½-4
2007Y	1500-SP-66	Angle Stop-Check	2½-4
2016Y	1500-SP-66	Globe Stop	2½-4
2017Y	1500-SP-66	Angle Stop	2½-4
2046Y	1500-SP-66	Globe Stop-Check	2½-4
2047Y	1500-SP-66	Angle Stop-Check	2½-4
3902Y	2500	Flite-Flow Globe Stop-Check (Y-Type)	6-20
3906 and 3906Y	2500	Globe Stop-Check	2½-12
3907 and 3907Y	2500	Angle Stop-Check	2½-22
3914Y	2500	Flite-Flow Globe Stop (Y-Type)	6-24
3916 and 3916Y	2500	Globe Stop	2½-12
3917 and 3917Y	2500	Angle Stop	2½-22
3942Y	2500	Flite-Flow Globe Stop-Check (Y-Type)	6-24
3946 and 3946Y	2500	Globe Stop-Check	2½-12
3947 and 3947Y	2500	Angle Stop-Check	2½-22
3948Y	2500	Elbow Down Stop-Check	10-16
4006 and 4006Y	900	Globe Stop-Check	2½-4
4007 and 4007Y	900	Angle Stop-Check	2½-4
4016 and 4016Y	900	Globe Stop	2½-4
4017 and 4017Y	900	Angle Stop	2½-4
4046 and 4046Y	900	Globe Stop-Check	2½-4
4047 and 4047Y	900	Angle Stop-Check	2½-4
4306Y	900-SP-66	Globe Stop-Check	2½-4
4307Y	900-SP-66	Angle Stop-Check	2½-4
4316Y	900-SP-66	Globe Stop	2½-4
4317Y	900-SP-66	Angle Stop	2½-4
4402Y	2500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-24
4406Y	2500-SP-66	Globe Stop-Check	2½-12
4407Y	2500-SP-66	Angle Stop-Check	2½-22
4414Y	2500-SP-66	Flite-Flow Globe Stop (Y-Type)	6-24
4416Y	2500-SP-66	Globe Stop	2½-12
4417Y	2500-SP-66	Angle Stop	2½-22
4442Y	2500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-20
4446Y	2500-SP-66	Globe Stop-Check	2½-12
4447Y	2500-SP-66	Angle Stop-Check	2½-22
4448Y	2500-SP-66	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
7506 and 7506Y	1500	Globe Stop-Check	2½-4
7507 and 7507Y	1500	Angle Stop-Check	2½-4
7516 and 7516Y	1500	Globe Stop	2½-4
7517 and 7517Y	1500	Angle Stop	2½-4
7546 and 7546Y	1500	Globe Stop-Check	2½-4
7547 and 7547Y	1500	Angle Stop-Check	2½-4

TYPE II

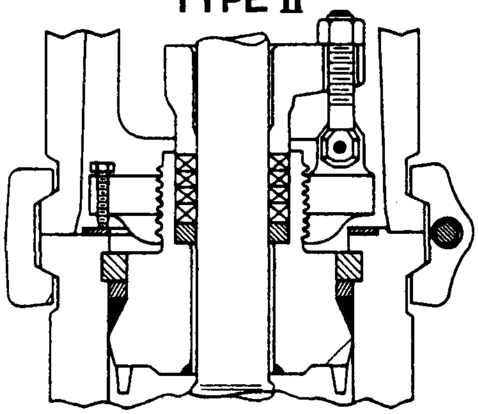


Illustration No. 2

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.

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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	24-32
714Y	600-SP-66	Flite-Flow Globe Stop (Y-Type)	24-32
792Y	600-SP-66	Flite-Flow Check (Y-Type)	24-32
960 and 960Y	900	Separated Stop-Check	4-8
961 and 961Y	900	Separated Stop-Check	4-8
970Y	900	Tilting Disk Check	2½-24
1560 and 1560Y	1500	Separated Stop-Check	4-8
1561 and 1561Y	1500	Separated Stop-Check	4-8
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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	24-32
1814Y	Special-SP-66	Flite-Flow Globe Stop (Y-Type)	24-32
1892Y	Special-SP-66	Flite-Flow Check (Y-Type)	24-32
2002Y	1500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-18
2006Y	1500-SP-66	Globe Stop-Check	5-14
2007Y	1500-SP-66	Angle Stop-Check	5-24
2014Y	1500-SP-66	Flite-Flow Globe Stop (Y-Type)	6-18
2016Y	1500-SP-66	Globe Stop	5-14
2017Y	1500-SP-66	Angle Stop	5-24
2042Y	1500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-18
2046Y	1500-SP-66	Globe Stop-Check	5-14
2047Y	1500-SP-66	Angle Stop-Check	5-24
2070Y	1500-SP-66	Tilting Disk Check	3-24
2092Y	1500-SP-66	Flite-Flow Check (Y-Type)	6-18
2094Y	1500-SP-66	Horizontal Check	2½-14
2095Y	1500-SP-66	Angle Check	2½-24
2570Y	2500	Tilting Disk Check	3-24
3992Y	2500	Flite-Flow Check (Y-Type)	6-24
3994 and 3994Y	2500	Horizontal Check	2½-12
3995 and 3995Y	2500	Angle Check	2½-24
4006 and 4006Y	900	Globe Stop-Check	5-14
4007 and 4007Y	900	Angle Stop-Check	5-24
4016 and 4016Y	900	Globe Stop	5-14
4017 and 4017Y	900	Angle Stop	5-24
4046 and 4046Y	900	Globe Stop-Check	5-14
4047 and 4047Y	900	Angle Stop-Check	5-24
4094 and 4094Y	900	Horizontal Check	2½-14
4095 and 4095Y	900	Angle Check	2½-24
4306Y	900-SP-66	Globe Stop-Check	5-14
4307Y	900-SP-66	Angle Stop-Check	5-24
4316Y	900-SP-66	Globe Stop	5-14
4317Y	900-SP-66	Angle Stop	5-24
4370Y	900-SP-66	Tilting Disk Check	2½-20
4394Y	900-SP-66	Horizontal Check	2½-14
4395Y	900-SP-66	Angle Check	2½-24
4470Y	2500-SP-66	Tilting Disk Check	3-24
4492Y	2500-SP-66	Flite-Flow Check (Y-Type)	6-24
4494Y	2500-SP-66	Horizontal Check	2½-12
4495Y	2500-SP-66	Angle Check	2½-24
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
7542Y	1500	Flite-Flow Globe Stop-Check (Y-Type)	6-18
7546 and 7546Y	1500	Globe Stop-Check	5-14
7547 and 7547Y	1500	Angle Stop-Check	5-24
7548Y	Special	Elbow Down Stop-Check	10-18
7592Y	1500	Flite-Flow Check (Y-Type)	6-18
7594 and 7594Y	1500	Horizontal Check	2½-14
7595 and 7595Y	1500	Angle Check	2½-24
7598Y	Special	Elbow Down Check	10-18

TYPE III

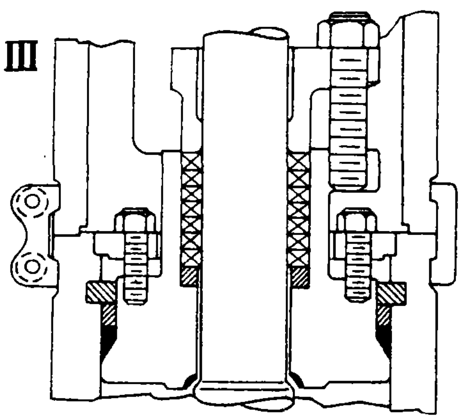


Illustration No. 3

TYPE IV

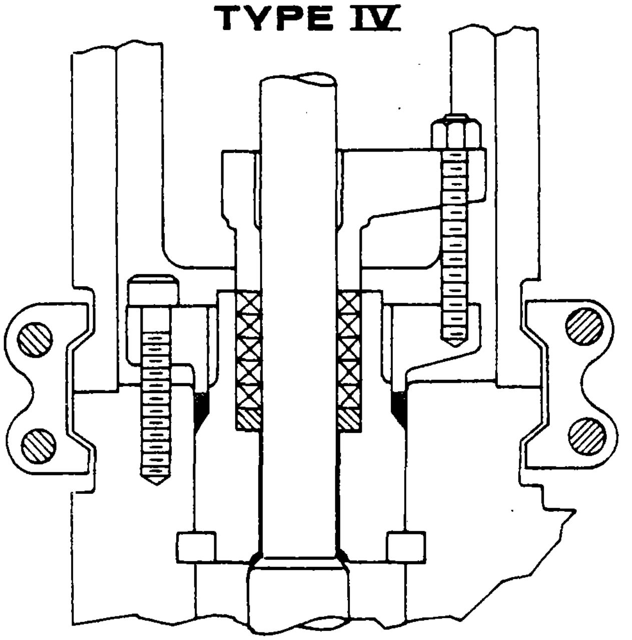


Illustration No. 4

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.

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 re-torquing the gland bolt nuts, 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

John Crane Style 187-I packing is used for the *upper* and *lower* rings on standard Edward pressure-seal valves with the exception of 2500 lb. and 4500 lb. valves, where it is used for all rings. John Crane style 6DCR packing is used for the middle rings. The designation 187-I indicates molded rings of graphited asbestos with an asbestos yarn jacket reinforced with monel wire. The 6DCR packing is composed of molded rings of graphited asbestos with a Neoprene cement binder. Both types are treated with a thin coating of paraffin to prevent water absorption. All are split rings and can be installed without disassembly of the valve.

The valve stem should be thoroughly cleaned before installing new packing to insure the best possible seal. Install each new packing ring separately, pushing each one to the bottom of the chamber. Make certain the lap joints of each consecutive ring are staggered 120 degrees so the lap of the fourth ring is in the same position as the first. When the chamber is filled, tighten the gland down solidly with a 24 inch wrench. This should make room for insertion of one or two more rings.

PRESSURE-SEAL LEAK

A torque wrench should be used for tightening the bonnet or cover retainer studs or cap screws which are used to preload the pressure-seal gasket.

The following procedure is recommended:

1. Guard against leakage by having these bolts tight at all times.
2. With line pressure in the valve, all nuts should be tightened to the torque shown below.

Bolt Diameter, Inches	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4
Nut Torque, Ft. Lbs.	45	68	90	150	240	370	585	750

3. In addition, these torques should be used for all stud nuts and cap screws.

An average man on a 12 inch wrench can develop about 100 ft. lb. of torque. Therefore, if a torque wrench is not available, use the following wrench-bolt combinations:

Bolt Sizes, Inches	1/2	9/16	5/8	3/4	7/8	1-1/8
Wrench Sizes, Inches	6	9	12	18	24	36

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. Edward pressure-seal gaskets are designed with a blunt lower end to minimize susceptability to accidental damage. However, they are made of soft Armco iron with a very soft malleable coating and should be handled carefully.
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 which may cause a by-pass around the pressure seal.

   If a gasket is ever removed, examine it very carefully for imperfections on its outside diameter, usually in the form of deep vertical score marks made by removing it from its tightly wedged position in the body. While these score marks were not made until the gasket was removed and are not the reason for the original disassembly of the valve, they may readily give rise to future leak areas if the gasket is used a second time. Such deep vertical score marks should be cause enough to install a new gasket.
3. **Leakage at the Gasket.** The possibility of a leak through the pressure-seal gasket itself, while more remote, should still be considered. This may not be the result of external flaws on the sealing edge of the gasket.

TYPICAL GLOBE VALVE NOMENCLATURE

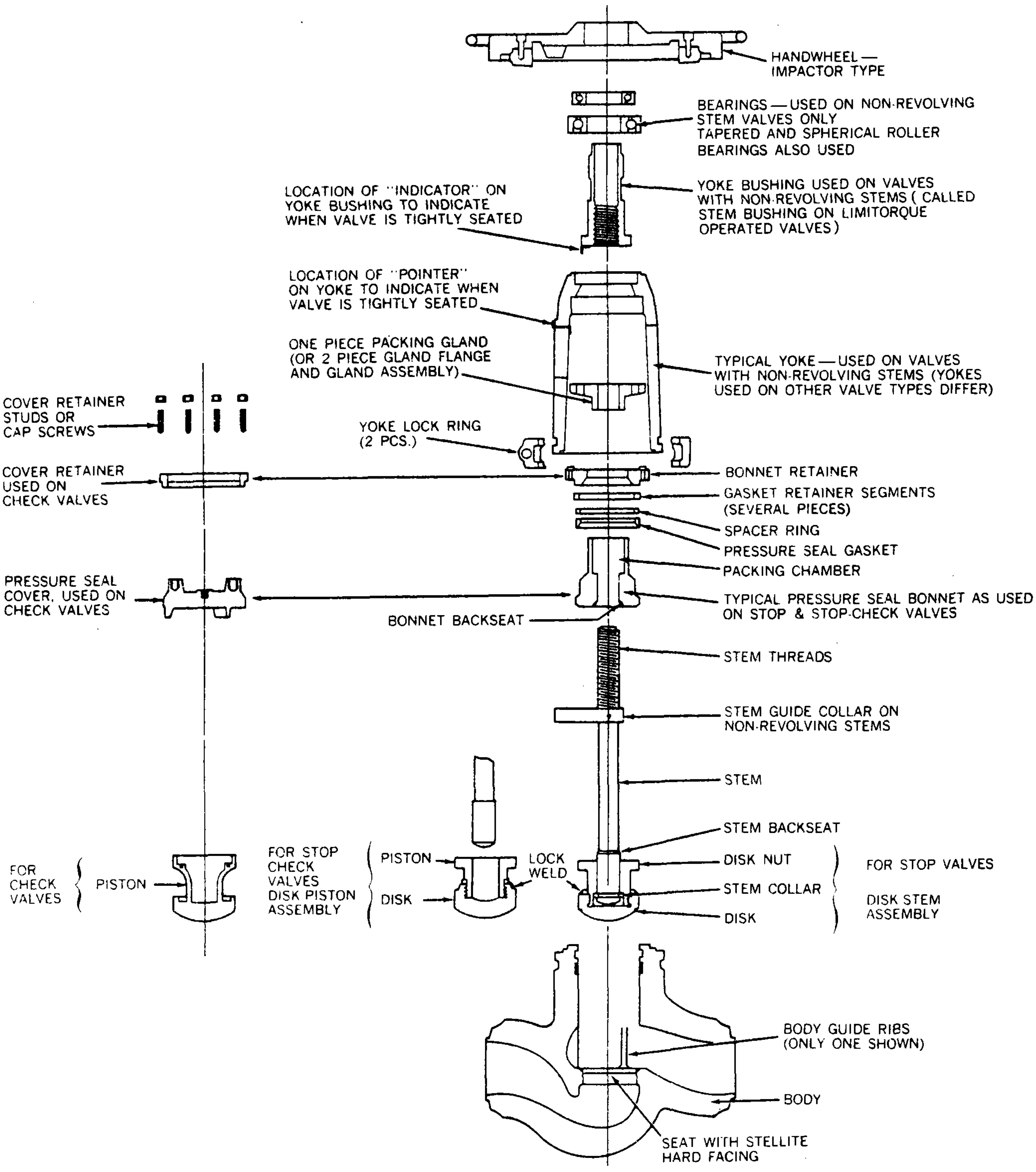


Illustration No. 5

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 stellited 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.

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.

To check for a properly closed valve, on valves with non-rising type handwheels (non-revolving stem), an indicator is attached to the lower side of the yoke bushing which 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 by-passing 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.

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 up sufficient contact pressure and eliminates the vibration. This also tends to dislodge any foreign particles which 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 gages, 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.

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 recommended level. (See Illustration No. 17, page 16)

Valves which have bearings in the top of the yoke have lube fittings on the valve yoke for convenient re-lubrication. (See Illustration No. 18, page 16).

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 is 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 re-lube schedule.

For valves that are operated infrequently, relubrication at least once a year is recommended. The recommended lubricant 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.

VALVE BODY REPAIRS

Body Bore Gasket Seal Area Repair

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 ½" to ¾" 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 which 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 thick bed of asbestos paper placed over the seat and cemented 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 degrees Fahrenheit.
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 degrees Fahrenheit 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 insure a weld without an undercut at the edges. The overlapping should be done along this edge by using a welding rod of ⅛" 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, page 11. Final finishing can be done with the adjustable Sunnen hone described on this page.

   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 On Globe and Angle Piston Check Valves

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."
2. Heat the body area adjacent to the guide rib to approximately 200 degrees Fahrenheit. This can be done locally with an oxyacetylene torch.
3. Select the proper welding rod to suit the body material (⅛" maximum size rod is recommended here). See page 10. Because of slag conditions and easy maneuverability, class 7010 rods are recommended. Using the same welding procedure as described for step 6, 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 proceeded up the guide rib.

   If stainless steel inlay is desired on the guide ribs, use either 18-8 stainless steel rod, Harstain 18-8, Stainlend "K" 18-8, Stainweld 18-8 or equivalent.
4. Finishing after welding is also similar to that described in this 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 Repairs

The following description does not apply to Tilting-Disk check valves. For repair information on these valves, contact your local Rockwell-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 stellited seats in these pressure-seal valves are not easily scored, but where reconditioning is necessary, the following points should be observed:

Where an indention 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 degrees 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 also 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 Fig. A page 11; for another type see Illustration No. 7.

For smaller size valves, a driving handle can be easily made of 3/8" diameter wire, bent as per Fig. B These small assemblies, being much lighter, do not require a supporting spring. Stellited 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 Figs. 8 and 9, page 11, 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 that weld which 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, Welding and Flanged End Valves

The four basic steps in repairing a casting defect in these areas are: (1) cut out to the sound metal, (2) pre-heat, (3) weld, and (4) stress relieve. The steps are simple, but many exceptions are encountered in working on valves which are operating in the field. Defects in these areas may be inspected in a variety of ways. Radiography and Magnaflux are two standard methods. Etching with acid is sometimes effective. Castings which have been in water service and may contain water in the defect can be heated to show porosity. This is very advantageous in determining the source of a leak as well as its exit point. Cutting may be done by chipping, grinding or flame gouging. Generally speaking, the amount of metal removed should be held to a minimum so as to avoid distortion upon subsequent welding. For example, small pinhole leaks in a casting wall 1½" thick may often be effectively welded by cutting down only ¼" deep at the inlet and outlet of the leak.

Preheating to 400°F is called for in most piping fabrication. However, in finished valve repair there may be weld locations wherein the preheat would do more harm than good. For example, in building up worn guide ribs the preheat may detract from the welder's efficiency without making a corresponding metallurgical gain. Here, keep the heat down to 200°F maximum.

The welding rod should generally match the valve body analysis. See page 10. However, many individual considerations such as welding position and rod availability will influence the choice.

Stress relieving is also generally recommended for piping fabrication. Again, it is not always practical in field valve casting repair. Heating which will distort the valve may do irreparable harm. Stress relieving is unnecessary for very small welds and a heavy peening is sufficient.

Where any work involving great heat has been done near the stellited seat joint, it is best to check the concentricity of the seat by blueing with the disk. Should the joint be out of round, it will be necessary to relap following the instructions previously given under "Seat and Disk Repairs," pages 8 and 9.

VALVE COMPONENT REPAIR

Disk-Piston Assembly Repairs

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 line scale or other foreign matter which 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.

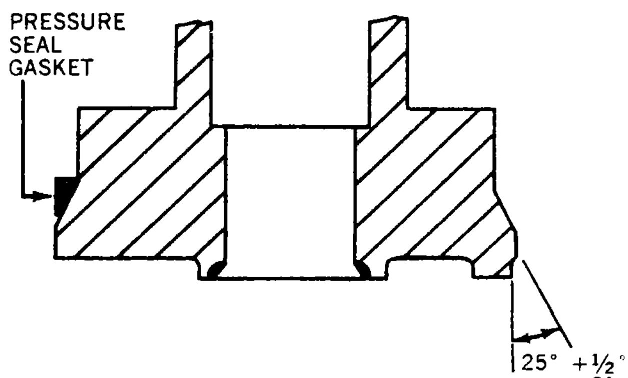


Illustration No. 6

PRESSURE SEAL BONNET SEAL ANGLE

Bonnet or Cover Repairs

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 which 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 ½°, minus 0° as shown in Illustration No. 6, page 9. For old style valves the angle should be 47°, plus ½°, 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.

WELDING ROD RECOMMENDATIONS

MATERIAL TO BE WELDED	ROD RECOMMENDATION AWS-ASTM CLASS°
Carbon Steel 1. ASTM-A216 — Grade WCB 2. ASTM-A105 — Grade II	ASTM-A233 E 7018
Carbon-Molybdenum Steel 1. ASTM-A217 — Grade WCI	ASTM-A316 E 7018-A1
Chromium-Molybdenum Steel 1. ASTM-A217 — Grade WC6 2. ASTM-A182 — Grade F11	ASTM-A316 E 8018-B2
Chromium-Molybdenum Steel 1. ASTM-A217 — Grade WC9 2. ASTM-A182 — Grade F22	ASTM-A316 E 9018-B3
18-8 Mo Stainless Steel 1. ASTM-A351 — Grade CF8M 2. AISI — Type 316	ASTM-A298 E 316-15 or E 316-16

°Weld metal deposit chemistry and procedures should conform to the requirements of ASTM 488 (See Table I, below, this manual), and Section IX of the Boiler Code.

☆ ☆ ☆ ☆ ☆

TABLE 1 — CLASSIFICATION OF WELD DEPOSIT MATERIAL*

P-Number	Material Covered	Type of Weld Deposit	Weld Deposit Analysis: Chromium	Molybdenum	Nickel	Manganese	Silicon	Electrode Coatings
P-1	Carbon steels such as: A 216, Grades WCA and WCB; A 352, Grades LCB; A 27, all Grades	Carbon steel	....	......	.....	1.25 max*	0.50 max†	F-1: XX20, XX24, XX27, XX28, XX30 F-2b: XX12, XX13, XX14 F-3b: XX10, XX11 F-4b: XX15, XX16, XX18
P-3	Steels with less than ¾ per cent Chromium and total alloy less than 2 per cent such as: A 217, Grade WC1; A 352, Grade LC1	Carbon-Molybdenum	0.50 max	0.40 to 0.65	....	1.25 max*	0.50 max†	
P-4	Steels with Chromium ¾ to 2 per cent and alloy steels with total alloy less than 2¾ per cent such as: A 217, Grades WC4, WC5, and WC6	Chromium-Molybdenum (½ to 2 per cent Chromium)	0.50 to 2.00	0.40 to 0.65	..	1.00 max	1.00 max	
	A 352, Grade LC2	Nickel-Molybdenum	...	0.30 to 1.00	1.50 to 3.75	1.00 max	1.00 max	
P-5	Total alloy content less than 10 per cent such as: A 217, Grades WC9, C5, and C12.	Chromium-Molybdenum (2 to 10 per cent)	2.0 to 10.0	0.4 to 1.5	.....	1.00 max	2.00 max	
P-5A	Total alloy content less than 6 per cent such as: A 148; A 352, Grades LC3		To provide comparable mechanical properties of the base metal					
P-6	High alloy steel martensitic, such as: A 351, Grade CA-15	High alloy martensitic	11.00 to 15.00	0.70 max	.....	2.00 max	1.00 max	F-4b XX15 XX16
	High alloy steel austenitic, such as: A 351, Grades CF-8, CF-8M, CF-8C, CH-20, and CK-20	Chromium-Nickel containing more than 1 per cent ferrite	AISI Types 302, 304, 308, 309, 316, 317, 318, 347, 348, 309 Mo, 309 Cb					F-5 XX16 XX15
		Chromium-Nickel fully austenitic Austenitic Manganese	AISI Types 310, 310Cb, 310 Mo, 330					

† Grades P-1 and P-3 where qualification under the ASME Boiler and Pressure Vessel Code is not required, the following limits may be used:

	P-1	P-2
Manganese, max, per cent	1.25	1.50
Silicon, max, per cent	0.60	0.60

b Performance qualification of a welder under any "F" number up to and including F-4 shall qualify a welder for all lower "F" numbers.

* With permission of ASME, From Section IX, Boiler and Pressure Vessel Code.

FIELD REPAIR EQUIPMENT

Available from the Rockwell-Edward Manufacturing plant at 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 Rockwell-Edward sales representative for more information. A list of this equipment follows:

1. Lapping equipment for all pressure seal valves from 2½ to 18″ in all pressure classes. See Figs. A, B and Illustration No. 7.
2. Self centering lap guide fixtures for lapping valve seats in valves 8″ and up in all pressure classes. See Figs. C, D. 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 14½″ diameter. (Not illustrated)
4. Van Norman portable boring machine for reboring valves in the field. Grinding attachments are also available for some sizes for grinding seat joints. See *Illustrations* No. 8 and No. 9, this page.
5. Air driven portable boring machine for reboring guide ribs and seats of valve bodies in the line. (Not illustrated)

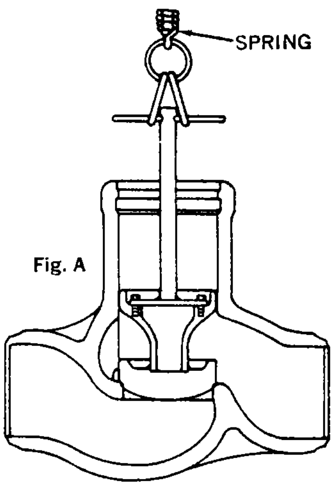


Fig. A

DISK DRIVER FOR LAPPING LARGE VALVES

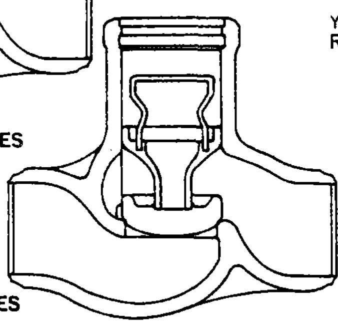
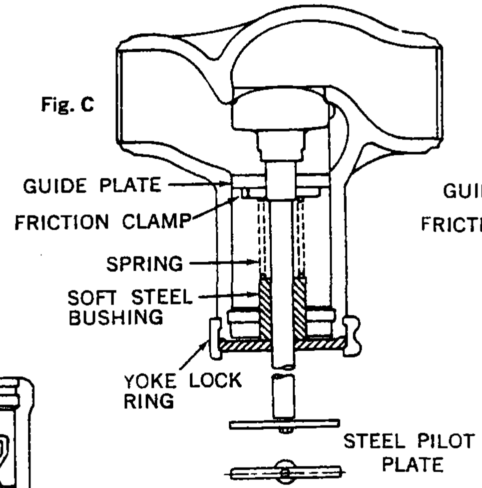


Fig. B

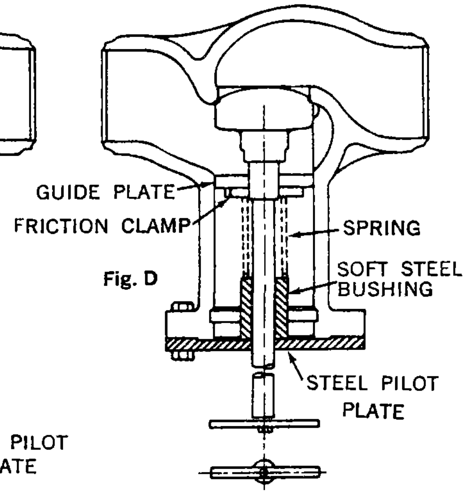
DISK DRIVER FOR LAPPING SMALL VALVES

Fig. C



SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL (SHOWING VALVE WITH YOKE LOCK RING CONNECTION TO BODY)

Fig. D



SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL (SHOWING VALVE WITH STUDDED YOKE CONNECTION TO BODY)

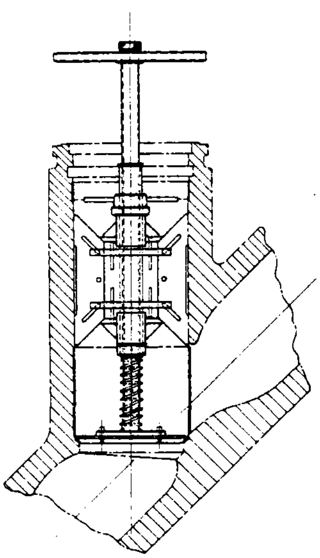


Illustration No. 7
PORTABLE LAPPING TOOL
FOR LARGE VALVES

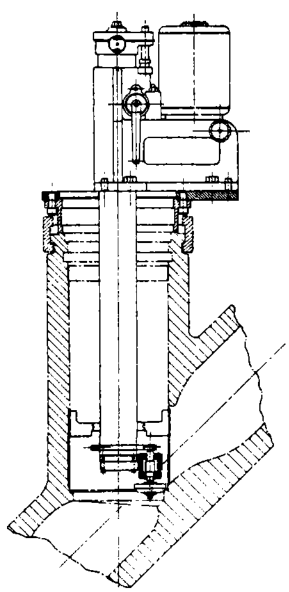


Illustration No. 8
VAN NORMAN PORTABLE
GRINDING MACHINE

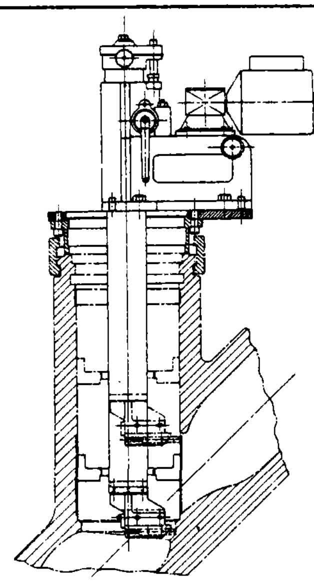


Illustration No. 9
VAN NORMAN PORTABLE
BORING MACHINE

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," page 13, or "Disassembly Procedure for Removing Limitorque Operators from Valve Yokes," page 15.

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," page 18, 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.

For *Method 1,* first remove the operator-yoke assembly combination as described in "Procedure for Removing Valve Operator and Yoke Assembly as a Unit," page 18. Then proceed to the section "Disassembly Procedure of Bonnet Types," page 20, *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," page 13, or "Disassembly Procedure for Removing Limitorque Operators from Valve Yokes," page 15. Then, proceed to the section, "Disassembly Procedure of Bonnet Types," page 20, for actual disassembly of Area 3. On Type IV bonnets, reverse this procedure and complete steps 1 through 9, page 27, 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," page 20.* Separated Stop-Check Feedline Valves should be treated as two valves, as a stop-check and a piston lift check. See the respective disassembly procedure covering the area to be serviced.

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, backseat 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 15).
   b. If no pressure is to be maintained in the valve, close the valve fully and open approximately ⅛".
2. **For service in Area 2.**
   a. For non-revolving stems only, if pressure is to be maintained in the valve, backseat 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 ⅛".
3. **For service in Area 3.**

   Close the valve fully and open approximately ⅛". Service Area 3 only without pressure in the valve.

DISASSEMBLY PROCEDURES FOR IMPACTOR HANDLES AND HANDWHEELS

(With or Without Impactogear Air Wrench Operators)

—AREA 1—

Rockwell-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 backseated or fully opened position. See "Caution", page 12.

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 12. 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.

Non-Ball Bearing Type Impactor Handles and Handwheels

All have 12, 14, 16, 20, 26, or 30 inch diameters. See illustrations Nos. 10, 11 and 12, 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, 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.

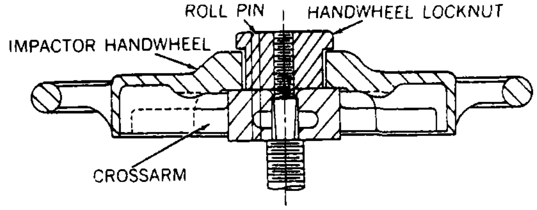


Illustration No. 10

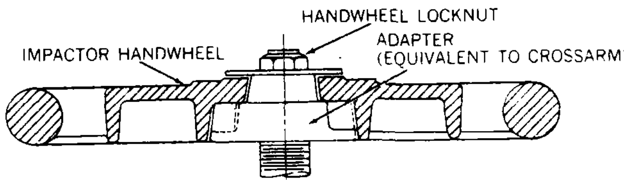


Illustration No. 11

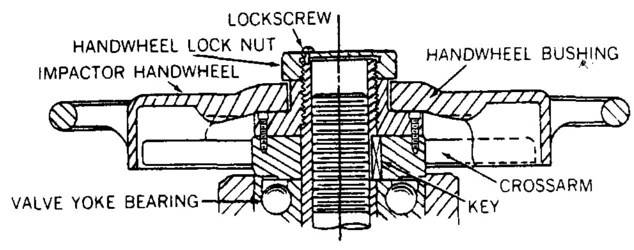


Illustration No. 12

NON-BALL BEARING TYPE IMPACTOR HANDWHEELS

Ball Bearing Type Impactor Handwheels
(With or without Impactogears)

All have 28, 36, 48 or 72 inch diameters. See Illustration No. 13, 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. Backoff 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.
   c. Begin with all slack out of the hoist, and retain a taut chain by simultaneously taking up the slack as the handwheel bearing nut is fully unscrewed and lifted off the valve.
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.

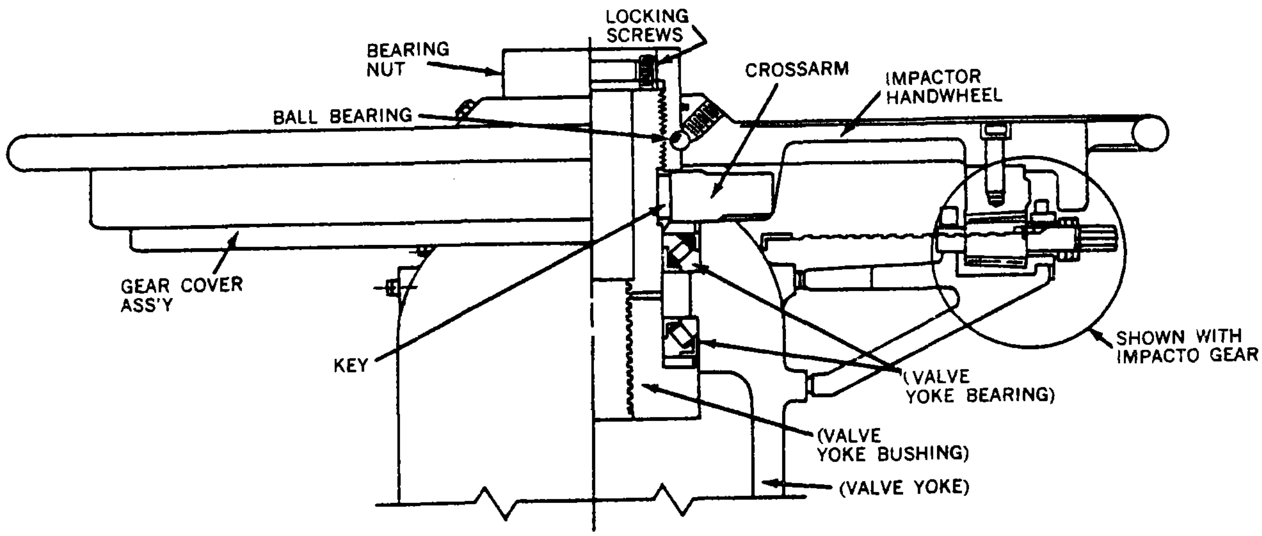


Illustration No. 13

BALL BEARING TYPE IMPACTOR HANDWHEEL

PROCEDURES FOR REMOVING LIMITORQUE OPERATORS FROM VALVE YOKES

Rockwell-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. Consult the Philadelphia Gear Corp.

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 backseated or fully open position. See "Caution," page 12.

All of the following disassembly procedures are arranged in accordance with the general comments on page 12. Study these pages carefully before beginning.

Determine first 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.

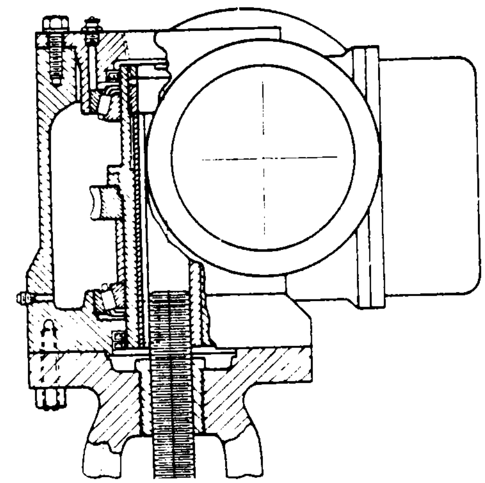


Illustration No. 14
TORQUE ONLY LIMITORQUE OPERATOR USED ON REVOLVING STEM VALVES SMA OR SMB TYPE

All Revolving Stem Valves, or Non-Revolving Stem Valves with Torque only Units ("XT" Type Not Included)

SMA or SMB Type. See Illustrations No. 14, No. 15, and No. 16, page 15.

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 SMB-4T or SMB-5T are torque only units and have their drive nut splined to the valve yoke bushing. See Illustration No. 15. On non-revolving stem valves using the older SMA type *torque only* Limitorques, the operator drive nut is also connected to the stem through a key, but in a different manner. See Illustration No. 16.

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

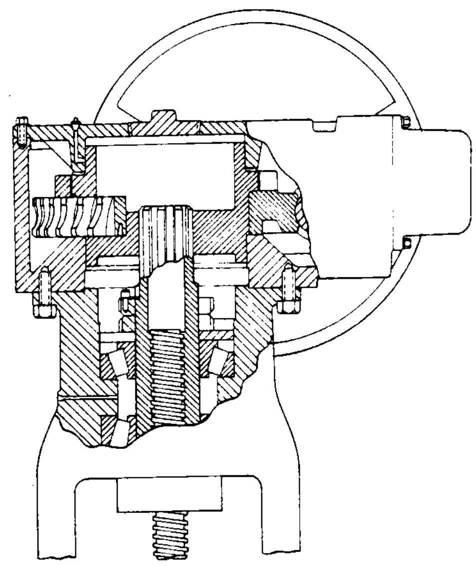


Illustration No. 15
TORQUE ONLY LIMITORQUE OPERATOR USED ON NON-REVOLVING STEM VALVES NEW SMB-4T OR SMB-5T TYPE

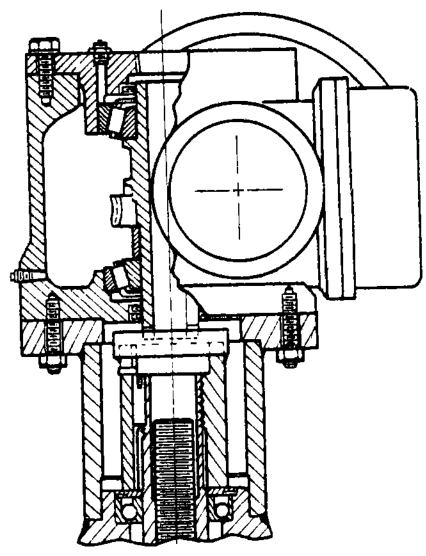


Illustration No. 16

TORQUE ONLY LIMITORQUE OPERATOR USED ON NON-REVOLVING STEM VALVES (OLD SMA TYPE)

Non-Revolving Stem Valves with Torque and Thrust Units SMA or SMB Type, See Illustration No. 17.

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 to prevent damage to the stem threads.
6. With the hoist, lift the operator clear of the stem and place down on a clean area for further disassembly, if required.

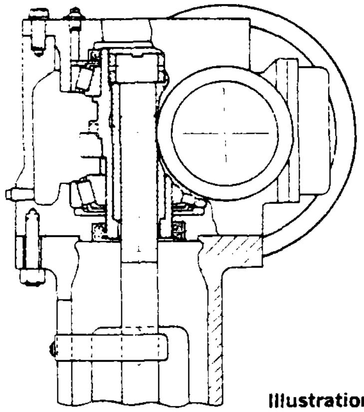


Illustration No. 17

TORQUE AND THRUST LIMITORQUE OPERATOR USED ON NON-REVOLVING STEM VALVES SMA OR SMB TYPE

Non-Revolving Stem Valves, Torque only Units with "XT" Boxes. Type SMA or SMB, See Illustration No. 18.

"XT" Limitorques are large spur gear units connected to a basic SM type operator to increase the torque output. On SMA types they are sometimes used on both the 3 and 4 sizes (SMA-3XT and SMA-4XT). On the new SMB series, they are sometimes used on the SMB-5 size (SMB-5XT). Construction is basically the same and in both series the large gear is keyed to the valve yoke bushing. The procedure for removing these units from the valve yoke is as follows:

1. Disconnect the electrical wiring to the operator.
2. Loosen and remove all but three of the cap screws holding the cover and operator to the gear housing.
3. On the bottom of the gear housing and below the pinion is a flange holding the pinion lower bearing. Remove the cap screws holding this on. Next to these through holes are threaded holes. Screw the cap screws into these tapped holes and jack the flange and bottom bearing off the pinion shaft.
4. Position a sling and chain hoist of suitable capacity around the operator and take up all slack.
5. Remove the remaining cap screws holding the cover and operator to the gear housing.
6. Pry the cover loose from the gear housing and hoist the cover-operator assembly away. Position down on clean rags or paper, for further disassembly, if required.
7. The large gear can be removed by driving down the tab on the lock washer and unscrewing the two locknuts.
8. Pull the gear and position away to a clean area.

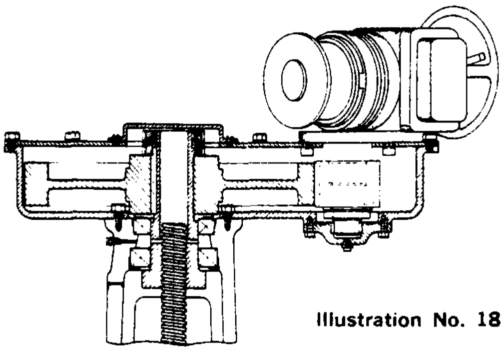


Illustration No. 18

TORQUE ONLY LIMITORQUE OPERATOR WITH "XT" BOX USED ON NON-REVOLVING STEM VALVES SMA OR SMB TYPES

9. The gear housing can be removed by positioning a sling around the housing, removing the cap screws holding it to the yoke, and lifting away.
10. One locknut should be reassembled on the yoke bushing so the bearing-yoke bushing assembly is secured.

Limitorque Limit Switch and Torque Switch Setting Procedures

The following descriptions apply only to Limitorque valve controls made by the Philadelphia Gear Corporation. 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. 19, page 17.)

Numbers in parenthesis ( ) refer to callouts on Illustration No. 19, "Geared Limit Switch Assembly."

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 contactor 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.
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 the valve is moving 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 certain there is sufficient clearance between the position at which the valve stem comes to rest and the valve back seat.

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.

Torque Switch See Illustration No. 20, page 17.

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.
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. The setting of this bushing should not be disturbed without advice from the Philadelphia Gear Corporation.

Double Torque Switch

1. See Step 1
2. See Step 2 above. 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.
3. Move the socket head adjusting screw (H) in for light seating.
4. See Step 4 above.
5. For heavier seating move the adjusting screw (H) out and re-tighten 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, 4 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. The setting of this bushing should not be disturbed without advice from the Philadelphia Gear Corporation.

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 requires it.

WARNING

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

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

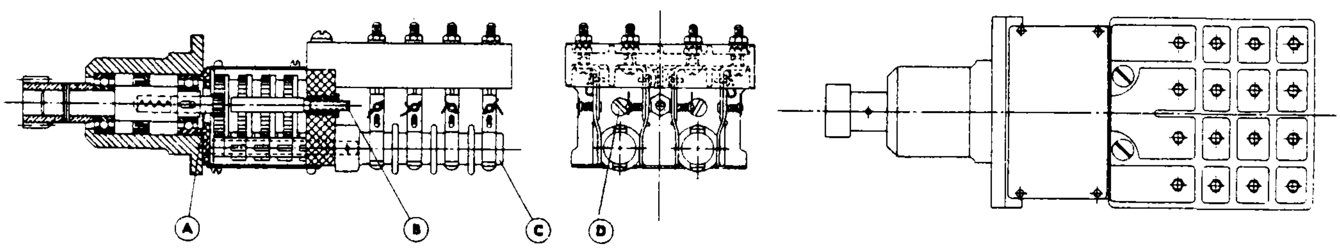


Illustration No. 19
GEARED LIMIT SWITCH ASSEMBLY

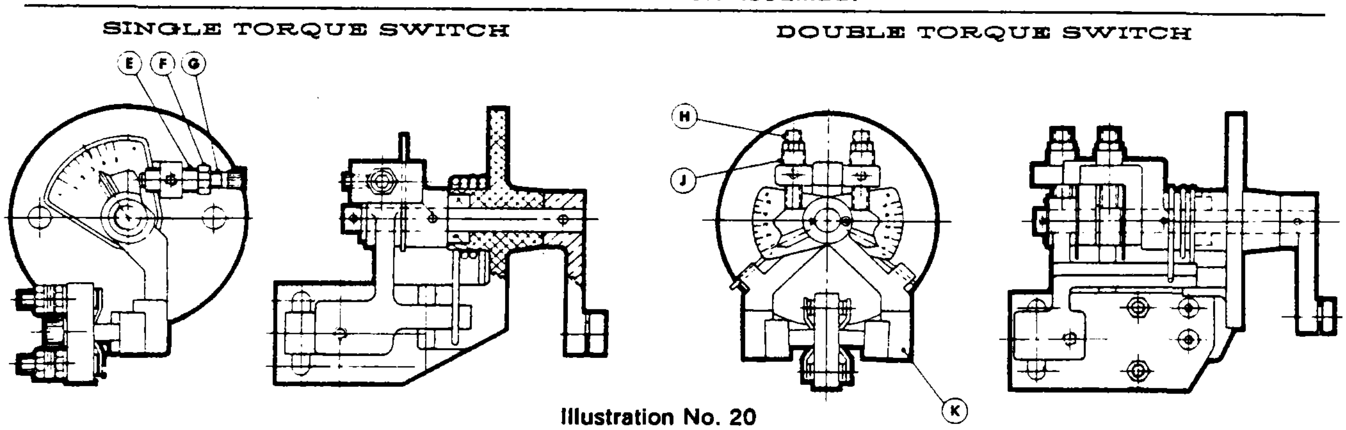


Illustration No. 20
SINGLE AND DOUBLE TORQUE SWITCH ASSEMBLIES

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 12. 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 3, 4 and 5.

Revolving Stem Valves — Valves with Type I Bonnets
See Illustration No. 21, page 19.

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 page 13 or 15, and then refer directly to the procedure for Bonnet Disassembly, Type I, page 20.

Revolving Stem Valves — Valves with Type II Bonnets
See Illustration No. 23, page 22.

1. The manual or Limitorque operator must first be removed in accordance with instructions page 13 or 15.
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 Nos. 24 and 25, pages 23 and 24.

1. The manual or Limitorque operator must first be removed in accordance with instructions page 13 or 15.
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 Handwheels," step 4, page 13 or step 5, page 14. 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. 28, page 27.

It is possible to remove the operator and yoke assembly as a unit on Type IV bonnets, but it then 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 12.

REMOVING OPERATOR AND YOKE ASSEMBLY AS A UNIT

-AREAS 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 12, 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 3, 4 and 5.

Revolving Stem Valves — Valves with Type I Bonnets
See illustration No. 21, page 19.

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 12 and use the "Method 2" procedure.

Revolving Stem Valves — Valves with Type II Bonnets

See valve illustration No. 23, page 22. See operator Illustration No. 14, page 15.

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 12 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 12 and use the "Method 2" procedure.

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

See valve illustrations No. 24. page 23; No. 25, page 24 and No. 28, page 27. See handwheel illustrations pages 13 and 14. See Limitorque illustrations No. 17, page 16, No. 18, page 16 and No. 16, page 15.

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.

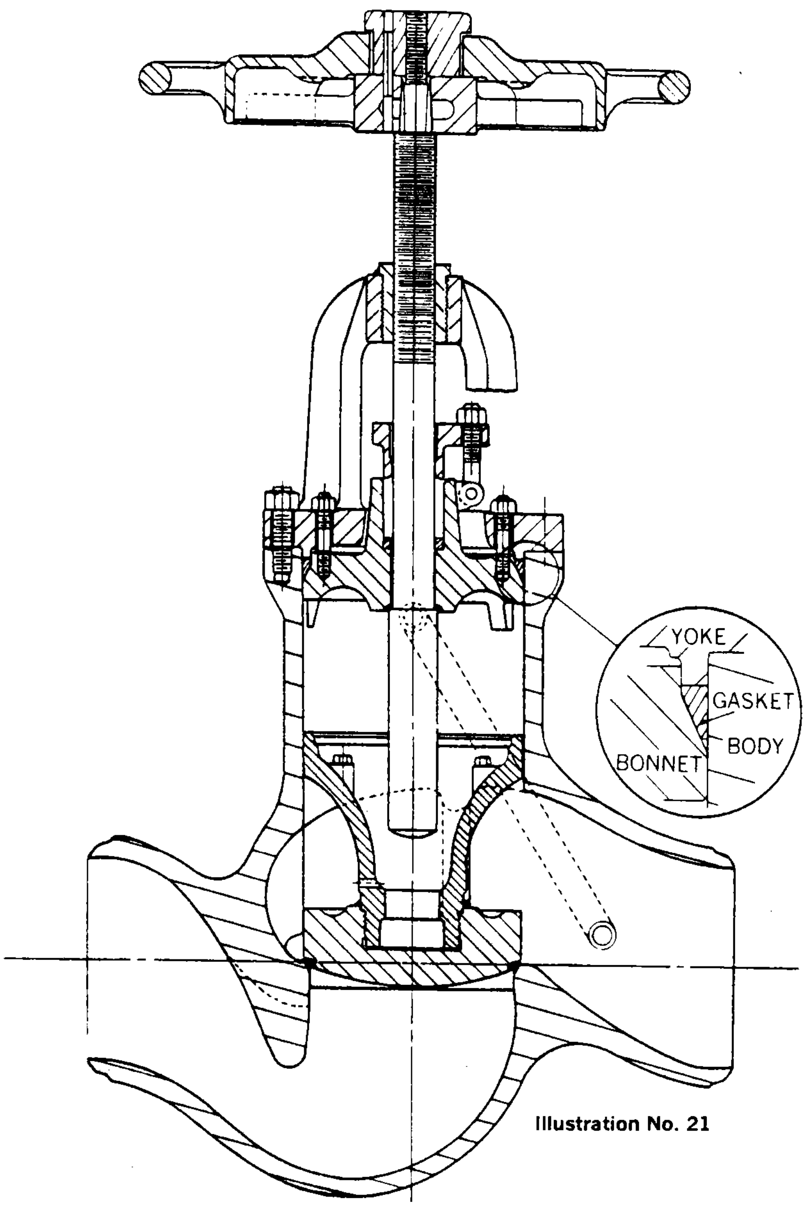


Illustration No. 21

STOP AND STOP-CHECK (ILLUSTRATED) VALVE WITH TYPE I PRESSURE SEAL BONNET (ALL TYPE 1 BONNETS HAVE REVOLVING STEMS)

DISASSEMBLY PROCEDURES OF BONNET TYPES

-AREA 3-

(For a definition of Area 3, see page 12).
(See Illustration No. 5, page 6, 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 3, 4 and 5. 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 12. Study these pages carefully before beginning.

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

See illustration No. 21, page 19.

Note: All Type I bonnets have revolving stems.

1. Loosen the gland bolt nuts and tap the gland *which should relieve any pressure which 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 which 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 caution in step 1.
4. Remove half of the bonnet stud nuts, alternating to leave those remaining equally spaced.
5. Remove the gland bolt nuts.
6. Back off the remaining bonnet stud nuts part way. 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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.
13. The bonnet end opening should be kept covered whenever possible.

Type I Pressure Seal Bonnets — Piston Lift Check Valves

See Illustration No. 22, page 21.

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 (downstream piping). Check to make certain all downstream 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. Back off the remaining bonnet stud nuts or cap screws part way. 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 and 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. In larger sizes where this assembly is too heavy to manhandle, remove the cover retainer cover 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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

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

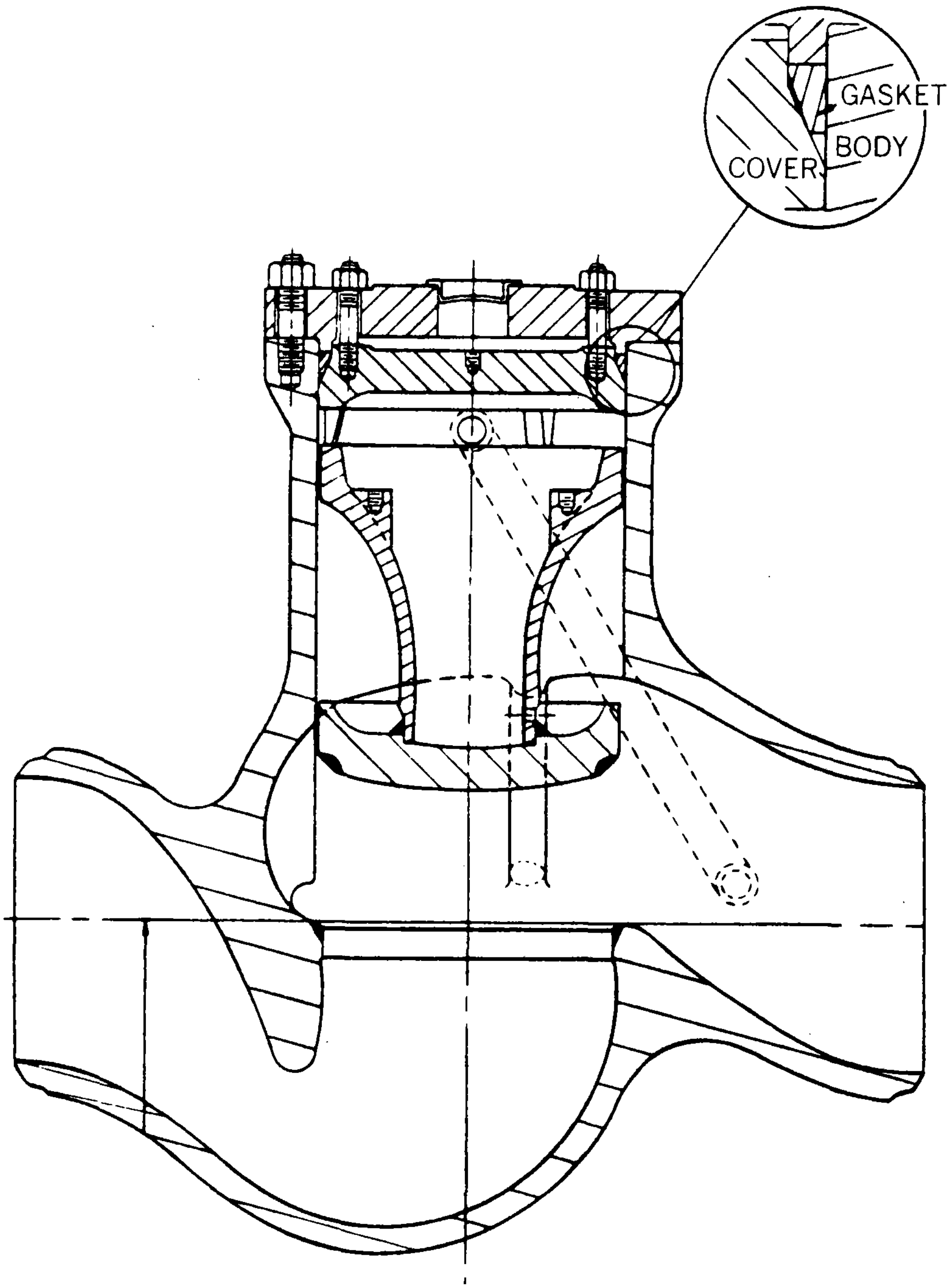


Illustration No. 22

PISTON LIFT CHECK VALVE
WITH TYPE I PRESSURE SEAL BONNET

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

See Illustration No. 23, page 22.

*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 top of the valve and all exposed surfaces of 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 drivepin, or small clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16 in.) 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 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.

19. Screw ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

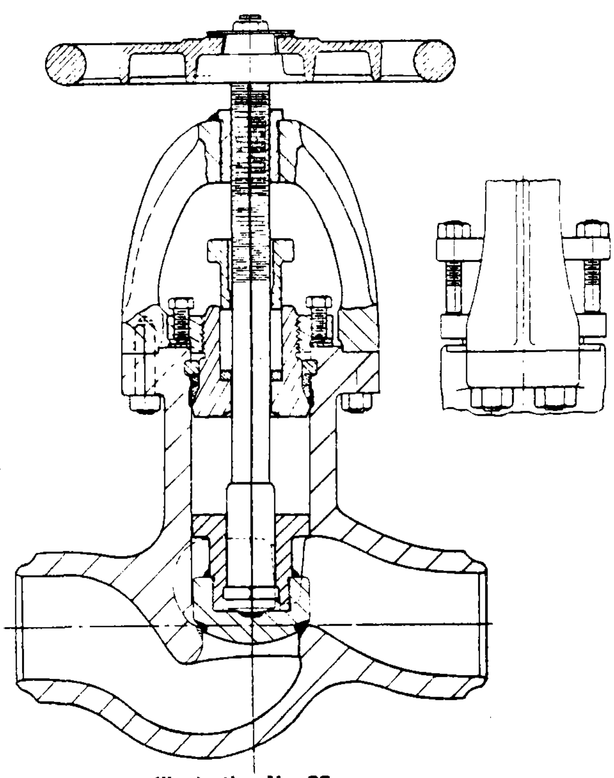


Illustration No. 23

REVOLVING STEM STOP (ILLUSTRATED) AND STOP-CHECK VALVE WITH TYPE II PRESSURE SEAL BONNET

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

See Illustration No. 24, page 23.

*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.

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.) 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 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.

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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

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

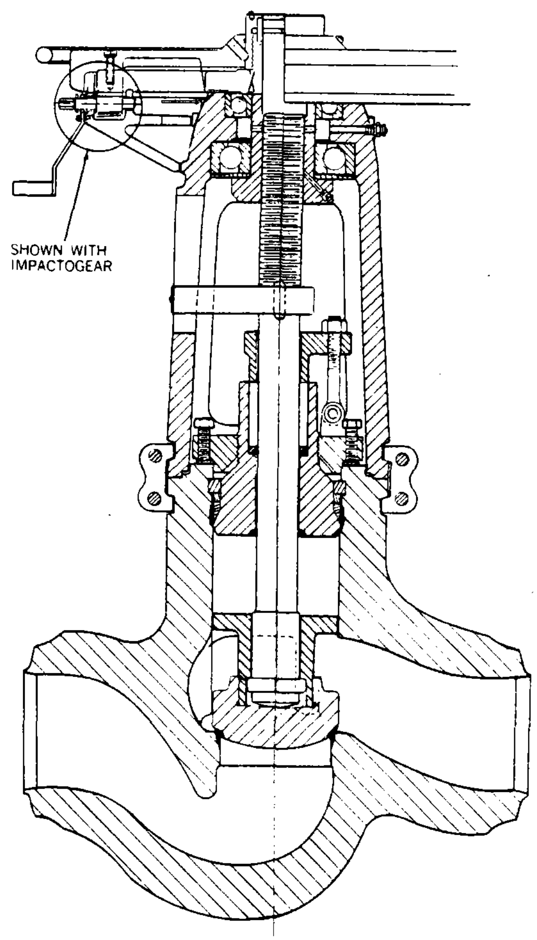


Illustration No. 24

NON-REVOLVING STEM STOP (ILLUSTRATED) AND STOP CHECK VALVE WITH TYPE II PRESSURE SEAL BONNET

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

See Illustration No. 25, page 24.

*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.) 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.

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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

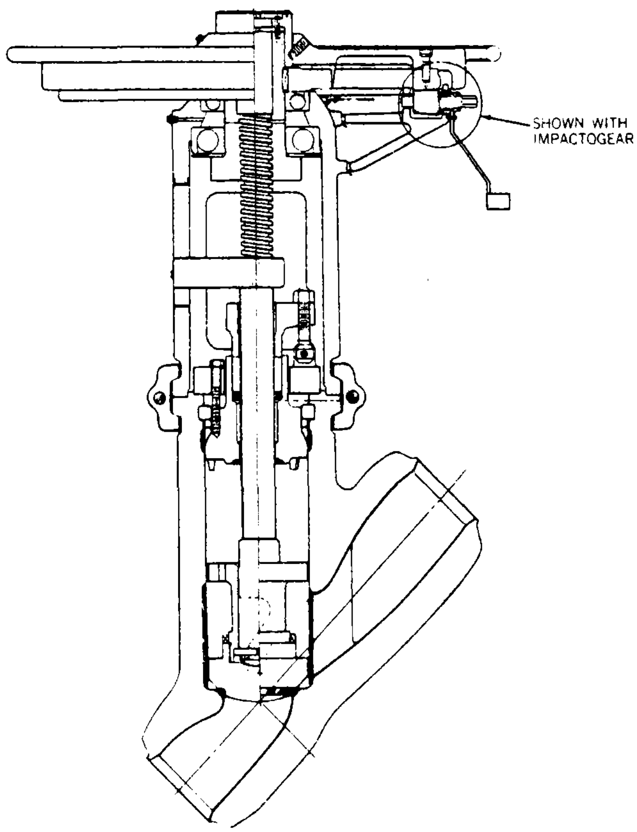


Illustration No. 25

STOP (ILLUSTRATED) AND STOP-CHECK VALVE WITH TYPE III PRESSURE SEAL BONNET (ALL TYPE III BONNETS HAVE NON-REVOLVING STEMS)

Type III Pressure-Seal Bonnets — Piston Lift Check Valves
See Illustration No. 26, page 25.

1. Remove the cover retainer cover.
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.) 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.
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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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, 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.

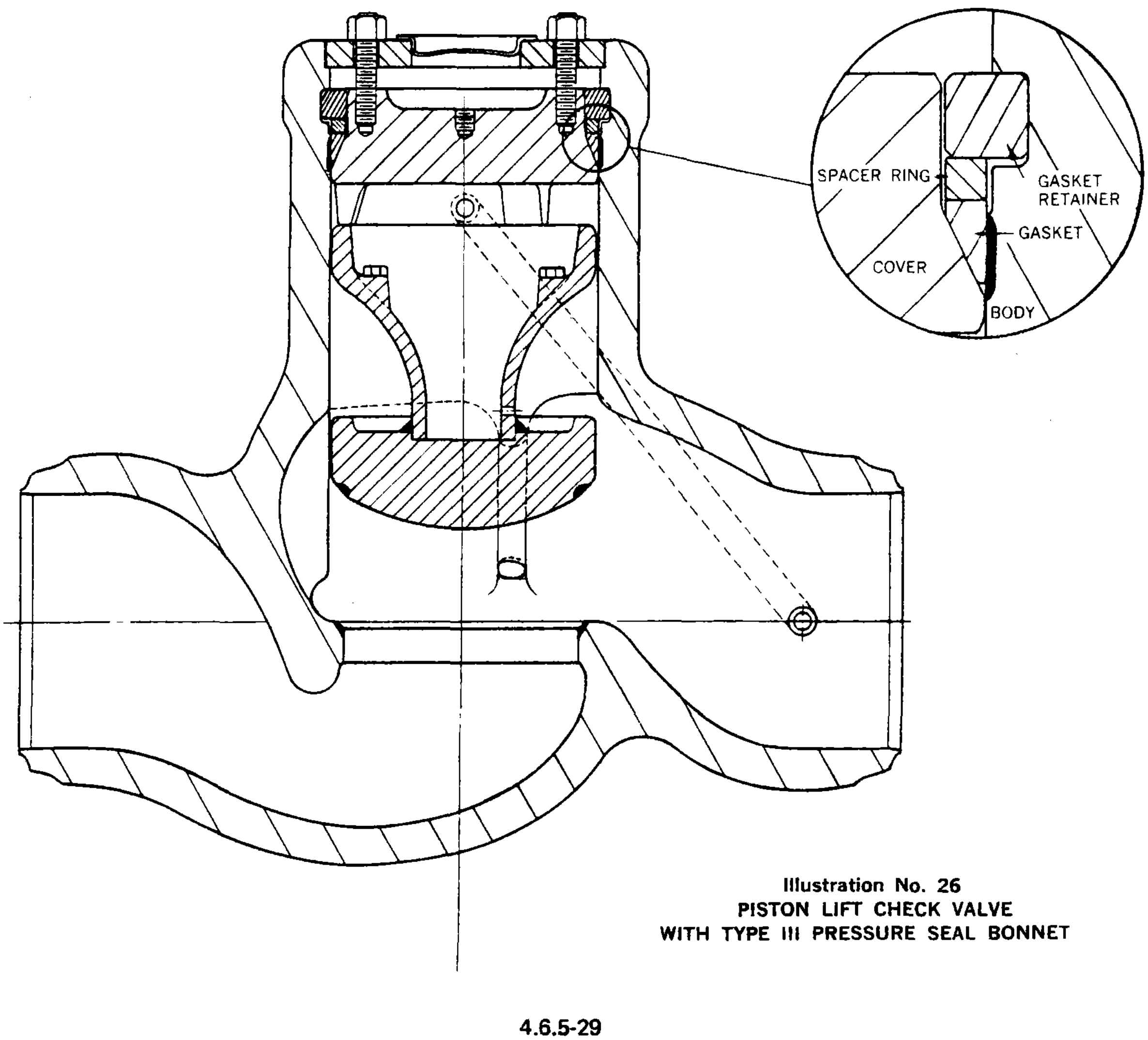


Illustration No. 26
PISTON LIFT CHECK VALVE
WITH TYPE III PRESSURE SEAL BONNET

Type III Pressure-Seal Bonnets — Tilting Disk Check Valves

Sizes 6"and larger.

See Illustration No. 27, page 26.

As explained under "Seat and Disk Repairs", page 8, this manual does not include information for *repair* of the seat and disk of Tilting Disk Check Valves. Consult your Rockwell-Edward Sales Representative.

1. Remove the cover retainer cover.
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 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 harwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16 in.) 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.
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.

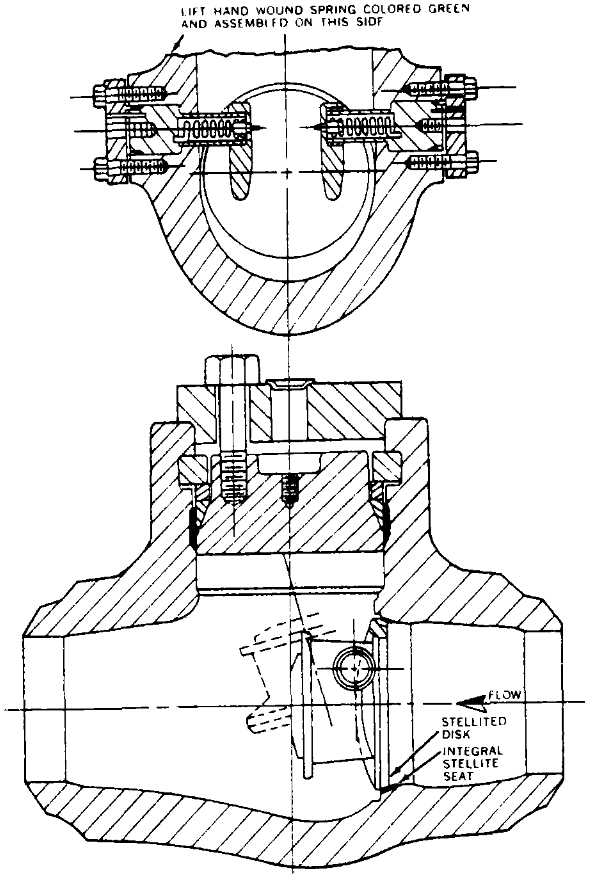


Illustration No. 27
TILTING DISK CHECK VALVE WITH TYPE III PRESSURE SEAL BONNET (SIZES 6" AND LARGER)

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

See Illustration No. 28, page 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 which might be trapped in the valve. This is important.*
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 backseated 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 ¼". 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 to 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 ⅛".
    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.

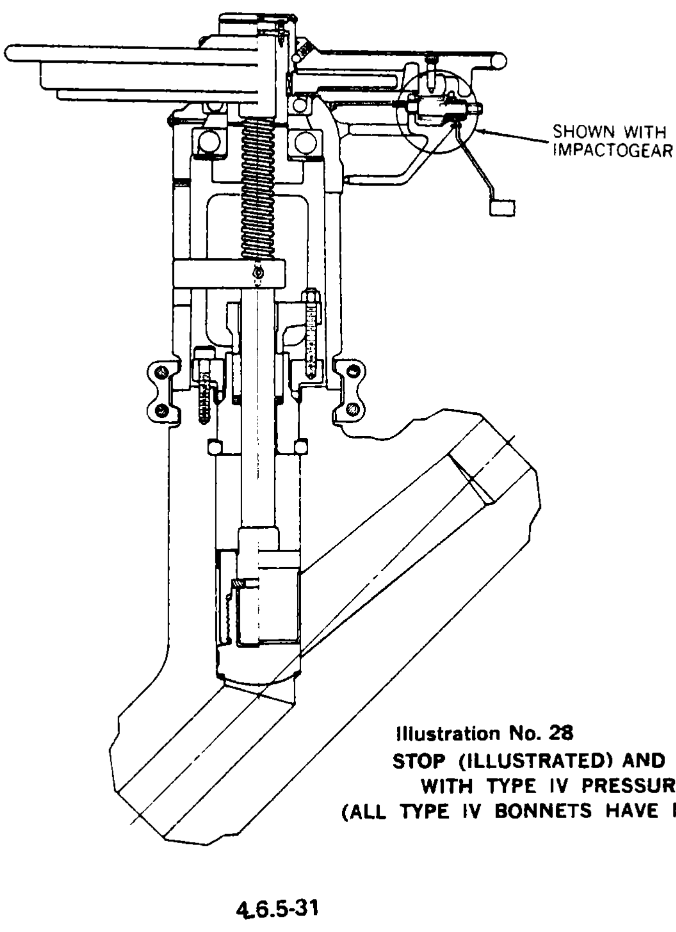


Illustration No. 28
STOP (ILLUSTRATED) AND STOP-CHECK VALVE WITH TYPE IV PRESSURE SEAL BONNET
(ALL TYPE IV BONNETS HAVE NON-REVOLVING STEMS)

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 dia. wire bent 90° a half an inch from the end. Insert the bent end into the ⅛" 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 bore and lift out the piston, being careful not to marr 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. 29, page 28.

1. If used, remove the cover retainer cover.

2. **NOTE: Checks should be made to 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 only by the friction of the pressure-seal gasket against the body bore. 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 retainer-cover 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 segments 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° a half an inch from the end. Insert the bent end into the ⅛" 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 carful 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 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.

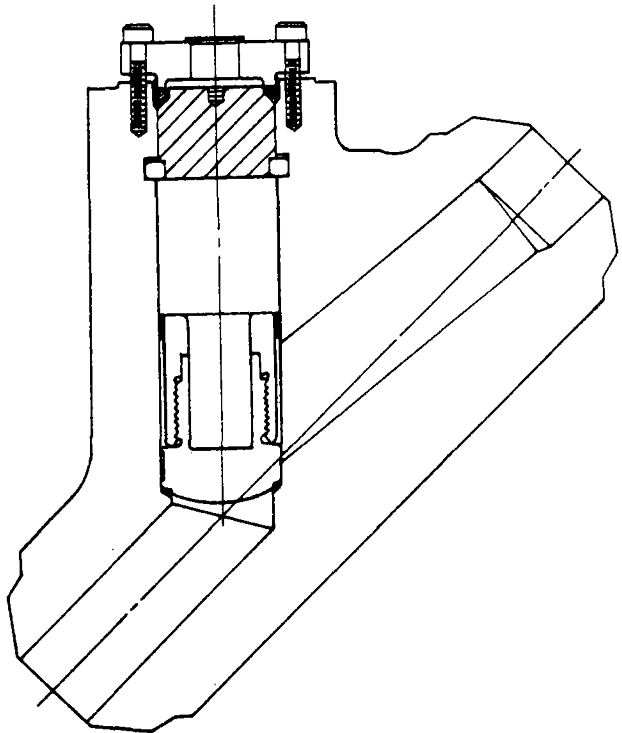


Illustration No. 29

PISTON LIFT CHECK VALVE WITH TYPE IV PRESSURE SEAL BONNET

REASSEEMBLY PROCEDURES FOR 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 which 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 shown on page 5.
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 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," page 15.

   a. Turn the manual handwheel on the Limitorque operator to apply 10 per cent of the handwheel torque required to seat the valve against maximum pressure.
   b. Tighten the lock nut on the large bull gear of "XT" operators. For valves without "XT" operators, 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 a seat joint test.
   d. To preload the upper bearing, open the valve fully to the bonnet backseat.
   e. Repeat step a.
   f. On "XT" operators, retighten the bull gear lock nut. For other operators, remove the key, retighten the yoke bushing nut and reinsert the key, as in b.
   g. On "XT" operators, bend the tabs on the lockwasher to fix the position of the nuts. For other operators, 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 not to 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 point 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. 29, page 19.

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 as 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 5.

6. Open valve to the backseat with the bonnet studs loose. Use the handwheel to backseat 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 valves shown on page 5. 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. 22, page 21.

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 5.

5. Install and tighten the cover stud nuts in accordance with the torque values shown on page 5. 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. 23, page 22.

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 backseat 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, spacer ring assembly up to the gasket retainer segments.

7. Screw the bonnet retainer ring on to the bonnet to the position marked in the disassembly.

8. Tighten the bonnet retainer cap screws in accordance with the torque valves shown on page 5. 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 22.

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. 24, page 23.

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 backseat 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, spacer ring assembly up to the gasket retainer segments.

7. Screw the bonnet retainer ring on to the bonnet to the position marked in disassembly.

8. Retighten the bonnet retainer cap screws in accordance with the torque valves shown on page 5. 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 23.

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. 25, page 24.

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, 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 5. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet. The stem can now be lowered to a closed position.

7. Retrace disassembly steps 9, 7, 6, 5, 4, 3, and 2 on page 24.

8. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type III Pressure-Seal Bonnets — Piston Lift Check Valves
See Ilustration No. 26, page 25.

1. Insert the piston in 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 in the body groove.

4. Install the cover retainer.

5. Lift the cover, pressure-seal gasket, 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 5. All nuts should be tightened uniformly in a star pattern to avoid cocking the cover.

7. Replace the cover retainer cover.

Type III Pressure-Seal Bonnets — Tilting Disk Check Valves
See Illustration No. 27, page 26.

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, page 26), 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-lb increments to the torque value shown on page 5.
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.
8. Insert the gasket retainer segments in the body groove.
9. Install the cover retainer.
10. Lift the cover, pressure-seal gasket, 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 5. All nuts must be tightened uniformly in a star pattern to avoid cocking the cover.
12. Replace the cover retainer cover.

Type IV Pressure-Seal Bonnets — Stop and Stop-Check (Non-Return) Valves
See Illustration No. 28, 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. 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 5. 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 27.
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. 29, page 28.

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 5. 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.

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 pressure 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. At what pressure, temperature or flow rate does the reported trouble occur.
8. Pressure drop across the valve.

INFORMATION REQUEST

If the maintenance problem looks particularly difficult, it is suggested that you contact your local Rockwell-Edward representative. He is 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.

ORDERING PARTS

All requests for replacement parts for cast steel valves should be forwarded to your local Rockwell-Edward Sales Office for shipment from the Rockwell Manufacturing Plant, Raleigh, North Carolina. Specify shipment requirements (Air Express, REA Express, etc.)

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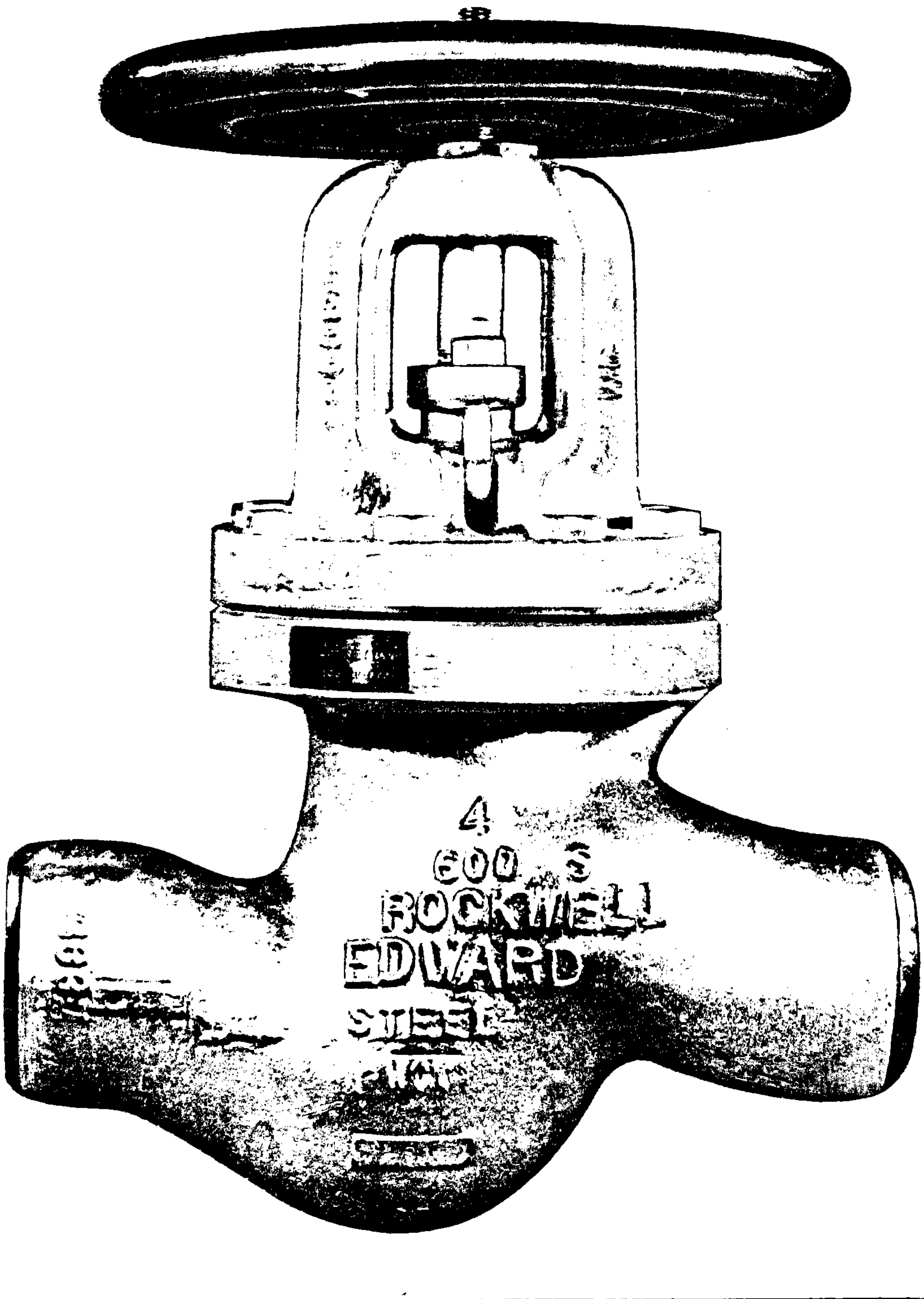
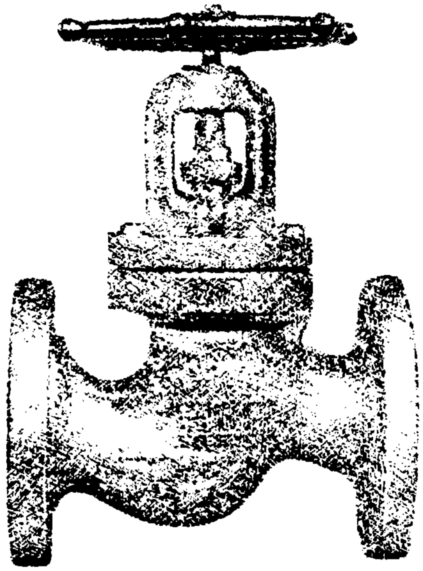
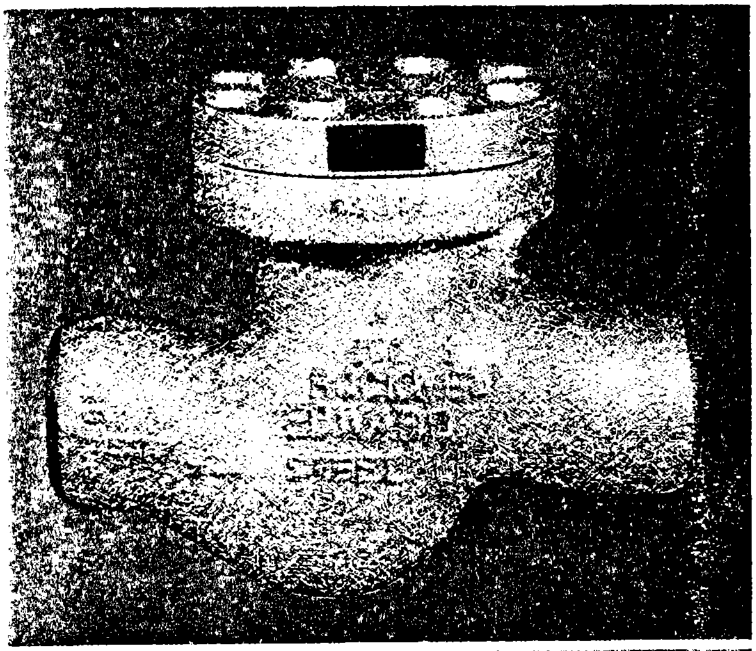
MAINTENANCE MANUAL FOR

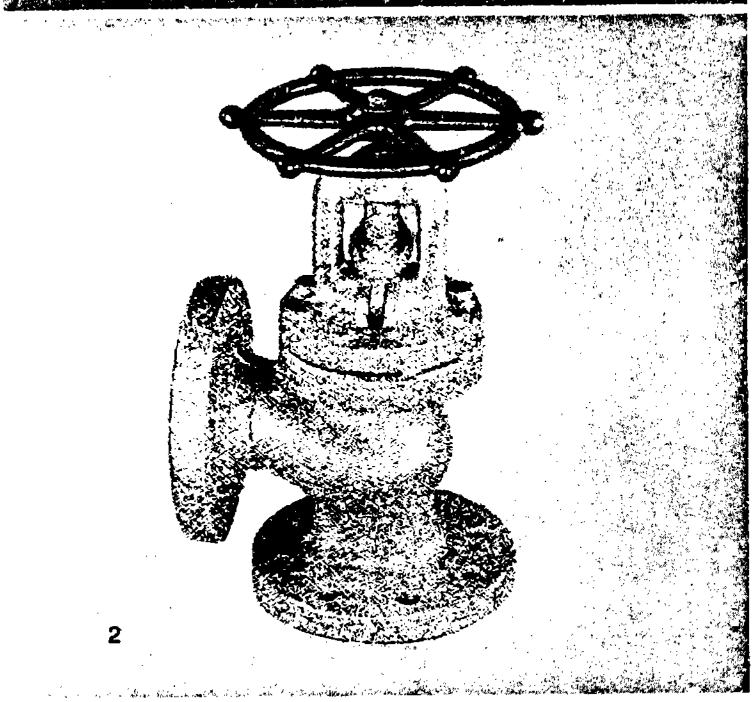
ROCKWELL EDWARD CAST STEEL BOLTED BONNET VALVES

Rockwell









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KEY TO ILLUSTRATIONS

ROCKWELL EDWARD CAST STEEL BOLTED BONNET VALVES MAINTENANCE MANUAL

INTRODUCTION CAST STEEL BOLTED BONNET

This manual has been prepared to serve as a guide for the maintenance of Rockwell Edward bolted bonnet valve construction. It is designed to help you in obtaining the most satisfactory service from these valves. Although rigid metallurgical, radiographic, physical and visual inspection is the standard procedure for all Rockwell 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.

Before starting, it will be helpful to have some understanding of the valve's physical construction. The drawing on page 4 will give you some idea of how the valve is put together.

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.

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

The next major section describes the disassembly procedures for the various valve components.

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 Rockwell for additional advice, if required, and how to order parts is included.

FIGURE NUMBERS OF ROCKWELL EDWARD BOLTED BONNET VALVES DESCRIBED IN THIS MANUAL

302	329Y	605	1441Y
302Y	390	605Y	1443
303	390Y	618	1443Y
303Y	391	618Y	1641
318	391Y	619	1641Y
318Y	392	619Y	1643
319	392Y	690	1643Y
319Y	393	690Y	
328	393Y	691	
328Y	604	691Y	
329	604Y	1441	

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 re-torquing the gland bolt nuts, the following points should be considered.

1. The packing may have become hard. Replace the packing.
2. Gland travel has been fully taken up. Install additional 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 as shown below under packing recommendations.
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

Packing for the upper and lower rings on standard valves is made up of molded rings of graphited asbestos with an asbestos yarn jacket reinforced with monel wire. Packing for the middle rings is composed of molded rings of graphited asbestos with a Neoprene cement binder. Both types are treated with a thin coating of paraffin to prevent water absorption. All are split rings and can be installed without disassembly of the valve.

The valve stem should be thoroughly cleaned before installing new packing to insure the best possible seal. Install each new packing ring separately, pushing each one to the bottom of the chamber. Make certain the lap joints of each consecutive ring are staggered 120 degrees so the lap of the fourth ring is in the same position as the first. When the chamber is filled, tighten the gland down solidly. This should make room for insertion of one or two more rings.

The following procedure is recommended:

1. After the packing has been properly installed, the gland nuts should be evenly tightened to the torque shown below.

NOMINAL VALVE SIZE, Inches

Pressure Class									
	300	2½	3	4	5	6	8	10	12
	600	—	2½	3	4	5	6	—	—
Nut Torque, Ft. Lbs.		20	20	20	35	45	50	75	110

2. After approximately one hour, step number one should be repeated. This is because the initial tightening of the gland nuts may cause only the top three or four rings of packing to compress to the necessary level. The waiting period allows the compression to be distributed through the lower rings.
3. Should leaking occur, step number two must be repeated. If the leaking continues, the applicable torque can be increased by twenty-five per cent of the recommended value.

Caution should be taken not to exceed the recommended torque values because:

1. When soft packing is used, it could be extruded through the packing chamber.

2. When standard packing is used, over compression can make the packing harden and therefore not properly seal.
3. The packing may act like a 'brake' on the stem, causing friction and making operation of the valve difficult or impossible.

BONNET GASKET LEAK

A torque wrench should be used for tightening the bonnet or cover retainer studs or cap screws which are used to preload the soft iron gasket.
The following procedure is recommended:
1. Guard against leakage by having these bolts tight at all times.
2. With line pressure in the valve, all nuts or capscrews should be tightened to the torque shown below.

Bolt Diameter, Inches	½	9/16	5/8	¾	7/8	1	1 1/8	1 ¼
Nut Torque, Ft. Lbs.	45	68	90	150	240	370	585	750

An average man on a 12-inch wrench can develop about 100 ft. lb. of torque. Therefore, if a torque wrench is not available, use the following wrench-bolt combinations:

Bolt Diameter, Inches	½	9/16	5/8	¾	7/8	1	1 1/8	1 ¼
Wrench Sizes, Inches	6	9	12	18	24	36	36	36

Should the leak fail to stop after tightening, it must be concluded that there is an imperfect seal, and the valve will have to be opened for examination. Such a leak may result from either of the following causes:

1. **Incomplete Seal Between Bonnet and Gasket Or Body and Gasket.** An incomplete seal around the gasket seating surfaces may be caused by corrosion, dirt, chips, or other foreign matter on the mating surfaces. An incomplete seal may be caused by surface imperfections in the body or bonnet surfaces 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 which may cause a by-pass around the gasket.
2. **Leakage at the Gasket.** The possibility of a leak through the gasket itself, while more remote, should still be considered. This may not be the result of external flaws on the sealing surfaces of the gasket.

TYPICAL
BOLTED BONNET VALVE
NOMENCLATURE

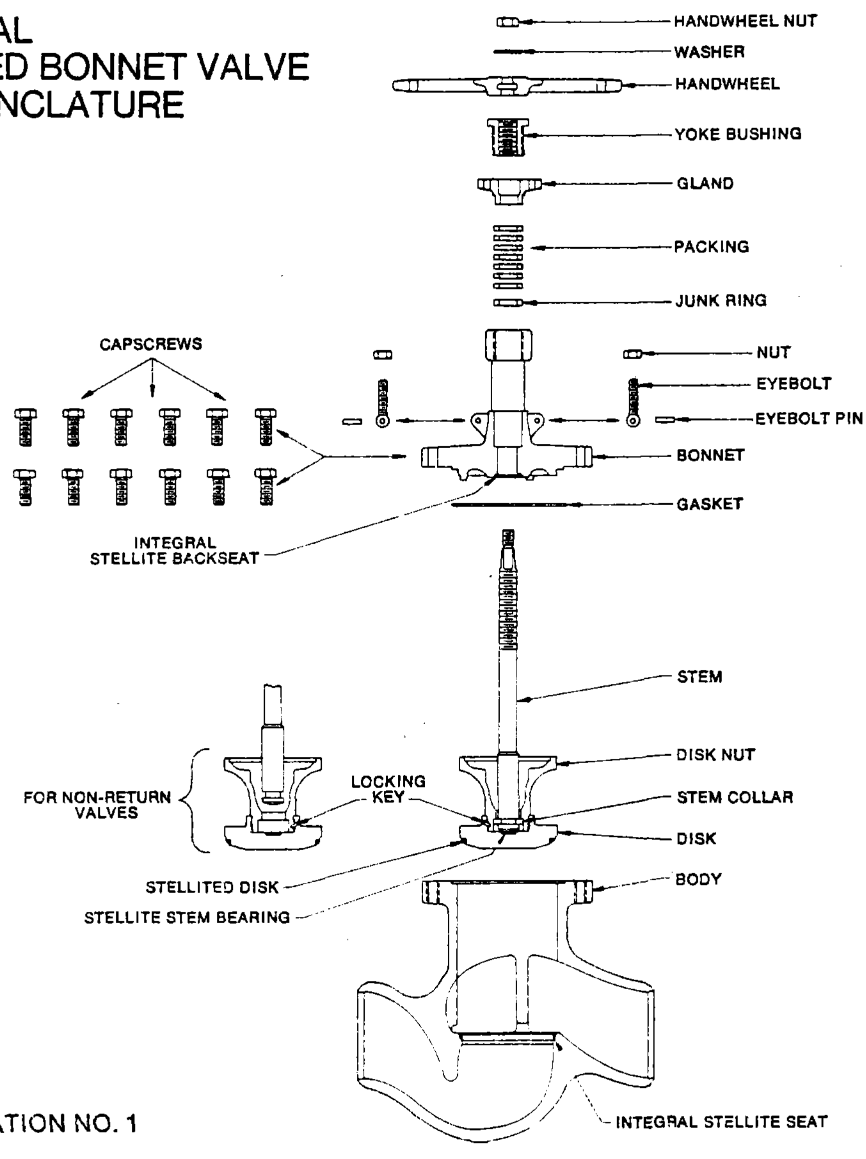


ILLUSTRATION NO. 1

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 stellited 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.

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.

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.

The stem should normally be fully open but not in the backseated position 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, bonnet 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 up sufficient contact pressure and eliminates the vibration. This also tends to dislodge any foreign particles which may have been the initial cause for disk-piston wedging.

The position of the stem, where vibration ceased, should be noted and any increase in pressure drop indicated on available gages, 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.

Another way to dislodge a wedged piston is to use other valves in the line. If possible, 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.

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 recommended level. (See illustration No. 6, page 10.)

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 is 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 re-lube schedule.

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

REPAIR PROCEDURES

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. 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 thick bed of asbestos paper placed over the seat and cemented 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. Heat the body area adjacent to the guide rib to 200 degrees Fahrenheit. This can be done locally with an oxy-acetylene torch.
5. Select the proper welding rod to suit the body material (1/8" maximum size rod is recommended here). See page 7. Because of slag conditions and easy maneuverability, class 7010 rods are recommended.

   If stainless steel inlay is desired on the guide ribs, use either 18-8 stainless steel rod, Harstain 18-8, Stainlend "K" 18-8, Stainweld 18-8 or equivalent.
6. The welding should be started at the bottom so as to create a small shelf, and then proceeded up the guide rib. Lay the weld in thin, even layers, peening each layer before proceeding with the next, and being careful to maintain a temperature of 200 degrees Fahrenheit 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 insure a weld without an undercut at the edges. The overlapping should be done along this edge by using a welding rod of ⅛" 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 a hammer. Thermal stress relieving is not recommended.

7. With a hand grinder, rough grind the welded surface to within about .010" of the finished surface. The edges of the guide ribs should be rounded off smooth. Check the progress of the rough grinding by using a straight edge and feeler gages. 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 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 REPAIRS

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 stellited seats in these bolted bonnet valves are not easily scored, but where reconditioning is necessary, the following points should be observed:

Where an indention 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 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 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 Fig. A page 8.

For smaller size valves, a driving handle can be easily made of ¼" diameter wire bent as per Fig. B. These small assemblies, being much lighter, do not require a supporting spring. Stellited 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, portable boring machines are available from Rockwell.

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.

The lock key weld and locking key can be drilled out. After the key has been removed, 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, WELDING AND FLANGED END VALVES

The four basic steps in repairing a casting defect in these areas are: (1) cut out to the sound metal, (2) pre-heat, (3) weld, and (4) stress relieve. The steps are simple, but many exceptions are encountered in working on valves which are operating in the field. Defects in these areas may be inspected in a variety of ways. Radiography and Magnaflux are two standard methods. Etching with acid is sometimes effective. Castings which have been in water service and may contain water in the defect can be heated to show porosity.

This is very advantageous in determining the source of a leak as well as its exit point. Cutting may be done by chipping, grinding or flame gouging. Generally speaking, the amount of metal removed should be held to a minimum so as to avoid distortion upon subsequent welding. For example, small pinhole leaks in a casting wall 1½" thick may often be effectively welded by cutting down only ¼" deep at the inlet and outlet of the leak.

Preheating to 400°F is called for in most piping fabrication. However, in finished valve repair there may be weld locations wherein the preheat would do more harm than good. For example, in building up worn guide ribs the preheat may detract from the welder's efficiency without making a corresponding metallurgical gain. Here, keep the heat down to 200°F.

The welding rod should generally match the valve body analysis. See page 7. However, many individual considerations such as welding position and rod availability will influence the choice.

Stress relieving is also generally recommended for piping fabrication. Again, it is not always practical in field valve casting repair. Heating which will distort the valve may do irreparable harm. Stress relieving is unnecessary for very small welds and a heavy peening is sufficient.

Where any work involving great heat has been done near the stellited seat joint, it is best to check the concentricity of the seat by blueing with the disk. Should the joint be out of round, it will be necessary to relap following the instructions previously given under "Seat and Disk Repairs," page 6.

VALVE COMPONENT REPAIR—DISK-PISTON ASSEMBLY REPAIRS

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 line scale or other foreign matter which 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.

GASKET SEAL AREA REPAIR

Where foreign matter of any sort is responsible for a gasket seal leak on the sealing surface of the bonnet, it is very likely that it has caused an impression in the same sealing surface which 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.

WELDING ROD RECOMMENDATIONS

MATERIAL TO BE WELDED	ROD RECOMMENDATION AWS-ASTM CLASS*
Carbon Steel 1. ASTM-A216—Grade WCB 2. ASTM-A105—Grade II	ASTM-A233 E 7018
Carbon-Molybdenum Steel 1. ASTM-A217—Grade WCI	ASTM-A316 E 7018-A1
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC6 2. ASTM-A182—Grade F11	ASTM-A316 E 8018-B2
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC9 2. ASTM-A182—Grade F22	ASTM-A316 E 9018-B3
18-8 Mo Stainless Steel 1. ASTM-A351—Grade CF8M 2. AISI—Type 316	ASTM-A298 E 316-15 or E 316-16

*Weld metal deposit chemistry and procedures should conform to the requirements of ASTM 488 (see Table I, below, this manual), and Section IX of the Boiler Code.

TABLE 1—CLASSIFICATION OF WELD DEPOSIT MATERIAL

P-Number	Material Covered	Type of Weld Deposit	Weld Deposit Analysis: Chromium	Molybdenum	Nickel	Manganese	Silicon	Electrode Coatings
P-1	Carbon steels such as: A216, Grades WCA and WCB; A352, Grades LCB; A27, all Grades	Carbon steel	—	—	—	1.25 max*	0.50 max†	F-1: XX20, XX24, XX27, XX28, XX30 F-2[b]: XX12, XX13, XX14 F-3[b]: XX10, XX11 F-4[b]: XX15, XX16, XX18
P-3	Steels with less than ¾ per cent Chromium and total alloy less than 2 per cent such as: A217, Grade WC1; A352, Grade LC1	Carbon-Molybdenum	0.50 max	0.40 to 0.65	—	1.25 max*	0.50 max†	
P-4	Steels with Chromium ¾ to 2 per cent and alloy steels with total alloy less than 2¾ per cent such as: A217, Grades WC4; WC5, and WC6	Chromium-Molybdenum (½ to 2 per cent Chromium)	0.50 to 2.00	0.40 to 0.65	—	1.00 max	1.00 max	
	A352, Grade LC2	Nickel-Molybdenum	—	0.30 to 1.00	1.50 to 3.75	1.00 max	1.00 max	
P-5	Total alloy content less than 10 per cent such as: A217, Grades WC9, C5, and C12.	Chromium-Molybdenum (2 to 10 per cent)	2.0 to 10.0	0.4 to 1.5	—	1.00 max	2.00 max	
P-5A	Total alloy content less than 6 per cent such as: A148; A352, Grades LC3		To provide comparable mechanical properties of the base metal					
P-6	High alloy steel martensitic, such as: A351, Grade CA-15	High alloy martensitic	11.00 to 15.00	0.70 max	—	2.00 max	1.00 max	F-4[b] XX15 XX16
	High alloy steel austenitic, such as: A351, Grades CF-8, CF-8M, CF-8C, CH-20, and CK-20	Chromium-Nickel containing more than 1 per cent ferrite	AISI Types 302, 304, 308, 309, 316, 317, 318, 347, 348, 309 Mo, 309 Cb					F-5 XX16 XX15
		Chromium-Nickel fully austenitic Austenitic Manganese	AISI Types 310, 310Cb, 310 Mo, 330					

†Grades P-1 and P-3 where qualification under the ASME Boiler and Pressure Vessel Code is not required, the following limits may be used:

	P-1	P-2
Manganese, max, per cent	1.25	1.50
Silicon, max, per cent	0.60	0.60

[b]Performance qualification of a welder under any "F" number up to and including F-4 shall qualify a welder for all lower "F" numbers.

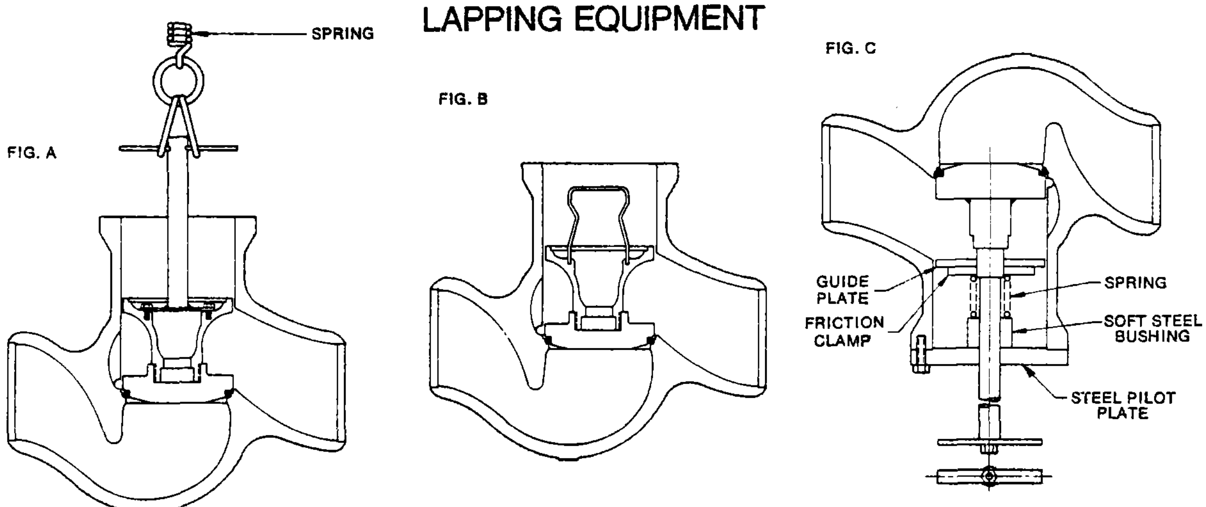
*With permission of ASME, From Section IX, Boiler and Pressure Vessel Code.

FIELD REPAIR EQUIPMENT

Available from Rockwell 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 Rockwell Edward sales representative for more information. A list of this equipment follows:

1. Lapping equipment. See Figs. A and B.
2. Self-centering lap guide fixtures for lapping valve seats in valves 8" and up. See Fig. C. 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 bores from 4" to 14½" diameter. (Not illustrated)
4. Van Norman portable boring machine for reboring valves in the field. Grinding attachments are also available for some sizes for grinding seat joints. (Not illustrated)
5. Air driven portable boring machine for reboring guide ribs and seats of valve bodies in the line. (Not illustrated)

LAPPING EQUIPMENT



DISK DRIVER FOR LAPPING LARGE VALVES

DISK DRIVER FOR LAPPING SMALL VALVES

SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL

ILLUSTRATION NO. 2

DISASSEMBLY PROCEDURES FOR BOLTED BONNET VALVES

INTRODUCTION

Step-by-step disassembly procedures are described for all types of Rockwell Edward bolted 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 two 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 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 Procedures for Impactor Handwheels," page 9, or "Procedures for Removing Electric Operators from Valve Bonnets," page 9.

IF FAILURE IS INDICATED IN AREA 2,

Two methods are available. In Method 1, the operator and bonnet assembly may be removed from the valve body as a unit. This requires less time but requires adequate clearance area above the valve. The second method is to first remove the operator from the bonnet, and then the bonnet from the body, in separate steps.

For Method 1, leave the valve operator mounted on the bonnet and follow instructions for "Disassembly Procedures For Valve Parts," page 11.

For Method 2, first remove the operator by following the applicable section, "Disassembly Procedure for Impactor Handwheels," page 9, or "Procedures for Removing Electric Operators from Valve Bonnets," page 9. Then proceed to the section, "Disassembly Procedures for Valve Parts," page 11.

If failures are indicated in any combination of Areas 1 & 2, then each of the respective procedures must be followed. **For check valves without stems or operators, simply use the proper section under "Disassembly Procedures for Valve Parts," page 11.**

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) where the valve can remain in service.

1. **For service in Area 1.**
   a. If pressure is to be maintained in the valve, fully close the valve or backseat in full open position. On electric operated valves with non-revolving stems, the valve must be backseated in the full open position only.
   b. If no pressure is to be maintained in the valve, close the valve fully and open approximately ⅛".
2. **For service in Area 2.**
   Close the valve fully and open approximately ⅛". Service Area 2 only without pressure in the valve.

DISASSEMBLY PROCEDURES FOR IMPACTOR HANDWHEELS AREA 1

Rockwell Edward 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. If under pressure, the valve should either be fully closed or backseated in the full open position.

All of the following handwheel disassembly procedures are arranged in accordance with the general comments on page 8. Study these comments carefully before beginning disassembly.

IMPACTOR HANDLES AND HANDWHEELS

Not illustrated, but of similar construction to Illustration No. 4, are Impactor handles. The following instructions apply, in general, to all.

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 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.
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, the crossarm can be removed by tapping lightly with a hammer on the underside and lifting off.

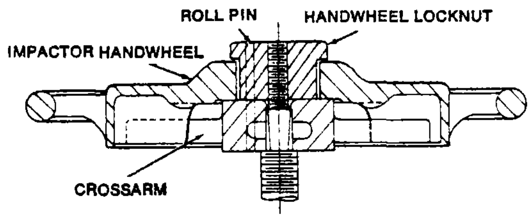


ILLUSTRATION NO. 3
Impactor Handwheel with Crossarm

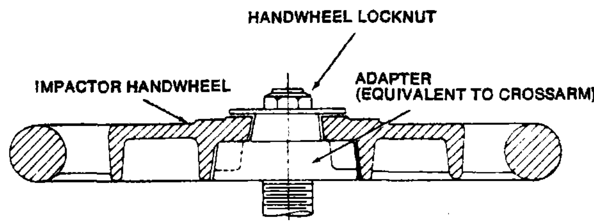


ILLUSTRATION NO. 4
Impactor Handwheel with Adapter

PROCEDURES FOR REMOVING ELECTRIC OPERATORS FROM VALVE BONNETS

Rockwell Edward Bolted Bonnet valves use various types of electric operators, depending upon the size and pressure class, which determine 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 bonnet. Also included are complete instructions for resetting the limit switches. Disassembly procedures for the electric operators themselves are not included and appropriate instructions should be obtained before starting. Consult the operator manufacturer.

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 backseated or fully open position before removing units from valves with non-revolving stems. See "Caution," page 9.

All of the following disassembly procedures are arranged in accordance with the general comments on page 8. Study these pages carefully before beginning.

Determine first whether the valve stem is revolving or non-revolving.

REVOLVING STEM VALVES

On revolving stem valves the operator drive nut is connected to the stem through a key. See Illustration No. 5.

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 or capscrews from the underside of the operator flange.
4. Lift the operator up and completely off the stem and stem key.
5. Position the operator away to a clean area for further disassembly, if required.

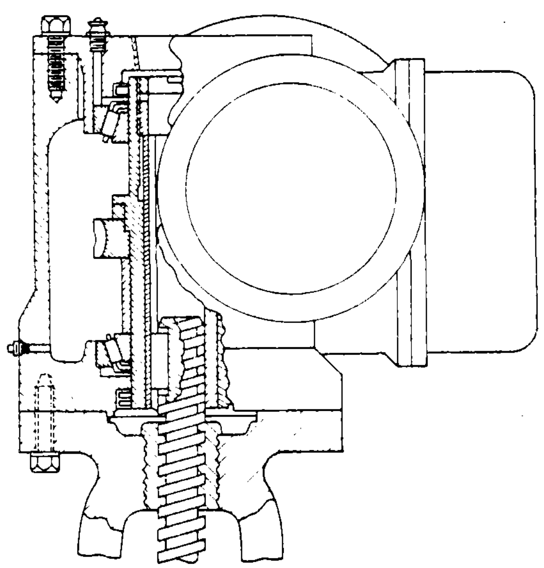


ILLUSTRATION NO. 5
Electric Operator used on Revolving Stem Valves

NON-REVOLVING STEM VALVES

On non-revolving stem valves, the operator drive nut is threaded to the stem. See Illustration No. 6.

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 or capscrews from the underside of the operator 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 to prevent damage to the stem threads.
6. With the hoist, lift the operator clear of the stem and place down on a clean area for further disassembly, if required.

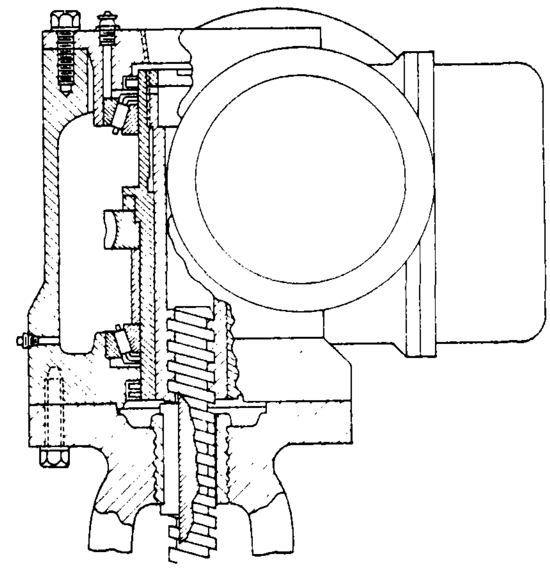


ILLUSTRATION NO. 6
Electric Operator used on Non-Revolving Stem Valves

ELECTRIC OPERATOR LIMIT SWITCH AND TORQUE SWITCH SETTING PROCEDURES

The following procedures are intended as a general guide for setting limit and torque switches on electric operators. For specific instructions, refer to the appropriate operator instruction manual or consult the operator manufacturer.

Geared Limit Switch
When mounting or re-mounting an electric operator, the geared limit switch must be reset as follows:

1. Make certain the electric current is off.
2. Open valve by hand until the stem strikes the backseat.
3. Mark the stem and reclose approximately ⅛" to allow for coast of the moving parts.
4. With the valve in this position, set the opening limit switch as outlined in the operator instruction manual.
5. 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 the valve is moving 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 certain there is sufficient clearance between the position at which the valve stem comes to rest and the valve backseat.
6. To set the position for operation of the indicating light, make sure the torque switch is properly wired into the closing circuit and run the valve to the closed position. Back the valve off the seat to the desired position and set the "closed" light using the procedure outlined by the operator manufacturer.

Torque Switch

The torque switch is set during factory assembly to seat the valve against the specified unbalanced pressure and to protect the backseat from excessive forces in the opening direction. Should it become necessary to change the torque switch setting for any reason, the local Rockwell representative should be contacted for instructions.

DISASSEMBLY PROCEDURES FOR VALVE PARTS AREA 2

(For a definition of Area 2, see page 8.)

(See Illustration No. 1, page 4, for an explanation of valve parts nomenclature.)

Step-by-step disassembly procedures are described below. The procedures include disassembly instructions for stop, stop-check (non-return), and piston lift 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 8. Study these pages carefully before beginning.

STOP AND STOP-CHECK (NON-RETURN) VALVES

See Illustration No. 1, page 4.

1. Loosen the packing gland bolt nuts and tap the gland which should relieve any pressure *which might be trapped in the valve. This is important.*
2. Carefully remove the bonnet stud nuts or capscrews.
3. Remove the packing gland bolt nuts.
4. Use a chain hoist in line with the stem to lift the stem-bonnet assembly out of the body. During this process, mark the body, bonnet, and 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.
5. Unscrew the stem from the bonnet bushing.
6. 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 7.
7. Screw ⅜—16 UNC bolts (½—13 UNC on 12″ valve) 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.
8. The bonnet end opening should be kept covered whenever possible.

PISTON LIFT CHECK VALVES

See Illustration No. 7, page 11.

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

NOTE: Care must be taken in removing the cover bolting in case pressure should be trapped in the body (downstream piping). Check to make certain all downstream pressure is relieved.

1. Carefully remove the cover nuts or capscrews observing the above caution.
2. Lift the cover off the valve. During this process, mark the body, cover and gasket at corresponding points (but not on sealing surfaces) for reference and 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.
3. Screw ⅜—16 UNC bolts (½—13 UNC on 12″ valve) 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.
4. The bonnet end opening should be kept covered whenever possible.

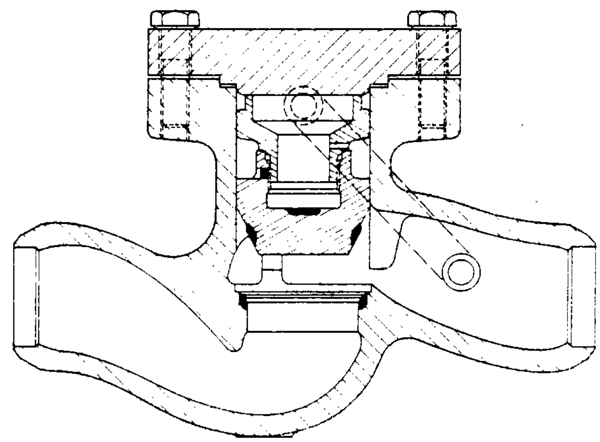


ILLUSTRATION NO. 7
Piston Lift Check Valve

REASSEMBLY PROCEDURES FOR BOLTED BONNET 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. In addition, the following general points should be considered.

1. The most important consideration in the reassembly of 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 gasket when reassembling a bonnet which 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.

STOP AND STOP-CHECK (NON-RETURN VALVES)

See Illustration No. 1, page 4.

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 gasket on the body.
3. Lower the bonnet into position, rotating the stem as necessary to engage the yoke bushing threads.
4. Install and tighten the bonnet stud nuts or cap screws in accordance with the torque values shown on page 4. All nuts or cap screws must be tightened uniformly in a star pattern to avoid cocking the bonnet.
5. Reassemble the operator to the valve using a procedure opposite the disassembly.

PISTON LIFT CHECK VALVES

See Illustration No. 7. page 11.

1. Insert the disk-piston, lowering it carefully until it rests on the valve seat.
2. Install a new gasket on the body.
3. Lower the cover carefully onto the valve.
4. Install and tighten the cover stud nuts or cap screws in accordance with the torque values shown on page 4. All nuts or cap screws should be tightened uniformly in a star pattern to avoid cocking the cover.

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. Lot number of the valve.
4. Service (water, oil, gas, superheated steam, etc.).
5. Operating pressure and temperature.
6. Direction of flow through stop valves (inlet pressure above the disk or below the disk).
7. Rate of flow through the valve (lbs. per hour or gallons per minute).
8. At what pressure, temperature or flow rate does the reported trouble occur.
9. Pressure drop across the valve.

INFORMATION REQUEST

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

ORDERING PARTS

All requests for replacement parts for cast steel valves should be forwarded to your local Rockwell Edward Sales Office. Specify shipment requirements (Air Express, REA Express, etc.).

ROCKWELL EDWARD SALES OFFICES

CONTINENTAL U.S.A.

CALIFORNIA	Los Angeles (Buena Park 90620), Rockwell International, 6363 Knott Ave., Telephone: (714) 523-4000 In Los Angeles, Call (213) 868-0841 San Francisco (Corte Madera 94925), Rockwell International, P.O. Box 689, 21 Tamal Vista Blvd., Telephone: (415) 924-6767
GEORGIA	Atlanta (Doraville 30340), Rockwell International, 3500 McCall Place, Telephone: (404) 458-2263
ILLINOIS	Chicago (Oakbrook Terrace 60181), Rockwell International, 1-S-132 Summit Avenue, Telephone: (312) 620-8840
LOUISIANA	New Orleans 70119, Rockwell International, 2609 Canal Street, P.O. Box 19438, Telephone: (504) 822-2524
NEW JERSEY	East Orange 07017, Rockwell International, 55 Washington St., Telephone: (201) 676-1400
NEW YORK	(See East Orange, New Jersey listing) In New York, Call (212) 563-4055
OKLAHOMA	Tulsa 74145, Rockwell International, 4845 South Sheridan Road, Suite 510, P.O. Box 45210, Telephone: (918) 622-0330
PENNSYLVANIA	Philadelphia (Bala-Cynwyd 19004), Rockwell International, 211 Rock Hill Road, Telephone: (215) 839-4850 Pittsburgh 15208, Rockwell International, 390 N. Lexington Ave., Telephone: (412) 247-3200
TEXAS	Houston 77018, Rockwell International, 5400 Mitchelldale St., Telephone: (713) 682-6651 Dallas 75247, Rockwell International, 2934 Iron Ridge, P.O. Box 47767, Telephone: (214) 631-1890

CANADA

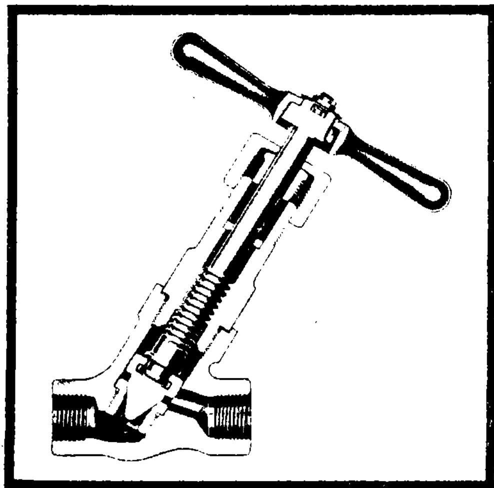
QUEBEC	LaSalle, Rockwell International of Canada Ltd., P.O. Box 190, Telephone: (514) 365-1400
ONTARIO	Rexdale, Rockwell International of Canada Ltd., 280 Belfield Rd., Telephone: (416) 675-3744
ALBERTA	Calgary, Rockwell International of Canada Ltd., 4411 Manitoba Rd., S.E., Telephone: (403) 287-2670
BRITISH COLUMBIA	Vancouver 10, Rockwell International of Canada Ltd., 45 West 7th Ave., Telephone: (604) 879-0921

INTERNATIONAL

LATIN AMERICA & FAR EAST	Rockwell International, Flow Control Division, 400 N. Lexington Ave., Pittsburgh, Pa. 15208, Cable: ROCKWL INT PGH
EUROPE, AFRICA & MIDDLE EAST	Rockwell International S.A., Flow Control Division, 430 Bath Road, Slough, London, England, Cable Address: ROCKFLOW SLOUGH
FRANCE	Rockwell Valves S.A., 56 rue des Acacias, 75017, Paris, France, Telex: RVSAPAR 640 658F

Rockwell International

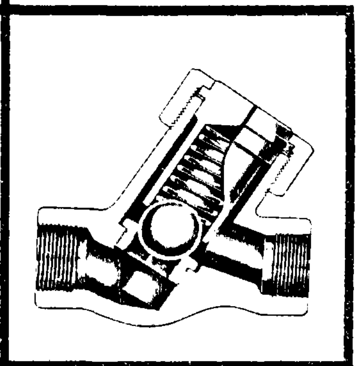
Flow Control Division
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208

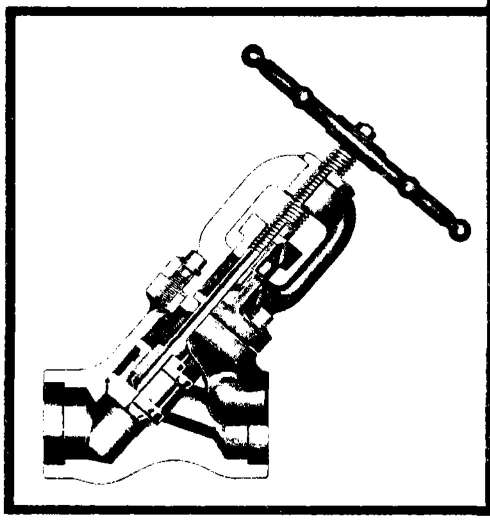


SERVICE MANUAL FOR

ROCKWELL EDWARD FORGED STEEL VALVES

Union, Bolted & Screwed Bonnet Types





Rockwell

Servicing Rockwell-Edward Forged Steel Valves

Typical Valve Designs

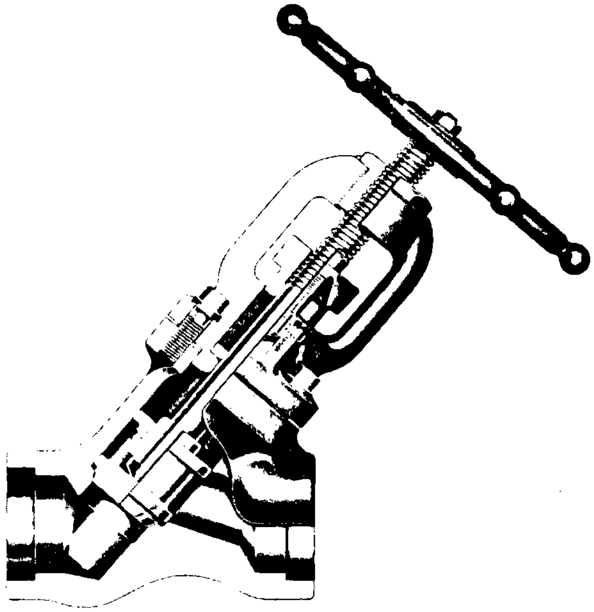


Fig. 848
Bolted Bonnet Stop, Bolted Gland, O.S.& Y.

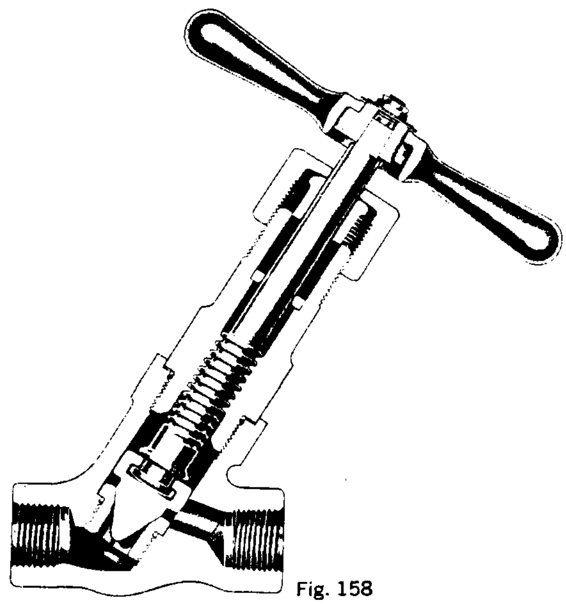


Fig. 158
Screwed Bonnet Stop, Screwed Gland, Inside Screw, Screwed-in Seat

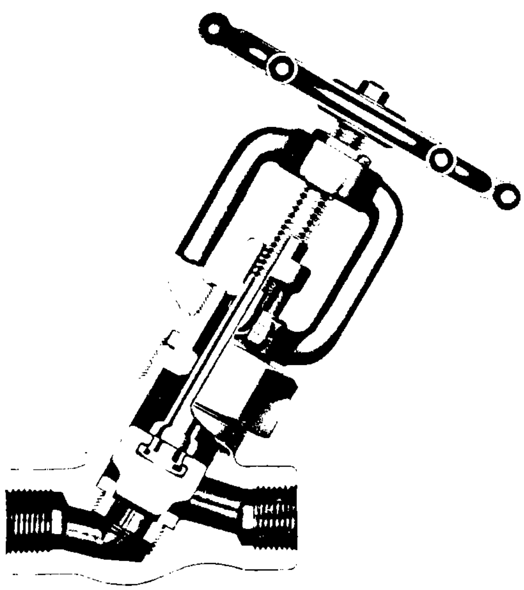


Fig. 444
Union Bonnet Stop, Bolted Gland, O.S.& Y., Screwed-in Seat

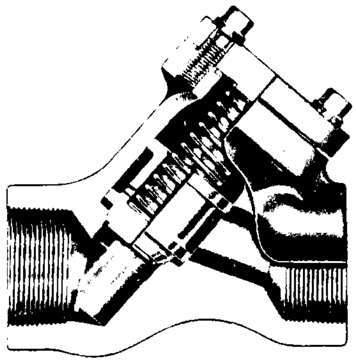
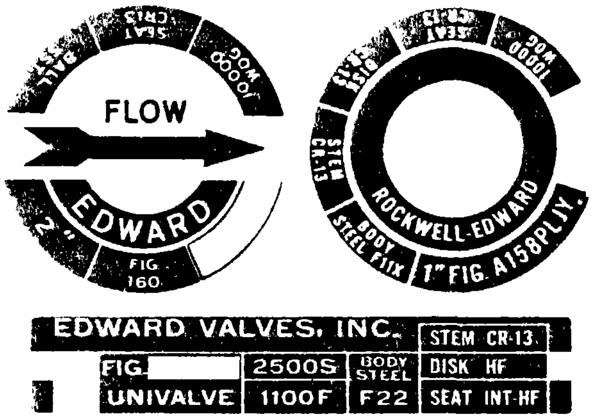


Fig. 838
Bolted Cover Piston Check

INTRODUCTION

This manual is provided to help you service your Rockwell-Edward Forged Steel valves.

Before disassembling any valve, we recommend that you check the valve identification plate and note size, fig-



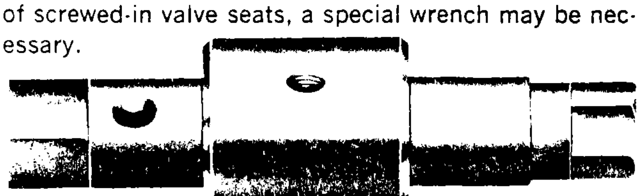
Identification Plates

ure number, and pressure class, so that you can identify it in the appropriate Rockwell-Edward Catalog.

This catalog will show typical cross sections to help identify the various parts.

Tools

Most Edward Forged Steel valves may be readily disassembled with ordinary hand tools. For the removal of screwed-in valve seats, a special wrench may be necessary.



Seat Wrench

Such seats are provided with hexagonal holes, lugs, or slots for disassembly and reassembly. Necessary drawings are available if valve users wish to make their own tools or they may be purchased from Rockwell.

DISASSEMBLY:

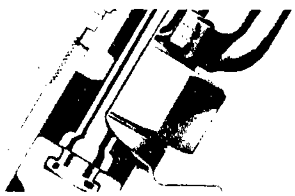
Be sure line is not under pressure when disassembling valves.

Bolted Bonnet

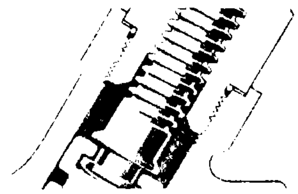
In bolted bonnet style valves, the nuts or cap screws should be removed (see Fig. 848 page 2). The bonnet assembly or cover can then be removed and the interior of the valve exposed.

Union & Screwed Bonnet

Small valves of the union ring or screwed bonnet type are disassembled by unscrewing the bonnet or union ring.



Union Ring Construction



Screwed Bonnet Construction

Gage Valves

Small gage valves of the Fig. 152 type have a pipe thread body-bonnet connection. These require the same consideration as any pipe thread joint.

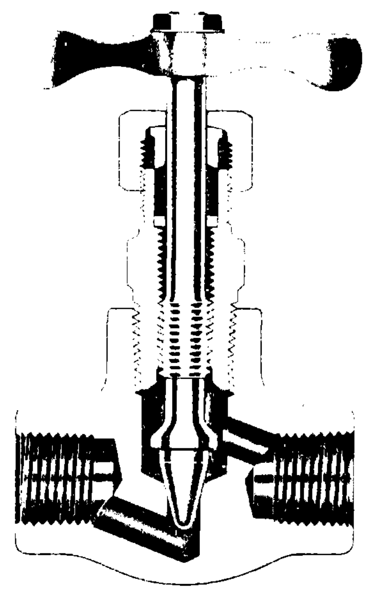
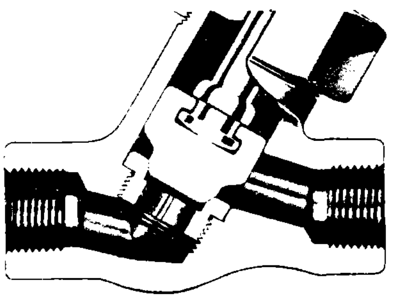


Fig. 152

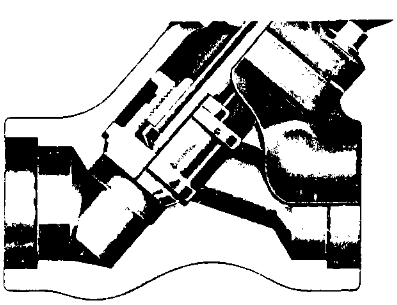
Screwed Bonnet, Screwed Gland, Inside Screw, Needle Stem Gage

Seats

Edward valve seats are of two types — screwed-in or integral with the valve body.



Screwed-in seats can best be repaired, if more than lightly damaged, by removal from the valve. If lock welded, the lock weld must be removed and the seat unscrewed. If screwed-in seats are badly damaged, it may be more economical to replace them with new seats, however, if they are repairable, they may be remachined on a lathe. The part should be accurately centered in the lathe before machining. EValloy seats can be cut with high speed tool bits. Stellite faced seats must be machined with tungsten-carbide tools or by grinding. In replacing a screwed-in seat in the valve body, care should be taken that the face on the body against which the seat shoulder rests is clean and true to provide a tight seal. Surfaces should be blued and checked for contact all the way around when replacing a seat. Care should be taken that reworking does not throw the sealing face between body and seat out of line with the seat threads. After reassembly, lock welded seats should be rewelded.



Integral Seat

®T.M. Haynes Div., Union Carbide Corp.

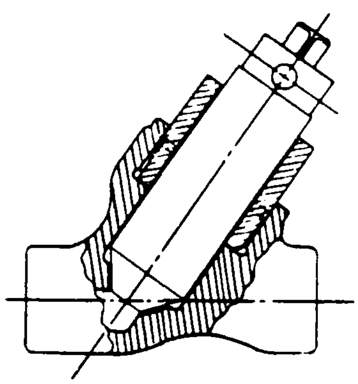
Integral valve seating surfaces cannot be removed for repair. Once the valve has been disassembled and thoroughly cleaned, determine the best procedure based on the extent of damage. Lightly damaged seats may simply be repaired by lapping with the valve disk assembly.

Heavier damage may require the use of special lapping tools or removal of the valve body from the line for remachining. These valves should then be finish lapped using the valve disk assembly. (See Below).

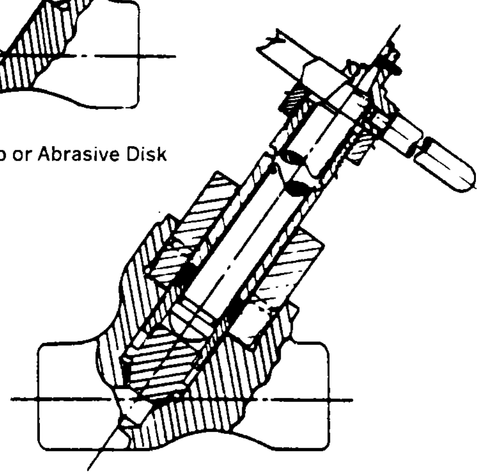
Complete instructions for the repair and finishing of integral stellite valve seats are contained in "Service Manual for Rockwell-Edward Univalves" V-375.

Seat Finishing

After properly installing seats in valve bodies or reworking integral seat valves, the seat and disk should be lapped together. To preclude galling, caution should be taken not to apply too much pressure in lapping EValloy seats and disks. Lapping should be done with a light load, lifting the disk frequently to a new position and cleaning the lapping faces as required. See below:



Lapping with Lap or Abrasive Disk

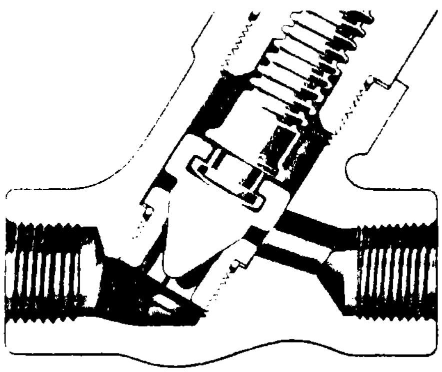


Lapping with Valve Disk Assembly

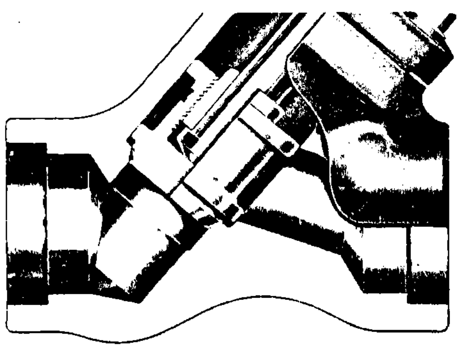
The effectiveness of valve seat lapping can best be judged by blueing the disk and rotating it lightly in the seat. A full contact should be obtained around the circumference of the seat. A valve which shows this full contact should be pressure tight after assembly when proper stem load is applied.

Disks

In all except small Rockwell-Edward gage, instrument and needle stem valves, disks are designed to swivel on the valve stem. They are held in place by either a "T"-slot connection or a disk nut.



T-slot Construction



Disk Nut Construction

Stop-Check valve disks are not attached to the stem and respond to the fluid flow in the same manner as check valve disks. (see below). The disk seating face can be repaired in a similar manner to that described for seats.

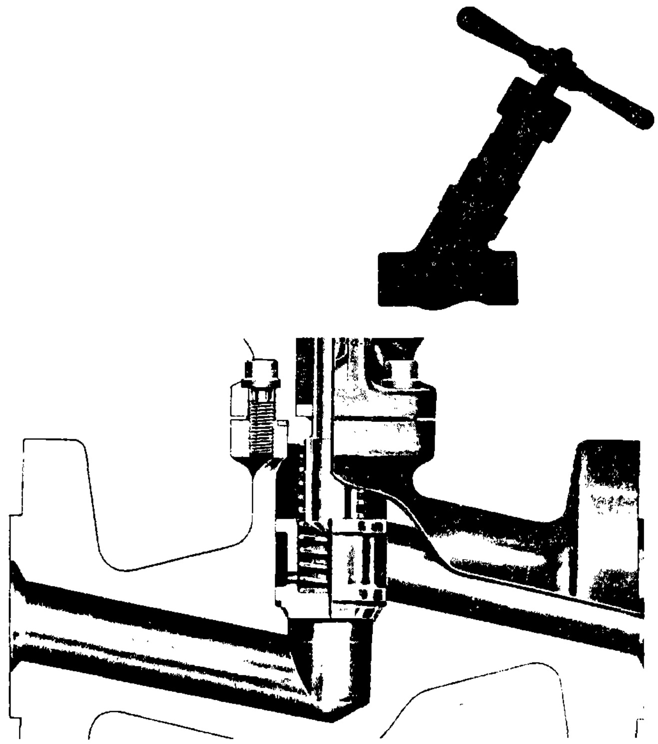


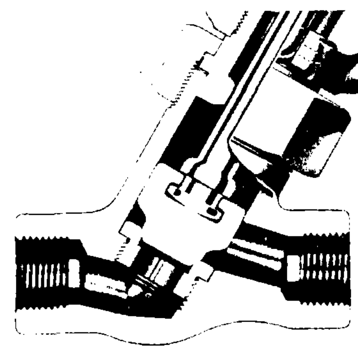
Fig. 846
Typical Stop-Check Valve with Body-Guided Disk

Valve stems are normally provided with a radius at the disk contact to give center loading. If foreign material gets between this spherical surface and the disk, or if galling occurs, it may not be possible to close the valve tightly. In a leaking valve this contact should be checked to be sure it is in proper condition.

Disk Tack Welds

In body-guided valve disks and small new style bolted bonnet valves, the disk nut is secured to the disk by a small weld through the side of the disk fusing the disk nut threads and preventing loosening of the disk assembly in service. Such disks can easily be disassembled if required by drilling out the fused material at the bottom of the small hole in the disk. The disk nut can then be unscrewed for servicing. Care must be exercised not to drill through the disk nut wall or the stem may be damaged. When repairs are complete, the parts can be reassembled with care being taken to screw the disk nut down until only a few thousandths of an inch end play remain in the assembly. The parts can then be lock welded again by depositing weld metal at the bottom of the small hole in the disk.

In other than body guided disk valves, it is equally important that the end play between disk and stem be held to a minimum. An end clearance of a few thousandths of an inch is ideal to give good swivel action without permitting excessive misalignment of the disk. If after some time in service, it is desired to reduce end play, the small tack weld should be broken and the disk nut removed.



Non-Body Guided Disk

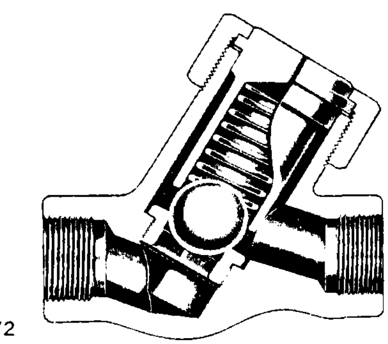


Fig. 3572

Union Bonnet Ball Check, Screwed-in Seat

The required reduction in end clearance can be effected by removing metal as required from the shoulders of the disk nut. After reassembly the tack weld should be replaced to secure the threaded parts. Such tack welds should be made with a stainless steel welding rod such as Lincoln Electric Company Stainweld No. A.

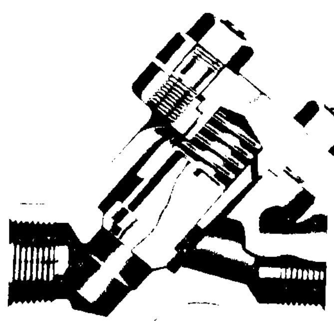


Fig. 5538

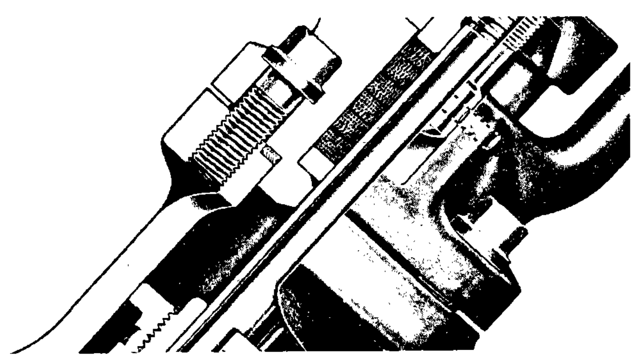
Cover Guided Disk, Bolted Cover Piston Check

Valves 4″ or smaller may be body guided by rings on the disk or in the case of "T"-slot disks by the disk outside diameter. A similar body guiding arrangement may be found in check valves. Some valves have disks which are stem guided with the disks of companion check valves being guided by an extension of the cover. (See above) The wear on sliding surfaces inside valves should be considered and the surfaces checked to be sure it is not excessive. Guiding in check valves is particularly critical. The guides must be close enough to bring the disk accurately down into the seat to make a tight joint.

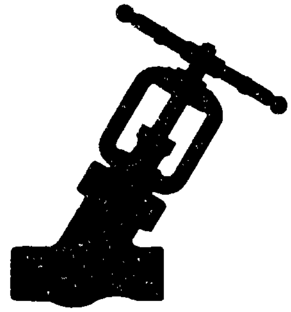
Foreign material in the flow medium may wedge between guiding surfaces with the possibility of making the disk stick. It is recommended that piston check valves be used where the fluids are clean and where tight seating is important. In smaller sizes, it is recommended that ball type check valves be used where the problem of sticking open is of serious consideration. Valves sized too large for flow condition will sometimes have excessive wear, chatter and noise.

Backseat

Rockwell-Edward stop valves, except bonnetless instrument valves of the 952 type and Univalves of the loose backseat type (withdrawable trim), have a backseat integral with the bonnet. The seating face on the bonnet is generally a bevel and the seating surface on the disk nut or stem is provided with a radius. Care must be taken of sealing surfaces on both the bonnet and the radius which seals against it to obtain a tight backseat.



Integral Backseat Construction



Packings

Many Rockwell-Edward valves are packed with all-purpose packing sets. This is a combination of packing using jacketed high density rings at the top and bottom in the packing chamber and softer packing in the center section. The outer rings are reinforced with Inconel† wire and are also used exclusively on valves for high temperature service. Valves for chemical service may be packed with Teflon*, filled Teflon or Teflon impregnated packing. 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. If packing has hardened, it should be removed and new packing installed. To obtain best results, the stem should be thoroughly cleaned. Replacement packing should be the same as that originally furnished. Rockwell-Edward valve packings are inhibited to prevent stem pitting in service.

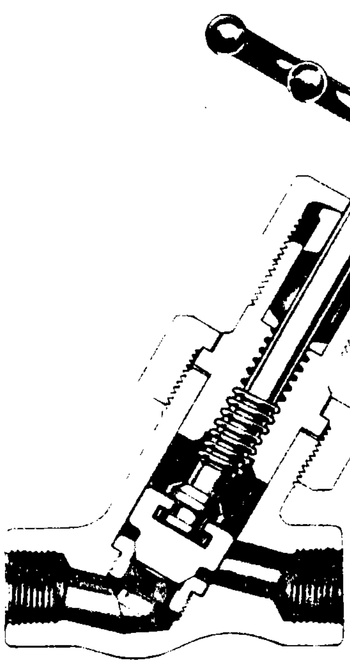
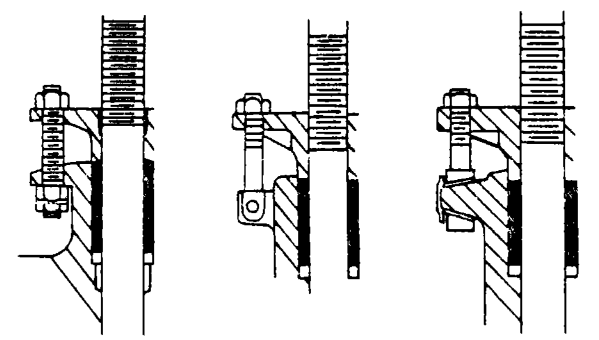


Fig. 2698
Union Bonnet Stop, Screwed Gland, Screwed-in Seat

Valves of the Fig. 2698 type have a packing nut with threads which should be kept well lubricated to prevent corrosion and eliminate packing adjustment difficulties.

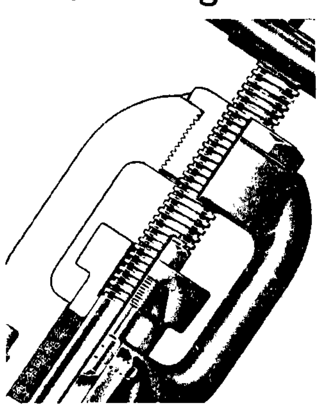
Gland Bolts

The removal of glands and gland stud bolts is accomplished by removing the nuts. Swing bolts can be removed by also driving out the pin. In some small valves the swing bolt pivots on the valve yoke and is held in



place by a spot welded steel washer (see pivot type above). If the replacement of these is necessary, the washer can be pried off and the bolt removed. A new washer can be applied by tack welding.

Yoke Bushing



Yoke Bushing

The yoke bushings of small Rockwell-Edward valves are threaded to the yoke. These can be removed by cutting the lock weld and unscrewing the bushing. Bushings are subject to wear in services where large amounts of grit accumulate on the valve threads. Lubrication aids easy operation of valves and reduces wear of yoke bushings.

†T.M. International Nickel Co., Inc. *T.M. E. I. du Pont de Nemours & Co.

REASSEMBLY

Valves of the union ring type, or bolted bonnet construction are sealed at the bonnet by flat, soft metal gaskets. Screwed-in seats are also frequently sealed by flat gaskets. Such gaskets require smooth clean surfaces on body, bonnet or seat. Current bolted bonnet valves, such as Fig. 848 type, are sealed with spiral wound stainless steel and asbestos gaskets. In all valves, new gaskets are recommended for reassembly. Bonnet and seat gaskets are inexpensive and available out of factory stock.

Valves with union bonnet joints require the union nut to be well lubricated and tightened to develop sufficient gasket compression.

Valve Size	¼ & ⅜	½	¾	1
Torque in Ft-Lb	130	400	450	750

On all bolted bonnet valves, it is desirable to maintain the bolt tension necessary to keep the bonnet joint tight. It is recommended that the initial bolt stress of 45,000 psi be maintained under service conditions. In high temperature service where creep may be anticipated, it is recommended that this bolt tension be maintained.

Spare Parts

Spare parts for Edward valves may be ordered by specifying valve size, figure number and name of part. This information may be developed from your files or from current Rockwell-Edward catalogs.

Service

If you have any further questions on valve repair or part replacement, your Rockwell representative will be happy to assist you. Rockwell Edward catalogs available on request:

Rockwell Edward Forged Steel Valves V-301
Service Manual for Rockwell Edward Univalves...... V-375

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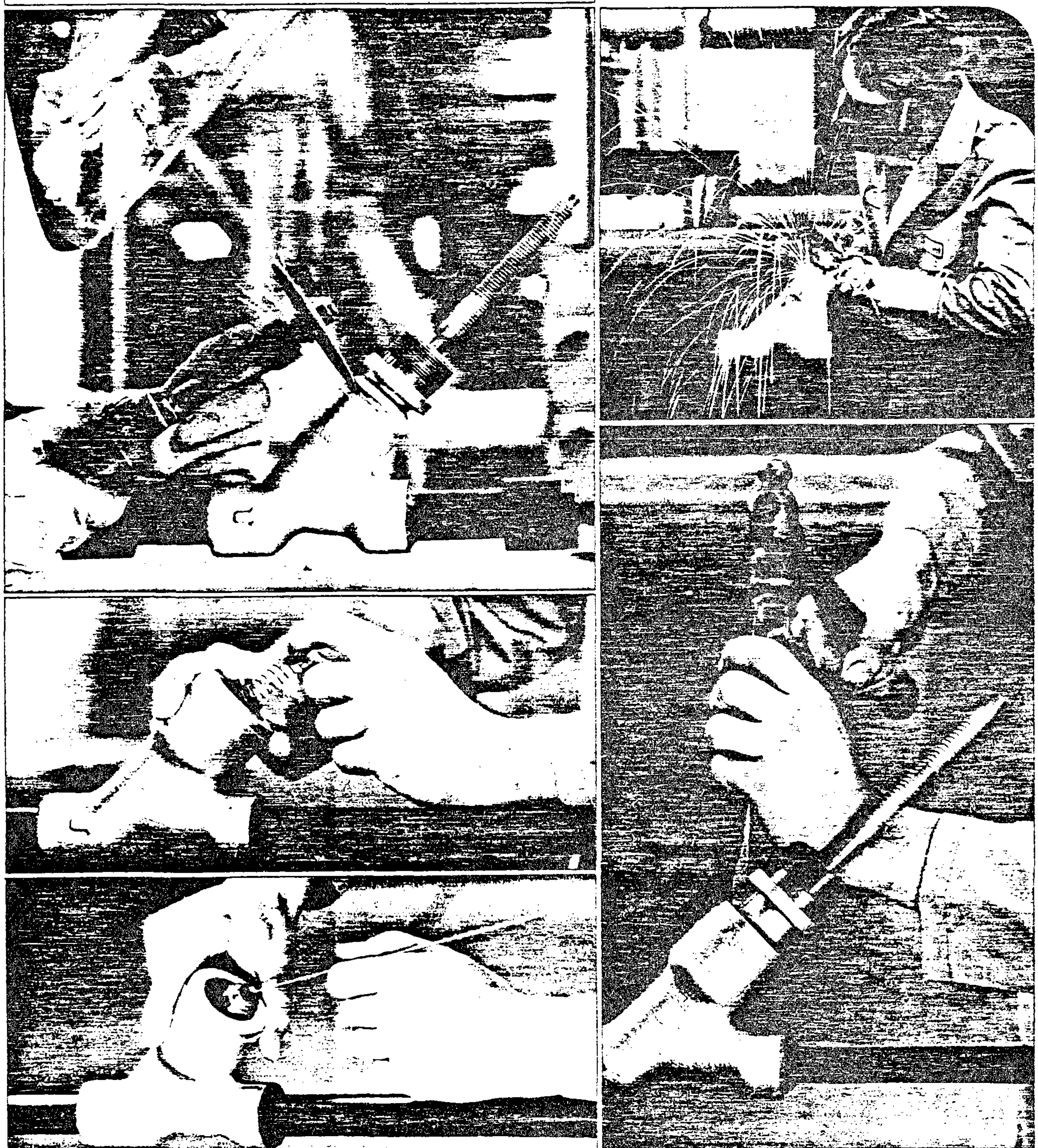
Rockwell International

Flow Control Division
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208

Rockwell Univalve® Maintenance Manual

Rockwell



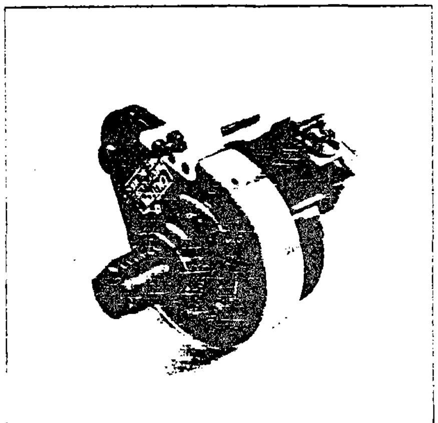
...products of Flow Control Division

Index

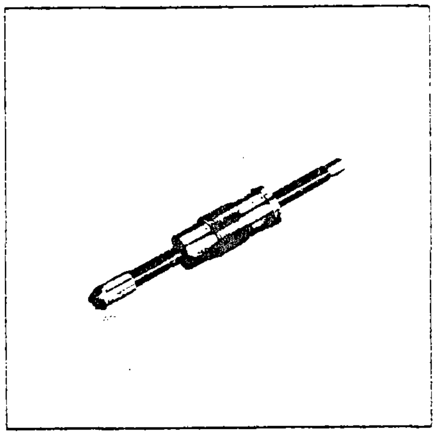
Three New Tools For Faster In-Line Repairs of Rockwell Univalves

The new Rockwell Univalves aren't likely to require any maintenance or repair work until they've been in service for quite a few years. But sooner or later—depending on the nature of the line fluids, frequency of operation and time in service—Univalve seats and disks may need to be repaired.

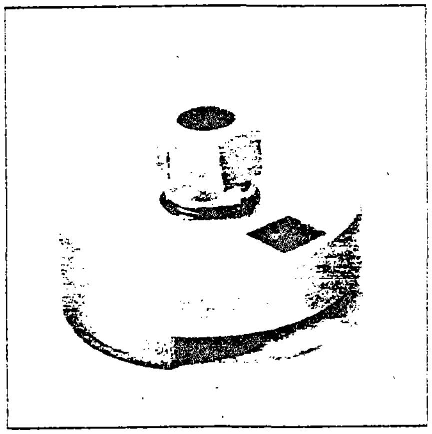
For fast, one-man, in-line repair of Rockwell Univalves, three new lightweight, portable tools are now available: Seal Weld Cutting Machine, Seat Refinishing Tool and Bonnet Torquing Tool. Following are illustrations and descriptions of each tool.



• The **Seal Weld Cutting Machine** has the ability to cut both fillet and canopy welds. By removing the handwheel and yoke, then installing the machine, seal welds can be cut leaving a suitable weld prep. The machine is operated by one person and uses conventional plant air. For more information on the new Seal Weld Cutting Machine, refer to Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine".



• The **Seat Refinishing Tool** is a self-centering head of multiple tungsten carbide cutters on a spindle which is hand-operated with a speed wrench for complete seat refinishing. Lapping or other finishing work is not required to produce finished seats.
Seat damage such as that produced by foreign materials in the line fluid can be repaired quickly.



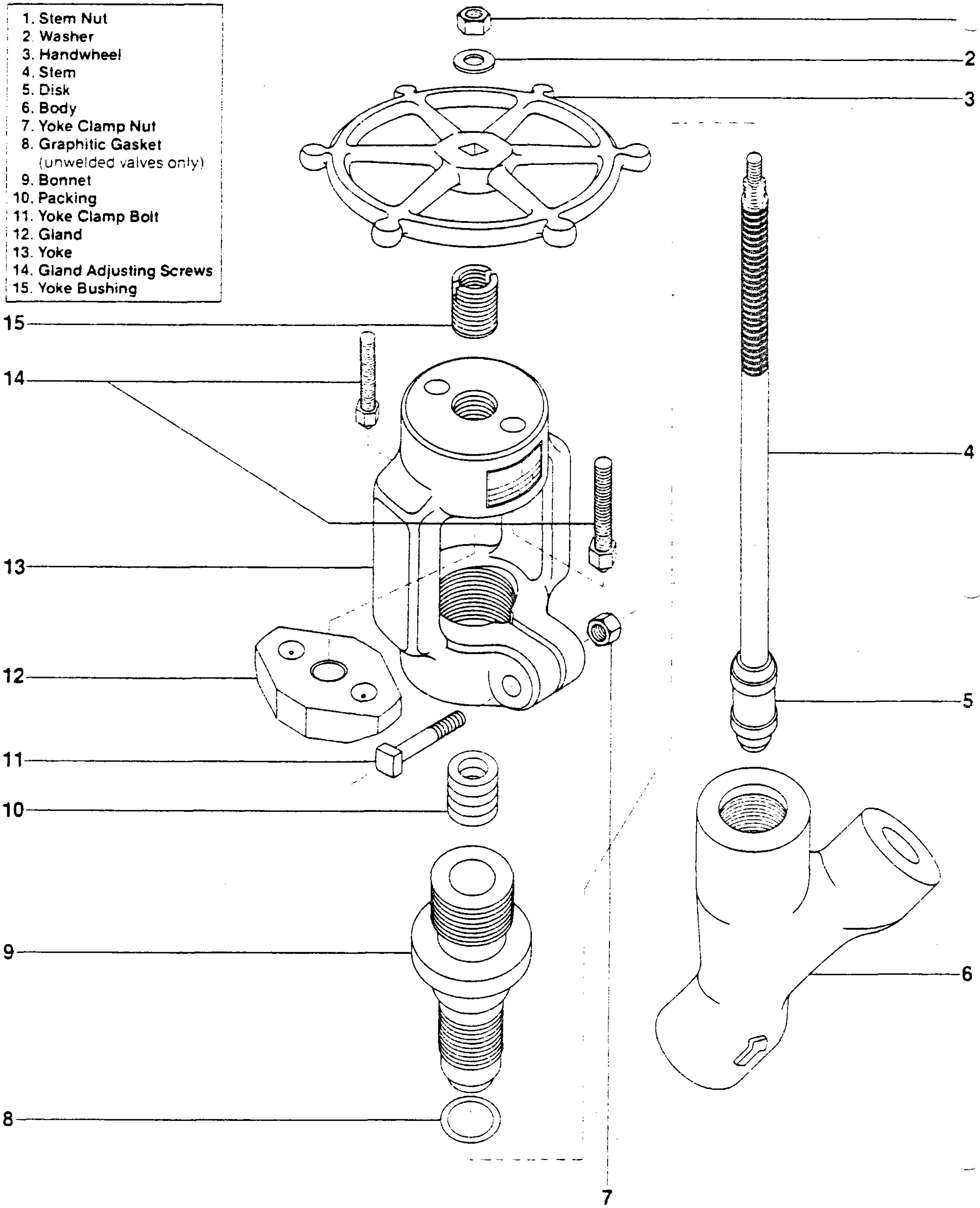
• The **Bonnet Torquing Tool** is essentially a torque wrench adapter that is used to remove and reassemble the bonnet of an unwelded Univalve.
The tool facilitates reassembly of the bonnet with the required torque—correctly applied—to ensure that the graphitic body-bonnet gasket is properly loaded to again establish a leak-tight seal. The tool may also be used to assemble and disassemble seal-welded valves.

Rockwell Customer Service

Consult your Rockwell representative for information on obtaining the new repair tools.
As always, field sales and service personnel are available to assist with maintenance and repairs involving any Rockwell valves. And they are backed up by factory-trained specialists to lend additional assistance whenever needed.
An improved low-maintenance Univalve design...new tools for fast in-line repairs...and reliable Rockwell service!

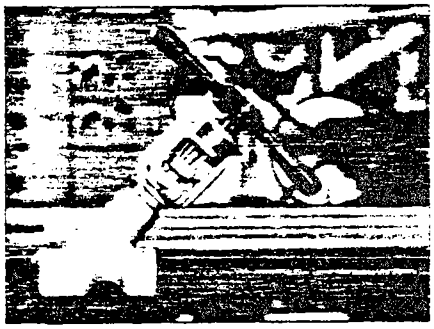
Exploded View

1. Stem Nut
2. Washer
3. Handwheel
4. Stem
5. Disk
6. Body
7. Yoke Clamp Nut
8. Graphitic Gasket (unwelded valves only)
9. Bonnet
10. Packing
11. Yoke Clamp Bolt
12. Gland
13. Yoke
14. Gland Adjusting Screws
15. Yoke Bushing

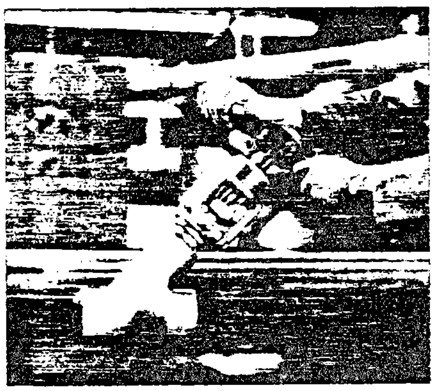


Disassembling The Univalve

CAUTION
Line pressure must be relieved before disassembling the valve.

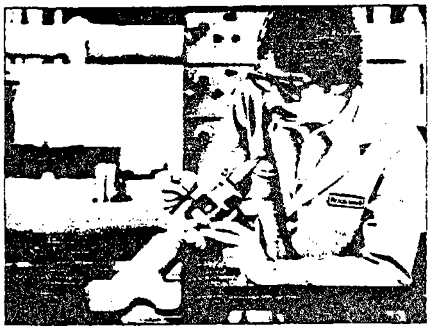


STEP 1
Double-check to make sure that line pressure has been relieved before disassembling the valve



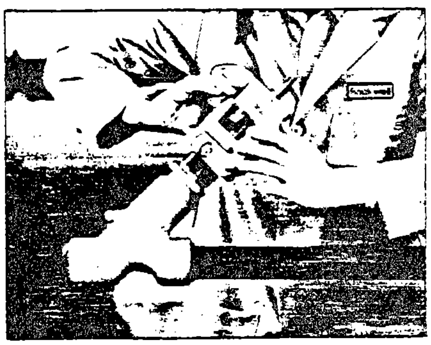
STEP 2
The valve should be in the open position and **not** against the body seat or backseat.

STEP 3
If the valve is manually operated, remove the lock nut and washer that attach the handwheel or impactor handle to the valve stem. Remove the handwheel or handle.
If the valve is motor operated, remove the actuator from the valve stem.

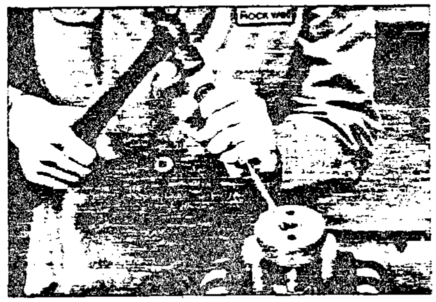


STEP 4
Loosen the two gland adjustment screws that rest against the packing gland by threading them higher into the yoke.

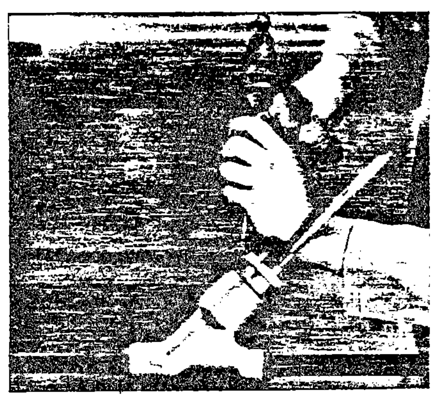
STEP 5
Loosen the yoke clamp bolt and nut. It is not necessary to completely remove them.



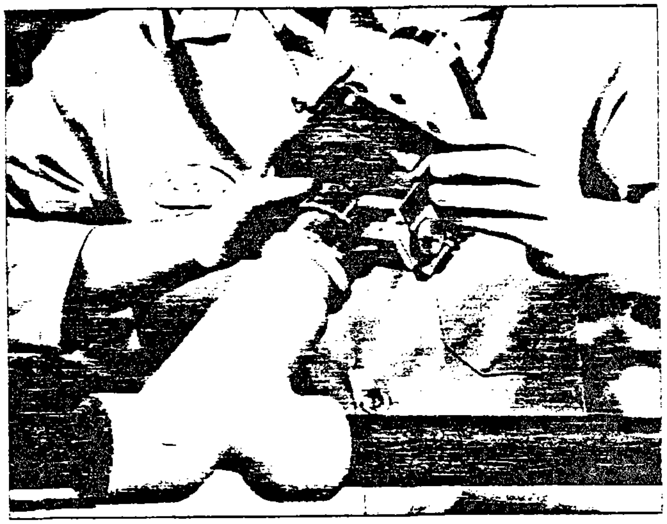
STEP 6
Remove the yoke assembly by unscrewing it from the bonnet. A gentle tap with a hammer might be necessary before the yoke will unscrew away from the bonnet. You may find it easier to remove the yoke by placing the handwheel on the stem to prevent the stem from rotating. When the yoke is even with the top of the stem, and you can no longer use the valve handwheel or handle to hold the stem, you will need to grasp the lower portion of the stem between the yoke and bonnet. If the yoke is turning freely, a cloth may be adequate to hold the stem. If this is not adequate, a strap wrench that will not damage the stem surface should be used



STEP 7
If the yoke bushing is damaged and must be removed, insert a 1/8" (or smaller) abrasive grinding wheel into the slot on top of the bushing. Using a standard grinding tool, work the grinder downward to remove yoke metal that was upset into the bushing during the valve assembly. Periodically during the grinding process, try to turn the bushing within the yoke to test how loose it is becoming. Once loosened, use a screwdriver in the slot to turn the bushing downward so that it is released through the bottom of the yoke.
To reinsert a new bushing, thread it into the yoke so that the top of the bushing is flush with the top of the yoke. Using a chisel and hammer, tap the yoke metal into the bushing slot creating an offset so that the bushing is tight within the yoke.

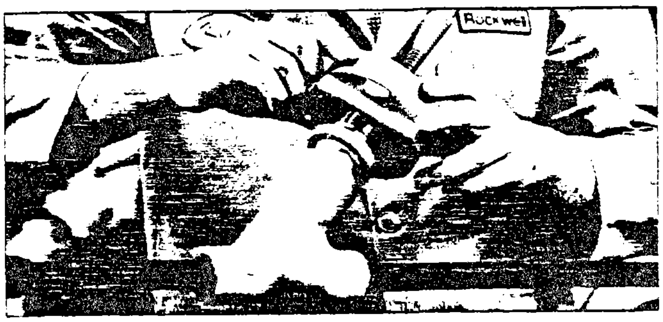


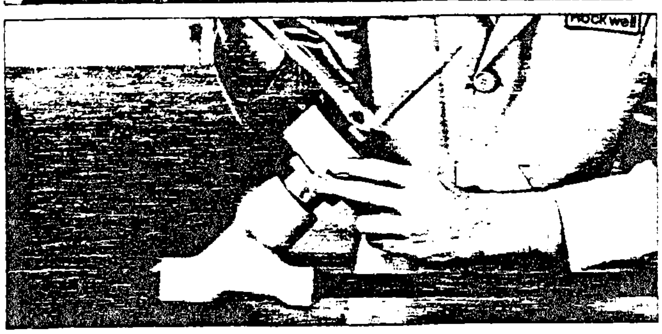
STEP 8
If the valve is unwelded, chip the atmospheric seal with a hammer and screwdriver (or other sharp instrument) and wire brush the seal area clean.



STEP 9

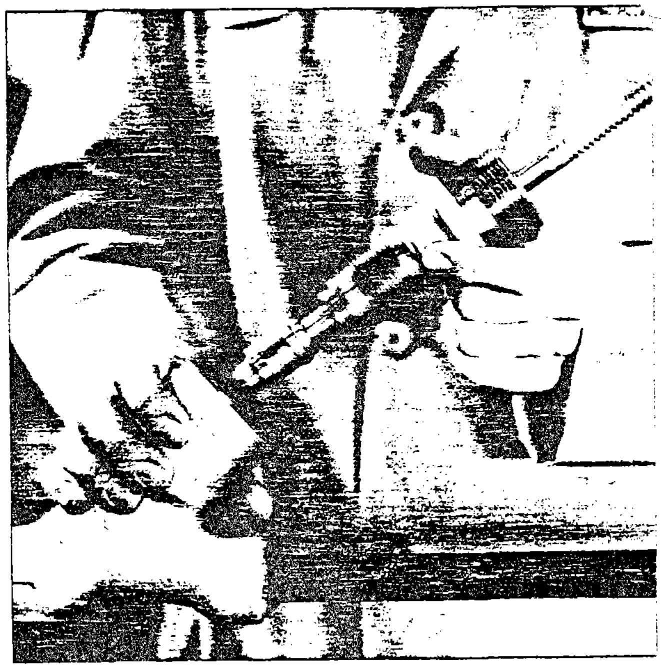
If the valve to be repaired is seal-welded, prepare the Seal Weld Cutting Machine for the weld cutting operation. Correct procedures for preparation, set-up and operation of the Seal Weld Cutting Machine can be found in Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine". If a cutting machine is not available, use one of the alternate methods shown on page 8.

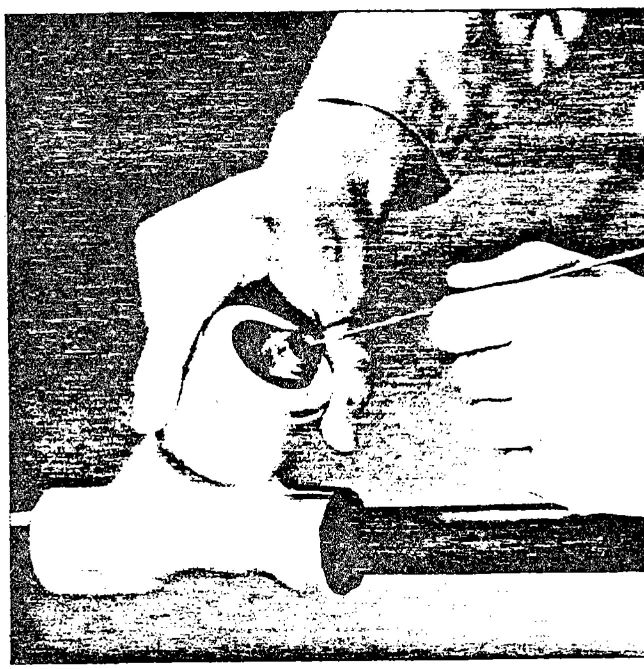




STEP 10

Refer to the chart on page 11 to select the proper torquing collar assembly (consisting of lock nut and collar). Screw the torquing collar clockwise on to the bonnet until it bottoms. A left-hand threaded lock nut is used to lock the torquing tool to the bonnet. Use a size ¾" drive with a breaker bar or torque wrench to turn the tool counterclockwise to remove the bonnet. After the valve has been reassembled, separate the lock nut and collar by turning the nut clockwise and the collar counterclockwise. If the valve has a graphitic body bonnet seal, a torque wrench should be used on the collar to properly load the bonnet. See chart on page 10.

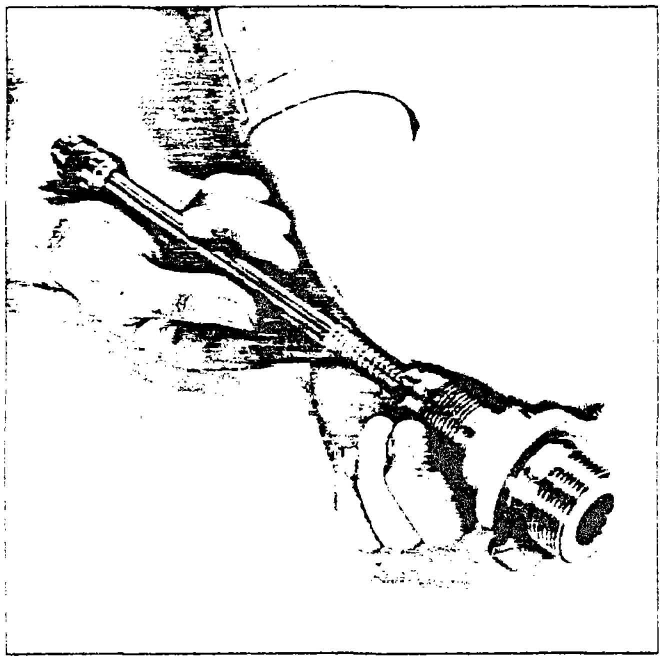




STEP 11

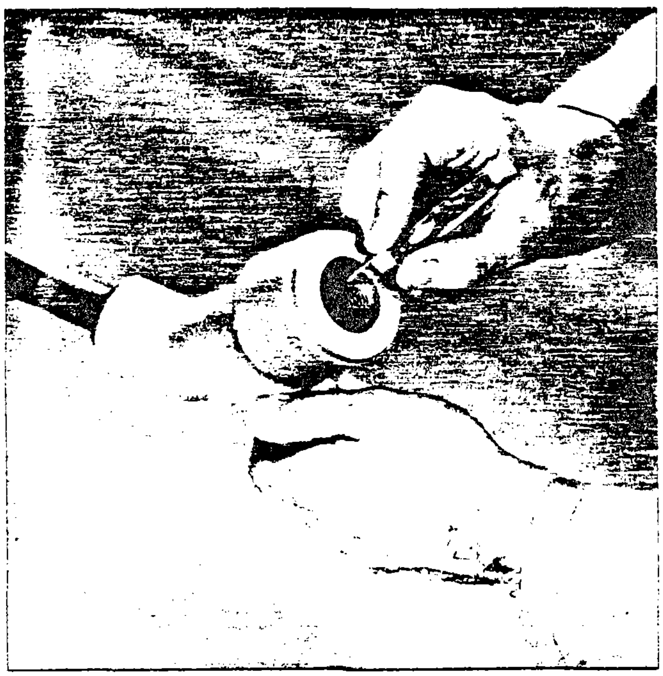
Remove the valve bonnet-stem-disk assembly if the valve being repaired is a stop valve (figure XXX2X). The disk in a stop-check valve (figure XXX6X) and the bonnet insert in welded class 4500 valves (figure 96X2X/96X6X) may be removed by forming a short piece of soft wire into the shape of an L and lifting up in the disk bore.

Disassembling The Univalve (cont'd.)



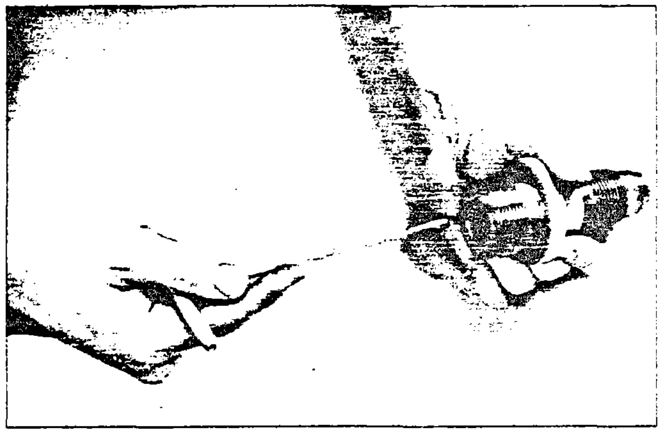
STEP 12

Remove the stem from the bonnet. It may be necessary to rotate the stem through the packing before it can be removed.



STEP 13

If the valve is unwelded, the graphitic gasket must be replaced by cutting it away from the valve bonnet. Care should be taken to not damage machined surfaces.



STEP 14

Using a packing removal tool, remove the valve packing. Standard Univalve packing contains four packing rings assembled as follows:

Top Ring—Crane 187-1X, zinc washer, **2nd Ring**—Graphite Ring, zinc washer, **3rd Ring**—Graphite Ring, zinc washer and **Bottom Ring**—Crane 187-1X

Class 4500 valves have four rings of Crane 187-IX packing—not a combination of Crane and Graphite. Stainless steel Univalves are equipped with a metal junk ring in the bottom of the packing chamber.

STEP 15

It is recommended that the graphitic gasket be replaced when an unwelded valve is disassembled for service work. The gasket should be slipped on to the bonnet and placed snugly against the off set. Then the bonnet should be carefully placed in the valve body.

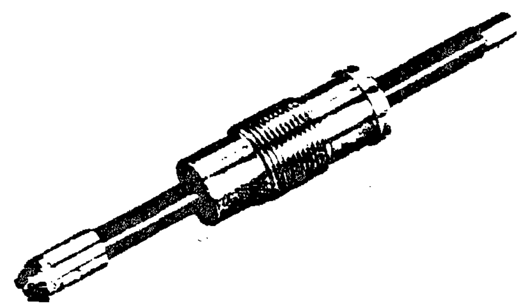
If the valve is unwelded, a new atmospheric seal should be applied. This can be done by spreading the sealing compound evenly around the body bonnet joint area with a putty knife (or similar flat, straight object). The compound will start to harden at room temperature in about 10 minutes, and will attain maximum stiffness in about 18 hours. The atmospheric seal compound for your Univalve is manufactured by Rockwell and should be purchased through your Rockwell representative

If the valve is a welded type, the assembly needs only to be hand-tightened so that the bonnet fits snugly against the body. For canopy-welded valves, reweld using the gas tungsten arc process. For fillet-welded valves, reweld with the shielded metal arc process.

Servicing Rockwell Univalves

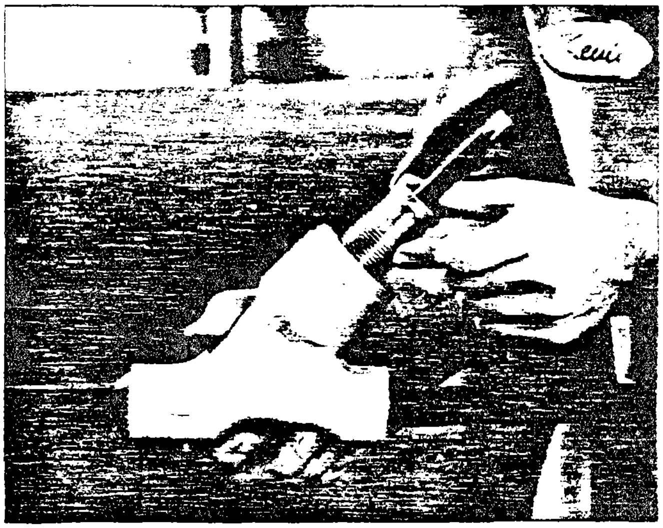
Although seat and disk damage to Rockwell Univalves is unlikely, severe service conditions and entrained solids in the line fluid may cause seat or disk damage. Outlined below are step-by-step procedures for fast, in-line repairs using the new Seat Refinishing Tool.

CAUTION
Line pressure must be relieved before making any repairs.



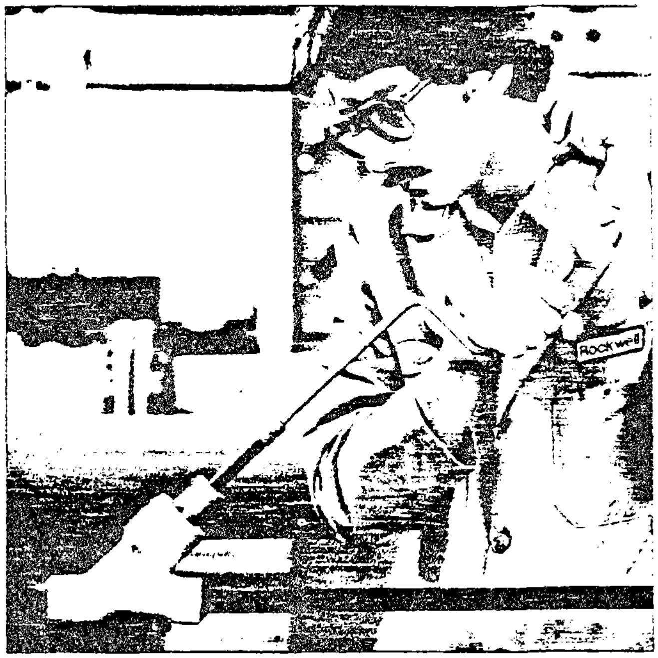
STEP 1

See pages 4-6 for proper disassembly procedures before performing repairs on the Univalves. Then, using the chart on page 15, select the proper Seat Refinishing Tool Arrangement for performing repairs on the seat area.



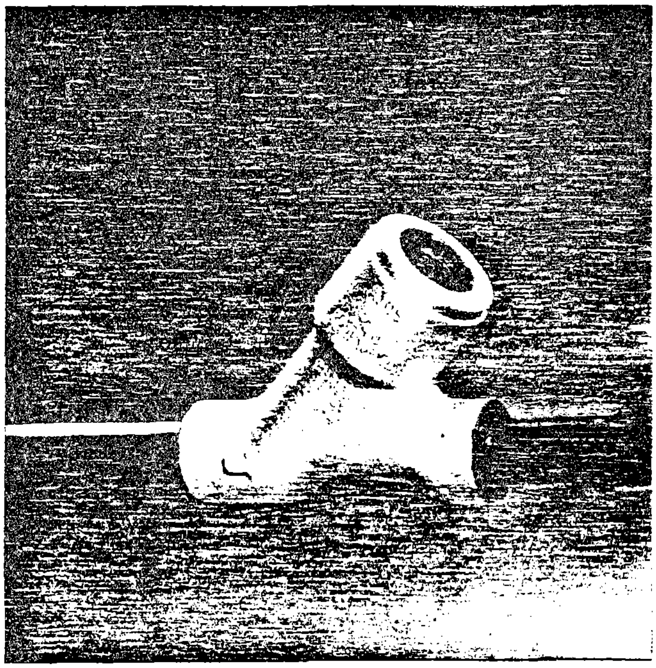
STEP 2

Take appropriate caution to make sure the inlet and outlet valve ports are blocked to prevent removed seat material from entering the line. Then, screw the Seat Refinishing Tool Assembly into the body while holding the shaft up to prevent tool and seat contact. The guide needs only to be hand-tightened.



STEP 3

The Seat Refinishing Tool is now ready for operation. Use a speed wrench to operate the tool. This manual process is fast, and means that a special air motor is not necessary. The tool assembly can easily be removed to inspect the seat and determine if more seat refinishing is required.

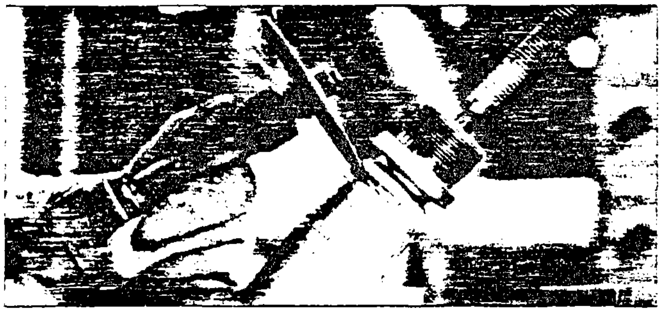


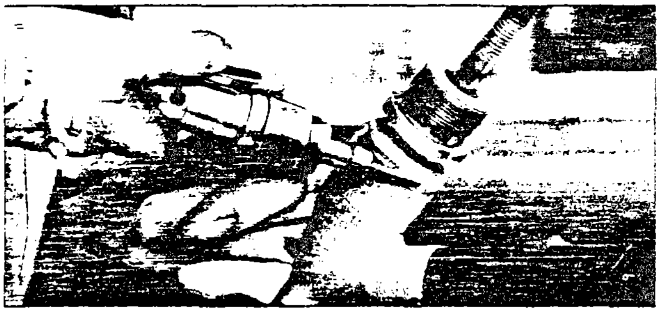
STEP 4

When a repair of the seat is finished, use a portable vacuum to remove loose chips.

Alternate Weld-Cutting Methods For Repairing Univalves

CAUTION
Line pressure must be relieved before making any repairs.





Grinding A Weld (for canopy seal Univalves) stainless steel valves

Open valve to backseat. Using a standard grinding wheel, remove the weld by grinding from the top of the body face and bonnet outside diameter (see photo). Continue this process around the valve until all weld is removed where the body and bonnet are joined together.

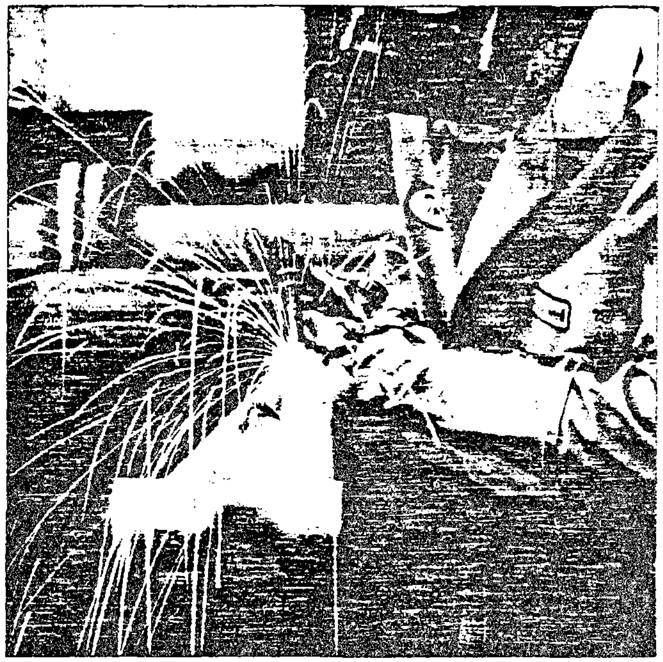
Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen the threads joining the body and bonnet.

Scarfing A Weld (for fillet-welded Univalves) carbon steel and low alloy valves

1. Air-arc method

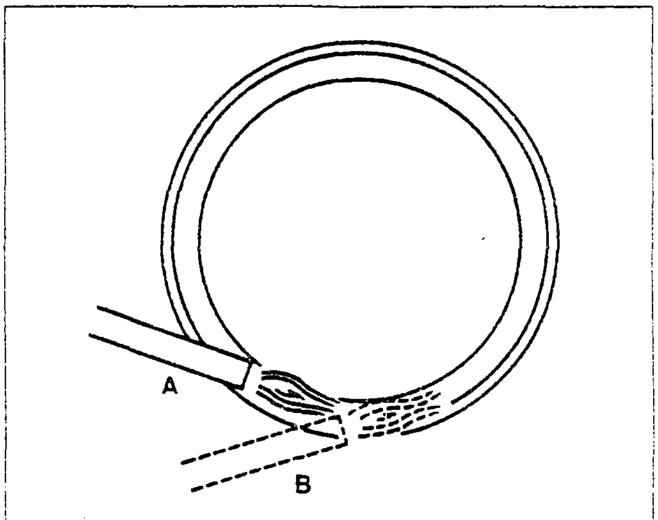
   Open valve to backseat. Using air-arc equipment, make a series of cuts in the valve weld (see photo and sketch). Continue making the cuts until the valve weld takes on a grooved, scarfed-out appearance. The cuts should be deep—a gap between the body and bonnet will appear.

   Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen the threads joining the body and bonnet.



2. Oxy-acetylene method

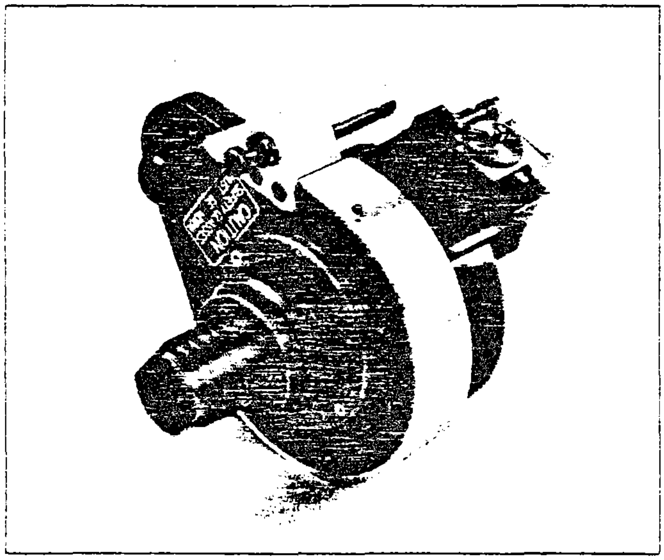
   Open valve to backseat. Using an oxy-acetylene torch equipped with a scarfing tip, make a series of cuts in the weld until it takes on a scarfed-out, grooved appearance. The cuts should be deep—a gap between the body and bonnet will appear. Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen threads joining the body and bonnet.



Sketch shows sequence of cuts necessary to remove fillet weld by both oxy-acetylene and Arc-Air methods. Place scarfing torch or welding electrode tangent to the bonnet as indicated in position A. When metal reaches cutting temperature, start blowing oxygen or air while moving torch backward. Weld metal should be blown away until the gap between body and bonnet is exposed. Move torch counterclockwise to position B—repeat until entire fillet weld is removed and gap is continuous. DO NOT REMOVE EXCESS MATERIAL FROM BONNET OR UPPER BODY FACE.

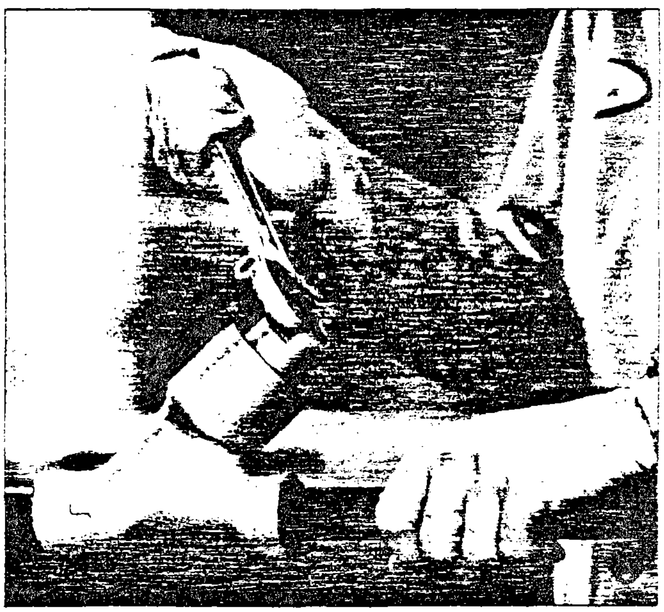
Servicing Univalve Check Valves

CAUTION
Line pressure must be relieved before servicing the valve.



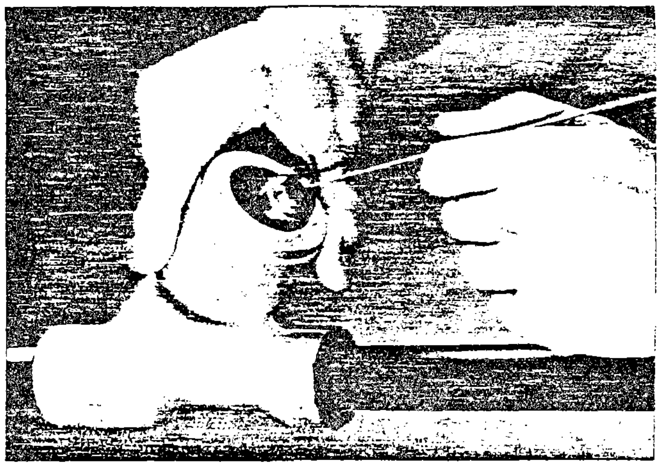
STEP 1

If the check valve to be repaired is seal-welded, prepare the Seal Weld Cutting Machine for the weld cutting operation. Correct procedures for preparation, set-up and operation of the Seal Weld Cutting Machine can be found in Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine". If a cutting machine is not available, use one of the alternative methods shown on page 8.



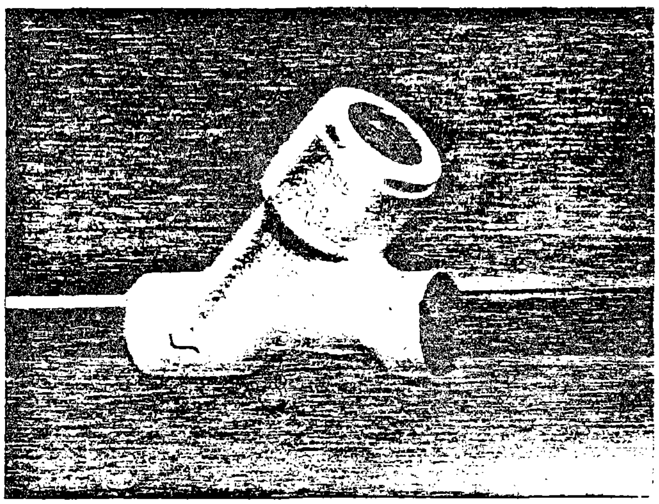
STEP 2

Once a seal-welded valve has been cut, it is ready for disassembly. If the check valve is unwelded, remove the atmospheric seal with a hammer and screwdriver (or other sharp instrument) and wire brush the seal area clean. Unscrew the valve cover from the body using the flats provided.



STEP 3

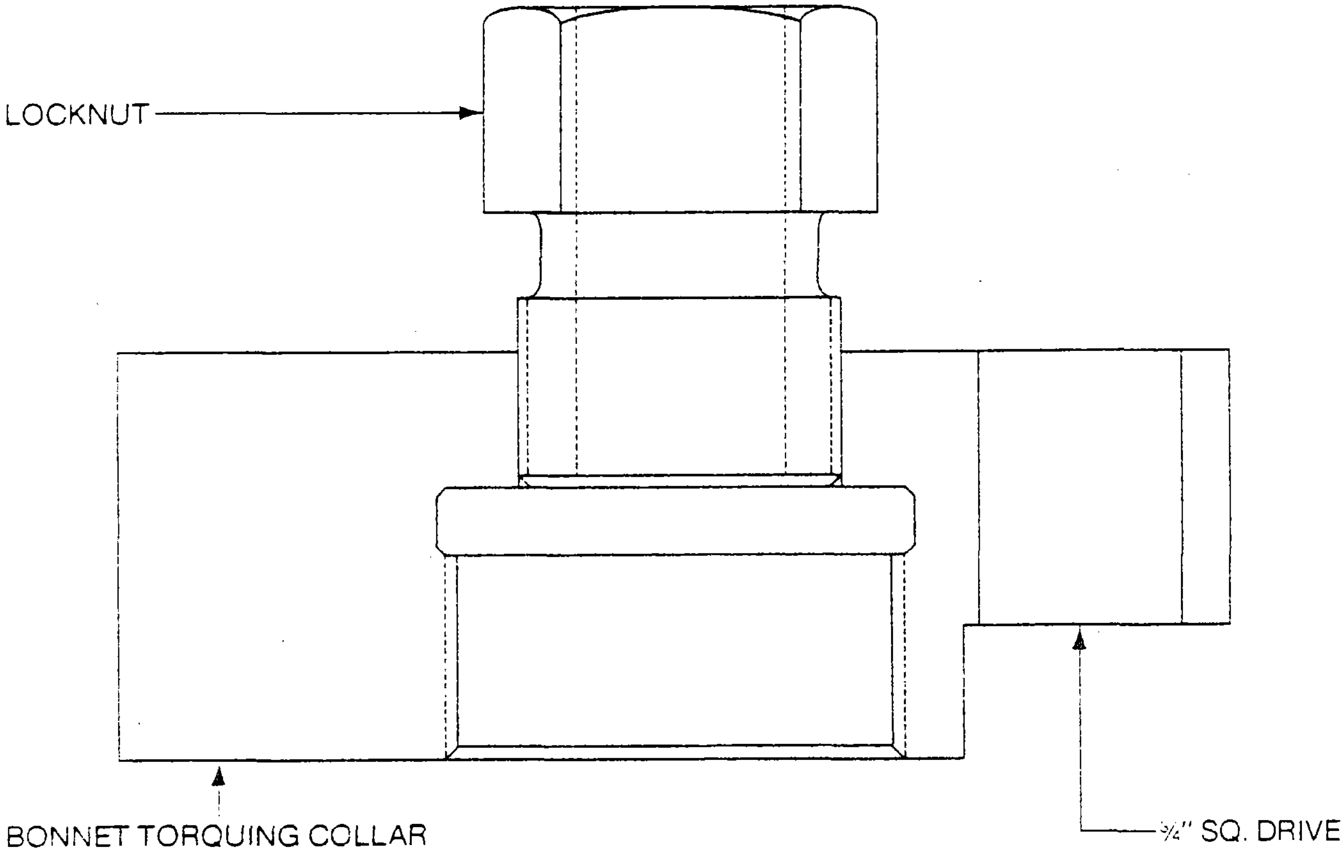
Remove the check valve spring and disk from the body bore. A short piece of soft wire formed into an L shape may be used to assist in disk removal by engaging it in the groove inside the disk.



STEP 4

The check valve is now ready for internal work. See the section entitled "Servicing Rockwell Univalves" (page 7) for correct repair procedures.

Bonnet Torquing Collar Assembly



Recommended Yoke Lock Bolt Torque

Bolt Dia.	Min. Torque
⅜ (9.5)	16/20 (22/27)
7/16 (11.1)	30/34 (41/46)

Recommended Gland Bolt Torque

Bolt Dia.	Min. Torque
⅜ (9.5)	9 (12)
7/16 (11.1)	15 (20)
½ (12.7)	20 (27)
9/16 (14.3)	30 (41)
⅝ (15.9)	40 (54)

Unwelded Univalve Bonnet Gasket Torques

Figure No.	Valve Size								
	½	¾	1	1¼	1½	2	2½	3	4
36220, 36224, 36228, 36264, 36268, 36270, 36274, 36278	50/60 (68/81)	50/60 (68/81)	50/60 (68/81)	90/105 (122/142)	90/105 (122/142)	140/155 (190/210)	260/290 (353/393)	260/290 (353/393)	400/440 (542/597)
66220, 66224, 66228, 66264, 66268, 66270, 66274, 66278	50/60 (68/81)	50/60 (68/81)	50/60 (68/81)	90/105 (122/142)	90/105 (122/142)	260/290 (353/393)	400/440 (542/597)	400/440 (542/597)	400/440 (542/597)
96224, 96228, 96264, 96268, 96274, 96278	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	430/475 (583/644)	430/475 (583/644)	430/475 (583/644)	430/475 (583/644)

Bolt diameters are in inches (millimeters are shown in parenthesis)
Torque values are in ft-lbs (newton meters are shown in parenthesis)

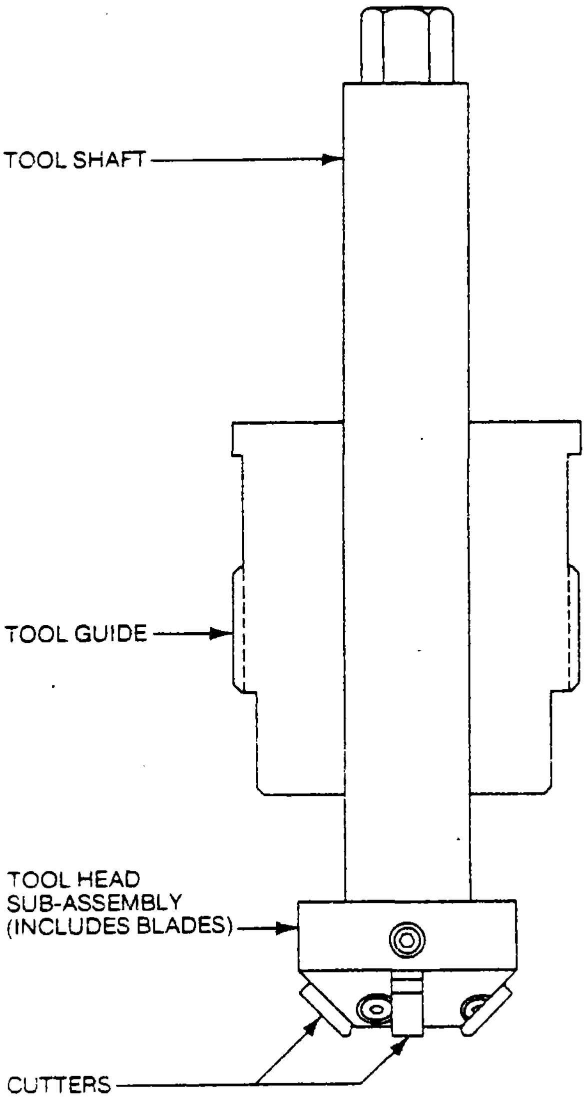
Bonnet Torquing Collar Assembly (cont'd.)

Size	Figure Number*	Bonnet Torquing Collar Assembly	Bonnet Torquing Collar	Locknut
¼	361	876744	875869	875852
¼	362	876744	875869	875852
½	361	876744	875869	875852
½	362	876744	875869	875852
¾	361	876744	875869	875852
¾	362	876744	875869	875852
1	361	876745	875870	875852
1	362	876744	875869	875852
1¼	361	876746	875871	875853
1¼	362	876746	875871	875853
1½	361	876746	875871	875853
1½	362	876746	875871	875853
2	361	876747	876031	875854
2	362	876746	875871	875853
2½	361	876748	876035	875854
2½	362	876749	876033	875854
3	361	876748	876035	875854
3	362	876749	876033	875854
4	361	876750	876036	875854
4	362	876750	876036	875854
¼	661	876744	875869	875852
¼	662	876744	875869	875852
½	661	876744	875869	875852
½	662	876744	875869	875852
¾	661	876744	875869	875852
¾	662	876744	875869	875852
1	661	876745	876870	875852
1	662	876744	875869	875852
1¼	661	876746	875871	875853
1¼	662	876746	875871	875853
1½	661	876746	875871	875853
1½	662	876746	875871	875853
2	661	876749	876033	875854
2	662	876749	876033	875854
2½	661	876750	876036	875854
2½	662	876750	876036	875854
3	661	876750	876036	875854
3	662	876750	876036	875854
4	661	876750	876036	875854
4	662	876750	876036	875854
¼	961	876751	876032	875854
¼	962	876751	876032	875854
½	961	876751	876032	875854
½	962	876751	876032	875854
¾	961	876751	876032	875854
¾	962	876751	876032	875854
1	961	876751	876032	875854
1	962	876751	876032	875854
1¼	961	876751	876032	875854
1¼	962	876751	876032	875854
1½	961	876751	876032	875854
1½	962	876751	876032	875854
2	961	876752	876037	875854
2	962	876752	876037	875854
2½	961	876752	876037	875854
2½	962	876752	876037	875854
3	961	876752	876037	875854
3	962	876752	876037	875854
4	961	876752	876037	875854
4	962	876752	876037	875854

* These numbers are the first three digits of the valve figure number

Seat Refinishing Tool Assembly

Univalve - Carbon Steel



Size	Fig. No.*	Refinishing Tool Assembly	Refinishing Tool Guide	Refinishing Tool Shaft	Refinishing Tool Head Assembly	Replacement Cutters†	No. of Replacement Cutters on Head Assembly
¼	**361**	876708	875920	875942	876111	—	—
¼	**362**	876708	875920	875942	876111	—	—
½	**361**	876708	875920	875942	876111	—	—
½	**362**	876708	875920	875942	876111	—	—
¾	**361**	876708	875920	875942	876111	—	—
¾	**362**	876708	875920	875942	876111	—	—
1	**361**	876709	875920	875942	876112	—	—
1	**362**	876708	875920	875942	876111	—	—
1¼	**361**	876710	875922	875942	876113	876703	3
1¼	**362**	876710	875922	875942	876113	876703	3
1½	**361**	876711	875921	875943	876114	876703	5
1½	**362**	876710	875922	875942.	876113	876703	3
2	**361**	876712	875924	875943	876115	876703	5
2	**362**	876713	875923	875943	876114	876703	5
2½	**361**	876714	875926	875944	876116	876703	7
2½	**362**	876715	875925	875944	876115	876703	5
3	**361**	876714	875926	875944	876116	876703	7
3	**362**	876715	876725	875944	876115	876703	5
4	**361**	876716	875927	875944	876116	876703	7
4	**362**	876716	875927	875944	876116	876703	7
¼	**661**	876708	875920	875942	876111	—	—
¼	**662**	876708	875920	875942	876111	—	—
½	**661**	876708	875920	875942	876111	—	—
½	**662**	876708	875920	875942	876111	—	—
¾	**661**	876708	875920	875942	876111	—	—
¾	**662**	876708	875920	875942	876111	—	—
1	**661**	876709	875920	875942	876112	—	—
1	**662**	876708	875920	875942	876111	—	—
1¼	**661**	876710	875922	875942	876113	876703	3
1¼	**662**	876710	875922	875942	876113	876703	3
1½	**661**	876710	875922	875942	876113	876703	3
1½	**662**	876710	875922	875942	876113	876703	3
2	**661**	876715	875925	875944	876115	876703	5
2	**662**	876715	875925	875944	876115	876703	5
2½	**661**	876716	875927	875944	876116	876703	7
2½	**662**	876716	875927	875944	876116	876703	7
3	**661**	876716	875927	875944	876116	876703	7
3	**662**	876716	875927	875944	876116	876703	7
4	**661**	876716	875927	875944	876116	876703	7
4	**662**	876716	875927	875944	876116	876703	7
¼	**961**	876777	876772	875942	876112	—	—
¼	**962**	876777	876772	875942	876112	—	—
½	**961**	876777	876772	875942	876112	—	—
½	**962**	876777	876772	875942	876112	—	—
¾	**961**	876777	876772	875942	876112	—	—
¾	**962**	876777	876772	875942	876112	—	—
1	**961**	876777	876772	875942	876112	—	—
1	**962**	876777	876772	875942	876112	—	—
1¼	**961**	876777	876772	875942	876112	—	—
1¼	**962**	876777	876772	875942	876112	—	—
1½	**961**	876777	876772	875942	876112	—	—
1½	**962**	876777	876772	875942	876112	—	—
2	**961**	876715	875925	875944	876115	876703	5
2	**962**	876715	875925	875944	876115	876703	5
2½	**961**	876715	875925	875944	876115	876703	5
2½	**962**	876715	875925	875944	876115	876703	5
3	**961**	876715	875925	875944	876115	876703	5
3	**962**	876715	875925	875944	876115	876703	5
4	**961**	876715	875925	875944	876115	876703	5
4	**962**	876715	875925	875944	876115	876703	5

* These numbers are the first three digits of the valve figure number.

† Where a dash is indicated, replacement cutters are not available. For new cutters, the entire head assembly must be replaced.

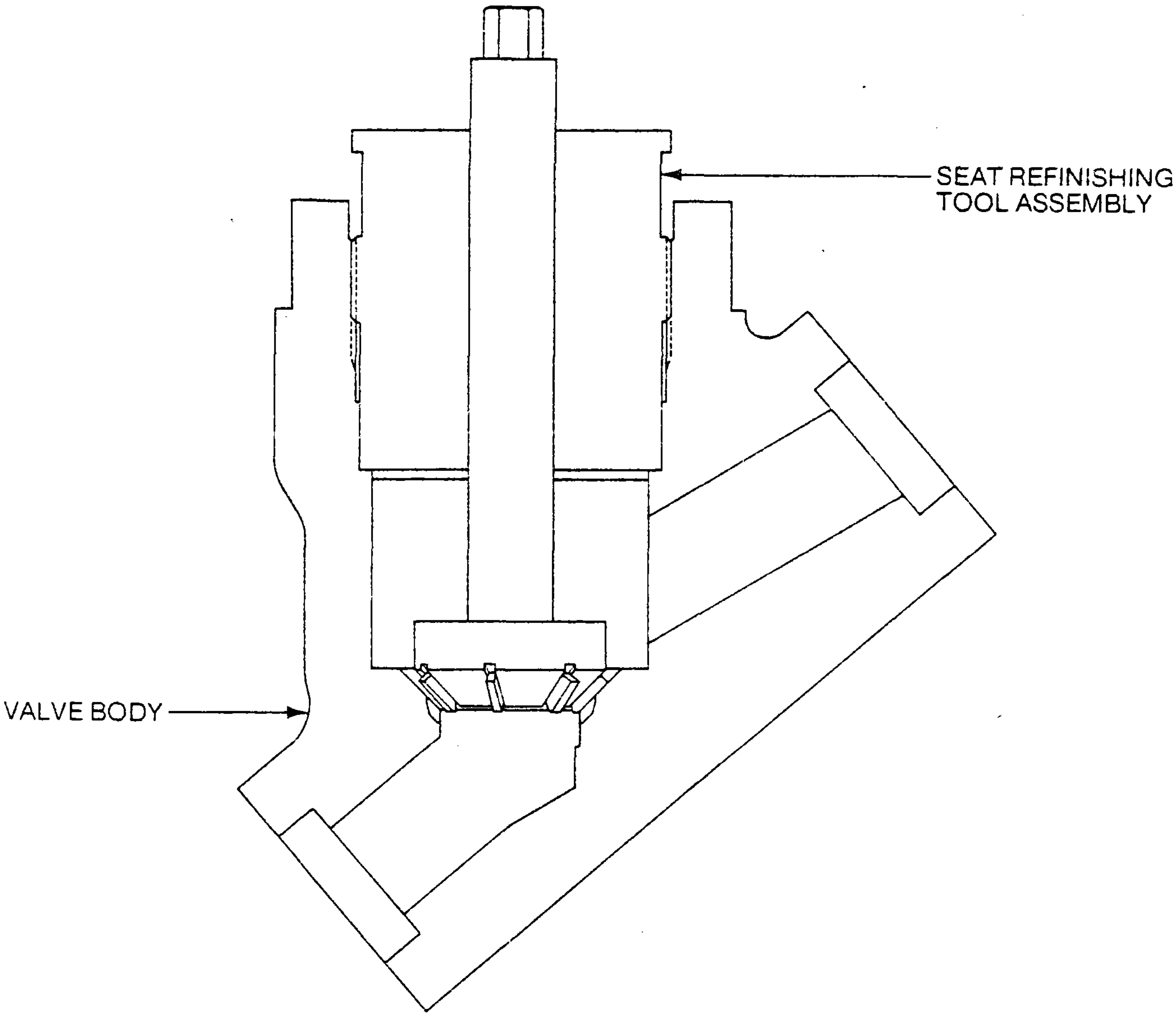
Univalve - Stainless Steel

Size	Fig. No.*	Refinishing Tool Assembly	Refinishing Tool Guide	Refinishing Tool Shaft	Refinishing Tool Head Assembly	Replacement Cutters†	No. of Replacement Cutters on Head Assembly
¼	**361**	876717	875929	875942	876111	—	—
¼	**362**	876717	875929	875942	876111		
½	**361**	876717	875929	875942	876111	—	—
½	**362**	876717	875929	875942	876111		
¾	**361**	876717	875929	875942	876111	—	—
¾	**362**	876717	875929	875942	876111		
1	**361**	876718	875929	875942	876112	—	—
1	**362**	876717	875929	875942	876111		
1¼	**361**	876719	875930	875942	876113	876703	3
1¼	**362**	876719	875930	875942	876113	876703	3
1½	**361**	876720	875931	875943	876114	876703	5
1½	**362**	876719	875930	875942	876113	876703	3
2	**361**	876721	875933	875943	876115	876703	5
2	**362**	876722	875918	875943	876114	876703	5
2½	**361**	876723	875917	875944	876116	876703	7
2½	**362**	876724	875934	875944	876115	876703	5
3	**361**	876723	875917	875944	876116	876703	7
3	**362**	876724	875934	875944	876115	876703	5
4	**361**	876725	875936	875944	876116	876703	7
4	**362**	876725	875936	875944	876116	876703	7
¼	**661**	876717	875929	875942	876111	—	—
¼	**662**	876717	875929	875942	876111		
½	**661**	876717	875929	875942	876111	—	—
½	**662**	876717	875929	875942	876111		
¾	**661**	876717	875929	875942	876111	—	—
¾	**662**	876717	875929	875942	876111		
1	**661**	876718	875929	875942	876112	—	—
1	**662**	876717	875929	875942	876111		
1¼	**661**	876719	875930	875942	876113	876703	3
1¼	**662**	876719	875930	875942	876113	876703	3
1½	**661**	876719	875930	875942	876113	876703	3
1½	**662**	876719	875930	875942	876113	876703	3
2	**661**	876724	875934	875944	876115	876703	5
2	**662**	876724	875934	875944	876115	876703	5
2½	**661**	876725	875936	875944	876116	876703	7
2½	**662**	876725	875936	875944	876116	876703	7
3	**661**	876725	875936	875944	876116	876703	7
3	**662**	876725	875936	875944	876116	876703	7
4	**661**	876725	875936	875944	876116	876703	7
4	**662**	876725	875936	875944	876116	876703	7
¼	**961**	876779	876773	875942	876112	—	—
¼	**962**	876779	876773	875942	876112		
½	**961**	876779	876773	875942	876112	—	—
½	**962**	876779	876773	875942	876112		
¾	**961**	876779	876773	875942	876112	—	—
¾	**962**	876779	876773	875942	876112		
1	**961**	876779	876773	875942	876112	—	—
1	**962**	876779	876773	875942	876112		
1¼	**961**	876779	876773	875942	876112	—	—
1¼	**962**	876779	876773	875942	876112		
1½	**961**	876779	876773	875942	876112	—	—
1½	**962**	876779	876773	875942	876112		
2	**961**	876724	875934	875944	876115	876703	5
2	**962**	876724	875934	875944	876115	876703	5
2½	**961**	876724	875934	875944	876115	876703	5
2½	**962**	876724	875934	875944	876115	876703	5
3	**961**	876724	875934	875944	876115	876703	5
3	**962**	876724	875934	875944	876115	876703	5
4	**961**	876724	875934	875944	876115	876703	5
4	**962**	876724	876934	875944	876115	876703	5

* These numbers are the first three digits of the valve figure number

† Where a dash is indicated, replacement cutters are not available. For new cutters, the entire head assembly must be replaced.

Typical Univalve Seat Refinishing Tool Arrangement



Typical Univalve Seat Refinishing Tool Arrangement (cont'd.)

Size	Figure Number*	Material†	Tool Assembly
¼	361	CS	876708
¼	362	CS	876708
¼	361	SS	876717
¼	362	SS	876717
½	361	CS	876708
½	362	CS	876708
½	361	SS	876717
½	362	SS	876717
¾	361	CS	876708
¾	362	CS	876708
¾	361	SS	876717
¾	362	SS	876717
1	361	CS	876709
1	362	CS	876708
1	361	SS	876718
1	362	SS	876717
1¼	361	CS	876710
1¼	362	CS	876710
1¼	361	SS	876719
1¼	362	SS	876719
1½	361	CS	876711
1½	362	CS	876710
1½	361	SS	876720
1½	362	SS	876719
2	361	CS	876712
2	362	CS	876713
2	361	SS	876721
2	362	SS	876722
2½	361	CS	876714
2½	362	CS	876715
2½	361	SS	876723
2½	362	SS	876724
3	361	CS	876714
3	362	CS	876715
3	361	SS	876723
3	362	SS	876724
4	361	CS	876716
4	362	CS	876716
4	361	SS	875725
4	362	SS	876725
¼	661	CS	876708
¼	662	CS	876708
¼	661	SS	876717
¼	662	SS	876717
½	661	CS	876708
½	662	CS	876708
½	661	SS	876717
½	662	SS	876717
¾	661	CS	876708
¾	662	CS	876708
¾	661	SS	876717
¾	662	SS	876717
1	661	CS	876709
1	662	CS	876708
1	661	SS	876718
1	662	SS	876717
1¼	661	CS	876710
1¼	662	CS	876710
1¼	661	SS	876719
1¼	662	SS	876719
1½	661	CS	876710
1½	662	CS	876710
1½	661	SS	876719
1½	662	SS	876719

*These numbers are the first three digits of the valve figure number
†CS denotes carbon steel material
SS denotes stainless steel material

Size	Figure Number*	Material†	Tool Assembly
2	661	CS	876715
2	662	CS	876715
2	661	SS	876724
2	662	SS	876724
2½	661	CS	876716
2½	662	CS	876716
2½	661	SS	876725
2½	662	SS	876725
3	661	CS	876716
3	662	CS	876716
3	661	SS	876725
3	662	SS	876725
4	661	CS	876716
4	662	CS	876716
4	661	SS	876725
4	662	SS	876725
¼	961	CS	876777
¼	962	CS	876777
¼	961	SS	876779
¼	962	SS	876779
½	961	CS	876777
½	962	CS	876777
½	961	SS	876779
½	962	SS	876779
¾	961	CS	876777
¾	962	CS	876777
¾	961	SS	876779
¾	962	SS	876779
1	961	CS	876777
1	962	CS	876777
1	961	SS	876779
1	962	SS	876779
1¼	961	CS	876777
1¼	962	CS	876777
1¼	961	SS	876779
1¼	962	SS	876779
1½	961	CS	876777
1½	962	CS	876777
1½	961	SS	876779
1½	962	SS	876779
2	961	CS	876715
2	962	CS	876715
2	961	SS	876724
2	962	SS	876724
2½	961	GS	876715
2½	962	CS	876715
2½	961	SS	876724
2½	962	SS	876724
3	961	CS	876715
3	962	CS	876715
3	961	SS	876724
3	962	SS	876724
4	961	CS	876715
4	962	CS	876715
4	961	SS	876724
4	962	SS	876724

*These numbers are the first three digits of the valve figure number.
†CS denotes carbon steel material
SS denotes stainless steel material

Low alloy valves are the same as carbon steel material.

4.6.7 CP #9 Furnished Valves

4.6.7.1 Identification

The following manual valves were furnished by the Waldinger Corp. CP#9.

4.6.7.2 Description of Information

See Section 4.7.13 for valve specifications.

4.6 Check and Stop Check Valves

4.6.9 Preheater Water Stop Check Valve

4.6.9.1

Identification Tag Number	Description
V-FW-10-301	Preheater Water Stop Check Valve
V-FW-10-302	Preheater Water Stop Check Valve

4.6.9.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 2 1/2 inch 302Y

Rocketdyne Specification No.: SP42-089 (following)

Material: Body: Carbon Steel

Weight: 72 lb.

4.6.9.3 Prescribed Service

Water

4.6.9.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.9.5 Special Cautions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.9.6 Periodic Service

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.9.7 Parts List

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.9.8 Special Tools

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.9.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.9.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-089
J. K. CHENG	Rockwell International Corporation	TYPE EQUIPMENT
APPROVALS	Rocketdyne Division	DATE 2-14-80
E G Spencer 3/13/80	Canoga Park, California	SUPERSEDES SPEC. DATED:
	SPECIFICATION	REV. LTR. / PAGE 1 of 3

TITLE

THERMAL STORAGE PREHEATER WATER STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	TPWSK-1 AND TPWSK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	2 1/2 INCH BUTT WELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	580 PSIG @ 540 F
CRACKING PRESSURE:	2.0 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 51 MINIMUM
ANSI RATING:	300 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATE VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. • WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

DESIGN FEATURES: (CONT'D)

- HANDWHEEL MUST BE KEPT BELOW 125°F

4.6 Check and Stop Check Valves

4.6.10 Preheater Panel Feed Water Inlet Check Valve

4.6.10.1

Identification Tag Number	Description
V-FW-200-202	Preheater Panel Feed Water Inlet Check Valve

4.6.10.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penna.
Part Number	:	4 inch Fig. 36178T
Rocketdyne Specification No.	:	SP42-058 (following)
Material	:	Body: Carbon Steel
Weight	:	89 lb

4.6.10.3 Prescribed Service

Water

4.6.10.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.10.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.10.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.10.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.10.9 Maintenance Instructions

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.10.10 Acceptance Tests

None

PREPARED BY			NUMBER SP42-058
J. W. LEWELLEN	FSCM NO. 02602	TYPE EQUIPMENT	
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 3-10-80	
E. Spencer 3/10/80		SUPERSEDES SPEC. DATED: 1-4-80	
J. G. Absalom 3/12/80	**SPECIFICATION**	REV. LTR. A	PAGE 1 of 2

TITLE

WATER INLET CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification suspersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø

TAG NUMBER:	RPWICK (COMPONENT SHALL BE TAG IDENTIFIED)
Ø TYPE:	PISTON
CONNECTIONS:	4 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 160 PIPE.
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	WATER AT 2185 PSIG MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
Ø CAPACITY:	Cv = 100 MINIMUM
LEAKAGE:	INTERNAL - 30 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
CRACKING PRESSURE:	2 PSID MAXIMUM
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop Check Valves

4.6.12 Superheater Steam Check Valve

4.6.12.1 Identification

Identification Tag Number	Description
V-ST-5-301	Superheater Steam Check Valve
V-ST-5-302	Superheater Steam Check Valve

4.6.12.2 Description

Manufacturer: Jenkins

Part Number: 6 inch Fig. 2026

Rocketdyne Specification No.: SP42-109 (following)

Material: Body: Carbon Steel

Weight: 148 lb.

4.6.12.3 Prescribed Service

Steam

4.6.12.4 Vendor

Jenkins

4.6.12.5 Special Cautions

4.6.12.6 Periodic Service

4.6.12.7 Parts List - see following

4.6.12.8 Special Tools

4.6.12.9 Maintenance Instructions

4.6.12.10 Acceptance Tests

Class 300

CAST STEEL SWING CHECK

FIG. 1026, *Flanged, 2"-10"*
FIG. 2026, *Weld, 2"-10"*

300 psi at 850°F.

Bolted Cover

Trim Combination #2 for Steam, Air, Gas or Water, 850°F. Max.; for Oil and Oil Vapor, 1000°F. Max.

Also available with Trim Combinations #4, 5 and 6.

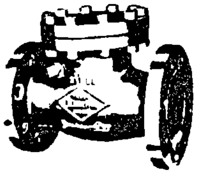
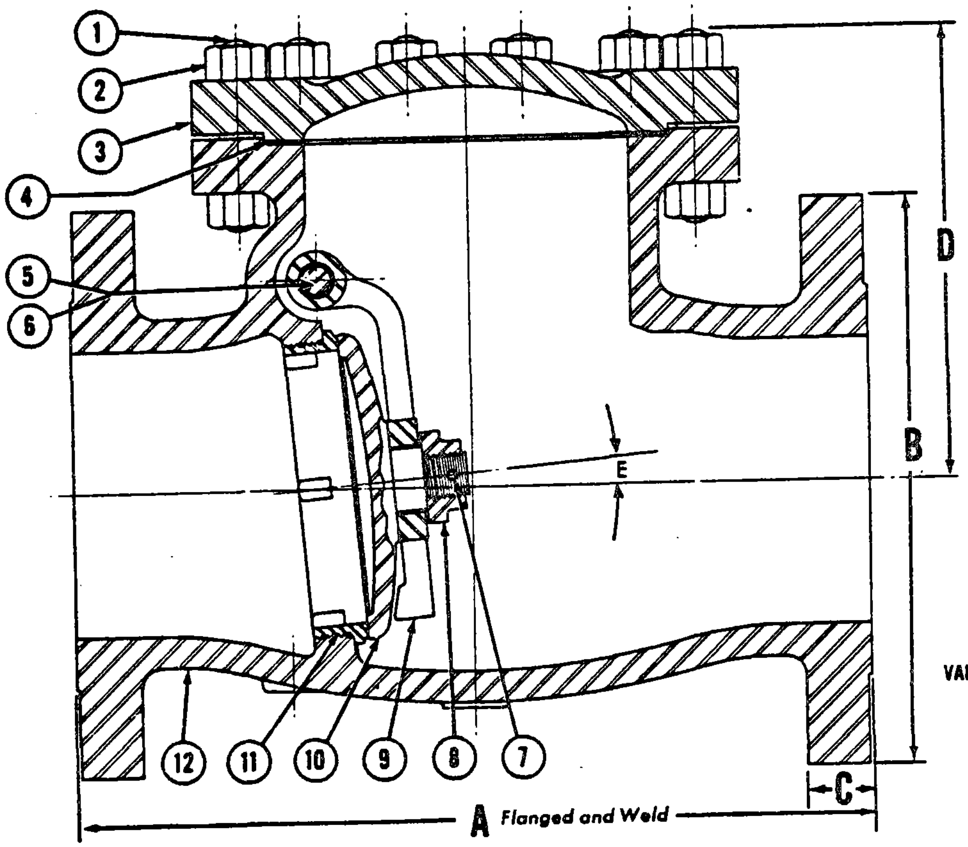


FIG. 1026



VALVES HAVE 2 BOSSES.

MATERIALS LIST for "B2" Valves

PART		SPECIFICATION
1	COVER STUD BOLT	ASTM A193, GR. B7, Steel
2	COVER BOLT NUT	ASTM A194, CL. 2H, Steel
3	COVER	ASTM A216, GR. WCB, Carbon Steel
4	GASKET	Stainless Steel & Asbestos
5	SIDE PLUGS	Steel
6	HANGER PIN	13% Chromium Stainless Steel
7	HANGER NUT PIN	Stainless Steel Cotter Pin
8	HANGER NUT	13% Chromium Stainless Steel
9	HANGER	Carbon Steel
10	DISC	13% Chromium Stainless Steel
11	SEAT RING	13% Chromium Stainless Steel
12	BODY	ASTM A216, GR. WCB, Carbon Steel

DIMENSIONS - INCHES

SIZES	A*	B	C*	D	E°
2	10½	6½	⅞	5⅝	5°
2½	11½	7½	1	6 11/16	5°
3	12½	8¼	1⅛	7 11/16	5°
4	14	10	1¼	8¼	5°
†5	13¾	11	1⅜	9 3/16	5°
6	17½	12½	1 7/16	10½	5°
8	21	15	1⅞	13⅝	15°
10	24½	17½	1⅞	16 3/16	5°

*Includes 1/16" raised faces on flanged end valves.

†5" flanged ends only.

Diameter of bore of weld end valves equals inside diameter of Schedule 40 pipe. When specially ordered, valves can be furnished with ends for other pipe schedules.

WEIGHTS-POUNDS

SIZE	2"	2½"	3"	4"	5"	6"	8"	10"
Fig. 1026	39	65	80	125	170	223	445	660
Fig. 2026	27	45	56	93		148	297	485

PREPARED BY	FSCM NO. 02602	NUMBER SP42-109
J. K. Cheng	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 9-3-80
E. C. Spencer 9/15/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 4-30-80
J. H. Absalom 9/15/80	**SPECIFICATION**	REV. LTR. B / PAGE 1 of 2

TITLE
SUPERHEATER STEAM CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TSSCK-1, TSSCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	SWING CHECK
CONNECTIONS:	6 INCH BUTT WELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	450 PSIG @ 580 F
CRACKING PRESSURE:	2.0 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 870 MINIMUM
Ø ANSI RATING:	300 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.6 Check and Stop Check Valves

4.6.17 Charging Pump Oil Stop Check Valve

4.6.17.1 Identification

Identification Tag Number	Description
V-TO-4-307	Charging Pump Oil Stop-Check Valve
V-TO-5-308	Charging Pump Oil Stop-Check Valve

4.6.17.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 8 inch Fig. 607Y

Rocketdyne Specification No.: SP42-110 (following)

Material: Body: Carbon Steel

Weight: 530 lb.

4.6.17.3 Prescribed Service

Oil

4.6.17.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.17.5 Special Cautions

See Rockwell Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.17.6 Periodic Service

See Rockwell Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.17.7 Parts List

See Rockwell Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.17.8 Special Tools

See Rockwell Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.17.9 Maintenance Instructions

See Rockwell Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.17.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-110
J. K. CHENG J.C.	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rockwell Rocketdyne Division**	DATE 4-30-80
E. Spencer 5-2-80	Canoga Park, California	SUPERSEDES SPEC. DATED: 2-14-80
5/5/80	**SPECIFICATION**	REV. LTR. A
		PAGE 1 of 3

TITLE

PUMP STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	TFESK-1, TFESK-2, TFCSK-1, TFCSK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	ANGLE
CONNECTIONS:	8 INCH BUTTWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600 °F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
CRACKING PRESSURE	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 1208 MINIMUM FOR TFESK-1 AND -2, Cv = 1250 MINIMUM FOR TFCSK-1 AND -2
ANSI RATING:	600 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

DESIGN FEATURES: (CONT'D)

- HANDWHEEL MUST BE KEPT BELOW 125°F.

4.6 Check and Stop Check Valves

4.6.18 Extraction Pump Oil Stop Check Valve

4.6.18.1 Identification Tag Number / Description

Identification Tag Number	Description
V-TO-12-316	Extraction Pump Oil Stop Check Valve
V-TO-13-319	Extraction Pump Oil Stop Check Valve

4.6.18.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 8 inch Fig. 607Y

Rocketdyne Specification No.: SP42-110 (following)

Material: Body: Carbon Steel

Weight: 530 lb.

4.6.18.3 Prescribed Service

Oil

4.6.18.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.18.5 Special Cautions

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.18.6 Periodic Service

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.18.7 Parts List

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.18.8 Special Tools

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.18.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-377R1 (See paragraph 4.6.5.11)

4.6.18.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-110
J. K. CHENG J.C.	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	DATE 4-30-80
E. Spencer 5-2-80		SUPERSEDES SPEC. DATED: 2-14-80
f. G. Abrahan 5/5/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 3

TITLE

PUMP STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Rockwell International Corporation
Rocketdyne Division
Canoga Park, California
FSCM NO. 02602

NUMBER	REVISION LETTER								PAGE
SP42-110	A								2

TAG NUMBER:	TFESK-1, TFESK-2, TFCSK-1, TFCSK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	ANGLE
CONNECTIONS:	8 INCH BUTTWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600 °F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
CRACKING PRESSURE	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 1208 MINIMUM FOR TFESK-1 AND -2, Cv = 1250 MINIMUM FOR TFCSK-1 AND -2
ANSI RATING:	600 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

DESIGN FEATURES: (CONT'D)

- HANDWHEEL MUST BE KEPT BELOW 125°F.

4.6 Check and Stop Check Valves

4.6.19 Superheater Oil Check Valve

4.6.19.1

Identification Tag Number	Description
V-TO-12-318	Superheater Oil Check Valve
V-TO-13-321	Superheater Oil Check Valve

4.6.19.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 8 inch Fig. 392

Rocketdyne Specification No.: SP42-106 (following)

Material: Carbon Steel

Weight: 380 lb.

4.6.19.3 Prescribed Service

Oil

4.6.19.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.19.5 Special Cautions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.19.6 Periodic Service

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.19.7 Parts List

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.19.8 Special Tools

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.19.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.19.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-106
J. K. CHENG J.C.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 4-30-80
E C Spencer 5-2-80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 2-14-80
J. H. Abrahm 5/5/80		REV. LTR. A / PAGE 1 of 2

TITLE

SUPERHEATER INLET FLUID CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TSFCK-1, TSFCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	PISTON
CONNECTIONS:	8 INCH RF FLANGE
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600°F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
Ø CRACKING PRESSURE:	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 293 MINIMUM
Ø ANSI RATING:	300 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL- NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

ϕ

4.6 Check and Stop Check Valves

4.6.20 Booster Oil Check Valve

4.6.20.1

Identification Tag Number	Description
V-TO-25-326	Boiler Oil Check Valve
V-TO-26-327	Boiler Oil Check Valve

4.6.20.2 Description

Manufacturer: Crane, Irvine, Calif.

Part Number: 8 inch Fig. 147-1/2-XU

Rockvetdyne Specification No.: SP42-107 (following)

Material: Body: Carbon Steel

Weight: 350 lb.

4.6.20.3 Prescribed Service

Oil

4.6.20.4 Vendor

Crane, Irvine, Calif.

4.6.20.5 Special Cautions

4.6.20.6 Periodic Service

4.6.20.7 Parts List

4.6.20.8 Special Tools

4.6.20.9 Maintenance Instructions

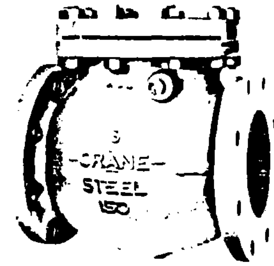
4.6.20.10 Acceptance Tests

Design Data and Features:

- These valves comply with applicable requirements of Standards: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34.
- Material—carbon steel. Other materials available when specified—Crane No. 5, 7, 9, LCB and "Arctic" steels.
- Trim—X or XU—suitable for a broad spectrum of services to 1100F. Other trims available when specified include: L or LU and A or AU.
- Outside weight and lever to assist in rapid closing or for sensitive balance at low velocities is available on valves up to 8" in size.

CRANE

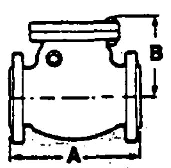
SWING CHECK VALV
CLASS 150 • 2" to



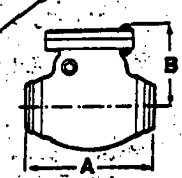
No. 147

Bolted Cap
No. 148, Threaded
No. 147, Flanged
No. 147½, Butt-Welding

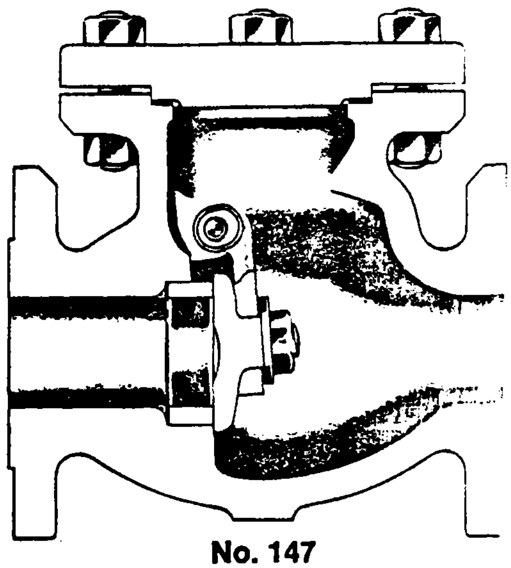
Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
285 psi @ −20F to 100F



Weights and Dimensions



Valve N.P.S.	Weight—Pounds 148	147	147½	Dimensions—Inches A 148	A 147	A 147½	B
2	27	35	25	8.0	8.0	8.0	5.00
2½	40	53	40	8.5	8.5	8.5	5.50
3	50	70	50	9.5	9.5	9.5	6.00
4	96	115	92	11.5	11.5	11.5	7.00
5	—	140	120	—	13.0	13.0	8.00
6	—	200	165	—	14.0	14.0	9.00
8	—	390	350	—	19.5	19.5	10.25
10	—	470	370	—	24.5	24.5	13.56
12	—	635	560	—	27.5	27.5	15.56
14	—	1200	1010	—	31.0	31.0	18.38
16	—	1450	1250	—	30.0	30.0	20.62



No. 147

PREPARED BY	FSCM NO. 02602	NUMBER SP42-107
J. K. CHENG J.C.	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 9-3-80
E. G. Spencer 9/15/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 4-30-80
J. H. Absalom 9/15/80	**SPECIFICATION**	REV. LTR. B — PAGE 1 of 2

TITLE

BOILER INLET FLUID CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TBFCK-1, TBFCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	SWING CHECK
CONNECTIONS:	8 INCH BUTTWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600°F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
Ø CRACKING PRESSURE:	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 878 MINIMUM
Ø ANSI RATING:	150 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATE VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.6 Check and Stop Check Valves

4.6.21 Auxiliary Pump Oil Stop Check Valve

4.6.21.1

Identification Tag Number	Description
V-TO-305-325	Auxilliary Pump Oil Stop Check Valve

4.6.21.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 4 inch Fig. 604Y

Rocketdyne Specification No.: SP42-111 (following)

Material: Body: Carbon Steel

Weight: 190 lb.

4.6.21.3 Prescribed Service

Oil

4.6.21.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.21.5 Special Cautions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.21.6 Periodic Service

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.21.7 Parts List

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.21.8 Special Tools

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.21.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.6.5.11)

4.6.21.10 Acceptance Tests

None

PREPARED BY J.K.C. J. K. CHENG APPROVALS E. [illegible] 5-2-80 J. G. [illegible] 5/5/80	FSCM NO. 02602 **Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California # SPECIFICATION	NUMBER SP42-111 TYPE EQUIPMENT DATE 4-30-80 SUPERSEDES SPEC. DATED: 2-14-80 REV. LTR. A PAGE 1 of 3

TITLE
AUXILLIARY FLUID STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TFASK (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	4 INCH BUTT WELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600°F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
CRACKING PRESSURE:	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 187 MINIMUM
ANSI RATING:	600 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

DESIGN FEATURES: (CONT'D)

- HANDWHEEL MUST BE KEPT BELOW 125°F

4.6 Check Valves

4.6.23 Identification / Description

Identification	Description
TAG No. V-VT(SCE)-3	Check Valve downstream of PV-647B

4.6.23.1 Description

Manufacturer:	Lunkenheimer
Part No.:	3072-65.540
Material:	A216 WCB
Weight:	268 lb.

4.6.23.2 Maintenance Instructions

See following pipe valve specification data sheet.

CHECK VALVE

SCE TAG NO.: 310

SCE MATERIAL CODE NO.: ______ V-VT-SCE-3

RATING: 300#

END CONNECTION: R.F. Flanged, ANSI B 16.5 3" thru 10" Sch. 40 *

BODY MATERIAL: Cast C.S. ASTM A216 GR WCB

BONNET TYPE: Bolted

DISC: Swing Type, 13% Chromium

SEAT: Stellite Faced Seat Ring

PACKING OR SEAL: Ring Joint or Asbestos Gasket

STEM: ________

OPERATOR: ________

REMARKS: For Vertical or Horizontal Installation.
To Conform to ANSI B 16.10

MANUFACTURER	FIG. NO.	SIZE RANGE	NOTES
Crane	159	2" - 16"	

ACCEPTABLE VALVE EQUIVALENTS

Powell	3061A	1" - 16"	
Lunkenheimer	3072	1-1/2" - 10"	

SERVICE: Medium Pressure Steam, Feedwater, Condensate

No.	Revisions	U.O. No.	Date
		7361	

Approved | O.K. | O.K. | Ck'd. | Made

Location SOLAR ONE GEN. STATION

PIPING VALVE SPECIFICATION

Southern California Edison

M-33654 SHEET 29

Approved | O.K. | O.K. | Ck'd. | Made || Approved | O.K. | O.K. | Ck'd. | Made || Approved | O.K. | O.K. | Ck'd. | Made

4.6 Check Valves

4.6.23 Identification — Description

Identification	Description
Tag No. V-VT-(SCE)-6	Check Valve for PV-640

4.6.23.1 Description

Manufacturer: Lunkenheimer
Part No.: 3072-69-540
Material: A216 WCB
Weight: 680 lb.

4.6.23.2 Maintenance Instruction

See following pipe valve specification data sheet.

CHECK VALVE

SCE TAG NO.: 310

SCE MATERIAL CODE NO.: V-VT-SCE-6

RATING: 300#

END CONNECTION: R.F. Flanged, ANSI B 16.5 3" thru 10" Sch. 40

BODY MATERIAL: Cast C.S. ASTM A216 GR WCB

BONNET TYPE: Bolted

DISC: Swing Type, 13% Chromium

SEAT: Stellite Faced Seat Ring

PACKING OR SEAL: Ring Joint or Asbestos Gasket

STEM: ----------

OPERATOR: ----------

REMARKS: For Vertical or Horizontal Installation.
To Conform to ANSI B 16.10

MANUFACTURER	FIG. NO.	SIZE RANGE	NOTES
Crane	159	2" - 16"	

ACCEPTABLE VALVE EQUIVALENTS

Powell	3061A	1" - 16"	
Lunkenheimer	3072	1-1/2" - 10"	

SERVICE: Medium Pressure Steam, Feedwater, Condensate

No.	Revisions		U.O. No.	Date
			7361	
Approved	O.K.	O.K.	Ck'd.	Made

Location SOLAR ONE GEN. STATION

PIPING VALVE SPECIFICATION

Southern California Edison

M-33054 SHEET 29

Approved	O.K.	O.K.	Ck'd.	Made	Approved	O.K.	O.K.	Ck'd.	Made	Approved	O.K.	O.K.	Ck'd.	Made

4.6 Check and Stop Check Valves

4.6.24 Swing Check Valve for Control Valve PV-640

4.6.24.1 Identification | Description

Identification	Description
Tag No. V-VT-SCE-9	Swing Check Valve

4.6.24.2 Description

Manufacturer:	Crane Company Indian Orchard, Mass.
Part No.:	10"-159-1/2 x U-7
Specification No:	DOE Spec. No. 40P700-295
Material:	Body: A217-WC6
Weight:	487 lb.

4.6.24.3 Prescribed Service

Steam

4.6.24.4 Vendor

Crane Company

4.6.24.5 Special Cautions

See Technical Data (following)

4.6.24.6 Periodic Service

See Technical Data (following)

4.6.24.7 Part List

See Technical Data (following)

4.6.24.8 Special Tools

None required

4.6.24.9 Maintenance Instructions

See Technical Data (following)

4.6.24.10 Acceptance Test

See Technical Data (following)

Book 4

TECHNICAL DATA

TECHNICAL MANUAL

FURNISHED TO

TOWNSEND BOTTOM, INC.
P.O.#3004-C21700

FOR

SOLAR ONE PILOT PLANT

CRANE I.O. NO. 515067

FINAL AUG 27 1981

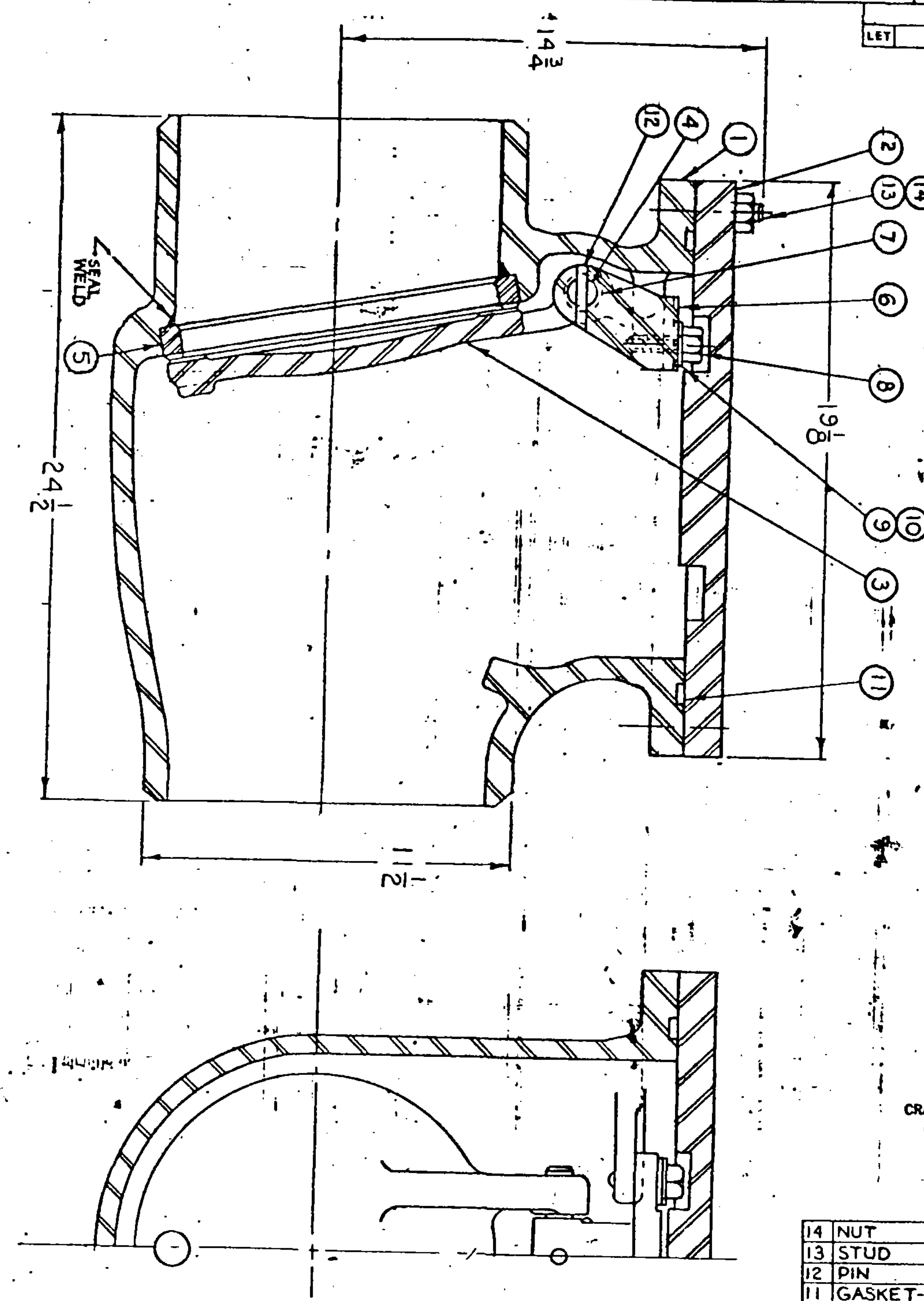
Stearns-Roger

[illegible] C21700 AUG 27 '81

S-R No. E-7A File No. 2

CRANE CO. • INDIAN ORCHARD PLANT

203 HAMPSHIRE STREET, INDIAN ORCHARD, MASSACHUSETTS



CRANE CO. INDIAN ORCHARD PLANT
CERTIFIED FOR CONSTRUCTION

FINAL MAR 1 6 1981

TOWNSEND BOTTOM INC.
CUST. P.O. # 3004-C21700
SOLAR ONE PILOT PLANT
ENGINEER'S PROJECT NO. C-21700
CRANE I.O.-S.O. # 515067 ITEM 01
QTY: 1
TAG: Y-YT SCE9

WELD ENDS TO P.F.I. ES-21 (1972) FIG. 2
FOR SCH. 40 PIPE

NO	NAME	REQ	MATERIAL
14	NUT	40	A194-2H
13	STUD	20	A193-B16
12	PIN	1	A276-410
11	GASKET-FLEX.	1	316L W/R ASB.
10	WASHER	2	STEEL
9	LOCKWASHER	2	STEEL
8	BOLT	2	A307-B
7	PIN BUSHING	1	A276-410
6	HINGE BRACKET	1	A217-WC6
5	SEAT RING	1	A387-11 HARD FACED
4	HINGE PIN	1	A276-410
3	DISC	1	A217-WC6 S.C. FACED
1	COVER	1	A387-11
1	BODY	1	A217-WC6

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED
FINISH MACHINED SURFACES PER SPS-
TOLERANCE ON MACHINED DIMS PER SPS-
TOLERANCE ON CAST DIMENSIONS PER SPS-
CHAMFERS & RADII PER SPS-6
BREAK ALL OTHER SHARP EDGES
PATTERN
MADE FROM

CRANE CO
INDIAN ORCHARD PLANT

10" NO. 159½XU-7 (LIST 301) W.E. SWING CHECK VALVE WITH FLEX. GASKET (A.N.S.I.-300#)

DRAWN M.K. 2-1980
CHKD J.J.K. 3-1980
APPR 3/1/80
SCALE
ASSEMBLY 5085103C-09
DESTROY PRINTS PRIOR TO

FB-165834 REV. 0

APPROX. WT.-487#

4.6.24-3

WORKING DWG.
ACTIVE
INACTIVE

B-144B

4.6.24-4

MANUFACTURING BILL OF MATERIAL

SIZE 10-0 | CAT NO 0159-4 | VALVE TYPE XU-7 300#SW CK | ASSEMBLY NO. 163834101 | REV 0 | DWG B | PAGE 1 OF | QTY ORDERED 1 | BY JCM | DATE 01/28/81

SO-515067 ITEM 01. APRGT NO. | CUST. TOWNSEND BOTTOM | REV. | H/M STATUS COMP FINAL | I SHOP I FDRY I A+T I SHIP I

MATERIAL-WC6 CR-13 TR | CUSTOMER INSP & REPORTS REQ TAG V-VT SCE 9

*=DENOTES RECOMMENDED SPARE PARTS

LEVEL	PART NO.	R #	DWG. SIZE/SPP PAGE	PART NAME	MATERIAL AND DESCRIPTION	QTY ASSY	DWG DET	PROD QTY	ROUTING	REQUISITION OR S.O. NO.
1	159636006	1	B	BODY SUB ASSEMBLY	WELD END E-152010001	1.0	135	1.0		
.2	165725001	0	E	BODY REF.DRAWING	A217-WC6 BODY PRINT B-159636	1.0		1.0		
..3	652913017B			WELD END BODY	A217-75 GR WC6	1.0		1.0		
...4	652913017			WELD END BODY	A217-75 GR-WC6	1.0		1.0		
.2	149326007	A	B	SEAT RING	A387-11 #6 STELLITE FACED	1.0		1.0		
..3	M98387104			PLATE.AS	A387-74A GR11 1 1/4 TK	45.0		45.0		
..3	M39300003			POWDER	#6 PLASMA	0.0		0.8		
.2	M36100000			COATED ROD	8018-B2 (WC6)	1.2		1.2		
.2	128414800	4	B	DISC & BRACKET S/A	WC6 410 FACED DISC	1.0		1.0		
..3	128414085	4	B	DISC	A217-WC6 410 FACED	1.0		1.0		
...4	617823017B			DISC	A217-75 GR WC6	1.0		1.0		
....5	617823017			DISC	A217-75 GR-WC6	1.0		1.0		
...4	M37035000			COIL WIRE	430	2.4		2.4		
..3	114527060	1	E	DISC BUSHING	A276-410	2.0		2.0		
...4	512410106			BAR.SS RD	A276-75 T 410 1 3/8 DIA	0.7		1.4		
..3	659411001	1	E	HINGE BRACKET	A217-WC6	1.0		1.0		
...4	600374017			HINGE BRACKET	A217-75 GR WC6	1.0		1.0		
..3	044346016	7	E	HINGE PIN	A276-410	1.0		1.0		
...4	512410100			BAR.SS RD	A276-75 T 410 1 DIA	1.4		1.4		
..3	900101271	0	SPP-26	PIN	A276-410 1/4"X 2 1/8"	1.0		1.0		
...4	512410004			BAR.SS RD	A276-75 T 410 1/4 DIA	0.1		0.1		
.2	901521455	0	SPP-11	BOLT	A307-74 GR B 5/8-11 X 2 LG	2.0		2.0		
1	153133005	2		CAP	A387-11(MARK A387-11 ON PART)	1.0	2	1.0		
.2	M99397200			PLATE.AS	A387-74A GR 11 2 TK	239.0		239.0		

RECOMMENDATIONS FOR THE STORAGE OF VALVES

1. The storage area should be reasonably level, well drained, and have a paved surface, and be protected by a roof and sheltered from rain, dust, dirt and the elements.

2. Packing should be removed from the stuffing box if the valve is to be stored for over 6 months. Valve stuffing box should be repacked before valve is installed. It is highly recommended that only new material be used when repacking.

3. If storage is less than 6 months, the stem should be repositioned periodically (by turning the handwheel) to differing locations to minimize galvanic corrosion. (Once a month may be adequate.)

4. If storage is greater than 6 months, desiccant bags should be placed inside the valve to prevent internal corrosion.

5. Ends should be adequately sealed off to prevent entrance of moisture or foreign material, and protected to prevent damage to weld ends or gasket surfaces.

6. Valves should be skidded and covered with heavy gauge polyethylene, or other suitable material, secured to the base of the skid with nailed battens, however, do not seal all sides since air circulation is necessary.

7. Crane Co. is anxious to assist in assuring that equipment is stored, installed, used and maintained in the best practical manner. Inasmuch as the material is not in our possession, you can however understand that Crane Co. cannot accept any responsibility for the storage of material.

CRANE CO., INDIAN ORCHARD PLANT

PE-145263-2
11/4/77 - WAS
Revised 10/26/79 JFP

INSTALLATION, ADJUSTMENT, TEST, LUBRICATION AND MAINTENANCE

OF

CRANE SWING CHECK VALVES

Installation: Flange End

Before installing the valve, examine the lines for foreign matter and clean them thoroughly. Make sure no foreign material is in the ports of the valve. Locate the valve in place after the gaskets have been fastened to either the valve or pipe flanges. Bolt the valve into the line. Draw down the bolts evenly, tightening down the bolts at 180 degrees from one another while proceeding around the flange (cross-tightening).

Installation: Weld End

Before installing the valve, examine the lines for foreign matter and clean them thoroughly. Make sure no foreign material is in the ports of the valve. Locate the valve in place and weld.

Adjustment and Test

After installation, check all joints for leaks. In the event of leakage, draw down the bolts on both sides of the leak as well as the bolts at the point of leakage.

Lubrication

Crane swing check valves require no lubrication.

Maintenance

Crane swing check valves require no maintenance.

Special Tools Required

None

CRANE CO., INDIAN ORCHARD PLANT

PE-138209, Rev. 2

5.0 ASSISTANCE FROM CRANE CO.

5.1 Questions arising during use of Crane Valves should be referred to your local Crane Representative.

5.2 Crane Co. operates Valve Service Centers which specialize in reconditioning or modification of valves. Your local representative will arrange details upon request.

4.0 VALVE REPAIR

4.1 The many different types and sizes of bolted bonnet valves supplied by Crane necessitates utilization of variations in design detail. Guidance relative to conditions common to Crane designs follow.

4.2 Repair or replacement of malfunctioning parts should be controlled by competent valve mechanics.

4.3 A replacement gasket should be available prior to disassembly; though re-use of ring type bonnet joint gaskets is possible.

4.4 Gate valve discs and bodies should be match marked to facilitate installation of the disc in the same orientation relative to body seats as at factory assembly.

4.5 The desirability of maintaining cleanliness of parts during reassembly cannot be overemphasized.

4.6 Lubrication of threaded parts as required for proper assembly is necessary.

4.7 Assure that the actuating mechanism is operating properly - reference Paragraph 2.8.

4.8 Follow the maintenance instructions per Paragraph 3.0 to verify suitability of product for continued usage.

3.3 Valve stems should not be backseated during operation. A tightly seated backseat may give a dangerously false indication that the stuffing box does not leak. It is recommended that manually operated valves be opened fully (to backseat) and then the stem nut turned approximately 1/2-revolution in the closing direction, when valves are to be positioned wide open.

3.4 Repacking of stuffing box while under pressure is <u>not</u> recommended; though a backseat which isolates pressure from the stuffing box could facilitate this procedure under emergency conditions.

3.5 Lubricate stems and stem nuts periodically, using a good grade of high quality grease. Grease should be injected into the stem nut bearing area by means of the injection fitting provided. A light film applied to threaded stem surface after cleaning is adequate.

3.6 Preserve the Identification Plate of all valves. I.D. Plates are fastened in a conspicuous location, frequently on a yoke arm. The numbers are used to identify the valve. These numbers are particularly helpful when replacement parts are required.

3.7 Do not disassemble any valve unless required to correct a malfunction. The vast majority of valves never require maintenance involving complete disassembly during the life of the product if properly installed, used, and maintained.

3.0 MAINTENANCE

3.1 Even though not normally required, it is recommended that flanged bonnet joint bolting be checked to assure that gasket loading is adequate. Using the crossover torquing method, apply the torque value listed below for the diameter of bolting used; do not exceed by more than 25%.

TORQUE VALUES (30,000#/IN^2 BOLT STRESS)

Bolt Dia. (in.)	Torque (ft. lb.)	Bolt Dia. (in.)	Torque (ft. lb.)
1/2	30	1	260
9/16	45	1-1/8	375
5/8	60	1-1/4	525
3/4	110	1-3/8	715
7/8	170	1-1/2	925

Should any leakage at the bonnet joint be noted during the system hydro test, an infrequent occurrence, disassembly and repair procedures should be undertaken unless bolt load had not been verified as recommended above. See Section 4.0 for valve repair procedures.

3.2 Stop visible leakage from stem packing boxes by adjustment of gland bolting. Leakage should be stopped as soon as possible to prevent degradation of valve parts.

2.0 INSTALLATION

2.1 Thoroughly clean and prepare the piping system for valve attachment.

2.2 Remove valve end closures and inspect ports and seating surfaces for cleanliness just prior to positioning in system.

2.3 Install packing if necessary, reference Paragraph 1.6.

2.4 Seat the valve disc with a light load to bring seating surfaces into contact during welding and heat treatment.

2.5 Support the valve to prevent unnecessary stresses induced by the connecting piping.

2.6 Assure that all bolting or welding (including heat treatment) associated with installation of the valve in the piping system is in compliance with applicable codes and standards. In the absence of a governing code, the ASME Boiler Code, Section IX is recommended.

2.7 Clean the system of weld spatter, construction debris, and scale, following installation and before hydro testing.

2.8 Check functioning of the actuating mechanism. Motor operated valves, which can be damaged by improper connection or adjustment, should be double checked to assure proper hook-up and control.

PRACTICES FOR HANDLING CRANE GATE, GLOBE AND CHECK VALVES WITH BOLTED BONNET JOINTS

1.0 RECEIVING AND STORAGE

1.1 Account for and check off each valve on the itemized list of products shipped.

1.2 Examine each item for obvious shipping damage.

1.3 Maintain all packing lists and/or data supplied with the valves for future reference.

1.4 Unload valves carefully, leaving all protective closures or skidding in place until valve is ready for installation. (Though valves are rugged devices, they can be damaged by careless handling.)

1.5 Store valves under roof in a clean, dry area.

1.6 If storage time is in excess of six (6) months, packing should be removed and replacement packing ordered.

1.7 Do not stack valves while in storage unless absolutely necessary. Any stacking should be carefully controlled to avoid potential damage by inadvertent dropping or handling contact; particularly during removal from storage.

M A N U F A C T U R I N G   B I L L   O F   M A T E R I A L

SIZE	CAT NO	VALVE TYPE	ASSEMBLY NO.	REV	DWG	PAGE 2 OF	QTY ORDERED	BY	DATE
10-0	0159-4	XU-7 300#SW CK	165834101	0	B		1	JCM	01/28/81

SO-515007 ITEM 01, ABOUT 004 CUST. TOWNSEND COTTON REV.

B/M STATUS COMP FINAL

MATERIAL-WC6 CR-13 TR CUSTOMER INSP & REPORTS REQ TAG V-VT SCE 9

SHOP	FDRY	A+T	SHIP

LEVEL	PART NO.	R #	DWG. SIZE SPP PAGE	PART NAME	MATERIAL AND DESCRIPTION	QTY ASSY	DWG DET	PROD QTY	ROUTING	REQUISITION OR S.O. NO.
1	* 153231017	0	E	GASKET BODY & CAP	JM SPIROTALLIC 316L W/R ASB	1.0	11	1.0		
1	901814521	0	SPP-21	STUD	A193-75 GR B16 3/4-10 X 5 1/2	20.0	13	20.0		
1	905221009	0	SPP-3	NUT	A194-75 GR 2H 3/4-10	40.0	14	40.0		
1	907221008	0	SPP-32	LOCKWASHER	STEEL 5/8"	2.0		2.0		
1	164463001	0	E	IDENTIFICATION PLATE	AUSTENITIC STAINLESS STEEL	1.0		1.0		
1	924521015	0	SPP-18	DRIVE SCREWS RD HD	STEEL #2 X 3/16 TYPE U	2.0		2.0		
1	907121008	0	SPP-31	WASHER	STEEL 5/8	2.0		2.0		

4.6.24-13

4.6 Check and Stop Check Valves

4.6.26 Boiler Panel Water Inlet Stop Check Valves

4.6.26.1

Identification Tag Number	Description
RBWISK-04 thru RBWISK-21	Boiler Panel Water Inlet Stop-Check Valve

4.6.26.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penna.

Part Number : 1 inch Fig. 36168T

Rocketdyne Specification No. : SP42-057 (following)

Material : Body: Carbon Steel

Weight : 15 lb.

4.6.26.3 Prescribed Service

Water

4.6.26.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.26.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.26.6 Periodic Service

None

4.6.26.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.26.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.28.9 Maintenance Instructions

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.26.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-057
J. W. LEWELLEN	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 1-4-80
E. C. Spencer 1-11-80		SUPERSEDES SPEC. DATED.
J. G. Absalom 1-11-80	SPECIFICATION	REV. LTR. / PAGE 1 of 2

TITLE

RECEIVER STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	RBWISK-04 THROUGH RBWISK-21 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL
CONNECTIONS:	1 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER AT 1775 PSIG MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
CAPACITY:	Cv = 10 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
CRACKING PRESSURE:	2 PSID MAXIMUM
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop Check Valves

4.6.27 Preheater Panel Nitrogen Check Valve

4.6.27.1 Identification

Tag Number	Description
RPNCK-1 and RPNCK-2	Preheater Panel Nitrogen Check Valve

4.6.27.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penna.

Part Number: 1 inch fig. 36178T

Rocketdyne
Specification No. : SP42-060 (following)

Material : Body: Carbon Steel

Weight : 9 lb.

4.6.27.3 Prescribed Service

Water

4.6.27.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.27.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.27.6 Periodic Services

None

4.6.27.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.27.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.27.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.27.10 Acceptance Tests

None

PREPARED BY J. W. LEWELLEN APPROVALS 1-11-80 1-11-80	FSCM NO. 02602 **Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California **SPECIFICATION**	NUMBER SP42-060 TYPE EQUIPMENT DATE 1-4-80 SUPERSEDES SPEC. DATED REV. LTR. / PAGE 1 of

TITLE

PREHEATER NITROGEN CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	RPNCK-1 AND RPNCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL
CONNECTIONS:	1 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	WATER AT 2185 PSIG MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
CAPACITY:	Cv = 10 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
CRACKING PRESSURE:	2 PSID MAXIMUM
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop Check Valves

4.6.28 Downcomer Manifold Nitrogen Check Valve

4.6.28.1

Identification Tag Number	Description
RMNCK-1 thru RMNCK-2	Downcomer Manifold Nitrogen Check Valve

4.6.28.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penna.
Part Number	:	1 inch 66178 (F22) T
Rocketdyne Specification No.	:	SP42-059 (following)
Material	:	Body: Chrome moly
Weight	:	10 lb.

4.6.28.3 Prescribed Service

Water or Steam

4.6.28.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.28.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.28.6 Periodic Service

None

4.6.28.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.28.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.6.5.11)

4.6.28.10 Acceptance Tests

None

PREPARED BY		NUMBER
J. W. LEWELLEN	FSCM NO. 02602	SP42-059
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE EQUIPMENT
5/29/80		DATE 5-28-80
5/29/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 1-4-80
		REV. LTR. A / PAGE 1 of 2

TITLE

DOWNCOMER NITROGEN CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER:	RMNCK-1, RMNCK-2 AND TDCCK (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	PISTON CHECK
CONNECTIONS:	1 INCH BUTT WELD TO ASTM A335 GRADE P22 SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
Ø LINE FLUID:	WATER OR STEAM AT 1765 PSIG MAXIMUM AND 1010 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	2500 LB
CAPACITY:	Cv = 8 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
CRACKING PRESSURE:	2 PSID MAXIMUM
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop Check Valves

4.6.29 Bootleg Drain Check Valve

4.6.29.1 Identification

Tag Number	Description
TDCCK	Bootleg Drain Check Valve

4.6.29.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penna.

Part Number : One inch 66178 (F11 T

Rocketdyne Specification No. : SP42-059 (following)

Material : Body: Chrome moly

Weight : 10 lb.

4.6.29.3 Prescribed Service

Water or Steam

4.6.29.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.29.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.29.6 Periodic Service

None

4.6.29.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.29.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.29.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.29.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-059
J. W. LEWELLEN	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	DATE 5-28-80
E. Spencer 5/29/80		SUPERSEDES SPEC. DATED: 1-4-80
J. G. Absalom 5/29/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 2

TITLE

DOWNCOMER NITROGEN CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER:	RMNCK-1, RMNCK-2 AND TDCCK (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	PISTON CHECK
CONNECTIONS:	1 INCH BUTT WELD TO ASTM A335 GRADE P22 SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
Ø LINE FLUID:	WATER OR STEAM AT 1765 PSIG MAXIMUM AND 1010 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	2500 LB
CAPACITY:	Cv = 8 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
CRACKING PRESSURE:	2 PSID MAXIMUM
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop Check Valves

4.6.30 Condenser Blanket Steam Stop-Check Valve

4.6.30.1 Identification

Identification Tag Number	Description
THSWSK-1	Condenser Blanket Steam Stop-Check Valve
THSWSK-2	Condenser Blanket Steam Stop-Check Valve

4.6.30.2 Description

Manufacturer	:	Rockwell Edward, Pittsburg, Penna.
Part Number	:	1-1/2 inch Fig. 36164T
Rocketdyne Specification No.	:	SP42-078 (following)
Material	:	Body: Carbon Steel
Weight	:	29 lb.

4.6.30.3 Prescribed Service

Steam

4.6.30.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.30.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.30.6 Periodic Service

None

4.6.30.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.30.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.30.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.6.5.11)

4.6.30.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-078
J. K. CHENG J.C.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 2-14-80
E. C. Spencer 3/13/80		SUPERSEDES SPEC. DATED:
F. M. Obsalu 3/13/80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 3

TITLE

THERMAL STORAGE BLANKET STEAM STOP CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THSWSK-1 AND THSWSK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	1 1/2 INCH SOCKET WELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	1550 PSIG @ 675°F
CRACKING PRESSURE:	1.0 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 28 MINIMUM
ANSI RATING:	1500 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113° F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE

DESIGN FEATURES: (CONT'D)

- WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.
- HANDWHEEL MUST BE KEPT BELOW 125°F

4.6 Check and Stop-Check Valves

4.6.31 Superheater Steam Bleed Check Valve

4.6.31.1

Identification Tag Number	Description
TSSBCK-1	Superheater Steam Bleed Check Valve
TSSBCK-2	Superheater Steam Bleed Check Valve

4.6.31.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 7 inch. Fig. 838TY

Rocketdyne Specification No.: SP42-105 (following)

Material: Body: Carbon Steel

Weight: 14 lb.

4.6.31.3 Prescribed Service

Steam

4.6.31.4 Vendor

Rockwell Edward, Pittsburgh, Penna. (See paragraph 4.6.5.11)

4.6.31.5 Special Cautions

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.31.6 Periodic Service

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.7 Parts List

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.8 Special Tools

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.9 Maintenance Instructions

See Rockwell Edward Service Manual V376

4.6.32.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-105
J. K. CHENG	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 4-22-80
4/25/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 2-14-80
4/25/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 2

TITLE

STEAM GENERATOR BLEED CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineeering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	TSSBCK-1, TSSBCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	PISTON
CONNECTIONS:	2 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	170 PSIG @ 500 F
CRACKING PRESSURE:	2 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 21 MINIMUM
ANSI RATING:	600 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. • WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop-Check Valves

4.6.32 Superheater Blanket Steam Check Valve

4.6.32.1 Identification

Identification Tag Number	Description
TSSWCK-1	Superheater Blanket Steam Check Valve
TSSWCK-2	Superheater Blanket Steam Check Valve

4.6.32.2 Description

Manufacturer: Rockwell Edward, Pittsburgh, Penna.

Part Number: 1 1/2 inch Fig. 838TY

Rocketdyne Specification No.: SP47-108 (following)

Material: Body: Carbon Steel

Weight: 10 lb.

4.6.32.3 Prescribed Service

Steam

4.6.32.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.6.32.5 Special Cautions

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.6 Periodic Service

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.7 Parts List

None

4.6.32.8 Special Tools

None

4.6.32.9 Maintenance Instructions

See Rockwell Edward Service Manual V376 (See paragraph 4.6.5.11)

4.6.32.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-108
J. K. CHENG J.C.	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 4-22-80
E G Spencer 4/25/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 2-14-80
J.G. Absalon 4/25/80		REV. LTR. A — PAGE 1 of 2

TITLE

STEAM GENERATOR BLANKET STEAM CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TSSWCK-1, TSSWCK-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	PISTON
CONNECTIONS:	1 1/2 INCH SOCKET WELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	450 PSIG @ 580 F
Ø CRACKING PRESSURE:	1.3 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv= 2.2 MINIMUM
ANSI RATING:	600 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. • WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.6 Check and Stop-Check Valves

4.6.33 Desuperheater Water Check Valve

4.6.33.1

Identification Tag Number	Description
TDWCK	Desuperheater Water Check Valve

4.6.33.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penna.

Part No. : 1-1/2 inch, Fig. 1038 TY

Rocketdyne
Specification No. : SP42-104, Rev. A (following)

Material : Body: Carbon Steel

Weight : 11 lb.

4.6.33.3 Prescribed Service

Water, 2200 psia, 600° F.

4.6.33.4 Vendor

Rockwell Edward (Mfgr), Pittsburgh, Penna.

4.6.33.5 Special Cautions

See Rockwell Edward Maintenance Manual V-376

4.6.33.6 Periodic Service

See Rockwell Edward Maintenance Manual V-376

4.6.33.7 Parts List

See Rockwell Edward Maintenance Manual V-376

4.6.33.8 Special Tools

None

4.6.33.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-376

4.6.33.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-104
J. K. CHENG	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	DATE 4-22-80
E G Spencer 4/25/80		SUPERSEDES SPEC. DATED: 2-14-80
T G Absalom 4/25/80	**SPECIFICATION**	REV. LTR. A / PAGE 1 of 2

TITLE

DESUPERHEATER WATER CHECK VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	TDWCK (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	PISTON
CONNECTIONS:	1 1/2 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 160
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
LINE FLUID:	WATER
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	2185 PISG @ 600 F
CRACKING PRESSURE:	5.0 PSID MAXIMUM
FLOWRATE CAPACITY:	Cv = 15 MINIMUM
ANSI RATING:	1500 LB CLASS
AMBIENT TEMPERATURE:	16° TO 113°F
LEAKAGE:	INTERNAL - MAXIMUM PERMISSIBLE 0.01% OF RATED VALVE CAPACITY EXTERNAL - NO VISIBLE LEAKAGE
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.

DESIGN FEATURES:

- VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
- VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
- WITH NO DIFFERENTIAL PRESSURE APPLIED, VALVE SHALL BE SELF-CLOSING REGARDLESS OF MOUNTING ATTITUDE.

4.7 MANUAL VALVES

Equipment Number	Description	Maintenance Section	Dwg. Number
V-CO-12-4		4.7.1	5163149
V-CO-5-7		4.7.2	5163143
V-CO-5-8	Flash Tank Drain Check Valve	4.7.3	5163143
V-CO-201-201	Moisture Accumulator Inlet Valve	4.7.4	5163140
V-CO-301-301	Subcooler Water Isolation Valve	4.7.5	5163144
V-CO-302-302	Subcooler Water Isolation Valve	4.7.5	5163144
V-CO-303-305	Flash Tank Steam Isolation Valve	4.7.6	5163143
V-CO-304-306	Flash Tank Steam Isolation Valve	4.7.6	5163143
V-CO-15-307	Flash Tank Water Isolation Valve	4.7.7	5163143
V-CO-(SCE)-1		4.7.8	5163151
V-CO-(SCE)-2		4.7.8	5163151
V-CO-(SCE)-3		4.7.8	5163151
V-CO-(SCE)-4		4.7.8	5163151
	Deleted	4.7.9	
	Deleted	4.7.10	
	Deleted	4.7.11	
	Deleted	4.7.12	
V-DW-2-1	CP #9 Furnished Valve	4.7.13	5163160
V-ED-2-1	CP #9 Furnished Valve	4.7.13	5163159
V-ED-17-2	CP #9 Furnished Valve	4.7.13	5163160
V-FP-1-2	CP #9 Furnished Valve	4.7.13	5163161
V-FP-2-3	CP #9 Furnished Valve	4.7.13	5163161
V-FP-2-4	CP #9 Furnished Valve	4.7.12	5163161
V-FP-3-6	CP #9 Furnished Valve	4.7.13	5163161
V-FP-4-7	CP #9 Furnished Valve	4.7.13	5163161

Equipment Number	Description	Maintenance Section	Dwg. Number
V-FP-4-8	CP #9 Furnished Valve	4.7.13	5163161
V-FP-4-9	CP #9 Furnished Valve	4.7.13	5163161
V-FP-5-10	CP #9 Furnished Valve	4.7.13	5163161
V-FP-5-11	CP #9 Furnished Valve	4.7.13	5163161
V-FP-6-12	CP #9 Furnished Valve	4.7.13	5163161
V-FP-8-14	CP #9 Furnished Valve	4.7.13	5163161
V-FP-1-15	CP #9 Furnished Valve	4.7.13	5163161
V-FP-8-16	CP #9 Furnished Valve	4.7.13	5163161
V-FP-10-17	CP #9 Furnished Valve	4.7.13	5163161
V-FP-11-18	CP #9 Furnished Valve	4.7.13	5163161
V-FP-10-19	CP #9 Furnished Valve	4.7.13	5163161
V-FP-13-20	CP #9 Furnished Valve	4.7.13	5163161
V-FP-14-21	CP #9 Furnished Valve	4.7.13	5163161
V-FP-14-22	CP #9 Furnished Valve	4.7.13	5163161
V-FP-15-23	CP #9 Furnished Valve	4.7.13	5163161
V-FP-17-24	CP #9 Furnished Valve	4.7.13	5163161
V-FP-27-25	CP #9 Furnished Valve	4.7.13	5163161
V-FP-19-26	CP #9 Furnished Valve	4.7.13	5163161
V-FP-19-27	CP #9 Furnished Valve	4.7.13	5163161
V-FP-20-28	CP #9 Furnished Valve	4.7.13	5163161
V-FP-21-29	CP #9 Furnished Valve	4.7.13	5163161
V-FP-12-30	CP #9 Furnished Valve	4.7.13	5163161
V-FP-1-31	CP #9 Furnished Valve	4.7.13	5163161
V-FP-1-32	CP #9 Furnished Valve	4.7.13	5163161
V-FP-22-34	CP #9 Furnished Valve	4.7.13	5163161

Equipment Number	Description	Maintenance Section	Dwg. Number
V-FP-26-35	CP #9 Furnished Valve	4.7.13	5163161
V-FP-34-36	CP #9 Furnished Valve	4.7.13	5163161
V-FP-26-37	CP #9 Furnished Valve	4.7.13	5163161
V-FP-38-38	CP #9 Furnished Valve	4.7.13	5163161
V-FP-22-39	CP #9 Furnished Valve	4.7.13	5163161
V-FP-26-40	CP #9 Furnished Valve	4.7.13	5163161
V-FP-34-41	CP #9 Furnished Valve	4.7.13	5163161
V-FW-200-201	Feedwater Inlet Valve	4.7.15	5163133
V-FW-228-203	Preheater Panel Water Outlet Valve	4.7.15	5163133
V-MS-6-1		4.7.	5163149
V-MS-8-2		4.7.	5163149
V-MS-10-3		4.7.	5163149
V-MS-3-301	Desuperheater Steam Isolation Valve	4.7.17	5163143
V-MS-4-302	Desuperheater Steam Isolation Valve	4.7.18	5163144
V-MS-4-304	Desuperheater Steam Isolation Valve	4.7.18	5163144
V-OW-8-1		4.7.13	5163155
V-RW-4-1	CP #9 Furnished Valve	4.7.13	5163159
V-RW-4-2	CP #9 Furnished Valve	4.7.13	5163159
V-RW-4-3	CP #9 Furnished Valve	4.7.13	5163159
V-RW-7-4	CP #9 Furnished Valve	4.7.13	5163159
V-SP-1-1	CP #9 Furnished Valve	4.7.13	
V-SP-1-2	CP #9 Furnished Valve	4.7.13	
V-SP-2-3	CP #9 Furnished Valve	4.7.13	
V-SP-2-4	CP #9 Furnished Valve	4.7.13	
V-SP-10-5	CP #9 Furnished Valve	4.7.13	

Equipment Number	Description	Maintenance Section	Dwg. Number
V-SP-10-6	CP #9 Furnished Valve	4.7.13	
V-SP-10-7	CP #9 Furnished Valve	4.7.13	
V-SP-12-8	CP #9 Furnished Valve	4.7.13	
V-SP-24-9	CP #9 Furnished Valve	4.7.13	
V-SP-24-10	CP #9 Furnished Valve	4.7.13	
V-SP-25-11	CP #9 Furnished Valve	4.7.13	
V-SP-25-12	CP #9 Furnished Valve	4.7.13	
V-SP-55-13	CP #9 Furnished Valve	4.7.13	
V-SP-56-14	CP #9 Furnished Valve	4.7.13	
V-SP-10-15	CP #9 Furnished Valve	4.7.13	
V-SP-12-16	CP #9 Furnished Valve	4.7.13	
V-ST-8-2	CP #9 Furnished Valve	4.7.13	5163149
V-ST-6-5	CP #9 Furnished Valve	4.7.13	5163149
V-SW-5-4	CP #9 Furnished Valve	4.7.13	5163159
V-SW-5-6	CP #9 Furnished Valve	4.7.13	5163159
V-SW-17-7	CP #9 Furnished Valve	4.7.13	5163159
V-SW-8-8	CP #9 Furnished Valve	4.7.13	5163159
V-SW-8-10	CP #9 Furnished Valve	4.7.13	5163159
V-SW-29-13	CP #9 Furnished Valve	4.7.13	5163146
V-SW-29-14	CP #9 Furnished Valve	4.7.13	5163146
V-TO-1-1	CP #9 Furnished Valve	4.7.13	5163163
V-TO-2-3	CP #9 Furnished Valve	4.7.13	5163163
V-TO-2-4	CP #9 Furnished Valve	4.7.13	5163147
V-TO-28-10	CP #9 Furnished Valve	4.7.13	5163163
V-TO-28-11	CP #9 Furnished Valve	4.7.13	5163163

Equipment Number	Description	Maintenance Section	Dwg. Number
V-TO-4-12	CP #9 Furnished Valve	4.7.13	5163142
V-TO-5-13	CP #9 Furnished Valve	4.7.13	5163142
V-TO-25-14	CP #9 Furnished Valve	4.7.13	5163142
V-TO-26-15	CP #9 Furnished Valve	4.7.13	5163142
V-TO-12-16	CP #9 Furnished Valve	4.7.13	5163142
V-TO-13-17	CP #9 Furnished Valve	4.7.13	5163145
V-TO-10-18	CP #9 Furnished Valve	4.7.13	5163147
V-TO-2-19		4.7.33	5163163
V-TO-3-301	Charging Pump Oil Filter Isolation Valve	4.7.37	5163142
V-TO-3-302	Charging Pump Oil Filter Isolation Valve	4.7.37	5163142
V-TO-3-303	Charging Pump Oil Filter Isolation Valve	4.7.37	5163142
V-TO-3-304	Charging Pump Oil Filter Isolation Valve	4.7.37	5163142
V-TO-3-305	Charging Pump Isolation Valve	4.7.35	5163142
V-TO-3-306	Charging Pump Isolation Valve	4.7.35	5163142
V-TO-301-309	Charging Pump Interconnect Oil Isolation Valve	4.7.34	5163142
V-TO-4-310	Subcooler Oil Isolation Valve	4.7.35	5163142
V-TO-9-311	Subcooler Oil Isolation Valve	4.7.35	5163142
V-TO-9-312	Condenser Oil Isolation Valve	4.7.35	5163142
V-TO-9-313	Condenser Oil Isolation Valve	4.7.35	5163142
V-TO-10-314	Extraction Pump Oil Isolation Valve	4.7.35	5163145
V-TO-10-315	Extraction Pump Oil Isolation Valve	4.7.35	5163145
V-TO-12-317	Superheater Oil Isolation Valve	4.7.35	5163145
V-TO-13-320	Superheater Oil Isolation Valve	4.7.35	5163145
V-TO-21-322	Preheater Oil Outlet Valve	4.7.35	5163145
V-TO-21-323	Preheater Oil Outlet Valve	4.7.35	5163145

Equipment Number	Description	Maintenance Section	Dwg. Number
V-TO-22-324	Auxiliary Pump Oil Isolation Valve	4.7.36	5163145
V-TO-3-328	TU Lower Manifold Oil Isolation Valve	4.7.37	5163147
V-TO-10-329	TU Upper Manifold Oil Isolation Valve	4.7.37	5163147
V-TO-22-330	TU Auxiliary Manifold Oil Isolation Valve	4.7.36	5163147
V-UG-1-401	TU Ullage Gas Isolation Valve	4.7.38	5163147
V-VT-1-1		4.7.39	5163149
V-VT-11-2		4.7.40	5163149
V-VT-(SCE)-1		4.7.41	5163149
V-VT-(SCE)-2		4.7.42	5163149
V-VT-(SCE)-4		4.7.43	5163149
V-VT-(SCE)-5		4.7.44	5163149
V-VT-(SCE)-7		4.7.43	5163149
V-VT-(SCE)-8		4.7.44	5163149
V-VT-4-301	Flash Tank Steam Isolation Valve	4.7.45	5163149
V-WD-1-2		4.7.46	5163155
V-WD-1-4		4.7.46	5163155
(THSBLV-1)	Condenser Steam Bleed Valve	4.7.47	5163144
(THSBLV-2)	Condenser Steam Bleed Valve	4.7.47	5163144
(THSBLV-3)	Condenser Steam Bleed Valve	4.7.47	5163144
(THSBLV-4)	Condenser Steam Bleed Valve	4.7.47	5163144
(TDCDV)	Desuperheater Condensate Drain Valve	4.7.48	5163143
(TDSBV)	TD_{siv} Steam Bypass Valve	4.7.48	5163143
(TSSWIS-1)	Superheater Blanket Steam Isolation Valve	4.7.49	5163146
(TSSWIS-2)	Superheater Blanket Steam Isolation Valve	4.7.49	5163146
(TDWIS)	Desuperheater Water Isolation Valve	4.7.50	5163143

Equipment Number	Description	Maintenance Section	Dwg. Number
(TFWDV)	Flash Tank Water Drain Valve	4.7.51	5163143
(TCVV-2)	Condensate Vent/Drain Valve	4.7.52	5163146
(TCVV-3)	Condensate Vent/Drain Valve	4.7.53	5163146
(TCDV)	Condensate Drain Valve	4.7.54	5163143
(TOVV)	Oil Vent/Drain Valve	4.7.55	5163145
(THSBV-1)	Surge Tank Steam Supply Valve	4.7.56	5163144
(THSBV-2)	Surge Tank Steam Supply Valve	4.7.56	5163144
(TFWIS-3)	Flash Tank Water Isolation Valve	4.7.57	5163143
(THSVV-1)	Surge Tank Steam Vent Valve	4.7.56	5163144
(THSVV-2)	Surge Tank Steam Vent Valve	4.7.56	5163144
(GIS)	Gage Isolation Valves	4.7.56	
(TRSIS-1)	Surge Tank Steam Isolation Valve	4.7.57	5163144
(TRSIS-2)	Surge Tank Steam Isolation Valve	4.7.57	5163144
(TTSIS-1)	Steam Trap Steam Isolation Valve	4.7.57	5163144
(TTSIS-2)	Steam Trap Steam Isolation Valve	4.7.57	5163144
(TDCIS-1)	Desuperheater Bootleg Dram Isolation Valve	4.7.58	5163143
(TDCIS-2)	Desuperheater Bootleg Level Switch Isolation Valve	4.7.54	5163143
(TDCIS-3)	Desuperheater Bootleg Drain Isolation Valve	4.7.54	5163143
(TLSDV)	Bootleg Level Switch Drain Valve	4.7.56	
(RTWVV-04)	Moisture Trap Separator Water Vent Valve	4.7.59	5163134
thru			thru
(RTWVV-21)			5163139
(RNMV)	Nitrogen Main Valve	4.7.60	5163140
(RMNIS)	Downcomer Manifold Nitrogen Isolation Valve	4.7.61	5163140
(RPNIS)	Preheater Panel Nitrogen Isolation Valve	4.7.62	5163140

Equipment Number	Description	Maintenance Section	Dwg. Number
(GV)	Gage Manifold Valves	4.7.60	
(DPGV)	Differential Pressure Gage Valves	4.7.63	
(TIAADV-1) thru (TIAADV-11)	Instrument Air Valves	4.7.65	
(TIAIS-1) thru (TIAIS-11)	Instrument Air Valves	4.7.65	
(UNIS-1)	Ullage Nitrogen Isolation Valve	4.7.67	
(UNIS-3)	Ullage Gas Isolation Valve	4.7.68	
(UNIS-4)	Ullage Nitrogen Isolation Valve	4.7.66	
(UNIS-5)	Ullage Nitrogen Isolation Valve	4.7.67	

4.7.3 Flash Tank Drain Pump 307 Check Valve

4.7.3.1 Identification

Tag Number	Description
V-CO-5-8	Check Valve

4.7.3.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: Series 5100

Specification Number: DOE Spec No. 40M7006I, CP 9

Material:

Weight:

4.7.3.3 Prescribed Service

Aux. Steam

4.7.3.4 Vendor

Yarway

4.7.3.5 Special Cautions

See Yarway Manual (following)

4.7.3.6 Periodic Service

None

4.7.3.7 Parts List

See Yarway Manual (following)

4.7.3.8 Special Tools

None

4.7.3.9 Maintenance Instructions

See Yarway Manual (following)

4.7.3-10 Acceptance Tests

None

V-10-5-8

YARWAY

Stearns-Roger

C21700 607 JUN 19 '81

S-R No. CP-9 File No. 351

operating instructions for ~~LARC™ low~~ pressure automatic recirculation control valve series 5100

- [x] REVIEWED/NO COMMENTS
- [ ] REVIEWED/SEE COMMENTS
- [ ] REVISE PER COMMENTS & RESUBMIT FOR REVIEW
- [ ] SEE LETTER OF TRANSMITTAL

ENG. DEPT. BY ________ DATE JUN 29 1981

NEITHER REVIEW, COMMENT, NOR REVISION RELIEVES MANUFACTURER OR CONTRACTOR FROM RESPONSIBILITY FOR COMPLIANCE WITH SPECIFICATIONS OR WITH ALL OTHER CONTRACT REQUIREMENTS.

RETURN TO

Stearns-Roger

ON OR BEFORE

RECEIVED
JUN 12 1981
TOWNSEND & BOTTUM INC.

The LARC Valve is an automatic modulating recirculation control valve designed expressly for protection of low pressure (ANSI Class 150 & 300) centrifugal pumps against overheating and possible unstable operation during low-load periods. With only eight parts, the valve functions simultaneously as: (1) A check valve—to prevent reverse flow through the pump and function as a flow senor. (2) A by-pass control valve—to maintain the minimum pump flow and provide a pressure let-down device.

FEATURES

1. Four separate functions in a single valve body without external power source; (a) reverse flow prevention (b) low flow detection (c) modulating by-pass flow control and (d) by-pass flow pressure reduction.

2. Compact, self-contained design that eliminates divided installation responsibility occurring with systems involving combinations of pneumatic, thermal and mechanical devices.

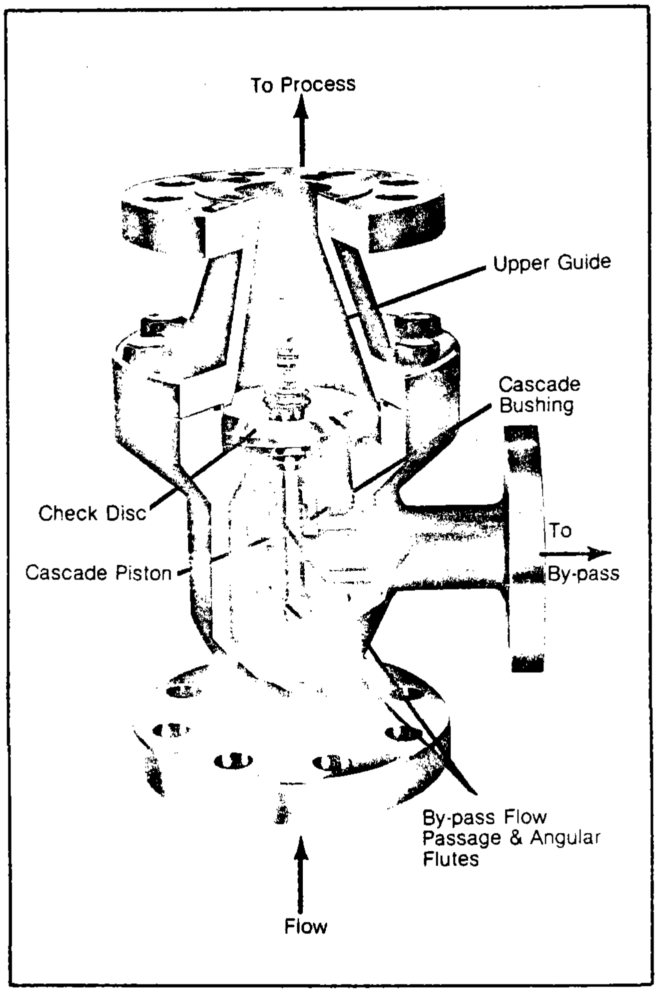
3. Minimum wear on vital parts during pressure reduction of by-pass flow.

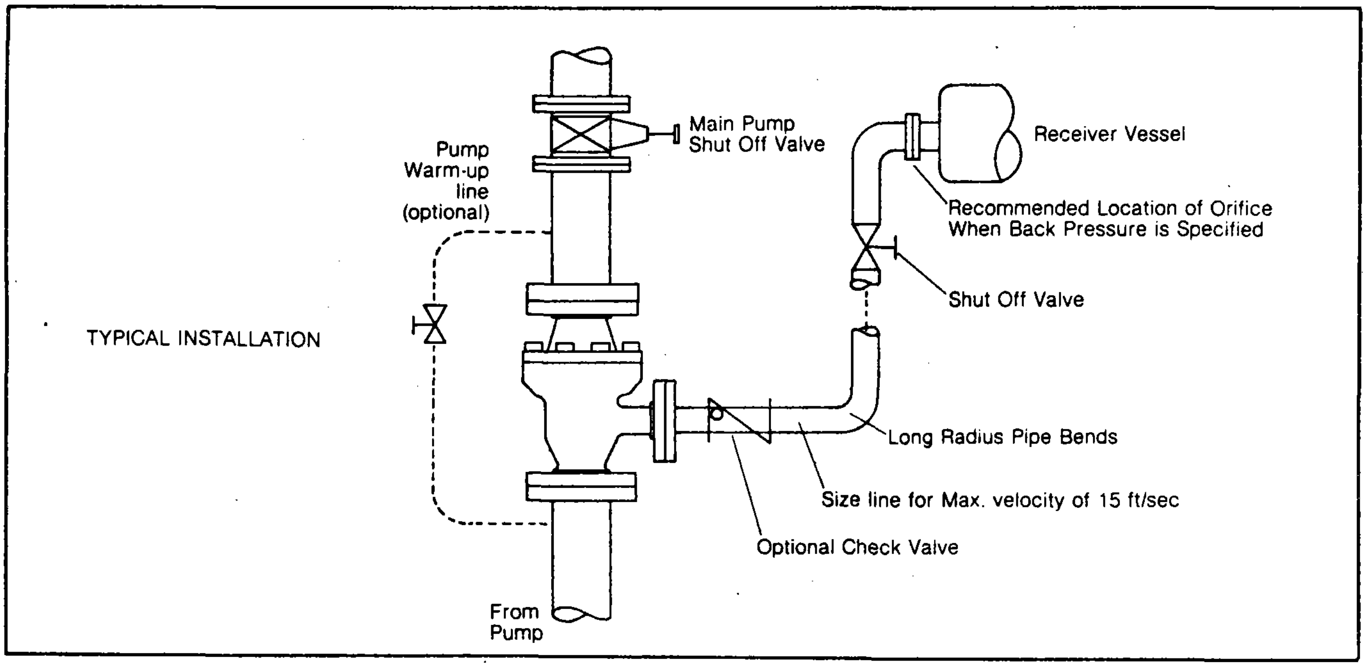
4. Quiet pressure drop provided by a cascade that changes the by-pass flow directions several times in passing the flow through a labyrinth to expend the energy harmlessly.

5. Erosion resistant surfacing of disc seat.

6. Steel or stainless steel body available for ANSI Class 150 and 300. Elastomer seal allows usage to 400F.

7. All connections flanged.





HOW IT OPERATES

Flow through the check valve overcomes the spring force to open the main check valve element. As the disc lifts in response to an increase in main flow, the connected cascade piston reduces the by-pass flow. Conversely, as the pump flow is reduced, the check valve assembly moves downward and at a point starts to uncover ports in the cascade bushing allowing by-pass flow to commence. Further reduction in main flow increases the opening in the cascade element resulting in increased by-pass flow. The sizing of the check valve disc and cascade element are such that the by-pass flow starts before the main flow is reduced below the specified minimum pump flow, and the combined main and by-pass flow provide a total greater than the pump minimum flow requirement.

By-pass flow enters the cascade element at both top and bottom. Lands on the cascade piston and angular flutes on the cascade bushing guide the streams through successive turns that dissipate the high pressure energy. The by-pass flow discharges from the cascade element through an integral orifice into the by-pass line. The controlled fit between cascade piston and bushing permits a small amount of by-pass flow with the check valve full open.

INSTALLATION

All elements of the LARC valve are chosen in accordance with the original installation specification supplied by the customer. Make certain these specifications are still applicable to the valve. Changes in pressure, temperature, main flow, direction of main flow, and required minimum flow can cause unsatisfactory operation. When specification changes are apparent contact Yarway. Modifications may be required prior to installation.

Remove all packing material, and place wooden support blocks to protect flange surfaces from damage. Place the valve vertically on the wooden blocks with the disc weight supported by the spring. Push the disc from its seat and flush away any packaging debris with compressed air or high pressure water. The disc should move freely (against spring load) for the entire stroke.

See table for stroke length. Observe that the hole in the cascade bushing lines up with the by-pass port. The valve must be installed as ordered, with main flow direction either horizontal or vertical upward. The direction of the by-pass flow may be selected to suit the installation.

OPERATIONAL CHECK

When the LARC valve is properly installed the combined main and by-pass flows should equal or exceed that of the specified minimum pump flow. Normally, field adjustments are not required. If operational checks indicate a deviation from the original specifications and field adjustments are necessary, contact the Yarway Corporation for additional information.

VALVE CARE

Except for periodic operational checks the LARC valve requires little maintenance. The disc-cascade assembly, spring, and cascade bushing should be inspected coincident with other annual inspections. The mechanism is easily removed whenever the main flow is stopped. Make certain that all pressure is relieved and the pipeline is secured against pressurization before attempting disassembly for inspection purposes.

DISASSEMBLY

(1) For complete disassembly and inspection remove the valve from the line. Match-mark the body and bonnet to facilitate re-assembly.

(2) Remove bolts attaching valve bonnet to body.

(3) Carefully lift straight up on bonnet to clear engagement of cascade shaft.

(4) The spring and disc-cascade assembly are now exposed for easy removal.

(5) Normally there is no need to remove the cascade bushing. Should the cascade be damaged, it may be removed using an arbor or bench press. One or more spacers may be present between the bushing and its housing placed there to produce the required by-pass flow rate.

REPAIR AND INSPECTION

Inspect the condition of the body to bonnet seal. Sealing surfaces must be free of defects. Replace the elastomer seal each time the valve is disassembled.

Examine the check valve seat for evidence of wear. The surface can be reconditioned by lapping. Use a very fine lapping compound and lap the disc to seat to obtain a smooth continuous seating surface. Thoroughly clean away all compound when lapping is completed.

Supply the following information when ordering spare parts: (1) Fig. No., (2) Serial No., (3) type of fluid.

REASSEMBLY

(1) If the cascade bushing was removed, reassemble in the body housing by coating the bushing O.D. with Loctite Compound 40. Replace the spacers, if required, and press the cascade bushing into body. The hole in the bushing must line up with the by-pass port. Note the reference mark on the bottom of the bushing.

(2) Slide the disc-cascade assembly into the cascade bushing. Replace the spring on top of the disc. Line up the bearing in the valve bonnet with top of the disc spindle and spring, and lower the bonnet onto the valve body.

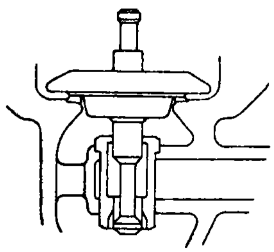
(3) Coat bolts with Never Seez #NS165 or equivalent lubricant prior to assembly. Torque bolts to the valve in the table.

(4) Check the valve stroke by pushing the bottom of the cascade shaft. The disc-cascade assembly must move freely (against spring load) for the entire stroke. The valve stroke length is given in table.

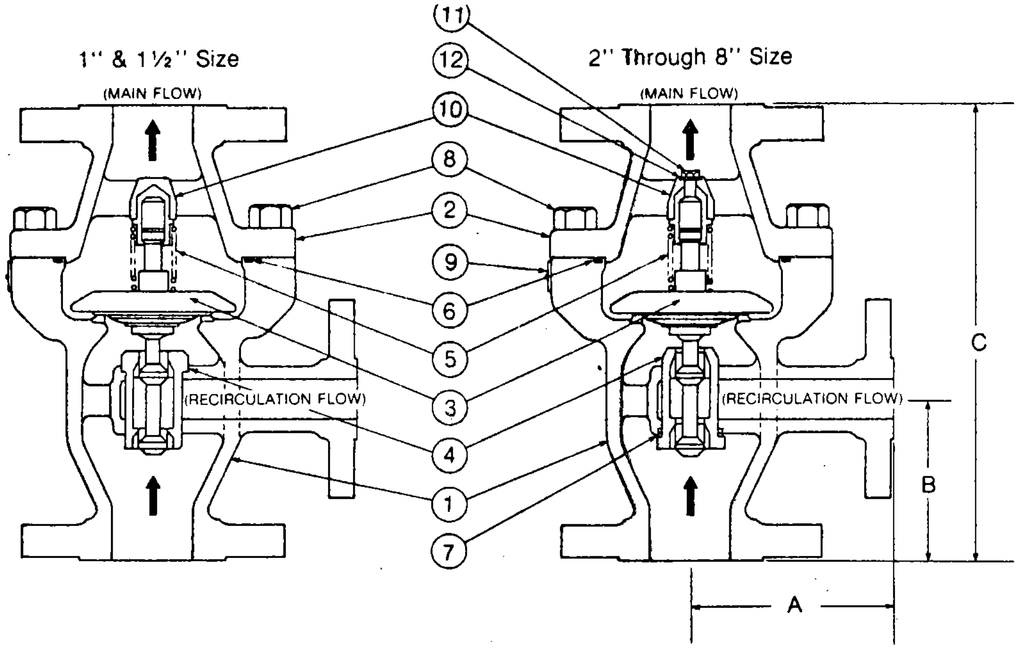
(5) The valve is now ready for reinstallation in the line. Be sure to use new flange gaskets when reassembling the valve in the line. Tighten flange bolts uniformly.

Valve Size (in.)	Bolt Torque (lb-ft)	Stroke Length (in.)
1	30-35	7/16
1-1/2	30-35	7/16
2	30-35	5/8
3	60-65	15/16
4	140-145	1-1/4
6	240-245	1-7/8
8	350-360	2-1/2

1" LARC INTERNALS



Recommended
Spare Parts



DIMENSIONS/WEIGHTS

Valve Size, in. (DN)	Dimensions, in. (mm)			Bypass Flange Size in. (DN)	Weight, lb (kg)	
	A	B	C		Class 150 (PN 10/16)	Class 300 (PN 25/40)
1 (25)	4½ (114)	4 (102)	10½ (267)	½ (12)	25 (11)	35 (16)
1½ (40)	4½ (114)	4 (102)	10½ (267)	½ (12)	29 (13)	39 (18)
2 (50)	5⅛ (130)	4¼ (108)	12 (305)	1 (25)	44 (20)	54 (24)
3 (80)	6½ (165)	5⅜ (136)	16 (406)	1½ (40)	92 (42)	102 (46)
4 (100)	8¼ (209)	6¼ (159)	19½ (495)	2 (50)	210 (95)	236 (107)
6 (150)	10½ (267)	9 (228)	26¾ (679)	3 (80)	440 (200)	480 (218)
8 (200)	14 (356)	12 (305)	35½ (902)	4 (100)	1050 (476)	1100 (499)

MATERIALS OF CONSTRUCTION

ITEM	PART	MATERIAL		SPECIFICATION	
		Carbon Steel Valve	Stainless Steel Valve	Carbon Steel Valve	Stainless Steel Valve
1	Body	Steel	Stainless Steel	ASME SA 216 Gr. WCB	ASME SA 351 CF 8M
2	Bonnet				
3	Disc-Cascade Assy.	Stainless Steel		Type 304/416	Type 304
4	Cascade Bushing	Stainless Steel		Type 17-4 PH	
5*	Spring	Stainless Steel		Type 302	
6	O-Ring	EPR*		—	
7	Spacer†	Stainless Steel		Type 316	
8	Bolts	Steel		ASME SA 193 Gr. B7	
9	Nameplate	Stainless Steel		Type 304	
10	Bonnet Bushing	Stainless Steel		Type 416	
11	Bolt	Stainless Steel		Type 18-8	
12	Lockwasher	Stainless Steel		Type 410	

*When ordering spring specify for horizontal or vertical installation. See suffix letter after valve Fig. No. on name plate.
**Or appropriate seals for special services.
†Quantity may be 0, 1, or 2.

YARWAY

YARWAY CORPORATION, BLUE BELL, PENNSYLVANIA 19422
YARWAY CANADA LTD., Guelph, Ontario
YARWAY EUROPA B.V., Roosendaal, The Netherlands
YARWAY LTD., Salisbury, England, U.K.
GADELIUS YARWAY K.K., Kobe, Japan

4.7 Manual Valves

4.7.4 Moisture Accumulator Water Inlet Valve

4.7.4.1 Identification Tag Number — Description

Identification Tag Number	Description
V-CO-201-201	Moisture Accumulator Water Inlet Valve

4.7.4.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penna.

Part Number : 3 inch Fig. 66128 (F22) T

Rocketdyne Specification No. : SP42-048 (following)

Material : Body: Chrome Moly

Weight : 124 lb.

4.7.4.3 Prescribed Service

Water & Steam

4.7.4.4 Vendor

Rockwell Edward, Pittsburgh, Penna.

4.7.4.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.4.6 Periodic Service

None

4.7.4.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.4.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.4.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.4.10 Acceptance Tests

None

PREPARED BY		NUMBER
J. W. Lewellen	FSCM NO. 02602	SP42-048
APPROVALS	**Rockwell International Corporation**	TYPE
E G Spencer 12/21/79	**Rocketdyne Division**	Equipment
J. G. Absalom 1-8-80	Canoga Park California	DATE
	SPECIFICATION	12-20-79
		SUPERSEDES SPEC. DATED:
		REV. LTR. / PAGE 1 of

TITLE

MANUALLY OPERATED SHUTOFF VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RAWIV (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	3 INCH BUTT WELD TO ASTM A335 GRADE P22, SCHEDULE 160 PIPE.
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER AND STEAM AT 1765 PSIG MAXIMUM AND 1010 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	2500 LB
CAPACITY:	Cv = 40 MINIMUM
LEKAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.4.11 Manufacturers Instructions

Valtek Maintenance Bulletin No. 1

Rockwell Edward Service Manual V376

Rockwell Edward Service Manual V377R1

Rockwell Edward Service Manual V380

Rockwell Edward Service Manual V475

Rockwell Edward Service Manual V370

VALTEK

Maintenance Bulletin Number 1

C

P

S

Tag. # ____________

Instructions for unpacking, installation, checkout, troubleshooting and service

Valtek Mark One and Mark Two Control Valves

GENERAL INFORMATION

Whenever possible, the control valve should be installed in an **upright** position. Vertical installation permits easier valve maintenance. This is important to cryogenic applications in order to keep the packing isolated from the flowing medium so that the packing temperature can be maintained close to ambient. Do not insulate the bonnet, especially extension bonnets provided for hot or cold services.

Throttling control valves are usually equipped with valve positioners. Two connections are marked—one for air supply, the other for instrument signal. The actuator and positioner are both suitable for a maximum pressure of 150 psi so the air supply can usually be unregulated, except as noted by sticker on cylinder showing maximum air pressure. An air filter is recommended for installation ahead of the positioner unless the supply air is unusually clean. Air supply and instrument tubing can be ¼" unless ultra high speed operation is required.

To Unpack...

1. Packing lists, describing the valve and accessories, are included with each valve shipped. Before installing, be sure to check the list against the material received.
2. When lifting the valve from the shipping box, make sure that any rope or cables used are of sufficient strength, and so positioned to avoid damaging tubing or mounted accessories. Lifting rings are provided on many valves. If not, lift by means of the yoke legs.
3. Be careful to insure that no foreign material enters the valve body prior to its installation in line.
4. In the event of any shipping damage, contact your carrier immediately.
5. If you see any other apparent problems with the valve, contact your Valtek sales representative immediately—he wants to know.

To install...

1. **Clean the line of all dirt, welding chips, scale or other foreign material before installing valve.**
2. Double check flow direction to be sure valve is installed correctly. Flow direction is shown by the arrow attached to the body flange. Air-to-open valves (closed on air failure) should be installed so that the flow tends to **close** the valve, except in rare circumstances which will be clearly indicated. Air-to-close valves (open on air failure) should be installed with the flow tending to **open** the valve.

3. Be sure to provide proper overhead clearance for the actuator to allow for disassembly of the plug from the valve body according to this table:

Valve Size	Clearance Inches	Valve Size	Clearance Inches
½, ¾, 1	3	6	10
1½, 2	5	8	13
3	6	10	14
4	8	12	15

Table 1

To Quick-Check. . .

Prior to startup, check the control valve to insure that it strokes properly—i.e. the valve plug position (shown on the stroke indicator) should change from open to close in a linear fashion.

1. Check for proper stroking by making the proper instrument signal change (such as 3-15, 15-3, 3-9, or 9-15).
2. With the correct signal for a closed valve, the plug should be seated. This can best be observed by changing the signal while putting a finger on the plug stem near a stationary part of the valve to determine when the plug comes off the seat.
3. Check all air connections for leaks.
4. Tighten packing nuts just slightly over hand-tight. The most common packing material is Teflon V-ring.

   Caution: **Don't overtighten packing. This can cause excessive packing wear and high stem friction which may impede stem movement.**
5. After valve has been in operation a short time, readjust the packing—again just slightly over hand-tight. Other types of packing such as Teflon-asbestos and semi-metallic should be tightened a little more than indicated above.
6. Be sure that the combined actions (direct or reverse) of the controller, positioner and valve will provide control of the variable and will insure required air failure direction of the valve.

To Troubleshoot. . .

If difficulty is suspected with the control valve. . .

1. Make sure valve has sufficient air supply.
2. Check for air leaks anywhere in supply and instrument system, and on valve.
3. Make sure packing isn't too tight.
4. Push restriction nozzle cleanout plunger on positioner several times.
5. Check for proper full-stroke operation as indicated in Quick-Check section.

VALVE SERVICE

An outstanding feature of the Valtek control valve is its ease of servicing. Much of this work can be done without taking the valve out of the line, provided it is in a suitable area.

To Inspect Body. . .

1. If valve is air-to-open, put air under the piston to lift the plug off the seat before taking valve apart.
2. Remove the four or more bonnet bolts and lift the actuator, bonnet and plug out of the valve.

   Caution: **Heavy actuators may require a hoist. In all valves great care should be taken to lift the actuator and plug straight out to avoid damage to plug, seat or stem. A lifting ring is provided on large actuators for this purpose. Otherwise, lift by means of the yoke legs.**
3. Lift the retainer, seat ring, and gaskets free of the body.
4. Check to see that seating surfaces on both the seat ring and the plug are free of damage to insure a tight shutoff. Make sure that gasket surfaces on the seat ring, bonnet and body are clean.

To Reassemble. . .

1. Install new bonnet and seat gaskets.
2. Install seat ring and seat retainer.
3. Place air under piston in air-to-open valves.
4. Be sure to lower plug squarely into the body to avoid damage.
5. Be sure bonnet, which pilots closely in body, enters the body perfectly squarely.
6. To properly align seat ring and plug, first bring body bolts to finger tightness. Apply air pressure to actuator to seat the plug in seat ring. With air pressure on actuator, tighten each body bolt about 1/6 (one flat) of a turn at a time in a clockwise direction around the bonnet flange. Firmly tighten all bolts evenly and completely, using full wrench force to compress the bonnet gasket and to seat the bonnet metal-to-metal in the body. Proper tightness requires considerable force, however the bottoming of the bonnet metal-to-metal in the body can easily be felt with the wrench.

Caution: Insufficient tightening means that the seat ring gasket does not have enough compression.

7. If the valve is taken out of the line to inspect its body, make sure the flow arrow indicates proper flow direction on reinstallation.

TO REMOVE PLUG. . .

With the valve apart, remove plug by loosening the stem clamp and the gland flange and removing the yoke clamps. The actuator can then be turned off the plug and bonnet, and the plug may be pulled carefully through the packing box.

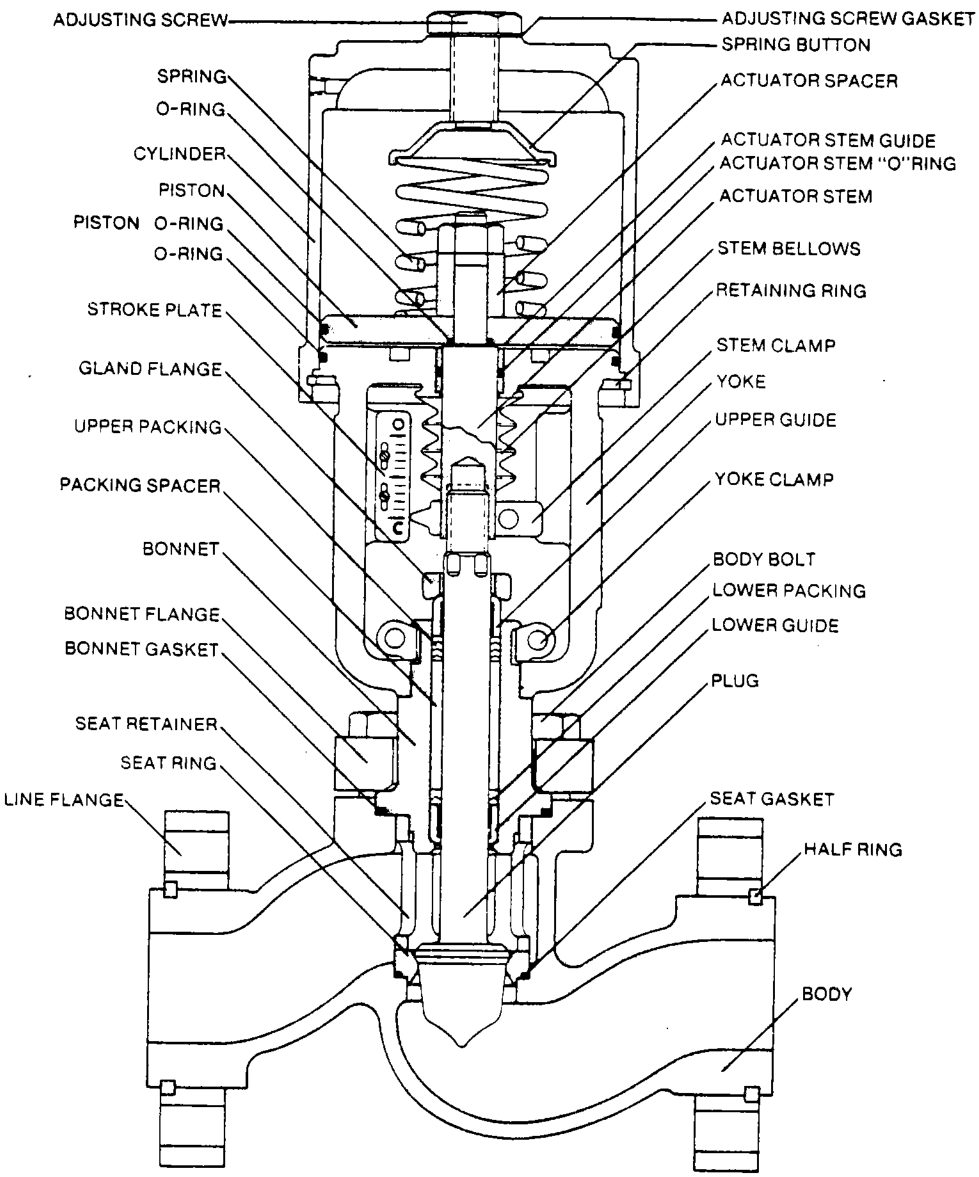
Caution: To avoid scoring guides and stem, be sure to turn the actuator off the plug as explained above.

TO REMACHINE SEAT SURFACES. . .

Remachine the surfaces on **both** parts. The seat angle on the plug is 30 degrees; the seat ring, 33 degrees. Lapping will not be necessary if proper reassembly procedures are followed.

Caution: Protect the stem during turning and insure concentricity of seating surfaces with stem on plug and the outside diameter of the seat ring.

Mark One
Control Valve



TO INSPECT ACTUATOR. . .

The actuator assembly may be removed completely from the valve for shop servicing. If desired, the actuator may be disassembled while still attached to the valve for on-the-spot servicing.

NOTE: For complete handwheel instructions, including push only and continuously connected, see Valtek Maintenance Bulletin No. 5.

To remove actuator, including yoke. . .

1. Make sure the plug is neither on the seat nor against the bonnet and that neither condition occurs while turning the plug. To do this, put air on the appropriate side of the cylinder and release the pressure on the opposite side.
   Caution: Galling of critical surfaces may result if plug is not positioned properly with respect to the seat and bonnet.
2. Loosen the stem clamp and remove the positioner take-off arm.
3. Loosen packing box and remove yoke clamps.
4. Completely turn the actuator off the plug and bonnet.

To disassemble cylinder. . .

1. Disconnect tubing.
2. Relieve spring compression by removing adjusting screw.
   Caution: Spring compression must be relieved before disassembly proceeds.
3. Remove the retaining ring from the groove at the base of the cylinder.
4. Pull the cylinder off the yoke and piston. Some O-ring resistance may be felt and may be substantial on 100 square-inch and larger cylinders.
   Caution: Do not use air pressure to remove cylinder.
5. The piston retainer nut may now be removed.
   Caution: The actuator stem should be held from rotating to avoid damage to the plug and seat, if the actuator is still attached to the valve.

To reassemble cylinder. . .

1. All O-rings should be replaced whenever the actuator is disassembled. O-rings should be lubricated using a silicone lubricant (Dow Corning 55M or equivalent).
2. Make sure all internal parts are thoroughly cleaned and lubricated before reassembly.
3. The cylinder must be carefully assembled to allow the retaining ring groove to be exposed enough to insert the ring.
4. Reinsert retaining ring by feeding it in a little at a time.
5. Replace adjusting screw and gasket. Make sure hole in spring button (on air-to-open) is directly centered under adjusting screw hole.
6. Bring down adjusting screw only enough to provide an air seal with the gasket. Do not overtighten.

To replace actuator, including yoke. . .

1. Lift the plug and turn the actuator back on to the plug.
   Caution: To avoid possible stem and/or seat galling, do not allow the plug to turn.
2. Attach yoke clamps before putting the adjusting screw in.
3. Insert the adjusting screw as described in the cylinder reassembly section. Apply air to the cylinder so pressure is applied to the side of piston opposite the spring, sufficient to move the actuator stem to approximately one half of its stroke.

   NOTE: The amount the plug stem is screwed into the actuator stem is not particularly important on air-to-close valves. It is necessary only to leave two or three threads exposed. On air-to-open valves, however, it is important that the stem engagement be correct.
4. To correctly engage stem, first screw the plug stem into the actuator as far as it will go. Then apply air pressure above the piston to drive it to the bottom of the cylinder. Back the plug stem out of the actuator stem until the plug just touches the seat.
   Caution: Do not turn the plug on the seat.
5. Apply air under the piston to lift the plug off the seat and back the plug stem out of the actuator stem one additional turn. This will establish the proper clearance between the piston and cylinder bottom plate to insure stiff, non slamming valve operation.
6. Apply air over the piston to seat the plug.
7. Slide the stem clamp down approximately even with the bottom of the actuator stem with the stem clamp pointer pointing to "Closed" on the stroke indicator.
8. Reconnect and tighten positioner take-off arm. Proper tightness is important since this adjustment clamps the actuator stem to the plug stem. An adjustable wrench should be used on the outer end of the take-off arm to keep it from turning.

TO REVERSE ACTION...

Two changes are required to modify the actuator from an air-to-retract to an air-to-extend configuration.

1. The actuator should be assembled with the spacer and spring under the piston for air-to-extend, with the spring button stored on top of the piston, under the locknut. The spacer and spring (with spring button in position) should be over the piston on an air-to-retract configuration. (See figure 1).
2. The positioner mounting bracket is provided with two sets of mounting holes so the positioner can be mounted for air-to-retract or air-to-extend action by inverting the positioner. The yoke has one set of holes that will serve either configuration. The positioner take-off arm (from the stem clamp) has a bushing so the arm can be positioned for either side of the clamp to get the right extension. The tubing will have to be rerouted if the positioner is inverted. No extra parts are needed and none are discarded.

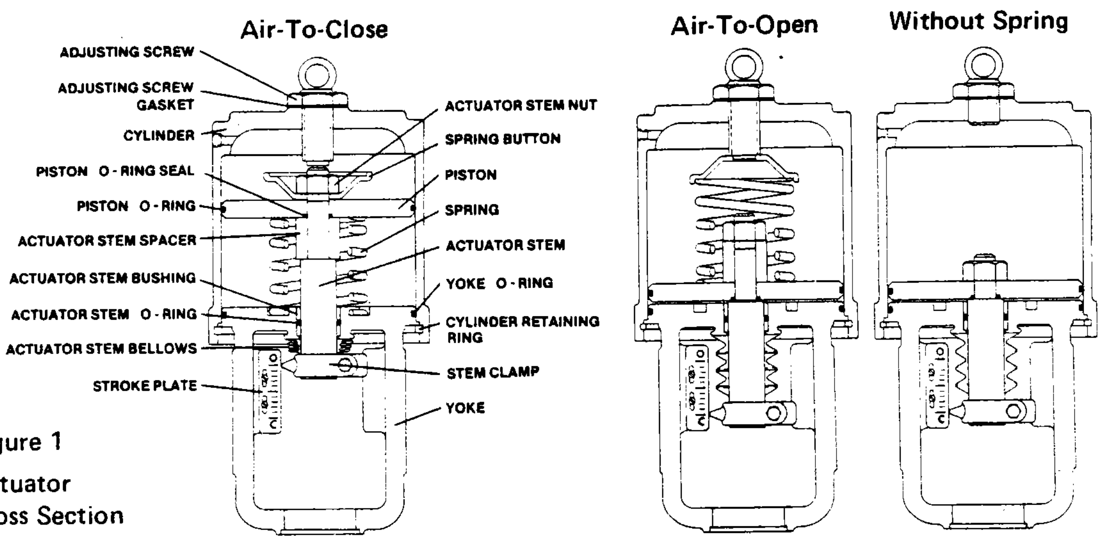
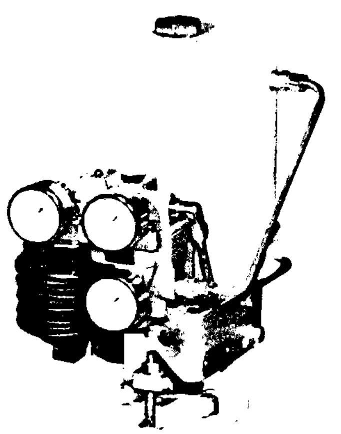


Figure 1
Actuator
Cross Section



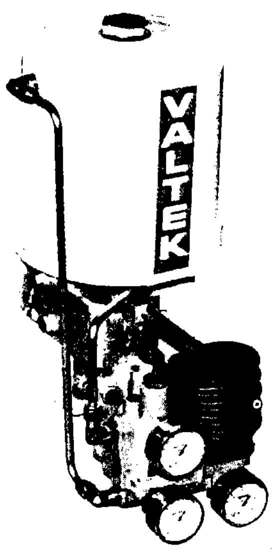


Figure 2
Positioner Mounting

Air-To-Close Flow-To-Open

Positioner Inverted
Valve 2 connection to top of cylinder
Valve 1 connection to bottom of cylinder

Air-To-Open Flow-To-Close

Positioner Normal
Valve 2 connection to bottom of cylinder
Valve 1 connection to top of cylinder

TO REPLACE PACKING. . .

The stem has been polished to a very smooth finish, as has the packing box bore. If the packing is adjusted as described in "Quick-Check" section the packing should seal perfectly for a long time. If replacement is needed, follow these instructions:

1. Remove the bonnet from the valve body and remove the plug.
2. Push out packing, spacer and guides with dowel of the approximate size, from underneath.

   Caution: Effective sealing of the V-ring takes place at the feather edge, so be sure to take care of the edge.
3. Refer to the Typical Packing Configurations illustrations below. Make sure packing configuration shown in the drawing is maintained.

   NOTE: Installing additional V-rings will do no harm (and will probably do no good, either), as long as male and female packing adapters are at the ends of the packing group as shown, and as long as the top guide can enter the box, at least 1/8" on reassembly.

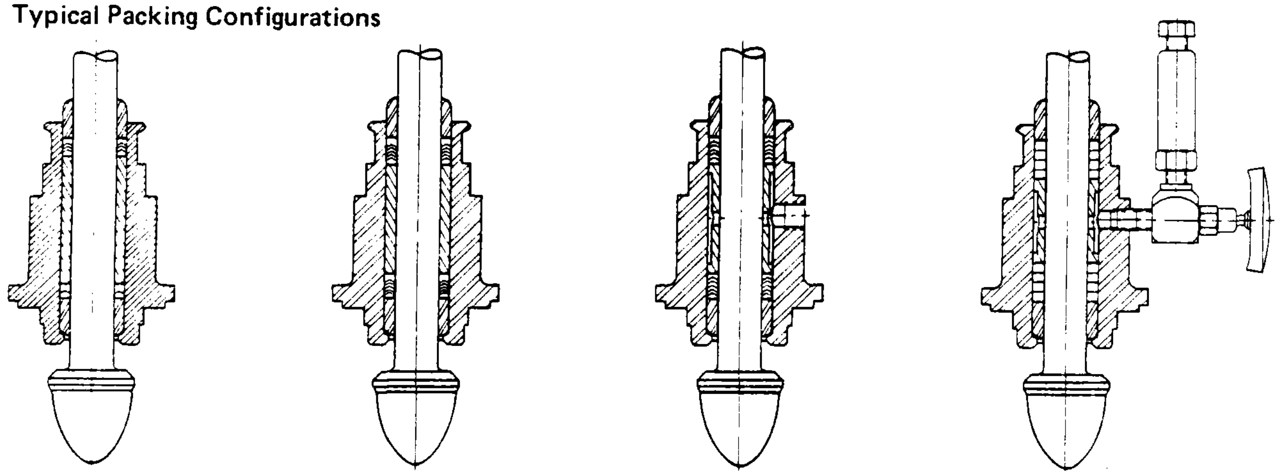
Different spacer lengths permit a wide variety of packing configurations, such as twin seal and vacuum-pressure packing to be used.

4. Some packings such as Teflon-asbestos with a split will permit installation without taking the valve apart. To install the new packing ring, loosen gland flange and lift top guide.
5. Where grafoil guides are used, the grafoil liner should be replaced each time the valve packing is replaced. Under no circumstances should the valve be rebuilt without the grafoil liner in the guide.

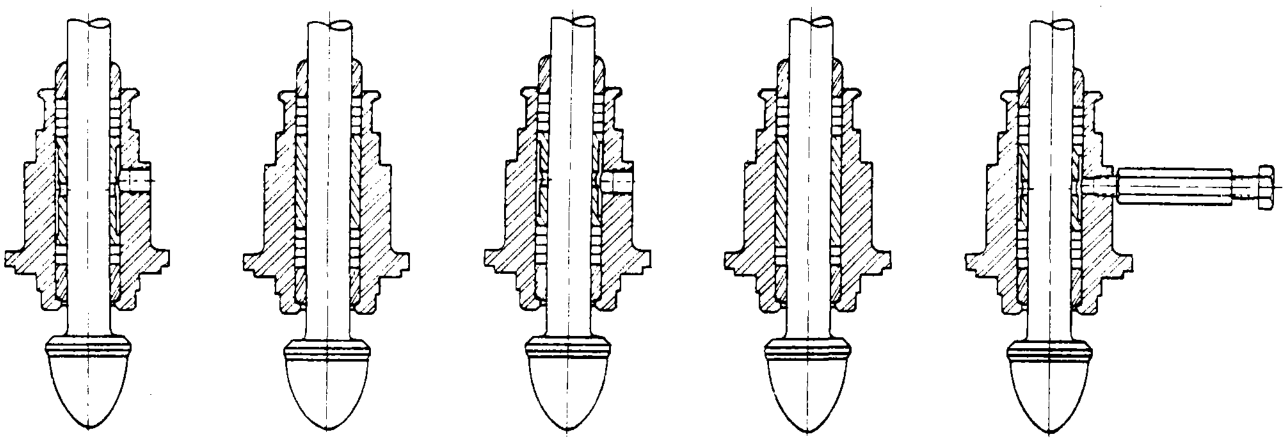
TO TAKE OFF SEPARABLE END FLANGES. . .

File off the peened-up pieces of metal behind the flanges. (The metal has been turned up to prevent the flanges from dropping off during shipment and handling).

Typical Packing Configurations



Std. "V" — Twin "V" — Twin "V" With Lantern Ring — Twin Sq. Lub. With Isolating Valve



Std. Sq. With Lantern Ring — Twin Sq. — Twin Sq. With Lantern Ring — Std. Sq. — Twin Sq. Lub.

TO WELD IN VALVES. . .

Use extreme care, avoiding excess heat buildup in valve.

POSITIONER INFORMATION

The Valtek Mark One Valve Positioner, if supplied, does not need a supply regulator and it has external span and zero adjustments. An air filter ahead of the positioner is recommended.

To Make Zero Adjustment. . .

Turn the zero screw which adjusts the initial tension of the range spring. The protecting bellows can be slid back up the take-off arm during the adjustment. (Zero may have to adjusted if linkage or positioner is disturbed).

To Adjust Stroke. . .

Turn the spring seat, after loosening locknut, to reduce or increase the number of active coils on the range spring.

Available stroke ranges in inches are ¼ to 1½, 1½ to 2¾, 2¾ to 4 and 4 to 6. Springs are available for each range.

Instrument Signal Range.

Standard range: 3-15 psi. Ranges of 3-9, 3-27, 6-30, and 0-15 are available for stroke ranges through 4 inch. Suppression to pressure of 2, 5, 6, 9, 11, 12 and 14 psi without affecting range is obtained with a suppression spring assembly installed between the diaphragms and the range spring.

To Adjust Actuator Balance Pressure. . .

1. Turn the output pressure level adjusting screw. This effectively changes the seat-to-seat dimensions between the supply ports on the two pilot plungers, adjusting the nominal output pressure at which the positioner comes to balance.
2. Set the balance pressure at about 80% of supply pressure. Higher pressure in the actuator makes it stiffer, and therefore more stable under variations in stem loading. Good equal speed operation is obtained in both directions with lower balance pressures.

Caution: Make this adjustment carefully and slowly, letting the positioner settle out before going too far. It is good practice to check after a short while to make sure balance pressure doesn't go too far.

To Clean Restriction Nozzle. . .

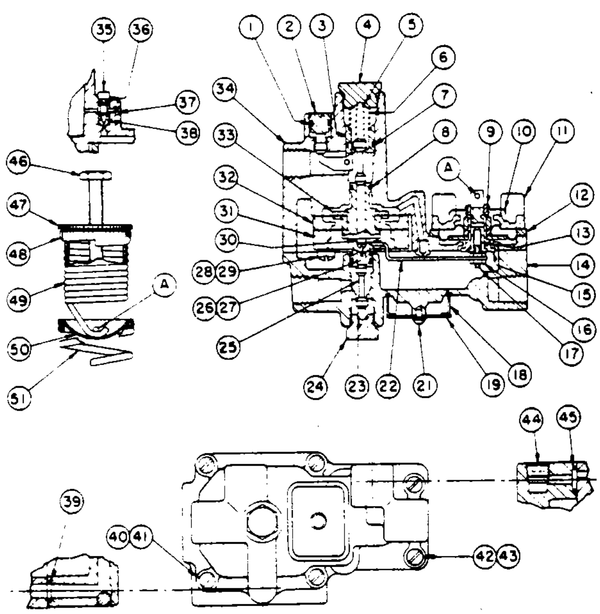
Push the plunger on the outside of the positioner several times. This will overcome occasional difficulties with the positioner that can be traced to dirt in the restriction nozzle. Repeated difficulties may indicate the need for an external filter, which is always recommended.

Mark One Valve Positioner

The following is a parts list for the Mark One positioner.

A positioner repair kit, consisting of parts most commonly required, is available on request.

Positioner Repair Kit



1. O-Ring
2. Adjusting Screw
3. Pilot Seat
4. Adjusting Screw
5. Plunger Spring
6. Spring
7. O-Ring
8. O-Ring
9. Grommet
10. Baffle
11. Instrument Capsule Casting
12. Diaphragm Ring
13. Spring
14. Housing
15. Diaphragm Assembly (Incl. Items 13 & 17)
16. Nut
17. Stud
18. Screen
19. Nameplate
20. =4
21. =4 x 3/16" Long
22. Beam Assembly
23. Plunger Spring
24. Sealing Screw
25. Plunger
26. =2-56NCX3/16" Long, Fillet Head
27. Washer
28. =10-32NCX7/8" Long, Fillet Head
29. =10
30. Spacer
31. Diaphragm Ring
32. Diaphragm Ring
33. Diaphragm Assembly
34. Housing
35. Cleaning Plunger
36. O-Ring
37. Screw
38. Spring
39. O-Ring
40. =10-32NCX 1/2" Long, Fillet Head
41. =10
42. =10-32NCX 7/8" Long, Fillet Head
43. =10

44a. 0-30 psi Guage, Instrument

44b. 0-160 psi Guage Actuator

45. O-Ring

46a. Zero Adj. Screw, 2-3/4" Lg. (According to Stroke and Span)

46b. Zero Adj. Screw, 1-7/8" Lg. (According to Stroke and Span)

47. Locknut
48. Spring Seat Assembly
49. Range Spring
50. Suppression Spring Seat (when req'd)
51. Suppression Spring (when req'd)

Positioner Operation

The Valtek Mark One Positioner provides high dynamic response, high positioning accuracy, speed and reversibility. It does not need a supply regulator but an air filter is recommended. The positioner is remarkably free from vibration-induced problems.

The positioner schematic shows a Valtek Mark One Positioner connected for double-acting service on a piston actuator. The range spring provides "Feedback" to the positioner. Tension on the range spring will vary as the stem position changes. As the drawing indicates, the spring-loading force is applied directly to the positioner's input capsule.

Control-instrument pressure is applied between the diaphragms in the input capsule. Thus, the input capsule serves as a force-balance member, matching the valve-stem position (as measured by tension on the range spring) to the control-instrument signal.

When the opposing forces balance exactly, the system will be in equilibrium—and the stem will be in the exact position called for by the control instrument. If the opposing forces are not in balance the input capsule will move up or down and, by means of the pilot valves, will change the output pressures, moving the stem until tension on the range spring opposes exactly the control-instrument pressure.

The sequence of operation is as follows: An increase in control-instrument pressure forces the input capsule downward. Displacement of the capsule in turn moves the baffle lever away from the detecting nozzle. This allows air to escape to the atmosphere, decreasing the pressure exerted on the top side of the pilot valve capsule.

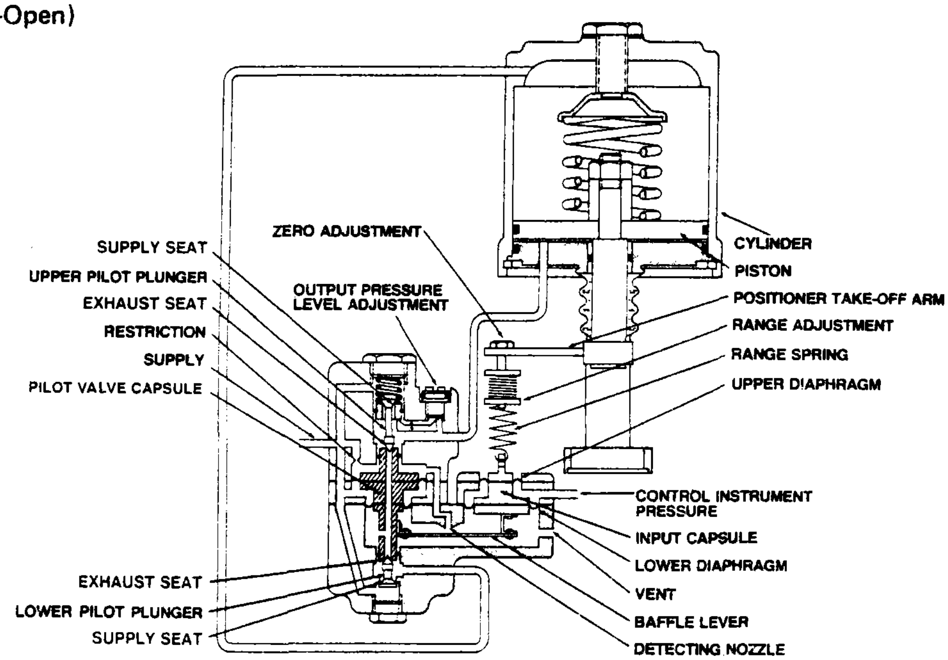
Supply air biases the pilot-valve capsule in an upward direction. As the capsule moves up, it will close off the exhaust seat of the upper pilot plunger--and open the supply seat, applying increased air pressure to the bottom of the actuator. At the same time, the pilot-valve capsule will open the exhaust seat for the lower pilot plunger—thus decreasing pressure to the top of the actuator.

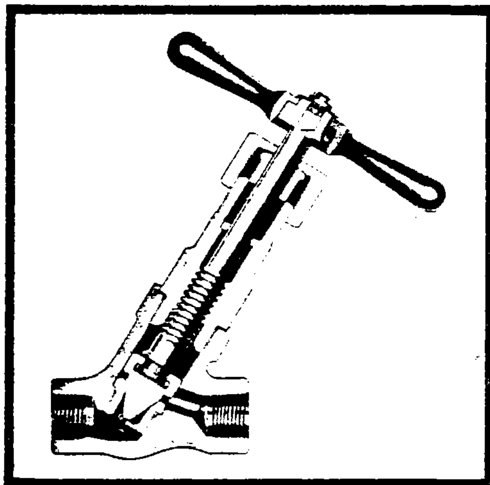
This difference in pressure will drive the piston upward—stretching the range spring—until the spring tension opposes exactly the force resulting from the new control instrument pressure signal. At this point, the baffle lever will be moved toward the detecting nozzle to restore the pressure above the pilot-valve capsule to its equilibrium value. As a force-balance condition is approached, the pilot-valve capsule will be forced back to a neutral position where the pilots are neither supplying air to, nor exhausting air from, their respective sides of the piston.

A decrease in instrument-air pressure reverses the described actions and causes a proportional downward movement of actuator piston and stem.

The input capsule and the pilot-valve capsule are connected to the baffle lever to provide a motion balance negative feedback in the detecting nozzle circuit. Negative feedback insures high gain in the detecting circuit—with no overshoot or instability.

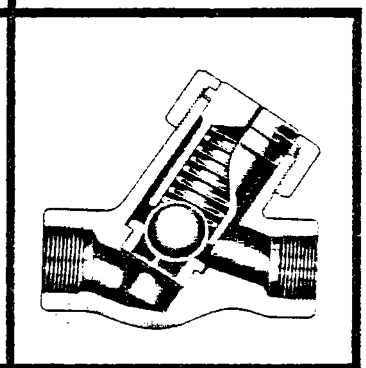
Positioner Schematic
(Air-To-Open)

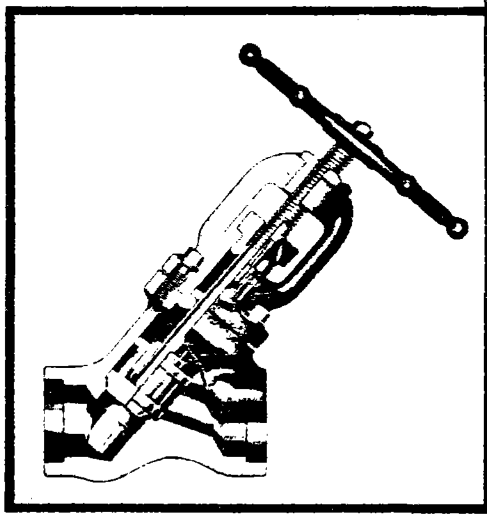




SERVICE MANUAL FOR ROCKWELL EDWARD FORGED STEEL VALVES

Union, Bolted & Screwed Bonnet Types





Rockwell

Servicing Rockwell-Edward Forged Steel Valves

Typical Valve Designs

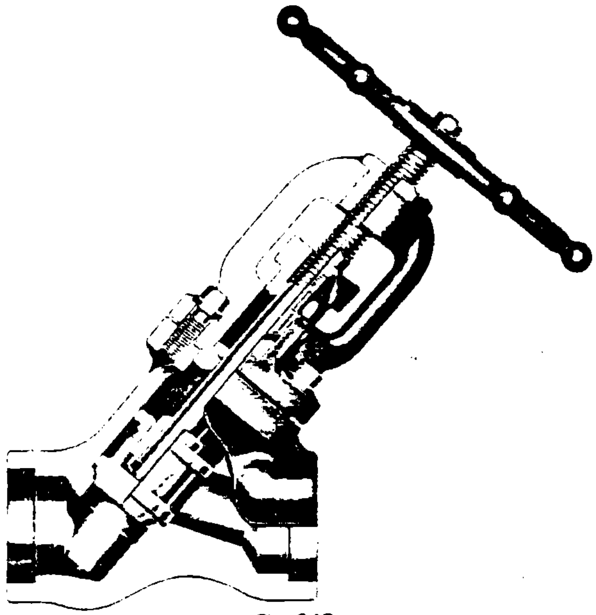


Fig. 848
Bolted Bonnet Stop, Bolted Gland, O.S.& Y.

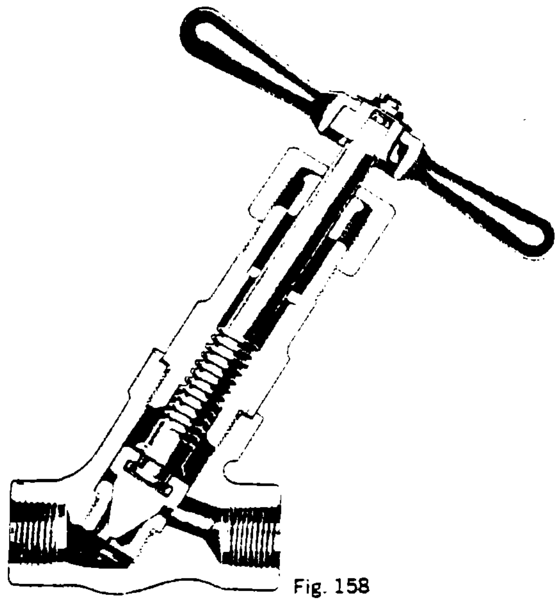


Fig. 158
Screwed Bonnet Stop, Screwed Gland, Inside Screw, Screwed-in Seat

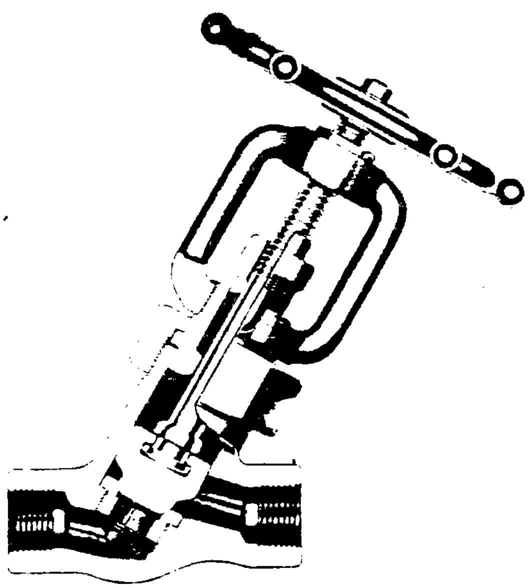


Fig. 444
Union Bonnet Stop, Bolted Gland, O.S.& Y., Screwed-in Seat

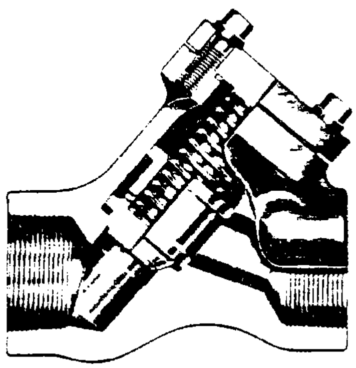
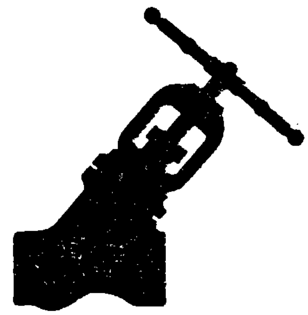


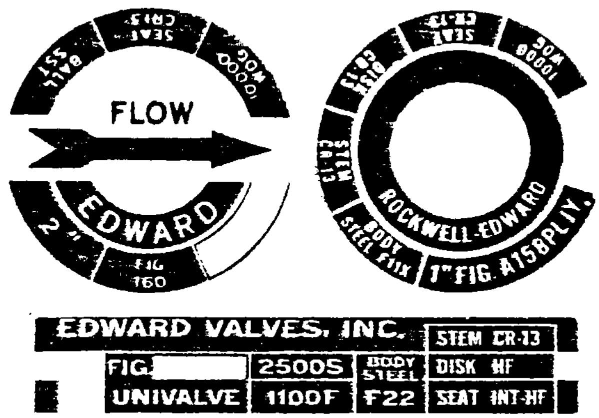
Fig. 838
Bolted Cover Piston Check



INTRODUCTION

This manual is provided to help you service your Rockwell-Edward Forged Steel valves.

Before disassembling any valve, we recommend that you check the valve identification plate and note size, figure number, and pressure class, so that you can identify it in the appropriate Rockwell-Edward Catalog.

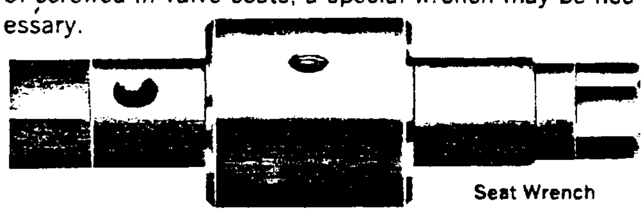


Identification Plates

This catalog will show typical cross sections to help identify the various parts.

Tools

Most Edward Forged Steel valves may be readily disassembled with ordinary hand tools. For the removal of screwed-in valve seats, a special wrench may be necessary.



Seat Wrench

Such seats are provided with hexagonal holes, lugs, or slots for disassembly and reassembly. Necessary drawings are available if valve users wish to make their own tools or they may be purchased from Rockwell.

DISASSEMBLY:

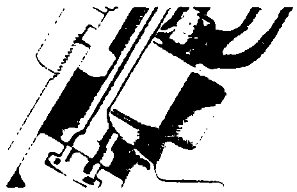
Be sure line is not under pressure when disassembling valves.

Bolted Bonnet

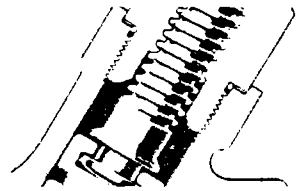
In bolted bonnet style valves, the nuts or cap screws should be removed (see Fig. 848 page 2). The bonnet assembly or cover can then be removed and the interior of the valve exposed.

Union & Screwed Bonnet

Small valves of the union ring or screwed bonnet type are disassembled by unscrewing the bonnet or union ring.



Union Ring Construction



Screwed Bonnet Construction

Gage Valves

Small gage valves of the Fig. 152 type have a pipe thread body-bonnet connection. These require the same consideration as any pipe thread joint.

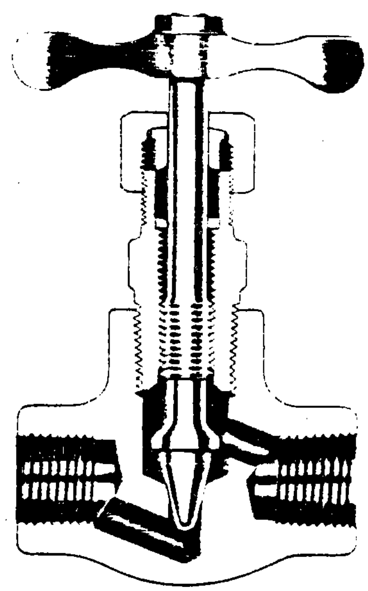
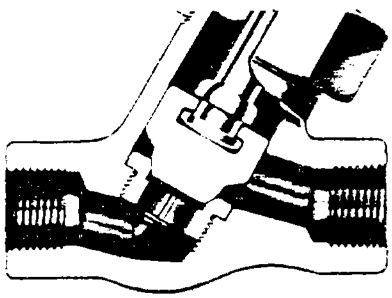


Fig. 152

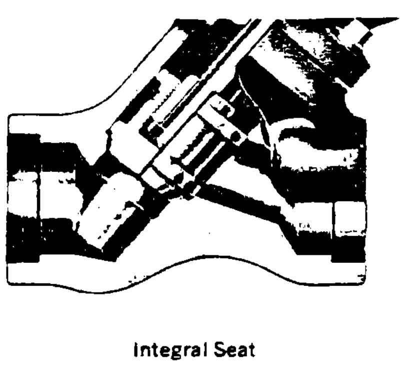
Screwed Bonnet, Screwed Gland, Inside Screw, Needle Stem Gage

Seats

Edward valve seats are of two types — screwed-in or integral with the valve body.



Screwed-in seats can best be repaired, if more than lightly damaged, by removal from the valve. If lock welded, the lock weld must be removed and the seat unscrewed. If screwed-in seats are badly damaged, it may be more economical to replace them with new seats, however, if they are repairable, they may be remachined on a lathe. The part should be accurately centered in the lathe before machining. EValloy seats can be cut with high speed tool bits. Stellite*faced seats must be machined with tungsten-carbide tools or by grinding. In replacing a screwed-in seat in the valve body, care should be taken that the face on the body against which the seat shoulder rests is clean and true to provide a tight seal. Surfaces should be blued and checked for contact all the way around when replacing a seat. Care should be taken that reworking does not throw the sealing face between body and seat out of line with the seat threads. After reassembly, lock welded seats should be rewelded.



Integral Seat

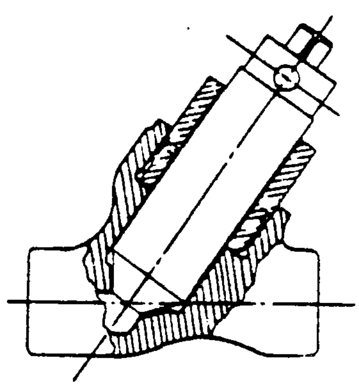
Integral valve seating surfaces cannot be removed for repair. Once the valve has been disassembled and thoroughly cleaned, determine the best procedure based on the extent of damage. Lightly damaged seats may simply be repaired by lapping with the valve disk assembly.

Heavier damage may require the use of special lapping tools or removal of the valve body from the line for remachining. These valves should then be finish lapped using the valve disk assembly. (See Below).

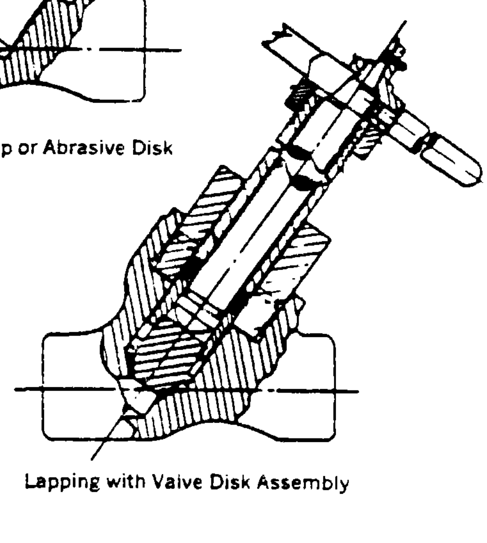
Complete instructions for the repair and finishing of integral stellite valve seats are contained in "Service Manual for Rockwell-Edward Univalves" V-375.

Seat Finishing

After properly installing seats in valve bodies or reworking integral seat valves, the seat and disk should be lapped together. To preclude galling, caution should be taken not to apply too much pressure in lapping EValloy seats and disks. Lapping should be done with a light load, lifting the disk frequently to a new position and cleaning the lapping faces as required. See below:



Lapping with Lap or Abrasive Disk



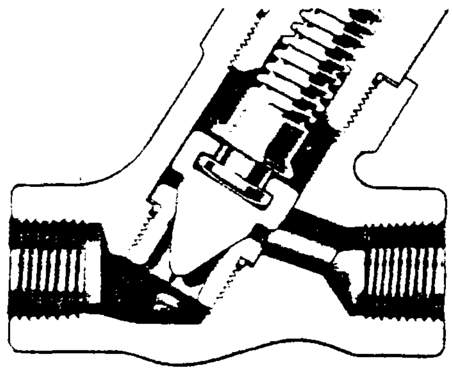
Lapping with Valve Disk Assembly

*T.M Haynes Div., Union Carbide Corp.

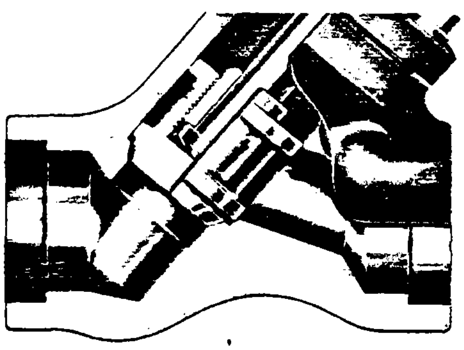
The effectiveness of valve seat lapping can best be judged by blueing the disk and rotating it lightly in the seat. A full contact should be obtained around the circumference of the seat. A valve which shows this full contact should be pressure tight after assembly when proper stem load is applied.

Disks

In all except small Rockwell-Edward gage, instrument and needle stem valves, disks are designed to swivel on the valve stem. They are held in place by either a "T"-slot connection or a disk nut.



T-slot Construction



Disk Nut Construction

Stop-Check valve disks are not attached to the stem and respond to the fluid flow in the same manner as check valve disks. (see below). The disk seating face can be repaired in a similar manner to that described for seats.

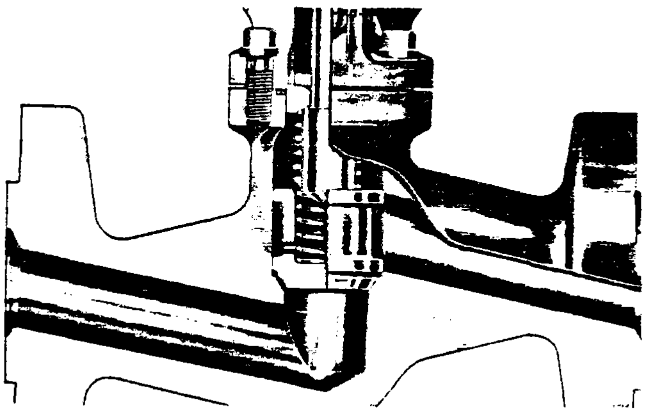


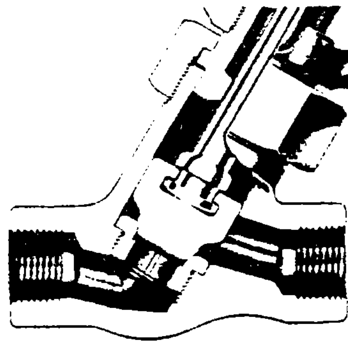
Fig. 846
Typical Stop-Check Valve with Body-Guided Disk

Valve stems are normally provided with a radius at the disk contact to give center loading. If foreign material gets between this spherical surface and the disk, or if galling occurs, it may not be possible to close the valve tightly. In a leaking valve this contact should be checked to be sure it is in proper condition.

Disk Tack Welds

In body-guided valve disks and small new style bolted bonnet valves, the disk nut is secured to the disk by a small weld through the side of the disk fusing the disk nut threads and preventing loosening of the disk assembly in service. Such disks can easily be disassembled if required by drilling out the fused material at the bottom of the small hole in the disk. The disk nut can then be unscrewed for servicing. Care must be exercised not to drill through the disk nut wall or the stem may be damaged. When repairs are complete, the parts can be reassembled with care being taken to screw the disk nut down until only a few thousandths of an inch end play remain in the assembly. The parts can then be lock welded again by depositing weld metal at the bottom of the small hole in the disk.

In other than body guided disk valves, it is equally important that the end play between disk and stem be held to a minimum. An end clearance of a few thousandths of an inch is ideal to give good swivel action without permitting excessive misalignment of the disk. If after some time in service, it is desired to reduce end play, the small tack weld should be broken and the disk nut removed.



Non-Body Guided Disk

The required reduction in end clearance can be effected by removing metal as required from the shoulders of the disk nut. After reassembly the tack weld should be replaced to secure the threaded parts. Such tack welds should be made with a stainless steel welding rod such as Lincoln Electric Company Stainweld No. A.

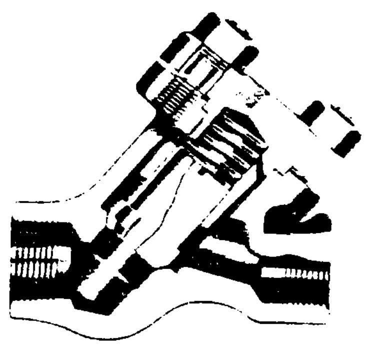


Fig. 5538

Cover Guided Disk, Bolted Cover Piston Check

Valves 4" or smaller may be body guided by rings on the disk or in the case of "T"-slot disks by the disk outside diameter. A similar body guiding arrangement may be found in check valves. Some valves have disks which are stem guided with the disks of companion check valves being guided by an extension of the cover. (See above) The wear on sliding surfaces inside valves should be considered and the surfaces checked to be sure it is not excessive. Guiding in check valves is particularly critical. The guides must be close enough to bring the disk accurately down into the seat to make a tight joint.

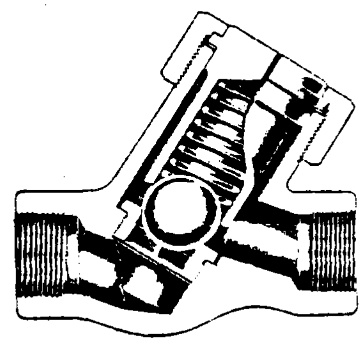


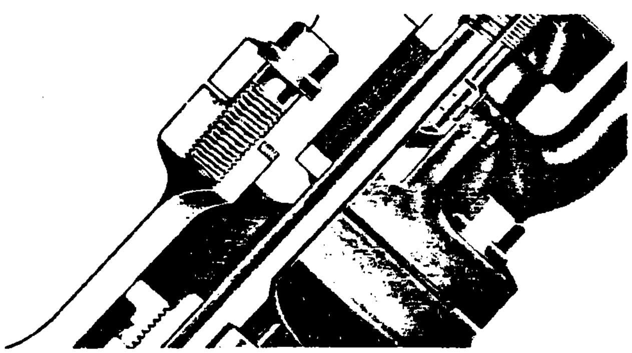
Fig. 3572

Union Bonnet Ball Check, Screwed-in Seat

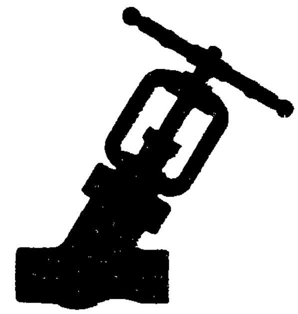
Foreign material in the flow medium may wedge between guiding surfaces with the possibility of making the disk stick. It is recommended that piston check valves be used where the fluids are clean and where tight seating is important. In smaller sizes, it is recommended that ball type check valves be used where the problem of sticking open is of serious consideration. Valves sized too large for flow condition will sometimes have excessive wear, chatter and noise.

Backseat

Rockwell-Edward stop valves, except bonnetless instrument valves of the 952 type and Univalves of the loose backseat type (withdrawable trim), have a backseat integral with the bonnet. The seating face on the bonnet is generally a bevel and the seating surface on the disk nut or stem is provided with a radius. Care must be taken of sealing surfaces on both the bonnet and the radius which seals against it to obtain a tight backseat.



Integral Backseat Construction



Packings

Many Rockwell-Edward valves are packed with all-purpose packing sets. This is a combination of packing using jacketed high density rings at the top and bottom in the packing chamber and softer packing in the center section. The outer rings are reinforced with Inconel† wire and are also used exclusively on valves for high temperature service. Valves for chemical service may be packed with Teflon*, filled Teflon or Teflon impregnated packing. 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. If packing has hardened, it should be removed and new packing installed. To obtain best results, the stem should be thoroughly cleaned. Replacement packing should be the same as that originally furnished. Rockwell-Edward valve packings are inhibited to prevent stem pitting in service.

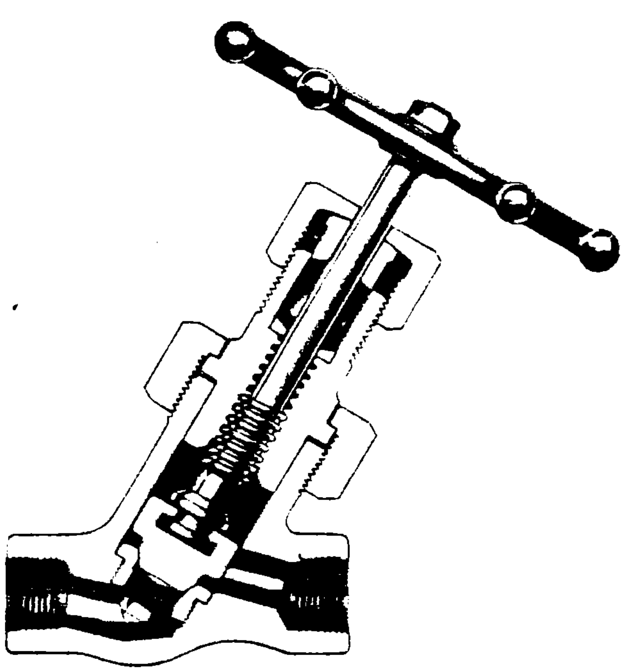
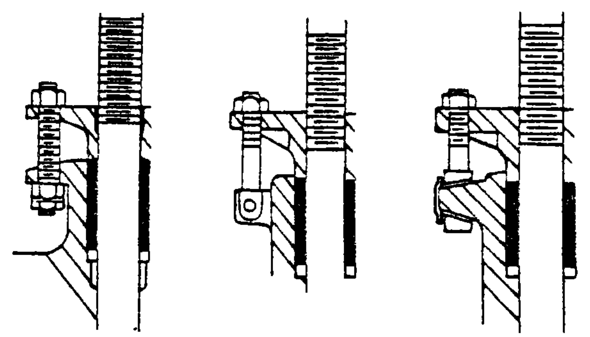


Fig. 2698
Union Bonnet Stop, Screwed Gland, Screwed-in Seat

Valves of the Fig. 2698 type have a packing nut with threads which should be kept well lubricated to prevent corrosion and eliminate packing adjustment difficulties.

Gland Bolts

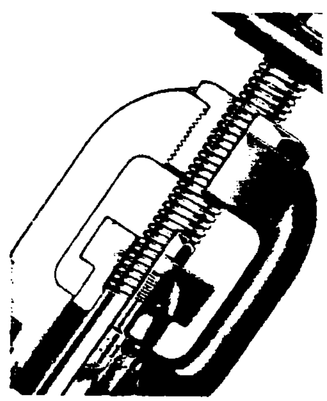
The removal of glands and gland stud bolts is accomplished by removing the nuts. Swing bolts can be removed by also driving out the pin. In some small valves the swing bolt pivots on the valve yoke and is held in



Stud Type   Swing Type   Pivot Type

place by a spot welded steel washer (see pivot type above). If the replacement of these is necessary, the washer can be pried off and the bolt removed. A new washer can be applied by tack welding.

Yoke Bushing



Yoke Bushing

The yoke bushings of small Rockwell-Edward valves are threaded to the yoke. These can be removed by cutting the lock weld and unscrewing the bushing. Bushings are subject to wear in services where large amounts of grit accumulate on the valve threads. Lubrication aids easy operation of valves and reduces wear of yoke bushings.

†T.M. International Nickel Co., Inc.   *T.M. E. I. du Pont de Nemours & Co.

REASSEMBLY

Valves of the union ring type, or bolted bonnet construction are sealed at the bonnet by flat, soft metal gaskets. Screwed-in seats are also frequently sealed by flat gaskets. Such gaskets require smooth clean surfaces on body, bonnet or seat. Current bolted bonnet valves, such as Fig. 848 type, are sealed with spiral wound stainless steel and asbestos gaskets. In all valves, new gaskets are recommended for reassembly. Bonnet and seat gaskets are inexpensive and available out of factory stock.

Valves with union bonnet joints require the union nut to be well lubricated and tightened to develop sufficient gasket compression.

Valve Size	¼ & ⅜	½	¾	1
Torque in Ft-Lb	130	400	450	750

On all bolted bonnet valves, it is desirable to maintain the bolt tension necessary to keep the bonnet joint tight. It is recommended that the initial bolt stress of 45,000 psi be maintained under service conditions. In high temperature service where creep may be anticipated, it is recommended that this bolt tension be maintained.

Spare Parts

Spare parts for Edward valves may be ordered by specifying valve size, figure number and name of part. This information may be developed from your files or from current Rockwell-Edward catalogs.

Service

If you have any further questions on valve repair or part replacement, your Rockwell representative will be happy to assist you. Rockwell Edward catalogs available on request:

Rockwell Edward Forged Steel Valves V-301
Service Manual for Rockwell Edward Univalves......V-375

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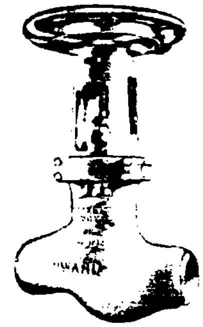
Rockwell International

Flow Control Division
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208

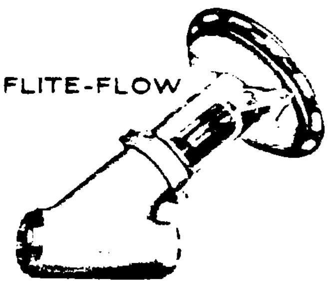
V-377 R1



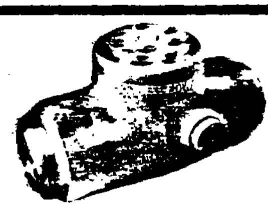
GLOBE STOP

MAINTENANCE MANUAL FOR ROCKWELL-EDWARD PRESSURE-SEAL VALVES

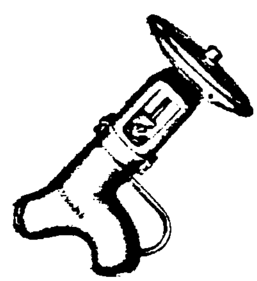
FLITE-FLOW



ANGLE-CHECK



TILTING DISK



ELBOW DOWN

Rockwell

CONTENTS

KEY TO ILLUSTRATIONS

ROCKWELL-EDWARD
PRESSURE SEAL VALVES MAINTENANCE MANUAL

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 in obtaining the most satisfactory service from these valves. Although rigid metallurgical, radiographic, physical and visual inspection is the standard procedure for all Rockwell-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.

Then the procedure to be followed in making the repair is explained. This includes normal valve maintenance as well as major valve repair. Field repair equipment, available from Rockwell-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 procedures for the various valve components: for example, manual or 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 Rockwell-Edward for additional advice, if required, and how to order parts is included.

FIGURE NUMBERS OF ROCKWELL-EDWARD PRESSURE SEAL VALVES DESCRIBED IN THIS MANUAL

602Y	694Y	1560Y	2007Y	3902Y	3946Y	4007Y	4095Y	4416Y	4570Y	7542Y
606	695	1561	2014Y	3906	3947	4016	4306Y	4417Y	4592Y	7546
606Y	695Y	1561Y	2016Y	3906Y	3947Y	4016Y	4307Y	4442Y	7502Y	7546Y
607	702Y	1570Y	2017Y	3907	3948Y	4017	4316Y	4446Y	7506	7547
607Y	714Y	1602Y	2042Y	3907Y	3992Y	4017Y	4317Y	4447Y	7506Y	7547Y
614Y	792Y	1614Y	2046Y	3914Y	3994	4046	4370Y	4448Y	7507	7548Y
616	960	1692Y	2047Y	3916	3994Y	4046Y	4394Y	4470Y	7507Y	7592Y
616Y	960Y	1802Y	2070Y	3916Y	3995	4047	4395Y	4492Y	7514Y	7594
617	961	1814Y	2092Y	3917	3995Y	4047Y	4402Y	4494Y	7516	7594Y
617Y	961Y	1892Y	2094Y	3917Y	4006	4094	4406Y	4495Y	7516Y	7595
692Y	970Y	2002Y	2095Y	3942Y	4006Y	4094Y	4407Y	4502Y	7517	7595Y
694	1560	2006Y	2570Y	3946	4007	4095	4414Y	4514Y	7517Y	

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 table at right.

TYPE I

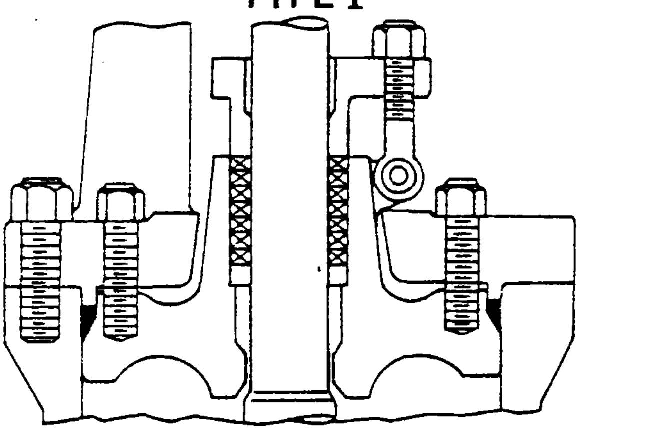


Illustration No. 1

Fig No.	Pressure Rating	Type of Valve	Size
602Y	600	Flite-Flow Globe Stop-Check (Y-Type)	16-20
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)	16-20
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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	16-20
714Y	600-SP-66	Flite-Flow Globe Stop (Y-Type)	16-20
792Y	600-SP-66	Flite-Flow Check (Y-Type)	16-20
1602Y	Special	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1614Y	Special	Flite-Flow Globe Stop (Y-Type)	16-20
1692Y	Special	Flite-Flow Check (Y-Type)	16-20
1802Y	Special-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	16-20
1814Y	Special-SP-66	Flite-Flow Globe Stop (Y-Type)	16-20
1892Y	Special-SP-66	Flite-Flow Check (Y-Type)	16-20

TYPE II is the push-up design in which the bonnet retainer ring is screwed on to 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.

Fig. No.	Pressure Rating	Type of Valve	Size
2006Y	1500-SP-66	Globe Stop-Check	2½-4
2007Y	1500-SP-66	Angle Stop-Check	2½-4
5Y	1500-SP-66	Globe Stop	2½-4
7Y	1500-SP-66	Angle Stop	2½-4
2046Y	1500-SP-66	Globe Stop-Check	2½-4
2047Y	1500-SP-66	Angle Stop-Check	2½-4
3902Y	2500	Flite-Flow Globe Stop-Check (Y-Type)	6-20
3906 and 3906Y	2500	Globe Stop-Check	2½-12
3907 and 3907Y	2500	Angle Stop-Check	2½-22
3914Y	2500	Flite-Flow Globe Stop (Y-Type)	6-24
3916 and 3916Y	2500	Globe Stop	2½-12
3917 and 3917Y	2500	Angle Stop	2½-22
3942Y	2500	Flite-Flow Globe Stop-Check (Y-Type)	6-24
3946 and 3946Y	2500	Globe Stop-Check	2½-12
3947 and 3947Y	2500	Angle Stop-Check	2½-22
3948Y	2500	Elbow Down Stop-Check	10-16
4006 and 4006Y	900	Globe Stop-Check	2½-4
4007 and 4007Y	900	Angle Stop-Check	2½-4
4016 and 4016Y	900	Globe Stop	2½-4
4017 and 4017Y	900	Angle Stop	2½-4
4046 and 4046Y	900	Globe Stop-Check	2½-4
4047 and 4047Y	900	Angle Stop-Check	2½-4
4306Y	900-SP-66	Globe Stop-Check	2½-4
4307Y	900-SP-66	Angle Stop-Check	2½-4
4316Y	900-SP-66	Globe Stop	2½-4
4317Y	900-SP-66	Angle Stop	2½-4
4402Y	2500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-24
4406Y	2500-SP-66	Globe Stop-Check	2½-12
4407Y	2500-SP-66	Angle Stop-Check	2½-22
4414Y	2500-SP-66	Flite-Flow Globe Stop (Y-Type)	6-24
4416Y	2500-SP-66	Globe Stop	2½-12
4417Y	2500-SP-66	Angle Stop	2½-22
4442Y	2500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-20
4446Y	2500-SP-66	Globe Stop-Check	2½-12
4447Y	2500-SP-66	Angle Stop-Check	2½-22
4448Y	2500-SP-66	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
7506 and 7506Y	1500	Globe Stop-Check	2½-4
7507 and 7507Y	1500	Angle Stop-Check	2½-4
7516 and 7516Y	1500	Globe Stop	2½-4
7517 and 7517Y	1500	Angle Stop	2½-4
7546 and 7546Y	1500	Globe Stop-Check	2½-4
7547 and 7547Y	1500	Angle Stop-Check	2½-4

TYPE II

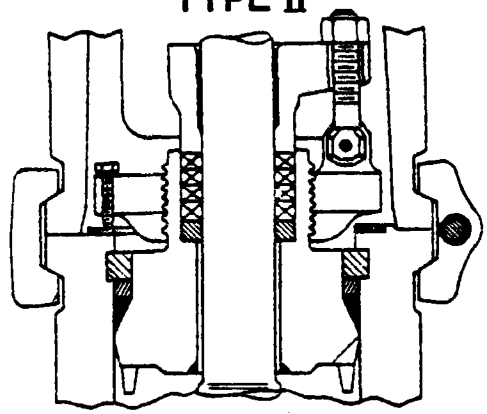


Illustration No. 2

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.

Fig. No.	Pressure Rating	Type of Valve	Size
02Y	600	Flite-Flow Stop-Check (Y-Type)	24-32
7Y	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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	24-32
714Y	600-SP-66	Flite-Flow Globe Stop (Y-Type)	24-32
792Y	600-SP-66	Flite-Flow Check (Y-Type)	24-32
960 and 960Y	900	Separated Stop-Check	4-8
961 and 961Y	900	Separated Stop-Check	4-8
970Y	900	Tilting Disk Check	2½-24
1560 and 1560Y	1500	Separated Stop-Check	4-8
1561 and 1561Y	1500	Separated Stop-Check	4-8
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-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	24-32
1814Y	Special-SP-66	Flite-Flow Globe Stop (Y-Type)	24-32
1892Y	Special-SP-66	Flite-Flow Check (Y-Type)	24-32
2002Y	1500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-18
2006Y	1500-SP-66	Globe Stop-Check	5-14
2007Y	1500-SP-66	Angle Stop-Check	5-24
2014Y	1500-SP-66	Flite-Flow Globe Stop (Y-Type)	6-18
2016Y	1500-SP-66	Globe Stop	5-14
2017Y	1500-SP-66	Angle Stop	5-24
2042Y	1500-SP-66	Flite-Flow Globe Stop-Check (Y-Type)	6-18
2046Y	1500-SP-66	Globe Stop-Check	5-14
47Y	1500-SP-66	Angle Stop-Check	5-24
70Y	1500-SP-66	Tilting Disk Check	3-24
2092Y	1500-SP-66	Flite-Flow Check (Y-Type)	6-18
2094Y	1500-SP-66	Horizontal Check	2½-14
2095Y	1500-SP-66	Angle Check	2½-24
2570Y	2500	Tilting Disk Check	3-24
3992Y	2500	Flite-Flow Check (Y-Type)	6-24
3994 and 3994Y	2500	Horizontal Check	2½-12
3995 and 3995Y	2500	Angle Check	2½-24
4006 and 4006Y	900	Globe Stop-Check	5-14
4007 and 4007Y	900	Angle Stop-Check	5-24
4016 and 4016Y	900	Globe Stop	5-14
4017 and 4017Y	900	Angle Stop	5-24
4046 and 4046Y	900	Globe Stop-Check	5-14
4047 and 4047Y	900	Angle Stop-Check	5-24
4094 and 4094Y	900	Horizontal Check	2½-14
4095 and 4095Y	900	Angle Check	2½-24
4306Y	900-SP-66	Globe Stop-Check	5-14
4307Y	900-SP-66	Angle Stop-Check	5-24
4316Y	900-SP-66	Globe Stop	5-14
4317Y	900-SP-66	Angle Stop	5-24
4370Y	900-SP-66	Tilting Disk Check	2½-20
4394Y	900-SP-66	Horizontal Check	2½-14
4395Y	900-SP-66	Angle Check	2½-24
4470Y	2500-SP-66	Tilting Disk Check	3-24
4492Y	2500-SP-66	Flite-Flow Check (Y-Type)	6-24
4494Y	2500-SP-66	Horizontal Check	2½-12
4495Y	2500-SP-66	Angle Check	2½-24
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
7542Y	1500	Flite-Flow Globe Stop-Check (Y-Type)	6-18
7546 and 7546Y	1500	Globe Stop-Check	5-14
7547 and 7547Y	1500	Angle Stop-Check	5-24
7548Y	Special	Elbow Down Stop-Check	10-18
7592Y	1500	Flite-Flow Check (Y-Type)	6-18
7594 and 7594Y	1500	Horizontal Check	2½-14
7595 and 7595Y	1500	Angle Check	2½-24
7598Y	Special	Elbow Down Check	10-18

TYPE III

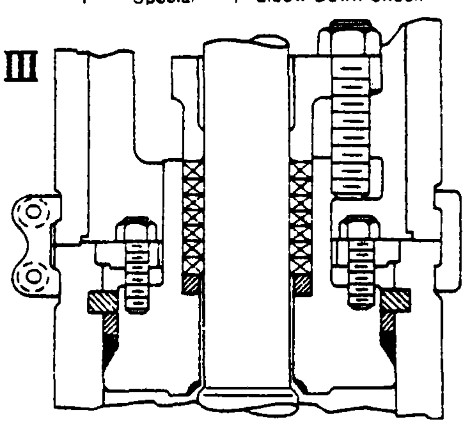


Illustration No. 3

TYPE IV

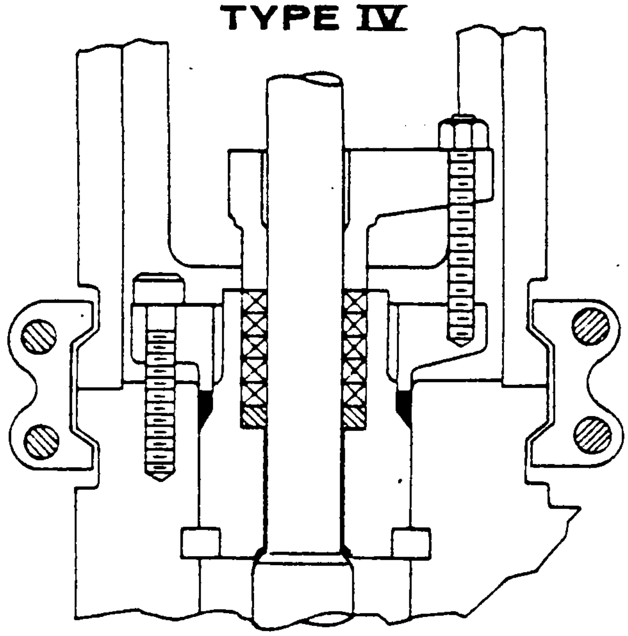


Illustration No. 4

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.

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 re-torquing the gland bolt nuts, 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

John Crane Style 187-I packing is used for the *upper* and *lower* rings on standard Edward pressure-seal valves with the exception of 2500 lb. and 4500 lb. valves, where it is used for all rings. John Crane style 6DCR packing is used for the middle rings. The designation 187-I indicates molded rings of graphited asbestos with an asbestos yarn jacket reinforced with monel wire. The 6DCR packing is composed of molded rings of graphited asbestos with a Neoprene cement binder. Both types are treated with a thin coating of paraffin to prevent water absorption. All are split rings and can be installed without disassembly of the valve.

The valve stem should be thoroughly cleaned before installing new packing to insure the best possible seal. Install each new packing ring separately, pushing each one to the bottom of the chamber. Make certain the lap joints of each consecutive ring are staggered 120 degrees so the lap of the fourth ring is in the same position as the first. When the chamber is filled, tighten the gland down solidly with a 24 inch wrench. This should make room for insertion of one or two more rings.

PRESSURE-SEAL LEAK

A torque wrench should be used for tightening the bonnet or cover retainer studs or cap screws which are used to preload the pressure-seal gasket.

The following procedure is recommended:

1. Guard against leakage by having these bolts tight at all times.
2. With line pressure in the valve, all nuts should be tightened to the torque shown below.

Bolt Diameter, Inches	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4
Nut Torque, Ft. Lbs.	45	68	90	150	240	370	585	750

3. In addition, these torques should be used for all stud nuts and cap screws.

An average man on a 12 inch wrench can develop about 100 ft. lb. of torque. Therefore, if a torque wrench is not available, use the following wrench-bolt combinations:

Bolt Sizes, Inches	1/2	9/16	5/8	3/4	7/8	1-1/8
Wrench Sizes, Inches	6	9	12	18	24	36

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. Edward pressure-seal gaskets are designed with a blunt lower end to minimize susceptability to accidental damage. However, they are made of soft Armco iron with a very soft malleable coating and should be handled carefully.
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 which may cause a by-pass around the pressure seal.

   If a gasket is ever removed, examine it very carefully for imperfections on its outside diameter, usually in the form of deep vertical score marks made by removing it from its tightly wedged position in the body. While these score marks were not made until the gasket was removed and are not the reason for the original disassembly of the valve, they may readily give rise to future leak areas if the gasket is used a second time. Such deep vertical score marks should be cause enough to install a new gasket.
3. **Leakage at the Gasket.** The possibility of a leak through the pressure-seal gasket itself, while more remote, should still be considered. This may not be the result of external flaws on the sealing edge of the gasket.

TYPICAL GLOBE VALVE NOMENCLATURE

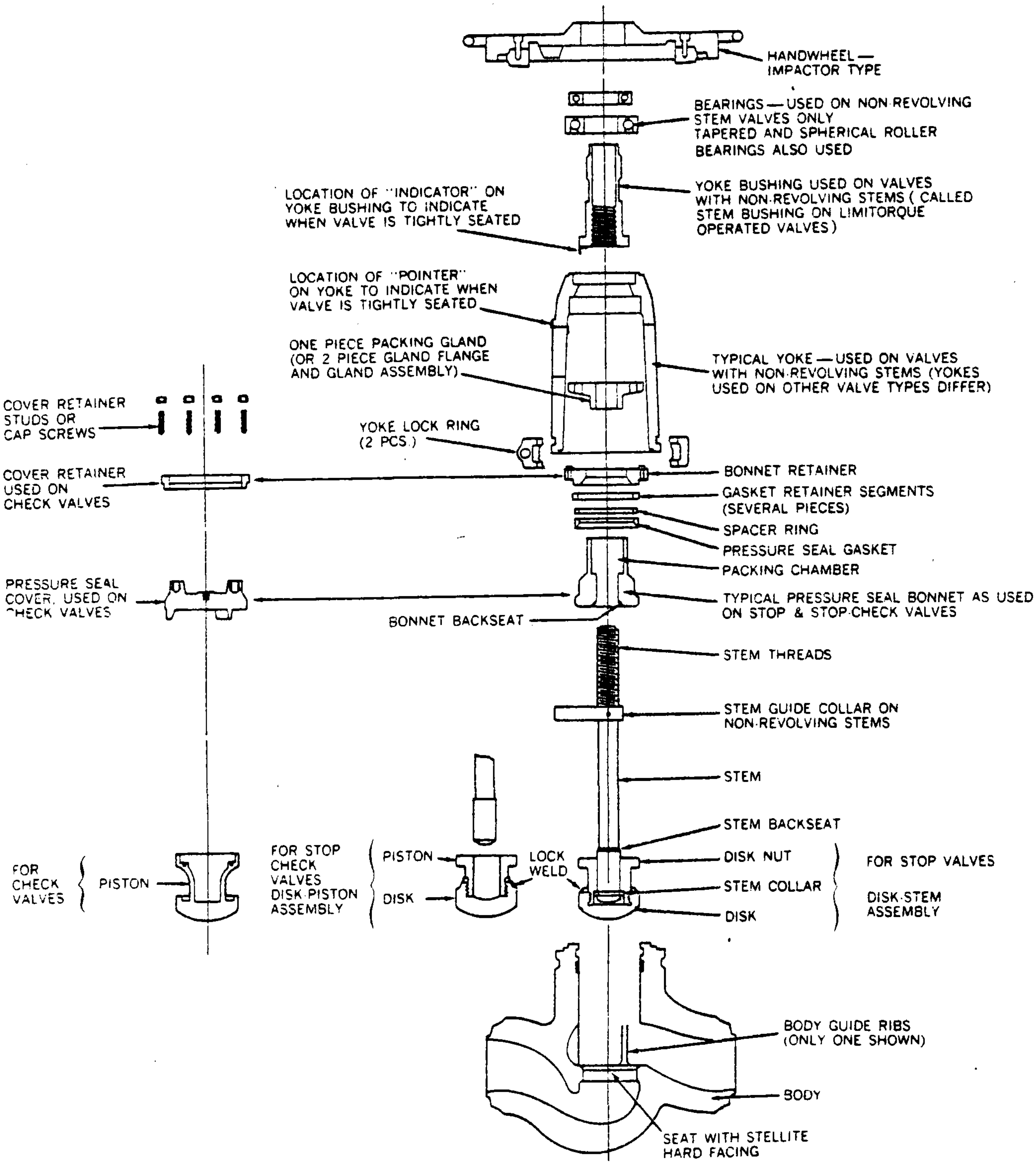


Illustration No. 5

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 stellited 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.

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.

To check for a properly closed valve, on valves with non-rising type handwheels (non-revolving stem), an indicator is attached to the lower side of the yoke bushing which 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 by-passing 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.

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 up sufficient contact pressure and eliminates the vibration. This also tends to dislodge any foreign particles which 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 gages, 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.

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 recommended level. (See Illustration No. 17, page 16)

Valves which have bearings in the top of the yoke have lube fittings on the valve yoke for convenient re-lubrication. (See Illustration No. 18, page 16).

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 is 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 re-lube schedule.

For valves that are operated infrequently, relubrication at least once a year is recommended. The recommended lubricant 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.

VALVE BODY REPAIRS

Body Bore Gasket Seal Area Repair

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 ½" to ¾" 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 which 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 thick bed of asbestos paper placed over the seat and cemented 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 degrees Fahrenheit.
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 degrees Fahrenheit 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 insure a weld without an undercut at the edges. The overlapping should be done along this edge by using a welding rod of ⅛" 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, page 11. Final finishing can be done with the adjustable Sunnen hone described on this page.

   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 On Globe and Angle Piston Check Valves

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."
2. Heat the body area adjacent to the guide rib to approximately 200 degrees Fahrenheit. This can be done locally with an oxyacetylene torch.
3. Select the proper welding rod to suit the body material (⅛" maximum size rod is recommended here). See page 10. Because of slag conditions and easy maneuverability, class 7010 rods are recommended. Using the same welding procedure as described for step 6, 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 proceeded up the guide rib.

   If stainless steel inlay is desired on the guide ribs, use either 18-8 stainless steel rod, Harstain 18-8, Stainlend "K" 18-8, Stainweld 18-8 or equivalent.
4. Finishing after welding is also similar to that described in this 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 Repairs

The following description does not apply to Tilting-Disk check valves. For repair information on these valves, contact your local Rockwell-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 stellited seats in these pressure-seal valves are not easily scored, but where reconditioning is necessary, the following points should be observed:

Where an indention 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 degrees 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 also 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 Fig. A page 11; for another type see Illustration No. 7.

For smaller size valves, a driving handle can be easily made of 3/8" diameter wire bent as per Fig. B These small assemblies, being much lighter, do not require a supporting spring. Stellited 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 Figs. 8 and 9, page 11, 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 that weld which 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, Welding and Flanged End Valves

The four basic steps in repairing a casting defect in these areas are: (1) cut out to the sound metal, (2) pre-heat, (3) weld, and (4) stress relieve. The steps are simple, but many exceptions are encountered in working on valves which are operating in the field. Defects in these areas may be inspected in a variety of ways. Radiography and Magnaflux are two standard methods. Etching with acid is sometimes effective. Castings which have been in water service and may contain water in the defect can be heated to show porosity. This is very advantageous in determining the source of a leak as well as its exit point. Cutting may be done by chipping, grinding or flame gouging. Generally speaking, the amount of metal removed should be held to a minimum so as to avoid distortion upon subsequent welding. For example, small pinhole leaks in a casting wall 1½" thick may often be effectively welded by cutting down only ¼" deep at the inlet and outlet of the leak.

Preheating to 400°F is called for in most piping fabrication. However, in finished valve repair there may be weld locations wherein the preheat would do more harm than good. For example, in building up worn guide ribs the preheat may detract from the welder's efficiency without making a corresponding metallurgical gain. Here, keep the heat down to 200°F maximum.

The welding rod should generally match the valve body analysis. See page 10. However, many individual considerations such as welding position and rod availability will influence the choice.

Stress relieving is also generally recommended for piping fabrication. Again, it is not always practical in field valve casting repair. Heating which will distort the valve may do irreparable harm. Stress relieving is unnecessary for very small welds and a heavy peening is sufficient.

Where any work involving great heat has been done near the stellited seat joint, it is best to check the concentricity of the seat by blueing with the disk. Should the joint be out of round, it will be necessary to relap following the instructions previously given under "Seat and Disk Repairs," pages 8 and 9.

VALVE COMPONENT REPAIR

Disk-Piston Assembly Repairs

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 line scale or other foreign matter which 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.

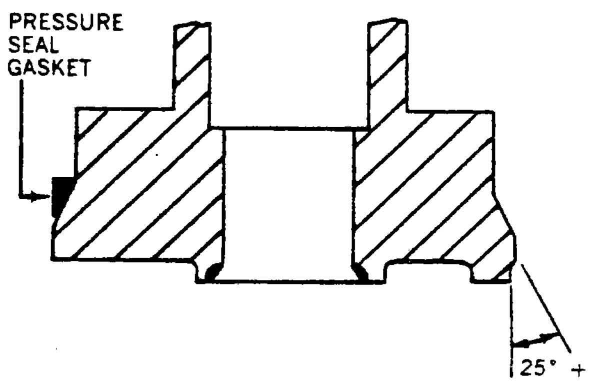


Illustration No. 6

PRESSURE SEAL BONNET SEAL ANGLE

Bonnet or Cover Repairs

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 which 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 ½°, minus 0° as shown in Illustration No. 6, page 9. For old style valves the angle should be 47°, plus ½°, 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.

WELDING ROD RECOMMENDATIONS

MATERIAL TO BE WELDED	ROD RECOMMENDATION AWS-ASTM CLASS*
Carbon Steel	ASTM-A233
1. ASTM-A216 — Grade WCB	
2. ASTM-A105 — Grade II	E 7018
Carbon-Molybdenum Steel	ASTM-A316
1. ASTM-A217 — Grade WCI	E 7018-A1
Chromium-Molybdenum Steel	ASTM-A316
1. ASTM-A217 — Grade WC6	
2. ASTM-A182 — Grade F11	E 8018-B2
Chromium-Molybdenum Steel	ASTM-A316
1. ASTM-A217 — Grade WC9	
2. ASTM-A182 — Grade F22	E 9018-B3
18-8 Mo Stainless Steel	ASTM-A298
1. ASTM-A351 — Grade CF8M	E 316-15 or
2. AISI — Type 316	E 316-16

*Weld metal deposit chemistry and procedures should conform to the requirements of ASTM 488 (See Table I, below, this manual), and Section IX of the Boiler Code.

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TABLE 1 — CLASSIFICATION OF WELD DEPOSIT MATERIAL*

P-Number	Material Covered	Type of Weld Deposit	Weld Deposit Analysis: Chromium	Molybdenum	Nickel	Manganese	Silicon	Electrode Coatings
P-1	Carbon steels such as: A 216, Grades WCA and WCB; A 352, Grades LCB; A 27, all Grades	Carbon steel	....	....	....	1.25 max*	0.50 max†	
P-3	Steels with less than ¾ per cent Chromium and total alloy less than 2 per cent such as: A 217, Grade WC1; A 352, Grade LC1	Carbon-Molybdenum	0.50 max	0.40 to 0.65	. .	1.25 max*	0.50 max†	
P-4	Steels with Chromium ¾ to 2 per cent and alloy steels with total alloy less than 2¾ per cent such as: A 217, Grades WC4, WC5, and WC6	Chromium-Molybdenum (½ to 2 per cent Chromium)	0.50 to 2.00	0.40 to 0.65	....	1.00 max	1.00 max	F-1: XX20, XX24, XX27, XX28, XX30; F-2[b]: XX12, XX13, XX14; F-3[b]: XX10, XX11; F-4[b]: XX15, XX16, XX18
	A 352, Grade LC2	Nickel-Molybdenum	. .	0.30 to 1.00	1.50 to 3.75	1.00 max	1.00 max	
P-5	Total alloy content less than 10 per cent such as: A 217, Grades WC9, C5, and C12.	Chromium-Molybdenum (2 to 10 per cent)	2.0 to 10.0	0.4 to 1.5	......	1.00 max	2.00 max	
P-5A	Total alloy content less than 6 per cent such as: A 148; A 352, Grades LC3		To provide comparable mechanical properties of the base metal					
P-6	High alloy steel martensitic, such as: A 351, Grade CA-15	High alloy martensitic	11.00 to 15.00	0.70 max	......	2.00 max	1.00 max	F-4[b] XX15 XX16
	High alloy steel austenitic, such as: A 351, Grades CF-8, CF-8M, CF-8C, CH-20, and CK-20	Chromium-Nickel containing more than 1 per cent ferrite	AISI Types 302, 304, 308, 309, 316, 317, 318, 347, 348, 309 Mo, 309 Cb					F-5 XX16 XX15
		Chromium-Nickel fully austenitic; Austenitic Manganese	AISI Types 310, 310Cb, 310 Mo, 330					

† Grades P-1 and P-3 where qualification under the ASME Boiler and Pressure Vessel Code is not required, the following limits may be used:

	P-1	P-2
Manganese, max, per cent	1.25	1.50
Silicon, max, per cent	0.60	0.60

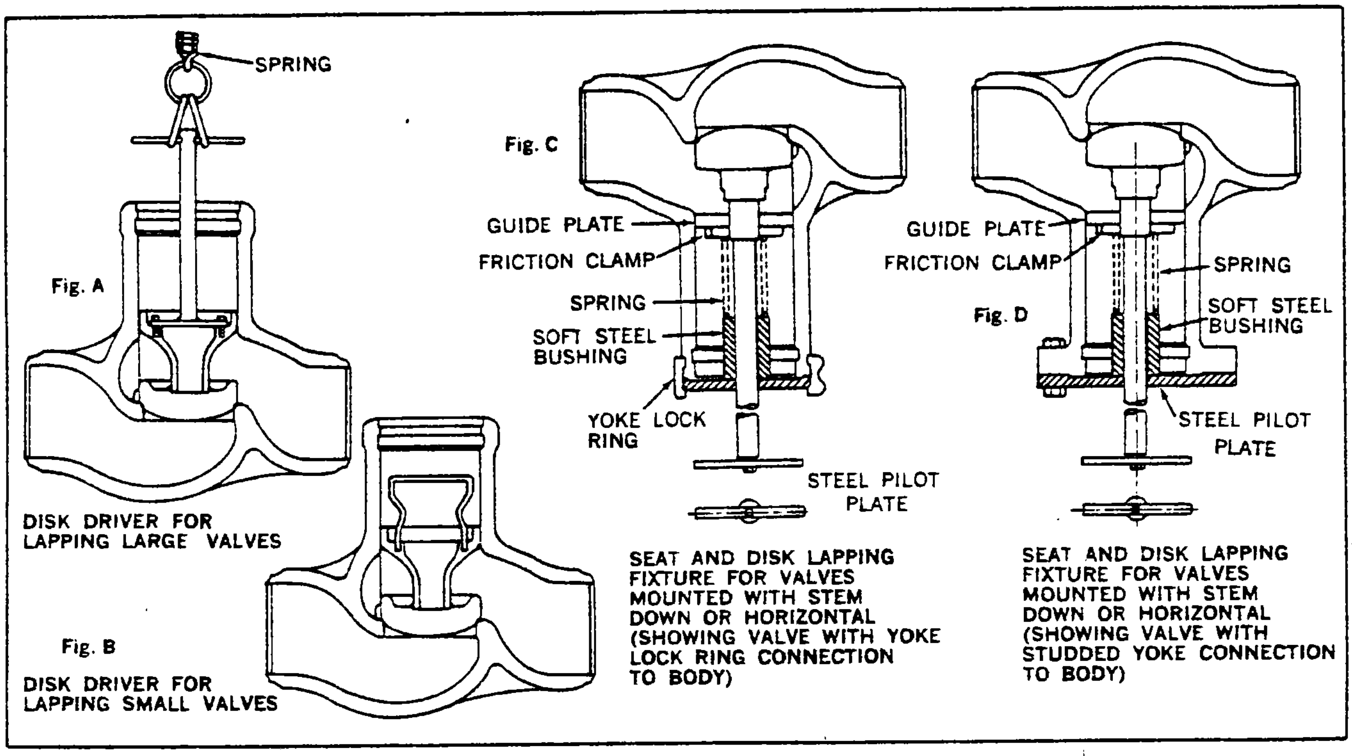
b Performance qualification of a welder under any "F" number up to and including F-4 shall qualify a welder for all lower "F" numbers.

c With permission of ASME, From Section IX, Boiler and Pressure Vessel Code.

FIELD REPAIR EQUIPMENT

Available from the Rockwell-Edward Manufacturing plant at 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 Rockwell-Edward sales representative for more information. A list of this equipment follows:

1. Lapping equipment for all pressure seal valves from 2½ to 18" in all pressure classes. See Figs. A, B and Illustration No. 7.
2. Self centering lap guide fixtures for lapping valve seats in valves 8" and up in all pressure classes. See Figs. C, D. 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 14½" diameter. (Not illustrated)
4. Van Norman portable boring machine for reboring valves in the field. Grinding attachments are also available for some sizes for grinding seat joints. See Illustrations No. 8 and No. 9, this page.
5. Air driven portable boring machine for reboring guide ribs and seats of valve bodies in the line. (Not illustrated)



DISK DRIVER FOR LAPPING LARGE VALVES

DISK DRIVER FOR LAPPING SMALL VALVES

SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL (SHOWING VALVE WITH YOKE LOCK RING CONNECTION TO BODY)

SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL (SHOWING VALVE WITH STUDDED YOKE CONNECTION TO BODY)

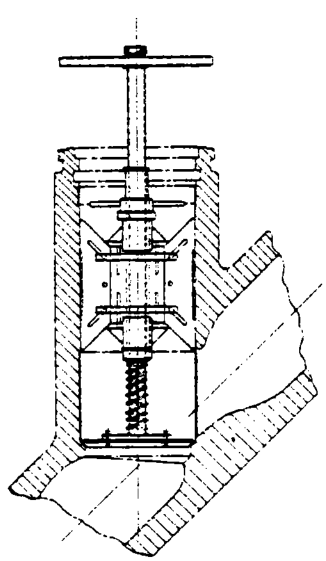


Illustration No. 7
PORTABLE LAPPING TOOL
FOR LARGE VALVES

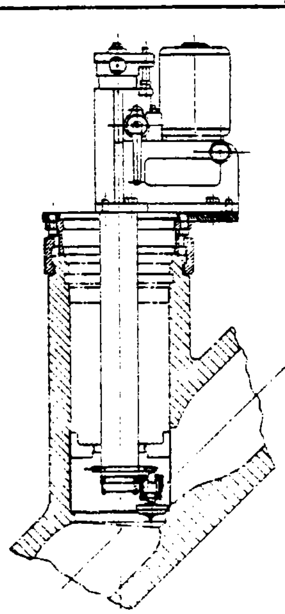


Illustration No. 8
VAN NORMAN PORTABLE
GRINDING MACHINE

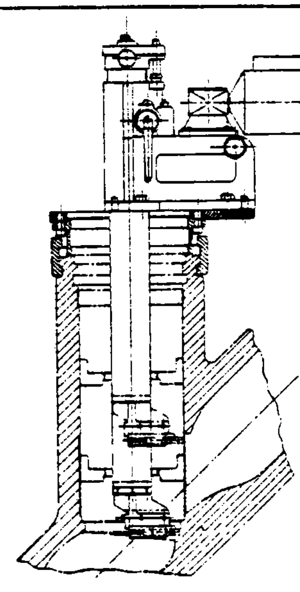


Illustration No. 9
VAN NORMAN PORTABLE
BORING MACHINE

DISASSEMBLY PROCEDURES FOR PRESSURE SEAL VALVES

TRODUCTION

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," page 13, or "Disassembly Procedure for Removing Limitorque Operators from Valve Yokes," page 15.

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," page 18, 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.

For *Method 1,* first remove the operator-yoke assembly combination as described in "Procedure for Removing Valve Operator and Yoke Assembly as a Unit," page 18. Then proceed to the section "Disassembly Procedure of Bonnet Types," page 20, *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," page 13, or "Disassembly Procedure for Removing Limitorque Operators from Valve Yokes," page 15. Then, proceed to the section, "Disassembly Procedure of Bonnet Types," page 20, for actual disassembly of Area 3. On Type IV bonnets, reverse this procedure and complete steps 1 through 9, page 27, 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." page 20.* Separated Stop-Check Feedline Valves should be treated as two valves, as a stop-check and a piston lift check. See the respective disassembly procedure covering the area to be serviced.

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, backseat 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 15).
   b. If no pressure is to be maintained in the valve, close the valve fully and open approximately ⅛".
2. **For service in Area 2.**
   a. For non-revolving stems only, if pressure is to be maintained in the valve, backseat 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 ⅛".
3. **For service in Area 3.**
   Close the valve fully and open approximately ⅛". Service Area 3 only without pressure in the valve.

DISASSEMBLY PROCEDURES FOR IMPACTOR HANDLES AND HANDWHEELS

(With or Without Impactogear Air Wrench Operators)

-AREA 1-

Rockwell-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 backseated or fully opened position. See "Caution", page 12.

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 12. 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.

Non-Ball Bearing Type Impactor Handles and Handwheels

All have 12, 14, 16, 20, 26, or 30 inch diameters. See illustrations Nos. 10, 11 and 12, 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, 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.

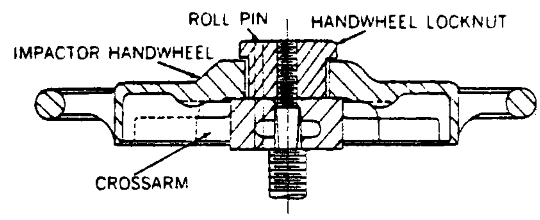


Illustration No. 10

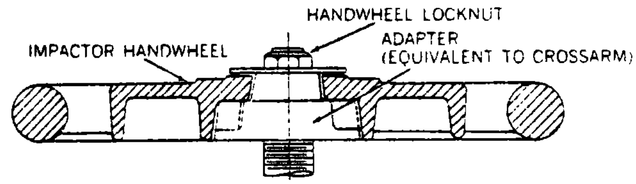


Illustration No. 11

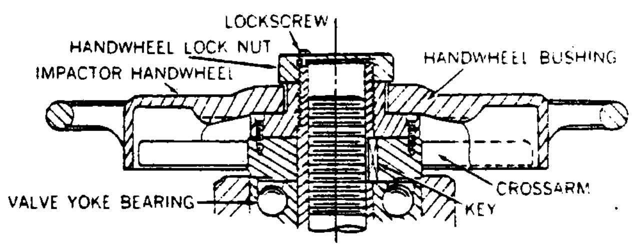


Illustration No. 12

NON-BALL BEARING TYPE IMPACTOR HANDWHEELS

Ball Bearing Type Impactor Handwheels

(With or without Impactogears)

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

hese 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. Backoff 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.
   c. Begin with all slack out of the hoist, and retain a taut chain by simultaneously taking up the slack as the handwheel bearing nut is fully unscrewed and lifted off the valve.
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.

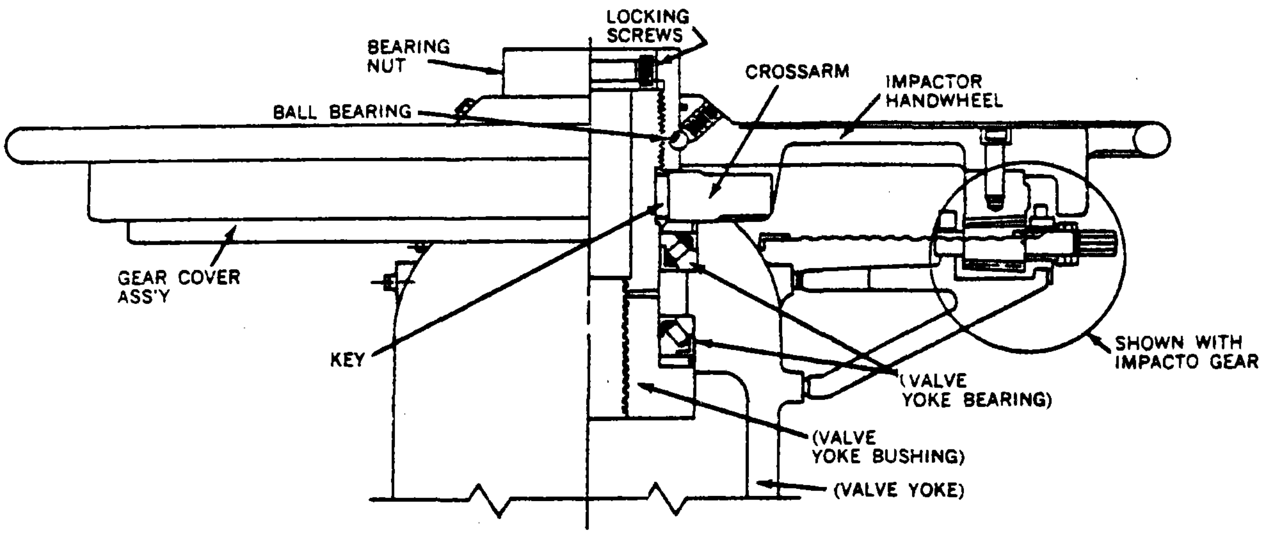


Illustration No. 13

BALL BEARING TYPE IMPACTOR HANDWHEEL

PROCEDURES FOR REMOVING LIMITORQUE OPERATORS FROM VALVE YOKES

Rockwell-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. Consult the Philadelphia Gear Corp.

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 backseated or fully open position. See "Caution," page 12.

All of the following disassembly procedures are arranged in accordance with the general comments on page 12. Study these pages carefully before beginning.

Determine first 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.

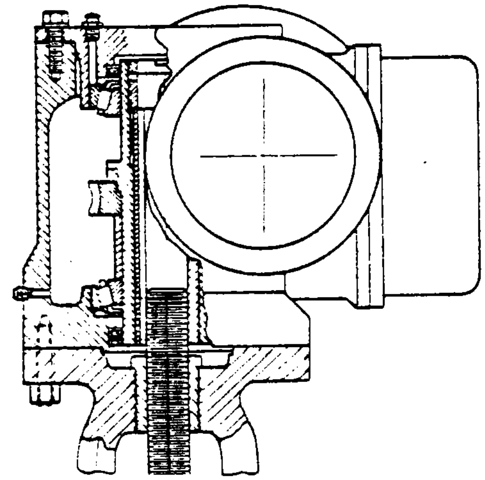


Illustration No. 14
TORQUE ONLY LIMITORQUE OPERATOR
USED ON REVOLVING STEM VALVES
SMA OR SMB TYPE

All Revolving Stem Valves, or Non-Revolving Stem Valves with Torque only Units ("XT" Type Not Included)

SMA or SMB Type, See Illustrations No. 14, No. 15, and No. 16, page 15.

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 SMB-4T or SMB-5T are torque only units and have their drive nut splined to the valve yoke bushing. See Illustration No. 15. On non-revolving stem valves using the older SMA type *torque only* Limitorques, the operator drive nut is also connected to the stem through a key, but in a different manner. See Illustration No. 16.

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

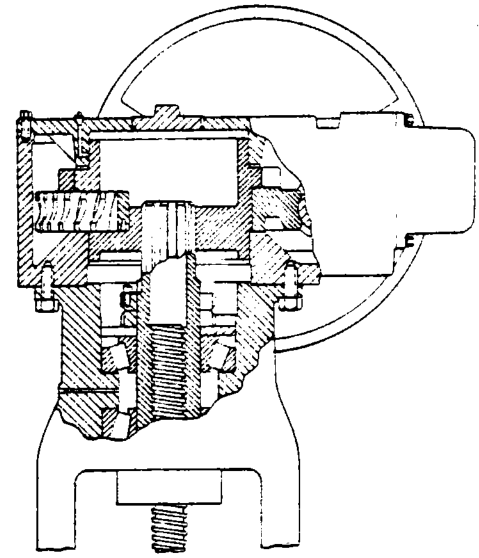


Illustration No. 15
TORQUE ONLY LIMITORQUE OPERATOR
USED ON NON-REVOLVING STEM VALVES
NEW SMB-4T OR SMB-5T TYPE

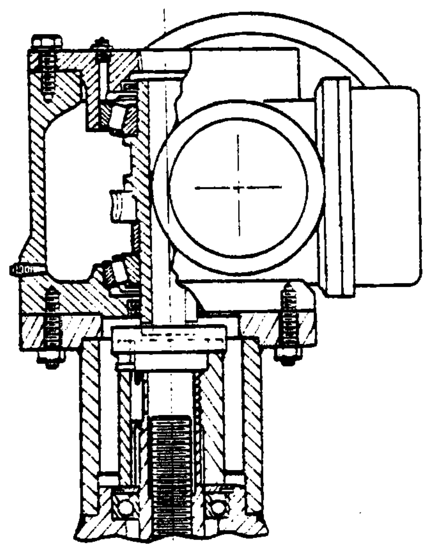


Illustration No. 16
TORQUE ONLY LIMITORQUE OPERATOR
USED ON NON-REVOLVING STEM VALVES
(OLD SMA TYPE)

Non-Revolving Stem Valves with Torque and Thrust Units
SMA or SMB Type. See Illustration No. 17.

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 to prevent damage to the stem threads.
6. With the hoist, lift the operator clear of the stem and place down on a clean area for further disassembly, if required.

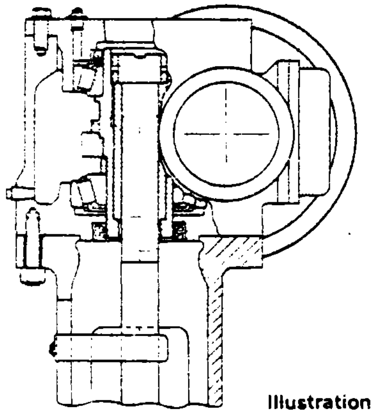


Illustration No. 17

TORQUE AND THRUST LIMITORQUE OPERATOR
USED ON NON-REVOLVING STEM VALVES
SMA OR SMB TYPE

Non-Revolving Stem Valves, Torque only Units with "XT" Boxes. Type SMA or SMB. See Illustration No. 18.

"XT" Limitorques are large spur gear units connected to a basic SM type operator to increase the torque output. On SMA types they are sometimes used on both the 3 and 4 sizes (SMA-3XT and SMA-4XT). On the new SMB series, they are sometimes used on the SMB-5 size (SMB-5XT). Construction is basically the same and in both series the large gear is keyed to the valve yoke bushing. The procedure for removing these units from the valve yoke is as follows:

1. Disconnect the electrical wiring to the operator.
2. Loosen and remove all but three of the cap screws holding the cover and operator to the gear housing.
3. On the bottom of the gear housing and below the pinion is a flange holding the pinion lower bearing. Remove the cap screws holding this on. Next to these through holes are threaded holes. Screw the cap screws into these tapped holes and jack the flange and bottom bearing off the pinion shaft.
4. Position a sling and chain hoist of suitable capacity around the operator and take up all slack.
5. Remove the remaining cap screws holding the cover and operator to the gear housing.
6. Pry the cover loose from the gear housing and hoist the cover-operator assembly away. Position down on clean rags or paper, for further disassembly, if required.
7. The large gear can be removed by driving down the tab on the lock washer and unscrewing the two locknuts.
8. Pull the gear and position away to a clean area.

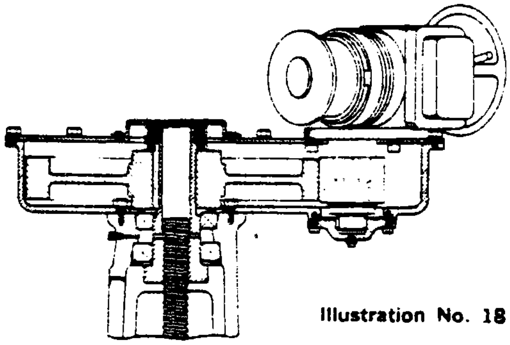


Illustration No. 18

TORQUE ONLY LIMITORQUE OPERATOR WITH "XT" BOX
USED ON NON-REVOLVING STEM VALVES
SMA OR SMB TYPES

9. The gear housing can be removed by positioning a sling around the housing, removing the cap screws holding it to the yoke, and lifting away.
10. One locknut should be reassembled on the yoke bushing so the bearing-yoke bushing assembly is secured.

Limitorque Limit Switch and Torque Switch Setting Procedures
The following descriptions apply only to Limitorque valve controls made by the Philadelphia Gear Corporation. 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. 19, page 17.)

Numbers in parenthesis ( ) refer to callouts on Illustration No. 19, "Geared Limit Switch Assembly."

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 contactor 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.
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 the valve is moving 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 certain there is sufficient clearance between the position at which the valve stem comes to rest and the valve back seat.

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.

Torque Switch See Illustration No. 20, page 17.

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.
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. The setting of this bushing should not be disturbed without advice from the Philadelphia Gear Corporation.

Double Torque Switch

1. See Step 1
2. See Step 2 above. 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.
3. Move the socket head adjusting screw (H) in for light seating.
4. See Step 4 above.
5. For heavier seating move the adjusting screw (H) out and re-tighten 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, 4 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. The setting of this bushing should not be disturbed without advice from the Philadelphia Gear Corporation.

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 requires it.

WARNING

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

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

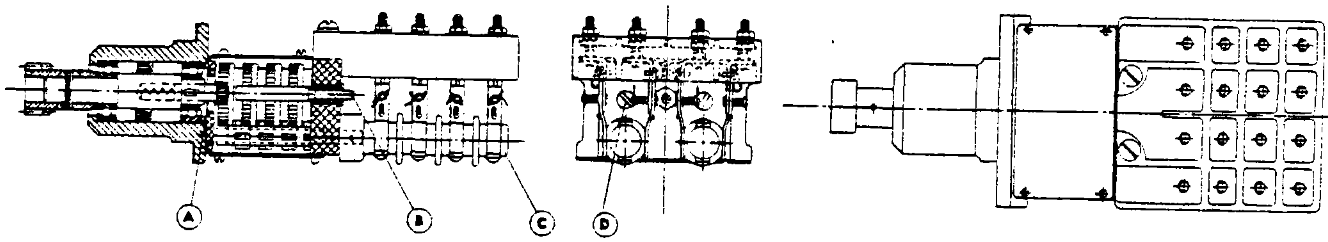


Illustration No. 19
GEARED LIMIT SWITCH ASSEMBLY

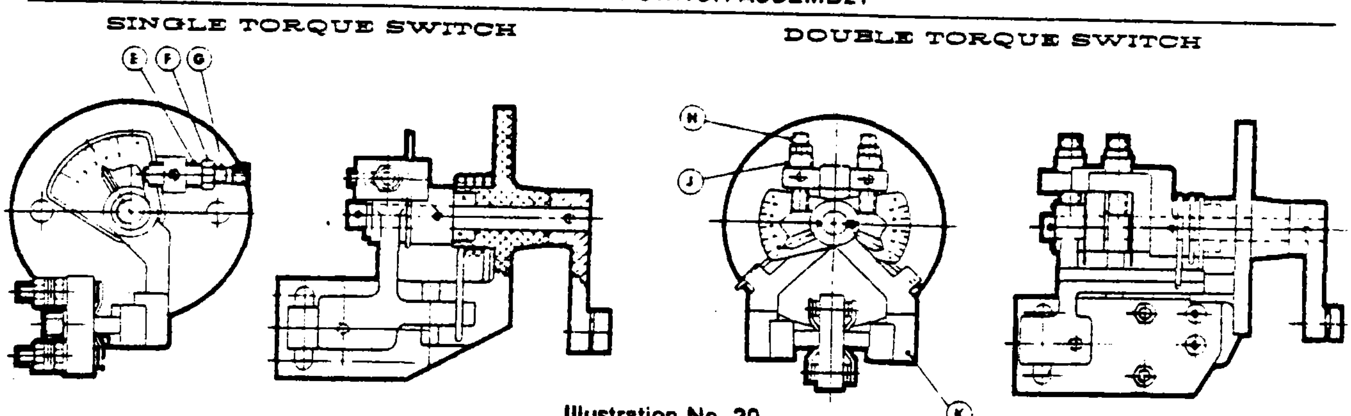


Illustration No. 20
SINGLE AND DOUBLE TORQUE SWITCH ASSEMBLIES

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 12. 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 3, 4 and 5.

Revolving Stem Valves — Valves with Type I Bonnets
See Illustration No. 21, page 19.

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 page 13 or 15, and then refer directly to the procedure for Bonnet Disassembly, Type I, page 20.

Revolving Stem Valves — Valves with Type II Bonnets
See Illustration No. 23, page 22.

1. The manual or Limitorque operator must first be removed in accordance with instructions page 13 or 15.
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 Nos. 24 and 25, pages 23 and 24.

1. The manual or Limitorque operator must first be removed in accordance with instructions page 13 or 15.
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 Handwheels," step 4, page 13 or step 5, page 14. 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. 28, page 27.

It is possible to remove the operator and yoke assembly as a unit on Type IV bonnets, but it then 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 12.

REMOVING OPERATOR AND YOKE ASSEMBLY AS A UNIT

-AREAS 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 12, and is specifically referenced in "Method 2." 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 3, 4 and 5.

Revolving Stem Valves — Valves with Type I Bonnets
See illustration No. 21, page 19.

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 12 and use the "Method 2" procedure.

Revolving Stem Valves — Valves with Type II Bonnets

See valve illustration No. 23, page 22. See operator Illustration No. 14, page 15.

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 12 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 12 and use the "Method 2" procedure.

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

See valve illustrations No. 24, page 23; No. 25, page 24 and No. 28, page 27. See handwheel illustrations pages 13 and 14. See Limitorque illustrations No. 17, page 16, No. 18, page 16 and No. 16, page 15.

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.

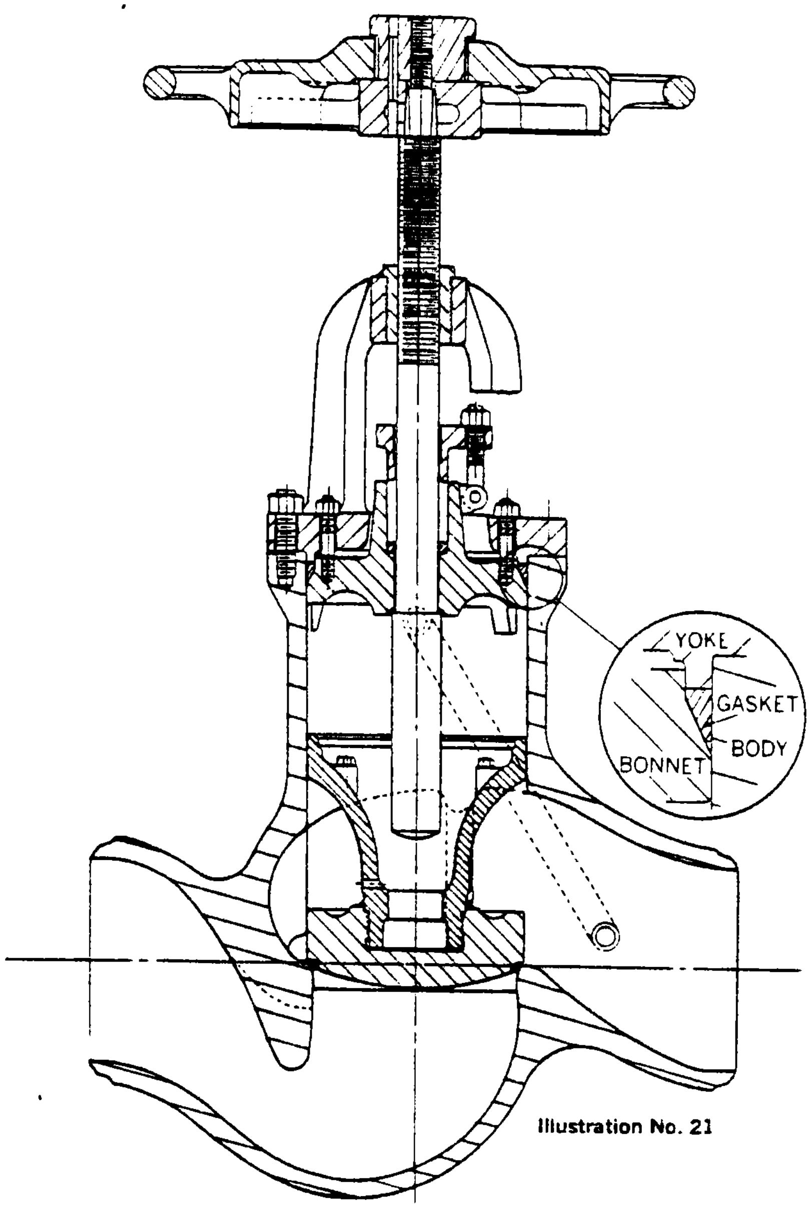


Illustration No. 21

**STOP AND STOP-CHECK (ILLUSTRATED) VALVE
WITH TYPE I PRESSURE SEAL BONNET
(ALL TYPE I BONNETS HAVE REVOLVING STEMS)**

DISASSEMBLY PROCEDURES OF BONNET TYPES

-AREA 3-

(For a definition of Area 3, see page 12).

(See Illustration No. 5, page 6, 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 3, 4 and 5. 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 12. Study these pages carefully before beginning.

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

See illustration No. 21, page 19.

Note: All Type I bonnets have revolving stems.

1. Loosen the gland bolt nuts and tap the gland *which should relieve any pressure which 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 which 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 caution in step 1.
4. Remove half of the bonnet stud nuts, alternating to leave those remaining equally spaced.
5. Remove the gland bolt nuts.
6. Back off the remaining bonnet stud nuts part way. 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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.
13. The bonnet end opening should be kept covered whenever possible.

Type I Pressure Seal Bonnets — Piston Lift Check Valves

See Illustration No. 22, page 21.

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 (downstream piping). Check to make certain all downstream 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. Back off the remaining bonnet stud nuts or cap screws part way. 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 and 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. In larger sizes where this assembly is too heavy to manhandle, remove the cover retainer cover 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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

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

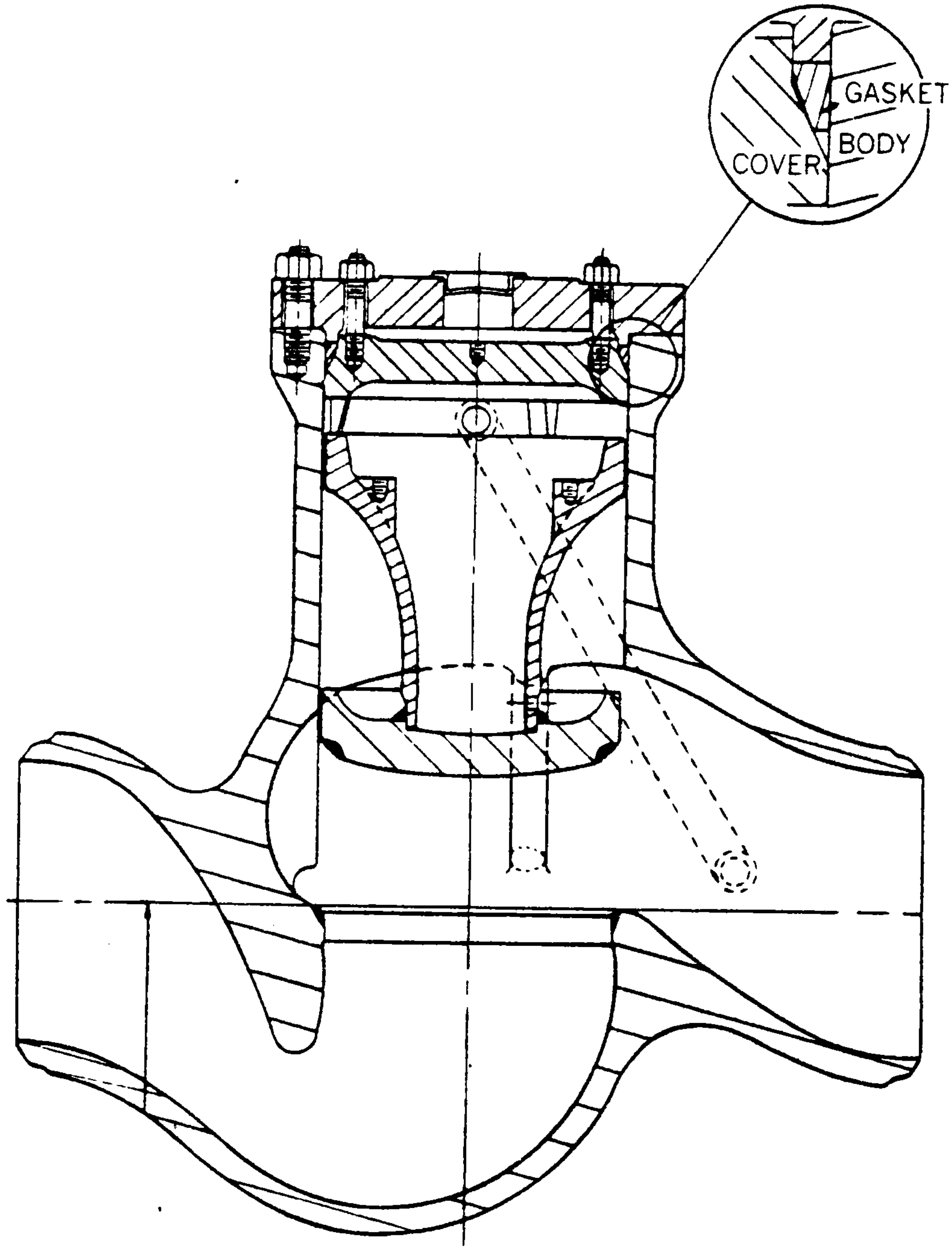


Illustration No. 22

PISTON LIFT CHECK VALVE
WITH TYPE I PRESSURE SEAL BONNET

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

See Illustration No. 23, page 22.

*1. Remove the crossarm by tapping with a hammer on the underside.

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 top of the valve and all exposed surfaces of 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 drivepin, or small clean hardwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16 in.) 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 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.

19. Screw ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

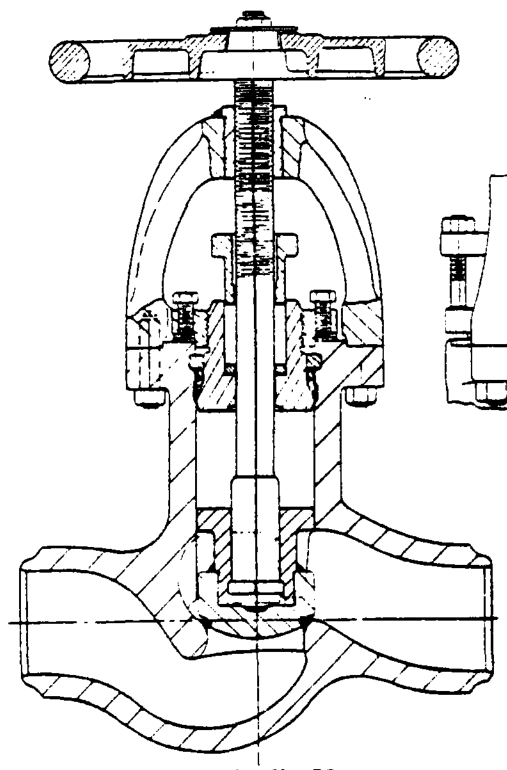


Illustration No. 23

REVOLVING STEM STOP (ILLUSTRATED) AND STOP-CHECK VALVE WITH TYPE II PRESSURE SEAL BONNET

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

See Illustration No. 24, page 23.

*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.

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.) 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 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.

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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

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

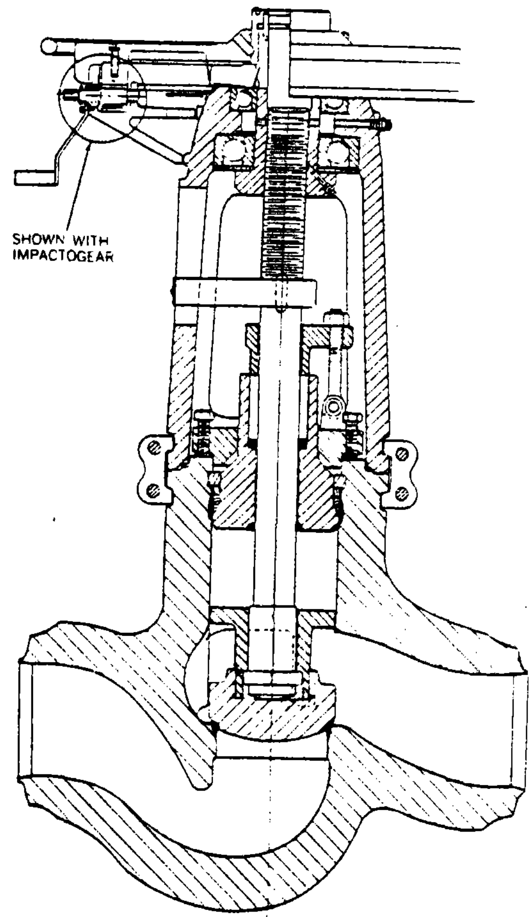


Illustration No. 24

NON-REVOLVING STEM STOP (ILLUSTRATED) AND STOP CHECK VALVE WITH TYPE II PRESSURE SEAL BONNET

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

See Illustration No. 25, page 24.

*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.) 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.

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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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.

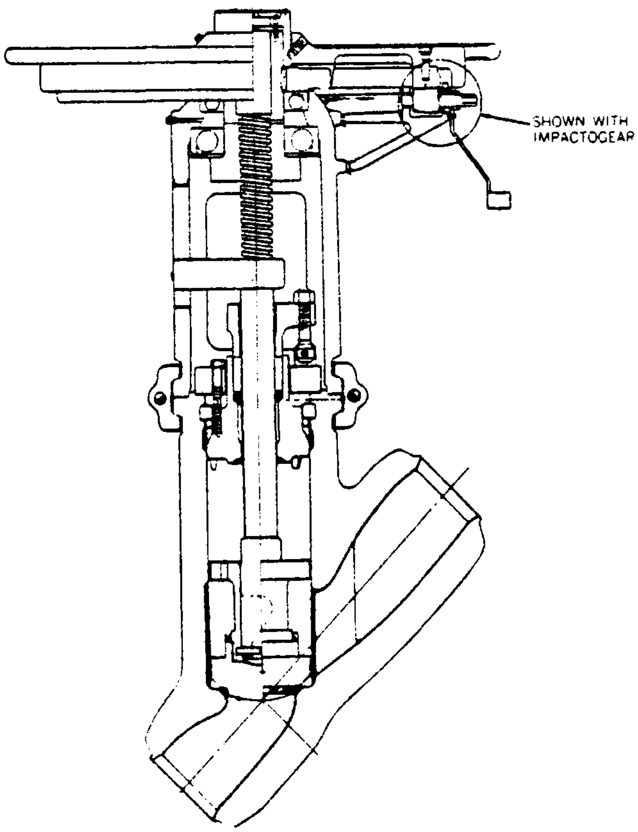


Illustration No. 25

STOP (ILLUSTRATED) AND STOP-CHECK VALVE
WITH TYPE III PRESSURE SEAL BONNET
(ALL TYPE III BONNETS HAVE NON-REVOLVING STEMS)

Type III Pressure-Seal Bonnets — Piston Lift Check Valves
See Illustration No. 26, page 25.

1. Remove the cover retainer cover.
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.) 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.
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 ½ in.-13 bolts (⅜ in.-16 on sizes 5 in. 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, 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.

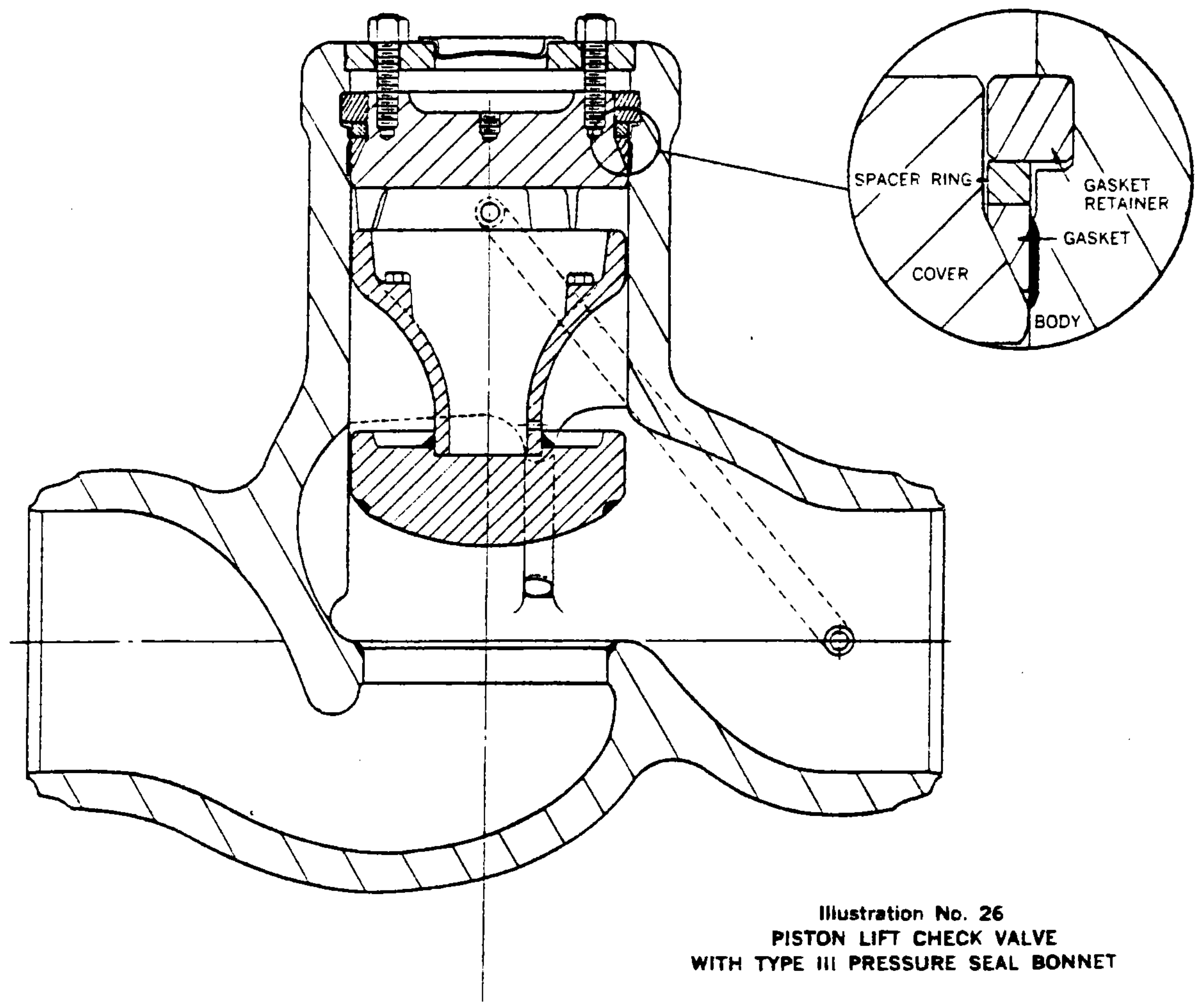


Illustration No. 26
PISTON LIFT CHECK VALVE
WITH TYPE III PRESSURE SEAL BONNET

Type III Pressure-Seal Bonnets — Tilting Disk Check Valves

Sizes 6" and larger.

See Illustration No. 27, page 26.

As explained under "Seat and Disk Repairs", page 8, this manual does not include information for *repair* of the seat and disk of Tilting Disk Check Valves. Consult your Rockwell-Edward Sales Representative.

1. Remove the cover retainer cover.
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 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 harwood block, drive the gasket retainer segments downward to the bottom of the retainer groove (about 1/16 in.) 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.
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.

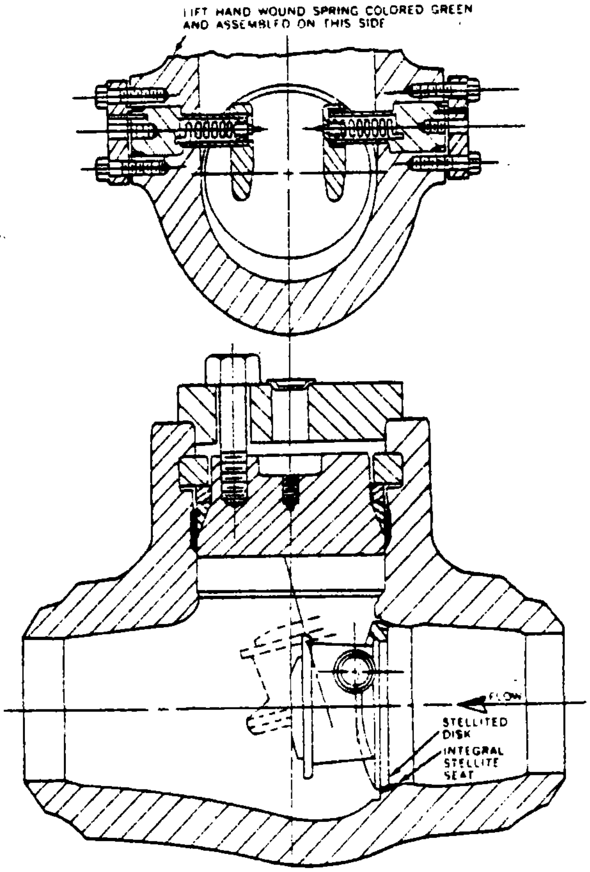


Illustration No. 27

TILTING DISK CHECK VALVE WITH TYPE III PRESSURE SEAL BONNET (SIZES 6" AND LARGER)

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

See Illustration No. 28, page 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 which might be trapped in the valve. This is important.*
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 backseated 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 ¼". 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 to 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 ⅛".
    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.

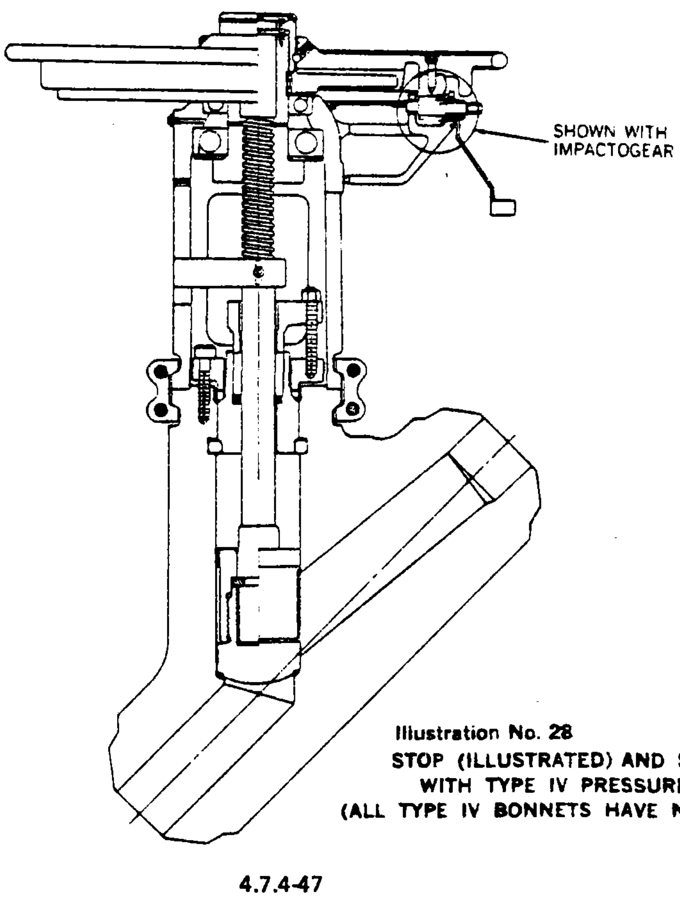


Illustration No. 28
STOP (ILLUSTRATED) AND STOP-CHECK VALVE WITH TYPE IV PRESSURE SEAL BONNET (ALL TYPE IV BONNETS HAVE NON-REVOLVING STEMS)

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 dia. wire bent 90° a half an inch from the end. Insert the bent end into the ⅛" 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 bore and lift out the piston, being careful not to marr 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. 29, page 28.

1. If used, remove the cover retainer cover.

2. **NOTE: Checks should be made to 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 only by the friction of the pressure-seal gasket against the body bore. 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 retainer-cover 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 segments 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° a half an inch from the end. Insert the bent end into the ⅛" 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 carful 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 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.

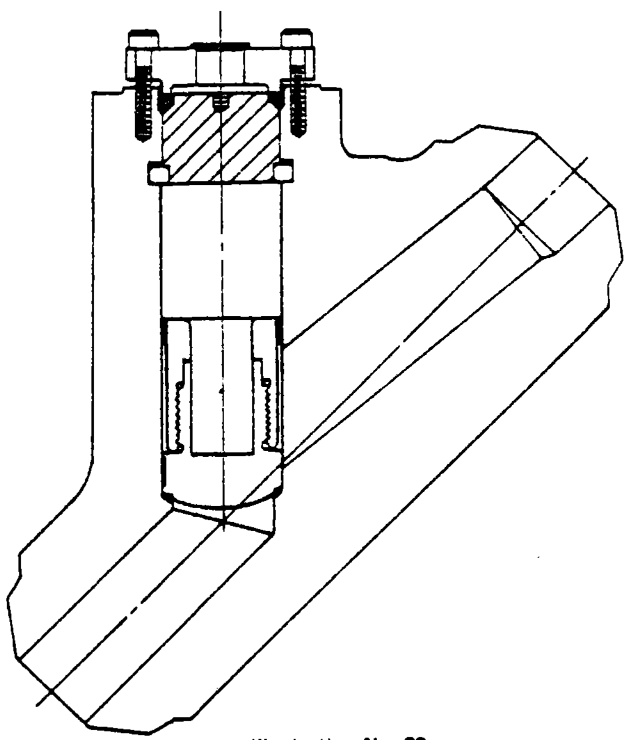


Illustration No. 29

PISTON LIFT CHECK VALVE WITH TYPE IV PRESSURE SEAL BONNET

REASSEEMBLY PROCEDURES FOR 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 which 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 shown on page 5.
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 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," page 15.

   a. Turn the manual handwheel on the Limitorque operator to apply 10 per cent of the handwheel torque required to seat the valve against maximum pressure.
   b. Tighten the lock nut on the large bull gear of "XT" operators. For valves without "XT" operators, 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 a seat joint test.
   d. To preload the upper bearing, open the valve fully to the bonnet backseat.
   e. Repeat step a.
   f. On "XT" operators, retighten the bull gear lock nut. For other operators, remove the key, retighten the yoke bushing nut and reinsert the key, as in b.
   g. On "XT" operators, bend the tabs on the lockwasher to fix the position of the nuts. For other operators, 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 not to 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 point 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. 29, page 19.

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 as 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 5.

6. Open valve to the backseat with the bonnet studs loose. Use the handwheel to backseat 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 valves shown on page 5. 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. 22, page 21.

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 5.
5. Install and tighten the cover stud nuts in accordance with the torque values shown on page 5. 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. 23, page 22.

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 backseat 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, spacer ring assembly up to the gasket retainer segments.
7. Screw the bonnet retainer ring on to the bonnet to the position marked in the disassembly.
8. Tighten the bonnet retainer cap screws in accordance with the torque valves shown on page 5. 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 22.
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. 24, page 23.

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 backseat 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, spacer ring assembly up to the gasket retainer segments.
7. Screw the bonnet retainer ring on to the bonnet to the position marked in disassembly.
8. Retighten the bonnet retainer cap screws in accordance with the torque valves shown on page 5. 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 23.
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. 25, page 24.

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, 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 5. All nuts must be tightened uniformly in a star pattern to avoid cocking the bonnet. The stem can now be lowered to a closed position.
7. Retrace disassembly steps 9, 7, 6, 5, 4, 3, and 2 on page 24.
8. Reassemble the operator to the valve using a procedure opposite the disassembly.

Type III Pressure-Seal Bonnets — Piston Lift Check Valves
See Illustration No. 26, page 25.

1. Insert the piston in 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 in the body groove.
4. Install the cover retainer.
5. Lift the cover, pressure-seal gasket, 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 5. All nuts should be tightened uniformly in a star pattern to avoid cocking the cover.
7. Replace the cover retainer cover.

Type III Pressure-Seal Bonnets — Tilting Disk Check Valves
See Illustration No. 27, page 26.

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, page 26), 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-lb increments to the torque value shown on page 5.
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.
8. Insert the gasket retainer segments in the body groove.
9. Install the cover retainer.
10. Lift the cover, pressure-seal gasket, 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 5. All nuts must be tightened uniformly in a star pattern to avoid cocking the cover.
12. Replace the cover retainer cover.

Type IV Pressure-Seal Bonnets — Stop and Stop-Check (Non-Return) Valves
See Illustration No. 28, 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. 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 5. 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 27.
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. 29, page 28.

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 5. 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.

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 pressure 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. At what pressure, temperature or flow rate does the reported trouble occur.
8. Pressure drop across the valve.

INFORMATION REQUEST

If the maintenance problem looks particularly difficult, it is suggested that you contact your local Rockwell-Edward representative. He is 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.

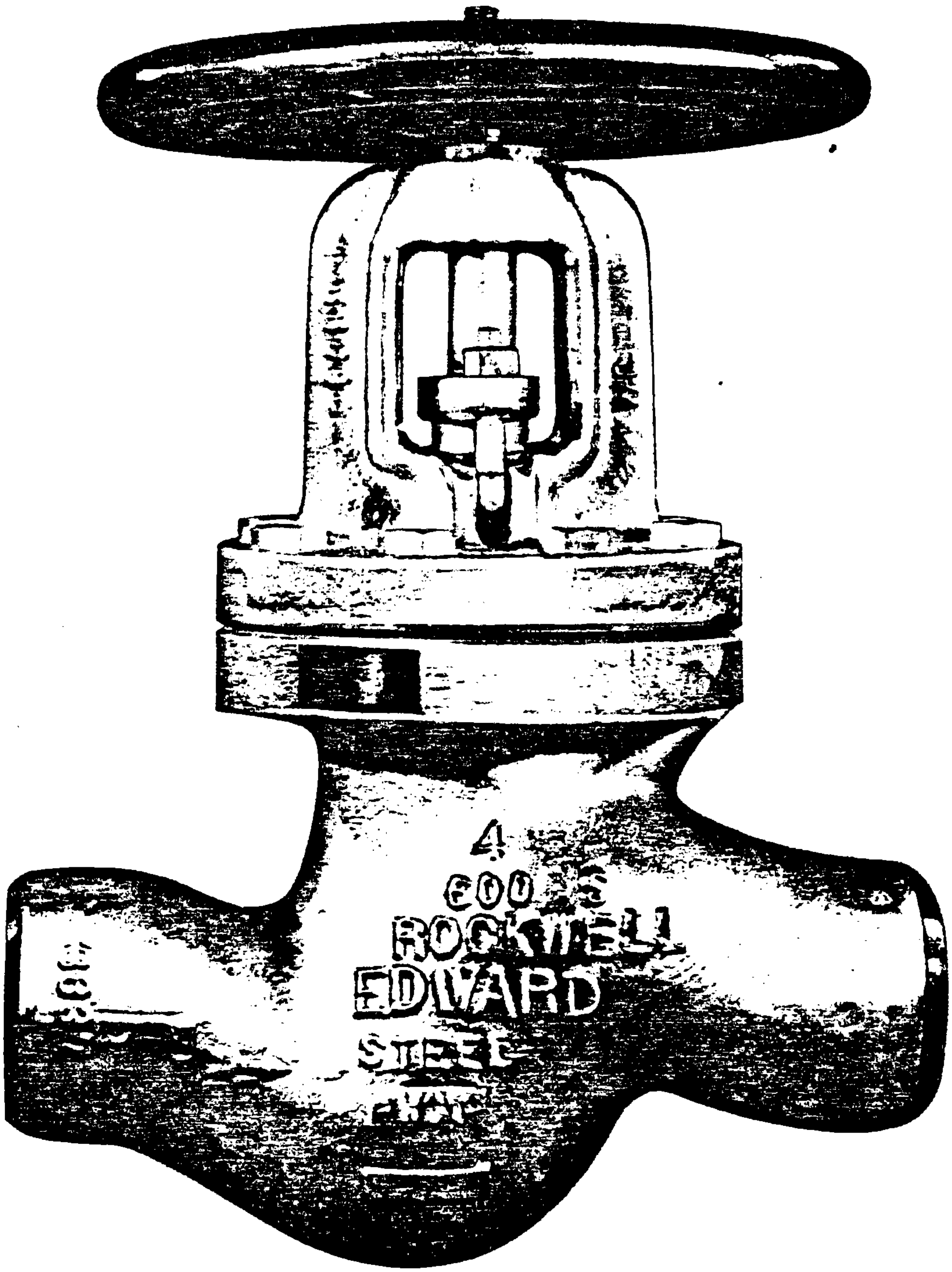
ORDERING PARTS

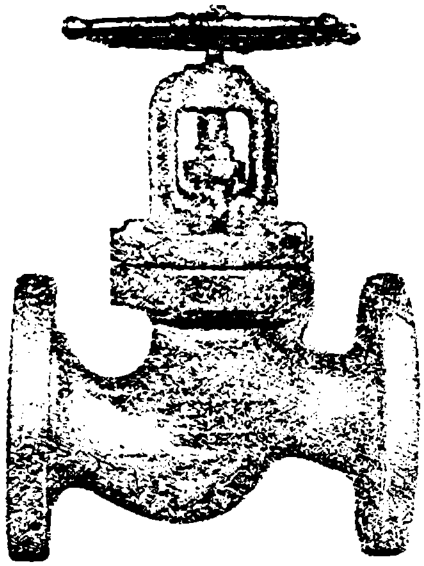
All requests for replacement parts for cast steel valves should be forwarded to your local Rockwell-Edward Sales Office for shipment from the Rockwell Manufacturing Plant, Raleigh, North Carolina. Specify shipment requirements (Air Express, REA Express, etc.)

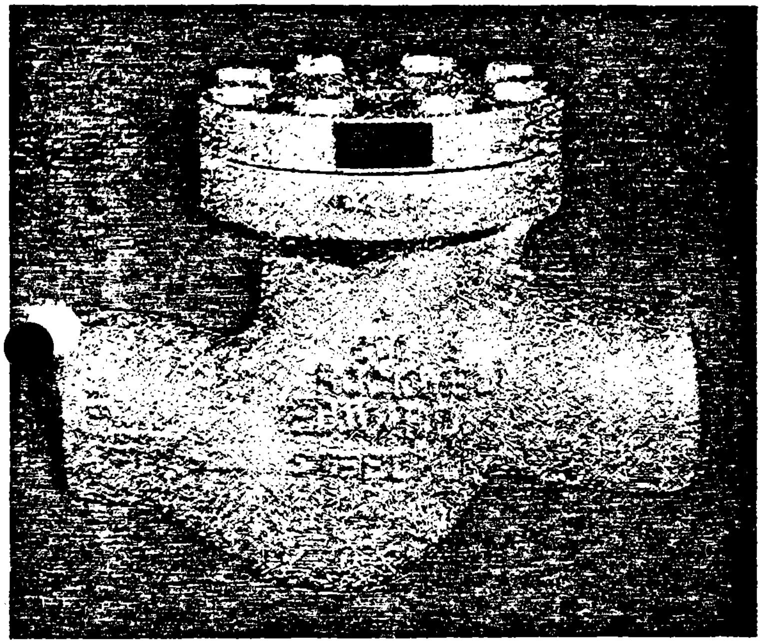
MAINTENANCE MANUAL FOR

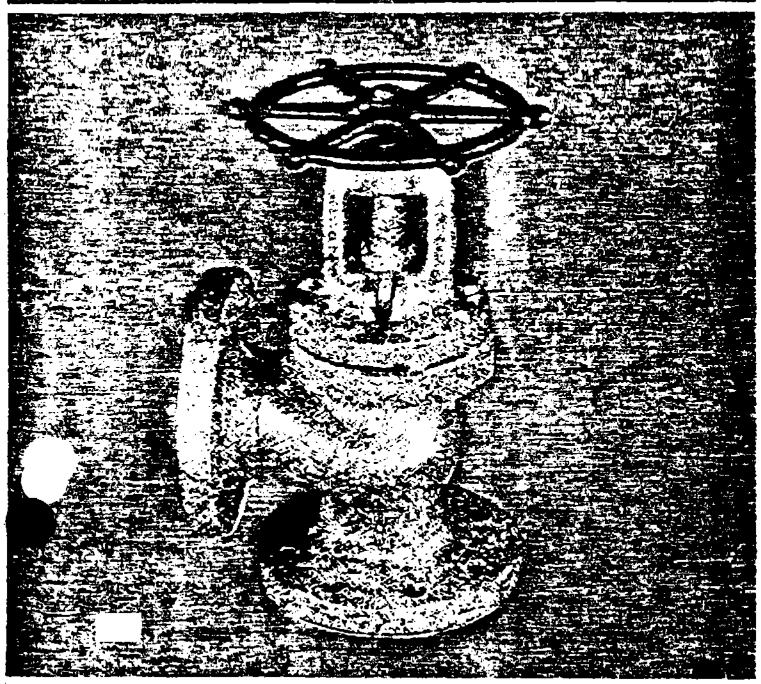
ROCKWELL EDWARD CAST STEEL BOLTED BONNET VALVES

Rockwell









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KEY TO ILLUSTRATIONS

ROCKWELL EDWARD CAST STEEL BOLTED BONNET VALVES MAINTENANCE MANUAL

INTRODUCTION CAST STEEL BOLTED BONNET

This manual has been prepared to serve as a guide for the maintenance of Rockwell Edward bolted bonnet valve construction. It is designed to help you in obtaining the most satisfactory service from these valves. Although rigid metallurgical, radiographic, physical and visual inspection is the standard procedure for all Rockwell 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.

Before starting, it will be helpful to have some understanding of the valve's physical construction. The drawing on page 4 will give you some idea of how the valve is put together.

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.

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

The next major section describes the disassembly procedures for the various valve components.

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 Rockwell for additional advice, if required, and how to order parts is included.

FIGURE NUMBERS OF ROCKWELL EDWARD BOLTED BONNET VALVES DESCRIBED IN THIS MANUAL

302	329Y	605	1441Y
302Y	390	605Y	1443
303	390Y	618	1443Y
303Y	391	618Y	1641
318	391Y	619	1641Y
318Y	392	619Y	1643
319	392Y	690	1643Y
319Y	393	690Y	
328	393Y	691	
328Y	604	691Y	
329	604Y	1441	

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 re-torquing the gland bolt nuts, the following points should be considered.

1. The packing may have become hard. Replace the packing.
2. Gland travel has been fully taken up. Install additional 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 as shown below under packing recommendations.
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

Packing for the upper and lower rings on standard valves is made up of molded rings of graphited asbestos with an asbestos yarn jacket reinforced with monel wire. Packing for the middle rings is composed of molded rings of graphited asbestos with a Neoprene cement binder. Both types are treated with a thin coating of paraffin to prevent water absorption. All are split rings and can be installed without disassembly of the valve.

The valve stem should be thoroughly cleaned before installing new packing to insure the best possible seal. Install each new packing ring separately, pushing each one to the bottom of the chamber. Make certain the lap joints of each consecutive ring are staggered 120 degrees so the lap of the fourth ring is in the same position as the first. When the chamber is filled, tighten the gland down solidly. This should make room for insertion of one or two more rings.

The following procedure is recommended:

1. After the packing has been properly installed, the gland nuts should be evenly tightened to the torque shown below.

NOMINAL VALVE SIZE, Inches

Pressure Class									
	300	2½	3	4	5	6	8	10	12
	600	—	2½	3	4	5	6	—	—
Nut Torque, Ft. Lbs.		20	20	20	35	45	50	75	110

2. After approximately one hour, step number one should be repeated. This is because the initial tightening of the gland nuts may cause only the top three or four rings of packing to compress to the necessary level. The waiting period allows the compression to be distributed through the lower rings.
3. Should leaking occur, step number two must be repeated. If the leaking continues, the applicable torque can be increased by twenty-five per cent of the recommended value.

Caution should be taken not to exceed the recommended torque values because:

1. When soft packing is used, it could be extruded through the packing chamber.

2. When standard packing is used, over compression can make the packing harden and therefore not properly seal.
3. The packing may act like a 'brake' on the stem, causing friction and making operation of the valve difficult or impossible.

BONNET GASKET LEAK

A torque wrench should be used for tightening the bonnet or cover retainer studs or cap screws which are used to preload the soft iron gasket.
The following procedure is recommended:

1. Guard against leakage by having these bolts tight at all times.
2. With line pressure in the valve, all nuts or capscrews should be tightened to the torque shown below.

Bolt Diameter, Inches	½	9/16	⅝	¾	⅞	1	1⅛	1¼
Nut Torque, Ft. Lbs.	45	68	90	150	240	370	585	750

An average man on a 12-inch wrench can develop about 100 ft. lb. of torque. Therefore, if a torque wrench is not available, use the following wrench-bolt combinations:

Bolt Diameter, Inches	½	9/16	⅝	¾	⅞	1	1⅛	1¼
Wrench Sizes, Inches	6	9	12	18	24	36	36	36

Should the leak fail to stop after tightening, it must be concluded that there is an imperfect seal, and the valve will have to be opened for examination. Such a leak may result from either of the following causes:

1. **Incomplete Seal Between Bonnet and Gasket Or Body and Gasket.** An incomplete seal around the gasket seating surfaces may be caused by corrosion, dirt, chips, or other foreign matter on the mating surfaces. An incomplete seal may be caused by surface imperfections in the body or bonnet surfaces 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 which may cause a by-pass around the gasket.
2. **Leakage at the Gasket.** The possibility of a leak through the gasket itself, while more remote, should still be considered. This may not be the result of external flaws on the sealing surfaces of the gasket.

TYPICAL
BOLTED BONNET VALVE
NOMENCLATURE

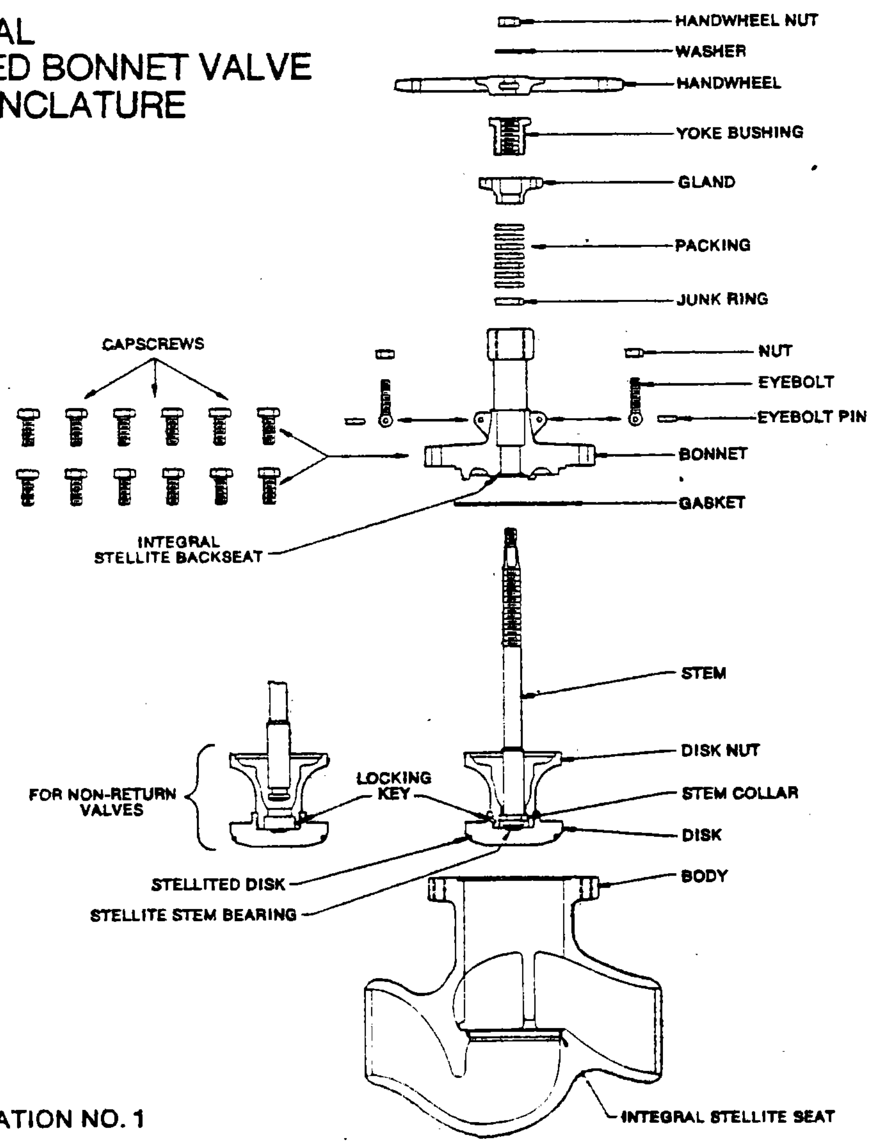


ILLUSTRATION NO. 1

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 stellited 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.

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.

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.

The stem should normally be fully open but not in the backseated position 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, bonnet 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 up sufficient contact pressure and eliminates the vibration. This also tends to dislodge any foreign particles which may have been the initial cause for disk-piston wedging.

The position of the stem, where vibration ceased, should be noted and any increase in pressure drop indicated on available gages, 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.

Another way to dislodge a wedged piston is to use other valves in the line. If possible, 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.

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 recommended level. (See illustration No. 6, page 10.)

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 is 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 re-lube schedule.

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

REPAIR PROCEDURES

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. 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 thick bed of asbestos paper placed over the seat and cemented 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. Heat the body area adjacent to the guide rib to 200 degrees Fahrenheit. This can be done locally with an oxy-acetylene torch.
5. Select the proper welding rod to suit the body material (1/8" maximum size rod is recommended here). See page 7. Because of slag conditions and easy maneuverability, class 7010 rods are recommended.

   If stainless steel inlay is desired on the guide ribs, use either 18-8 stainless steel rod, Harstain 18-8, Stainlend "K" 18-8, Stainweld 18-8 or equivalent.
6. The welding should be started at the bottom so as to create a small shelf, and then proceeded up the guide rib. Lay the weld in thin, even layers, peening each layer before proceeding with the next, and being careful to maintain a temperature of 200 degrees Fahrenheit 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 insure a weld without an undercut at the edges. The overlapping should be done along this edge by using a welding rod of ⅛" 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 a hammer. Thermal stress relieving is not recommended.

7. With a hand grinder, rough grind the welded surface to within about .010" of the finished surface. The edges of the guide ribs should be rounded off smooth. Check the progress of the rough grinding by using a straight edge and feeler gages. 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 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 REPAIRS

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 stellited seats in these bolted bonnet valves are not easily scored, but where reconditioning is necessary, the following points should be observed:

Where an indention 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 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 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 Fig. A page 8.

For smaller size valves, a driving handle can be easily made of ¼" diameter wire bent as per Fig. B. These small assemblies, being much lighter, do not require a supporting spring. Stellited 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, portable boring machines are available from Rockwell.

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.

The lock key weld and locking key can be drilled out. After the key has been removed, 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, WELDING AND FLANGED END VALVES

The four basic steps in repairing a casting defect in these areas are: (1) cut out to the sound metal, (2) pre-heat, (3) weld, and (4) stress relieve. The steps are simple, but many exceptions are encountered in working on valves which are operating in the field. Defects in these areas may be inspected in a variety of ways. Radiography and Magnaflux are two standard methods. Etching with acid is sometimes effective. Castings which have been in water service and may contain water in the defect can be heated to show porosity.

This is very advantageous in determining the source of a leak as well as its exit point. Cutting may be done by chipping, grinding or flame gouging. Generally speaking, the amount of metal removed should be held to a minimum so as to avoid distortion upon subsequent welding. For example, small pinhole leaks in a casting wall 1½" thick may often be effectively welded by cutting down only ¼" deep at the inlet and outlet of the leak.

Preheating to 400°F is called for in most piping fabrication. However, in finished valve repair there may be weld locations wherein the preheat would do more harm than good. For example, in building up worn guide ribs the preheat may detract from the welder's efficiency without making a corresponding metallurgical gain. Here, keep the heat down to 200°F.

The welding rod should generally match the valve body analysis. See page 7. However, many individual considerations such as welding position and rod availability will influence the choice.

Stress relieving is also generally recommended for piping fabrication. Again, it is not always practical in field valve casting repair. Heating which will distort the valve may do irreparable harm. Stress relieving is unnecessary for very small welds and a heavy peening is sufficient.

Where any work involving great heat has been done near the stellited seat joint, it is best to check the concentricity of the seat by blueing with the disk. Should the joint be cut of round, it will be necessary to relap following the instructions previously given under "Seat and Disk Repairs," page 6.

VALVE COMPONENT REPAIR—DISK-PISTON ASSEMBLY REPAIRS

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 line scale or other foreign matter which 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.

GASKET SEAL AREA REPAIR

Where foreign matter of any sort is responsible for a gasket seal leak on the sealing surface of the bonnet, it is very likely that it has caused an impression in the same sealing surface which 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.

WELDING ROD RECOMMENDATIONS

MATERIAL TO BE WELDED	ROD RECOMMENDATION AWS-ASTM CLASS*
Carbon Steel 1. ASTM-A216—Grade WCB 2. ASTM-A105—Grade II	ASTM-A233 E 7018
Carbon-Molybdenum Steel 1. ASTM-A217—Grade WCI	ASTM-A316 E 7018-A1
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC6 2. ASTM-A182—Grade F11	ASTM-A316 E 8018-B2
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC9 2. ASTM-A182—Grade F22	ASTM-A316 E 9018-B3
18-8 Mo Stainless Steel 1. ASTM-A351—Grade CF8M 2. AISI—Type 316	ASTM-A298 E 316-15 or E 316-16

*Weld metal deposit chemistry and procedures should conform to the requirements of ASTM 486 (see Table I, below, this manual), and Section IX of the Boiler Code.

TABLE 1—CLASSIFICATION OF WELD DEPOSIT MATERIAL

P-Number	Material Covered	Type of Weld Deposit	Weld Deposit Analysis: Chromium	Molybdenum	Nickel	Manganese	Silicon	Electrode Coatings
P-1	Carbon steels such as: A216, Grades WCA and WCB; A352, Grades LCB; A27, all Grades	Carbon steel	—	—	—	1.25 max*	0.50 max†	F-1: XX20, XX24, XX27, XX28, XX30 F-2b: XX12, XX13, XX14 F-3b: XX10, XX11 F-4b: XX15, XX16, XX18
P-3	Steels with less than ¾ per cent Chromium and total alloy less than 2 per cent such as: A217, Grade WC1; A352. Grade LC1	Carbon-Molybdenum	0.50 max	0.40 to 0.65	—	1.25 max*	0.50 max†	
P-4	Steels with Chromium ¾ to 2 per cent and alloy steels with total alloy less than 2¾ per cent such as: A217, Grades WC4; WC5, and WC6	Chromium-Molybdenum (½ to 2 per cent Chromium)	0.50 to 2.00	0.40 to 0.65	—	1.00 max	1.00 max	
	A352, Grade LC2	Nickel-Molybdenum	—	0.30 to 1.00	1.50 to 3.75	1.00 max	1.00 max	
P-5	Total alloy content less than 10 per cent such as: A217, Grades WC9, C5, and C12.	Chromium-Molybdenum (2 to 10 per cent)	2.0 to 10.0	0.4 to 1.5	—	1.00 max	2.00 max	
P-5A	Total alloy content less than 6 per cent such as: A148; A352, Grades LC3		To provide comparable mechanical properties of the base metal					
P-6	High alloy steel martensitic, such as: A351, Grade CA-15	High alloy martensitic	11.00 to 15.00	0.70 max	—	2.00 max	1.00 max	F-4b XX15 XX16
	High alloy steel austenitic, such as: A351. Grades CF-8, CF-8M, CF-8C, CH-2C, and CK-20	Chromium-Nickel containing more than 1 per cent ferrite	AISI Types 302, 304, 308, 309, 316, 317, 318, 347, 348, 309 Mo, 309 Cb					F-5 XX16 XX15
		Chromium-Nickel fully austenitic Austenitic Manganese	AISI Types 310, 310Cb, 310 Mo, 330					

†Grades P-1 and P-3 where qualification under the ASME Boiler and Pressure Vessel Code is not required, the following limits may be used:

	P-1	P-2
Manganese, max, per cent	1.25	1.50
Silicon, max, per cent	0.60	0.60

b Performance qualification of a welder under any "F" number up to and including F-4 shall qualify a welder for all lower "F" numbers.

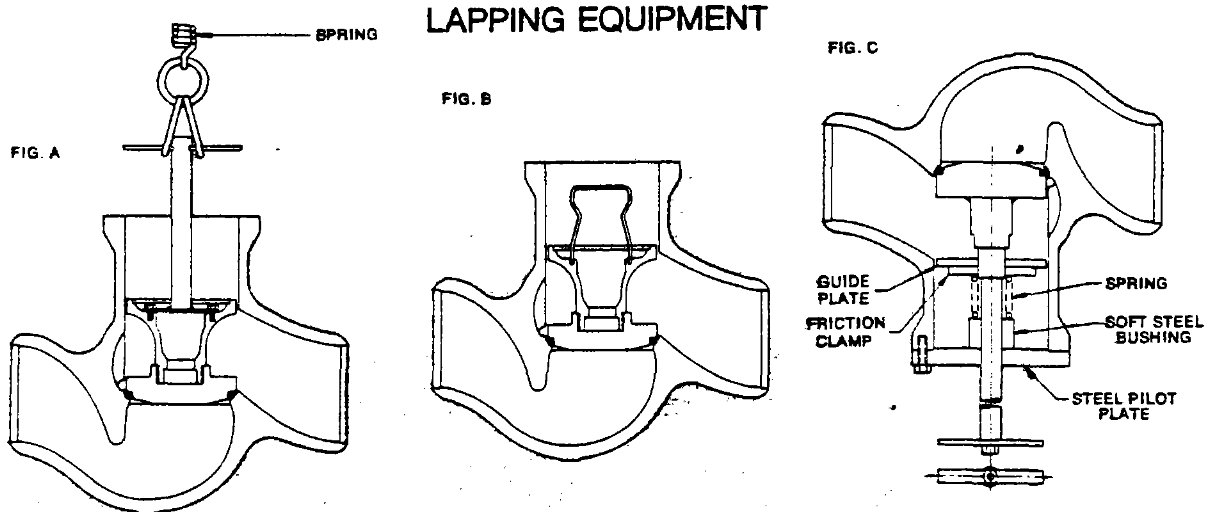
*With permission of ASME, From Section IX, Boiler and Pressure Vessel Code.

FIELD REPAIR EQUIPMENT

Available from Rockwell 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 Rockwell Edward sales representative for more information. A list of this equipment follows:

1. Lapping equipment. See Figs. A and B.
2. Self-centering lap guide fixtures for lapping valve seats in valves 8" and up. See Fig. C. 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 bores from 4" to 14½" diameter. (Not illustrated)
4. Van Norman portable boring machine for reboring valves in the field. Grinding attachments are also available for some sizes for grinding seat joints. (Not illustrated)
5. Air driven portable boring machine for reboring guide ribs and seats of valve bodies in the line. (Not illustrated)

LAPPING EQUIPMENT



DISK DRIVER FOR LAPPING LARGE VALVES

DISK DRIVER FOR LAPPING SMALL VALVES

SEAT AND DISK LAPPING FIXTURE FOR VALVES MOUNTED WITH STEM DOWN OR HORIZONTAL

ILLUSTRATION NO. 2

DISASSEMBLY PROCEDURES FOR BOLTED BONNET VALVES

INTRODUCTION

Step-by-step disassembly procedures are described for all types of Rockwell Edward bolted 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 two 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 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 Procedures for Impactor Handwheels," page 9, or "Procedures for Removing Electric Operators from Valve Bonnets," page 9.

IF FAILURE IS INDICATED IN AREA 2,

Two methods are available. In Method 1, the operator and bonnet assembly may be removed from the valve body as a unit. This requires less time but requires adequate clearance area above the valve. The second method is to first remove the operator from the bonnet, and then the bonnet from the body, in separate steps.

For Method 1, leave the valve operator mounted on the bonnet and follow instructions for "Disassembly Procedures For Valve Parts," page 11.

For Method 2, first remove the operator by following the applicable section, "Disassembly Procedure for Impactor Handwheels," page 9, or "Procedures for Removing Electric Operators from Valve Bonnets," page 9. Then proceed to the section, "Disassembly Procedures for Valve Parts," page 11.

If failures are indicated in any combination of Areas 1 & 2, then each of the respective procedures must be followed. **For check valves without stems or operators, simply use the proper section under "Disassembly Procedures for Valve Parts," page 11.**

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) where the valve can remain in service.

1. **For service in Area 1.**
   a. If pressure is to be maintained in the valve, fully close the valve or backseat in full open position. On electric operated valves with non-revolving stems, the valve must be backseated in the full open position only.
   b. If no pressure is to be maintained in the valve, close the valve fully and open approximately ⅛".
2. **For service in Area 2.**
   Close the valve fully and open approximately ⅛". Service Area 2 only without pressure in the valve.

DISASSEMBLY PROCEDURES FOR IMPACTOR HANDWHEELS AREA 1

Rockwell Edward 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. If under pressure, the valve should either be fully closed or backseated in the full open position.

All of the following handwheel disassembly procedures are arranged in accordance with the general comments on page 8. Study these comments carefully before beginning disassembly.

IMPACTOR HANDLES AND HANDWHEELS

Not illustrated, but of similar construction to Illustration No. 4, are Impactor handles. The following instructions apply, in general, to all.

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 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.
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, the crossarm can be removed by tapping lightly with a hammer on the underside and lifting off.

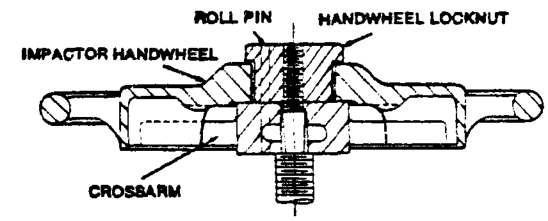


ILLUSTRATION NO. 3
Impactor Handwheel with Crossarm

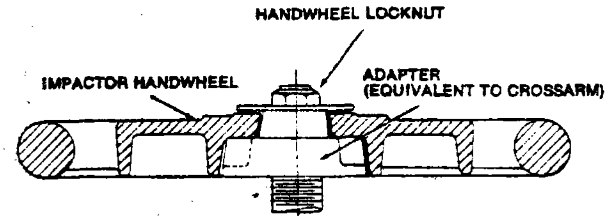


ILLUSTRATION NO. 4
Impactor Handwheel with Adapter

PROCEDURES FOR REMOVING ELECTRIC OPERATORS FROM VALVE BONNETS

Rockwell Edward Bolted Bonnet valves use various types of electric operators, depending upon the size and pressure class, which determine 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 bonnet. Also included are complete instructions for resetting the limit switches. Disassembly procedures for the electric operators themselves are not included and appropriate instructions should be obtained before starting. Consult the operator manufacturer.

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 backseated or fully open position before removing units from valves with non-revolving stems. See "Caution," page 9.

All of the following disassembly procedures are arranged in accordance with the general comments on page 8. Study these pages carefully before beginning.

Determine first whether the valve stem is revolving or non-revolving.

REVOLVING STEM VALVES

On revolving stem valves the operator drive nut is connected to the stem through a key. See Illustration No. 5.

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 or capscrews from the underside of the operator flange.
4. Lift the operator up and completely off the stem and stem key.
5. Position the operator away to a clean area for further disassembly, if required.

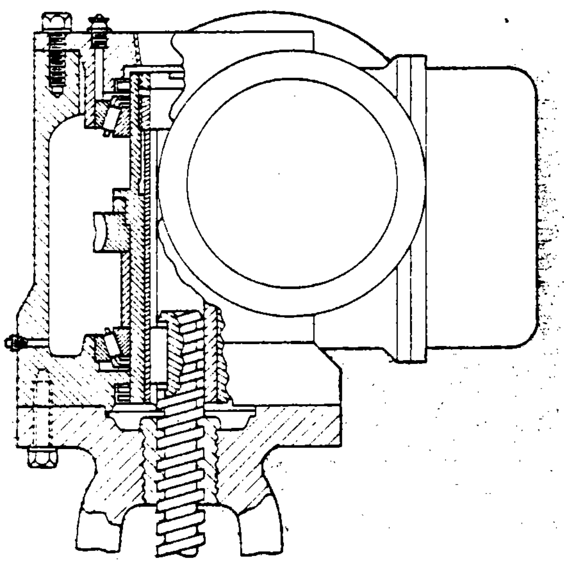


ILLUSTRATION NO. 5
Electric Operator used on Revolving Stem Valves

NON-REVOLVING STEM VALVES

On non-revolving stem valves, the operator drive nut is threaded to the stem. See Illustration No. 6.

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 or capscrews from the underside of the operator 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 to prevent damage to the stem threads.
6. With the hoist, lift the operator clear of the stem and place down on a clean area for further disassembly, if required.

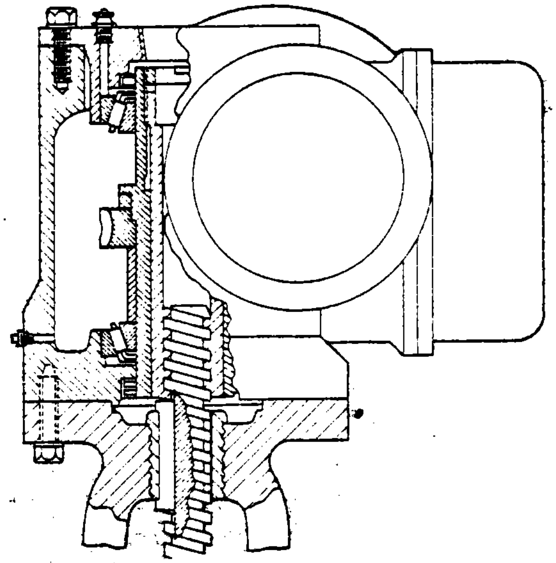


ILLUSTRATION NO. 6
Electric Operator used on Non-Revolving Stem Valves

ELECTRIC OPERATOR LIMIT SWITCH AND TORQUE SWITCH SETTING PROCEDURES

The following procedures are intended as a general guide for setting limit and torque switches on electric operators. For specific instructions, refer to the appropriate operator instruction manual or consult the operator manufacturer.

Geared Limit Switch

When mounting or re-mounting an electric operator, the geared limit switch must be reset as follows:

1. Make certain the electric current is off.
2. Open valve by hand until the stem strikes the backseat.
3. Mark the stem and reclose approximately ⅛" to allow for coast of the moving parts.
4. With the valve in this position, set the opening limit switch as outlined in the operator instruction manual.
5. 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 the valve is moving 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 certain there is sufficient clearance between the position at which the valve stem comes to rest and the valve backseat.
6. To set the position for operation of the indicating light, make sure the torque switch is properly wired into the closing circuit and run the valve to the closed position. Back the valve off the seat to the desired position and set the "closed" light using the procedure outlined by the operator manufacturer.

Torque Switch
The torque switch is set during factory assembly to seat the valve against the specified unbalanced pressure and to protect the backseat from excessive forces in the opening direction. Should it become necessary to change the torque switch setting for any reason, the local Rockwell representative should be contacted for instructions.

DISASSEMBLY PROCEDURES FOR VALVE PARTS AREA 2

(For a definition of Area 2, see page 8.)

(See Illustration No. 1, page 4, for an explanation of valve parts nomenclature.)

Step-by-step disassembly procedures are described below. The procedures include disassembly instructions for stop, stop-check (non-return), and piston lift 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 8. Study these pages carefully before beginning.

STOP AND STOP-CHECK (NON-RETURN) VALVES

See Illustration No. 1, page 4.

1. Loosen the packing gland bolt nuts and tap the gland which should relieve any pressure *which might be trapped in the valve. This is important.*
2. Carefully remove the bonnet stud nuts or capscrews.
3. Remove the packing gland bolt nuts.
4. Use a chain hoist in line with the stem to lift the stem-bonnet assembly out of the body. During this process, mark the body, bonnet, and 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.
5. Unscrew the stem from the bonnet bushing.
6. 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 7.
7. Screw ⅜–16 UNC bolts (½–13 UNC on 12" valve) 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.
8. The bonnet end opening should be kept covered whenever possible.

PISTON LIFT CHECK VALVES

See Illustration No. 7, page 11.

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

NOTE: Care must be taken in removing the cover bolting in case pressure should be trapped in the body (downstream piping). Check to make certain all downstream pressure is relieved.

1. Carefully remove the cover nuts or capscrews observing the above caution.
2. Lift the cover off the valve. During this process, mark the body, cover and gasket at corresponding points (but not on sealing surfaces) for reference and 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.
3. Screw ⅜–16 UNC bolts (½–13 UNC on 12" valve) 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.
4. The bonnet end opening should be kept covered whenever possible.

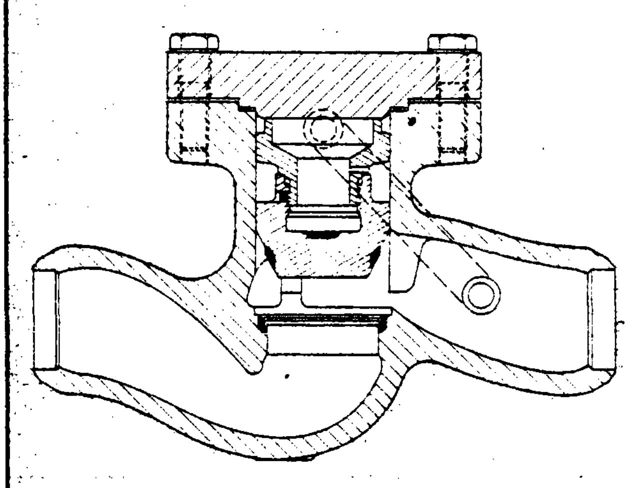


ILLUSTRATION NO. 7
Piston Lift Check Valve

REASSEMBLY PROCEDURES FOR BOLTED BONNET 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. In addition, the following general points should be considered.

1. The most important consideration in the reassembly of 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 gasket when reassembling a bonnet which 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.

STOP AND STOP-CHECK (NON-RETURN VALVES)

See Illustration No. 1. page 4.

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 gasket on the body.
3. Lower the bonnet into position. rotating the stem as necessary to engage the yoke bushing threads.
4. Install and tighten the bonnet stud nuts or cap screws in accordance with the torque values shown on page 4. All nuts or cap screws must be tightened uniformly in a star pattern to avoid cocking the bonnet.
5. Reassemble the operator to the valve using a procedure opposite the disassembly.

PISTON LIFT CHECK VALVES

See Illustration No. 7. page 11.

1. Insert the disk-piston, lowering it carefully until it rests on the valve seat.
2. Install a new gasket on the body.
3. Lower the cover carefully onto the valve.
4. Install and tighten the cover stud nuts or cap screws in accordance with the torque values shown on page 4. All nuts or cap screws should be tightened uniformly in a star pattern to avoid cocking the cover.

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. Lot number of the valve.
4. Service (water, oil. gas. superheated steam. etc.).
5. Operating pressure and temperature.
6. Direction of flow through stop valves (inlet pressure above the disk or below the disk).
7. Rate of flow through the valve (lbs. per hour or gallons per minute).
8. At what pressure, temperature or flow rate does the reported trouble occur.
9. Pressure drop across the valve.

INFORMATION REQUEST

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

ORDERING PARTS

All requests for replacement parts for cast steel valves should be forwarded to your local Rockwell Edward Sales Office. Specify shipment requirements (Air Express, REA Express, etc.).

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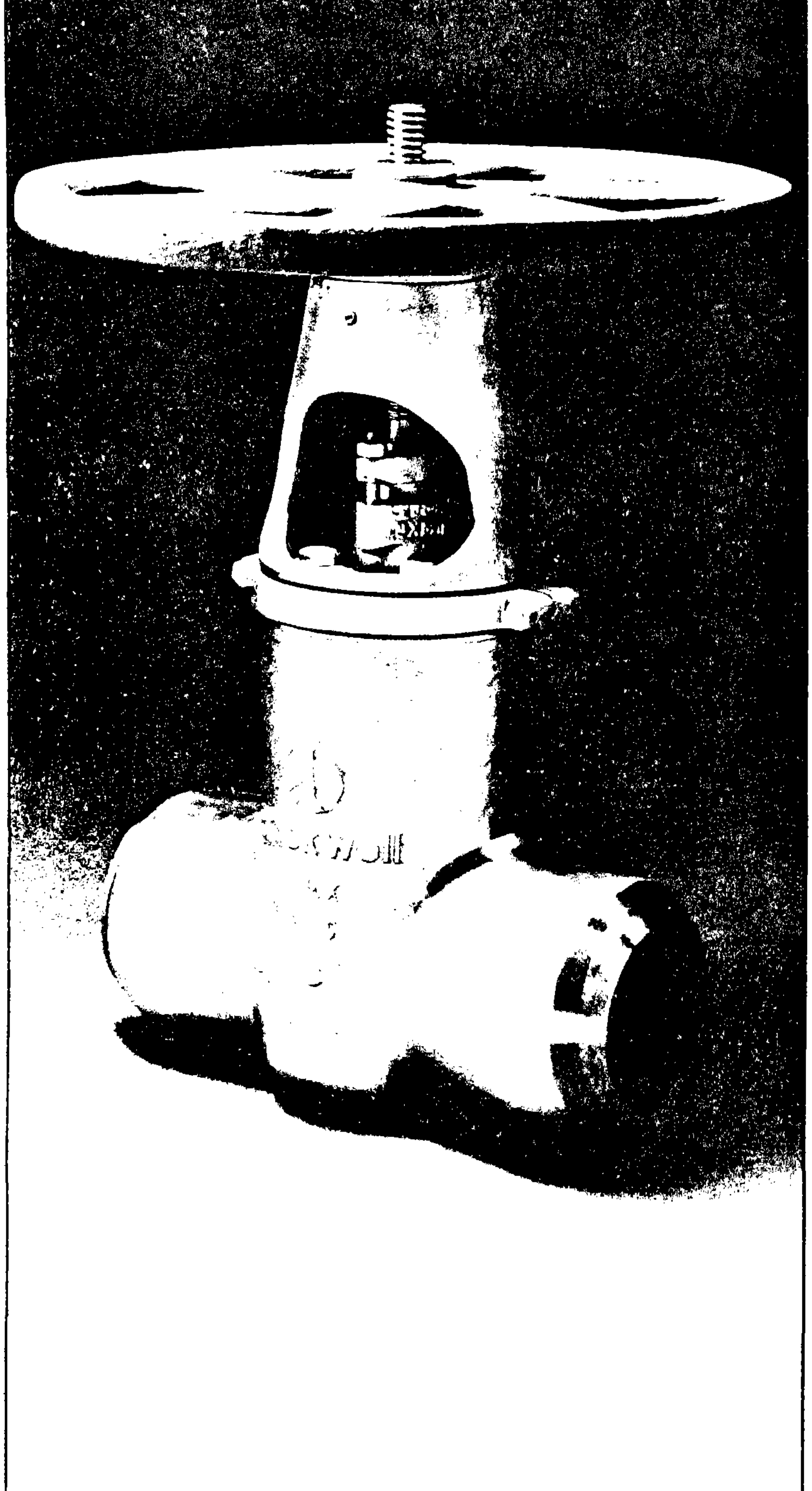
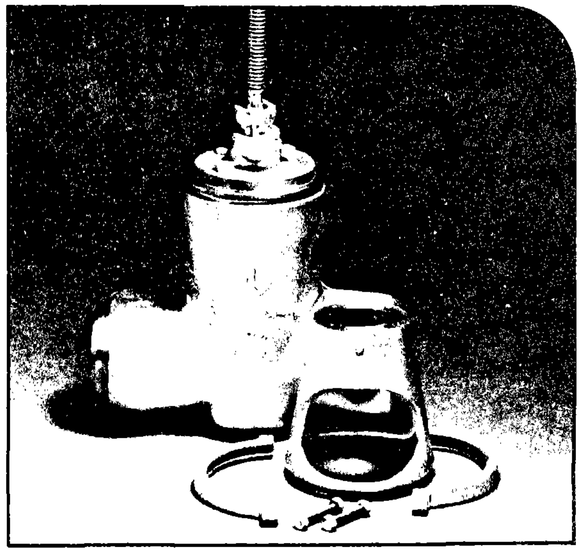
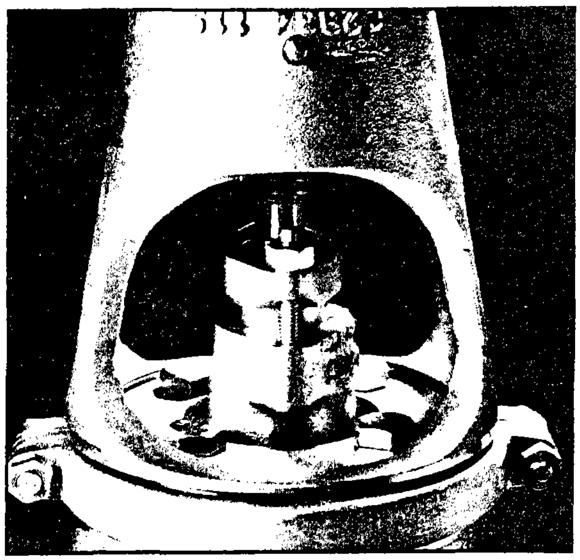
V-475

Rockwell-Edward Equiwedge™ Gate Valve Maintenance Manual

Rockwell







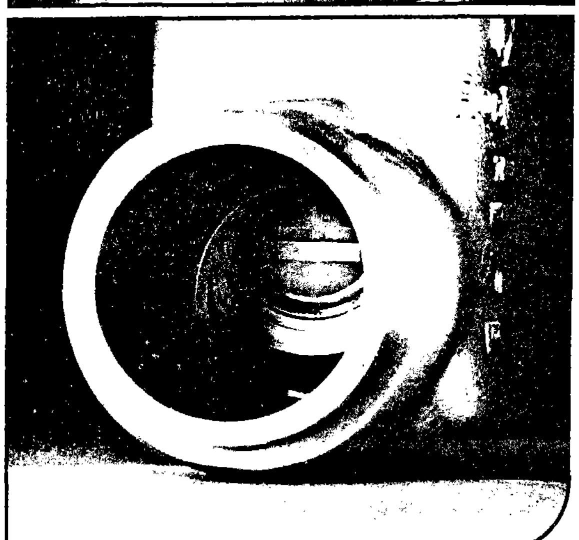


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Table of Contents

Introduction and Scope

Introduction

This manual has been prepared to serve as a guide for maintenance of Rockwell Equiwedge gate valves, all of which feature the pressure seal bonnet joint construction. Although rigid metallurgical, non-destructive examination, physical and visual inspection is standard procedure for Rockwell products, it is inevitable that some valves, after a period of time, will require repairs. This manual will assist you in restoring the valve to good working condition with a minimum of time and expense.

Scope

Before starting any repairs, it will be helpful to have some understanding of the valve's physical construction. Consequently, the five basic types of pressure seal construction are discussed and illustrated first. All Rockwell Equiwedge gate valves employ one of these five basic types.

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

Then, the procedure to be followed in making the repair is explained. This section includes normal valve maintenance as well as major valve repairs. Field repair equipment available from Rockwell is described and illustrated. Valve lubrication and welding rod recommendations are also included. These procedures should be adequate for almost any Equiwedge gate valve repair or maintenance problem that may arise.

Following is a section describing the disassembly procedure for the various valve components; for example, manual handwheel, manual geared actuators or electric actuators, valve yokes, and the five basic bonnet types. It is very important that this manual be studied before any disassembly work is done to avoid needless work and loss of time by selecting the improper procedures.

The last sections include reassembly instructions and available maintenance equipment and information on the various types of actuators, both manual and electrical.

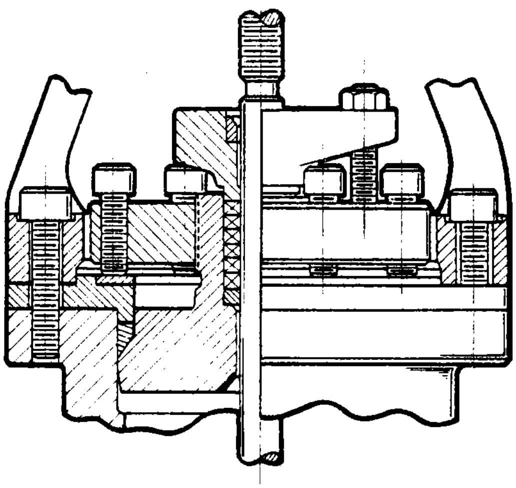
Gate Valve Figure Numbers Described in this Manual

Figure No.	Class	Pressure Seal Type	Size
1611-1611Y	600	I & II	2½ to 28
1711-1711Y	Special Class 600	I & II	2½ to 28
1911-1911Y	900		2½ to 28
14311-14311Y	Special Class 900	III, IV, & V	2½ to 28
11511-11511Y	1500	III, IV, & V	2½ to 24
12011-12011Y	Special Class 1500		2½ to 24
12511-12511Y	2500	III, IV, & V	2½ to 24
11411-14411Y	Special Class 2500	III, IV, & V	2½ to 24

Description of Equiwedge Gate Valve Types:

Type I is a flanged yoke design with a separate gasket retainer ring, both of which are held to the body by cap screws. The bonnet retainer is screwed onto the bonnet and cap screws are screwed down on top of the body to force the bonnet into contact with the gasket. See illustration No. 1.
Type II is a flanged yoke design with or without a separate bonnet retainer ring, both of which are held on the body by cap screws or studs and nuts. The bonnet is pulled up into contact with the gasket with studs and hex nuts. See illustrations Nos. 2A and 2B.
Type III is a wishbone yoke design bolted to the body. It has a segmental retaining ring, spacer ring and a screwed on bonnet retainer equipped with push down bolts to pull the bonnet up into contact with the gasket. See illustration No. 3, page 5.
Type IV is a wishbone yoke designed bolted to the body. It has a segmental retaining ring, spacer ring and separate bonnet retainer with pull up studs screwed into the bonnet to contact the gasket. See illustration No. 4, page 5.
Type V has a yoke lock ring connection to the body with a segmented ring, gasket retainer and a separate bonnet retainer with studs screwed into the bonnet to pull up the bonnet against the gasket. See illustration No. 5, page 5.

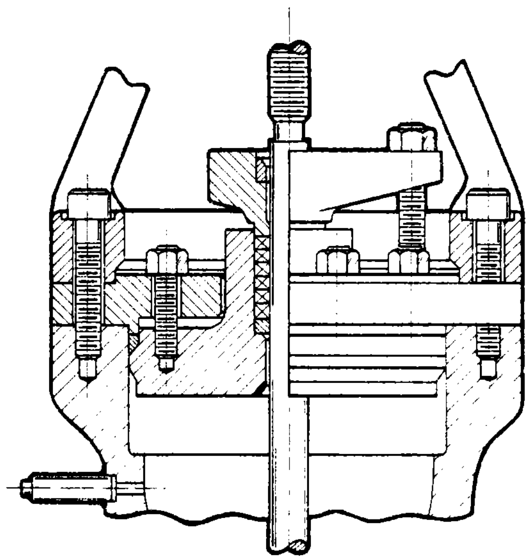
Valve Type I



Size 2½ & 3 - Figure 1611 and 1611Y
Size 2½ & 3 - Figure 1711 and 1711Y

Illustration No. 1

Valve Type II

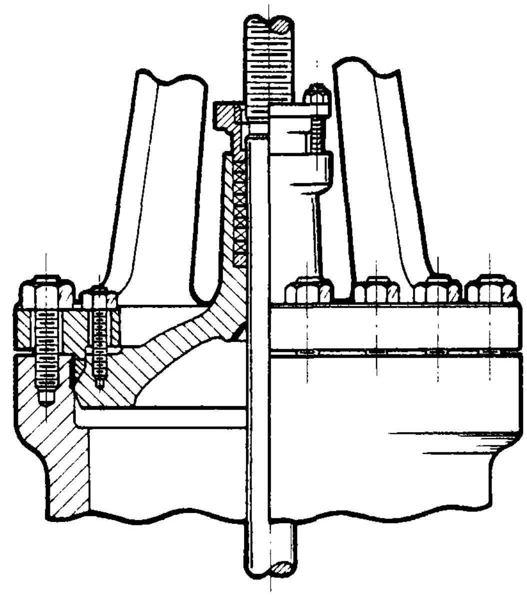


Size 4" - Figure 1611 and 1611Y
Size 4" - Figure 1711 and 1711Y

Illustration No. 2A

Description of Equiwedge Gate Valve Types (cont.):

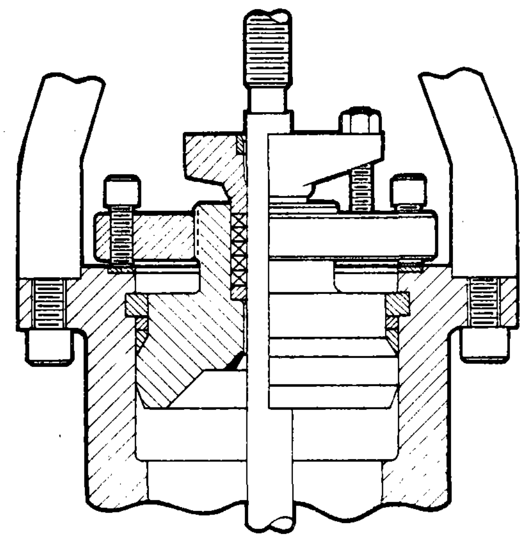
Valve Type II



Size 6 - 28 - Figure 1611 and 1611Y
Size 6 - 28 - Figure 1711 and 1711Y
NOTE: Size 6 and 8 valves are wishbone yoke design with flange.

Illustration No. 2B

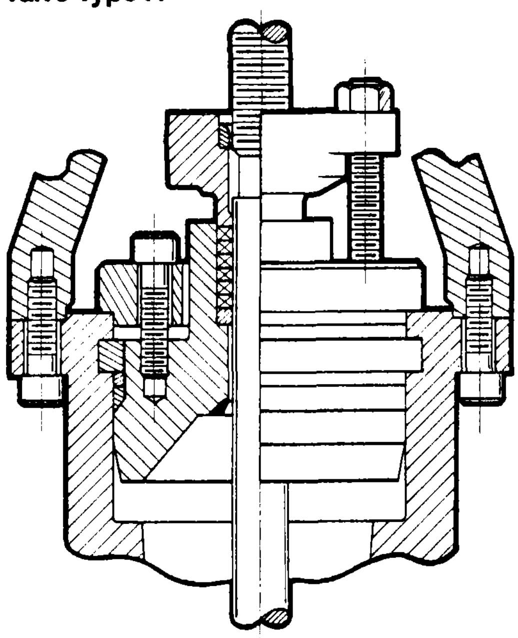
Valve Type III



Size 2½ - 3 - Figure 1911-14311 & 1911Y-14311Y
Size 2½ - 3 - Figure 11511-12011 & 11511Y-12011Y
Size 2½ - 3 - Figure 12511-14411 & 12511Y-14411Y

Illustration No. 3

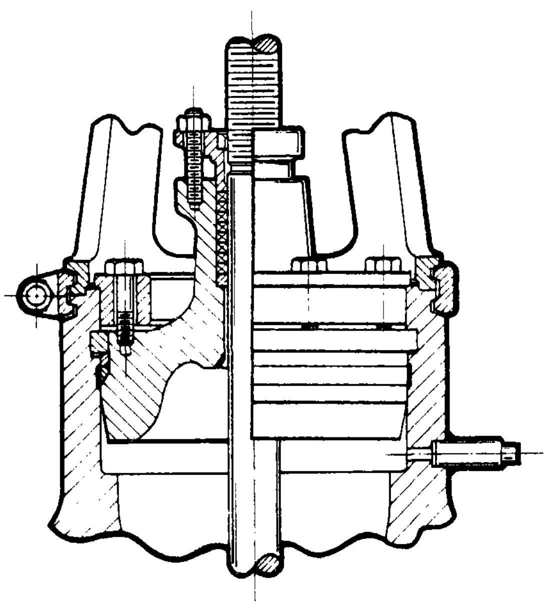
Valve Type IV



Size 4 - 8 - Figure 1911-14311 & 1911Y-14311Y
Size 4 - 8 - Figure 11511-12011 & 11511Y-12011Y
Size 4 - 8 - Figure 12511-14411 & 12511Y-14411Y

Illustration No. 4

Valve Type V



Size 10 - 28 - Figure 1911-14311 & 1911Y-14311Y
Size 10 - 24 - Figure 11511-12011 & 11511Y-12011Y
Size 10 - 24 - Figure 12511-14411 & 12511Y-14411Y

Illustration No. 5

Service Problems

Packing Chamber Leak:

When moisture appears or actual dripping occurs at the packing chamber around the stem or gland (that cannot be eliminated by tightening the gland bolt nuts), the following points should be considered:

1. Gland travel has been fully taken up. Repack with new packing.
2. Packing may have become hard and no longer compresses to fill the chamber. Replace packing.
3. Wrong packing is being used. See packing recommendations below.
4. Stem may be grooved, worn, scored, or bent. Stem should be replaced and new packing used.
5. The splits in the packing rings have not been staggered around the stem.
6. The packing gland may be binding against the packing chamber or stem and does not compress the packing properly. Make certain that the gland barrel fits into the packing chamber and is tightened down evenly.
7. Also, remember that when packing is compressed most of the gland force is exerted on the upper rings in the packing chamber. After a time the force is transmitted to the lower rings and then gland bolts should be retightened. It may take two or three very short turns of the gland bolts to firmly seat the packing.
8. If the valve is normally open, packing leakage can be stopped by backseating the valve. By taking the pressure off the packing, tightening the packing gland nuts will be more effective.

Packing Recommendations

John Crane Style 187-IX die formed packing is used for the upper and lower rings on all standard Rockwell Equiwedge gate valves with the exception of Class 2500 and 4500 valves where it is used for all rings. John Crane 6DCR packing is used for the middle rings. The designation 187-IX indicates molded rings of graphited asbestos with an asbestos yarn braided jacket reinforced with inconel wire.

The 6DCR packing is composed of molded rings of graphited asbestos with a Neoprene cement binder. Both types are treated with a thin coat of parafin to prevent water absorption. In addition, both types of rings have finely dispersed powdered zinc in the packing to act as a sacrificial material for galvanic corrosion to prevent stem pitting. All the rings are split and can be installed without disassembly of the valve.

The valve stem, gland barrel and packing chamber should be thoroughly cleaned before installation of new packing to insure the best possible seal. Install each packing ring separately and push each one down to the bottom of the chamber. A brass rod 6" to 10" **(150mm to 250mm)** long is a good tool to tamp the packing in place. Make certain the lap joint on each succeeding ring of packing is placed 90° to 120° from the last one inserted so the laps are staggered. The chamber will be filled before the last ring is placed in the chamber. Now the gland can be engaged and the gland bolts tightened. This should make room for additional packing rings. Be sure that the last ring inserted is type 187-IX. Also, make sure that the gland barrel enters the chamber.

Pressure-Seal Leak

A torque wrench should be used to tighten the bonnet retainer studs or cap screws which supplies the preload to the pressure seal gasket. When the valve was built in the factory these fasteners were tightened while the valve contained test pressure. In the field the following procedure is recommended:

1. Guard against leakage by having the bonnet retainer fasteners tight at all times.
2. If the valve is disassembled for any reason, the bonnet retainer fasteners should be tightened to the torque shown below with line pressure in the valve. (See charts below.)

Torques for Bonnet Retainer Fasteners

Bolt Dia. Inches	½	9/16	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½
Torque Foot Pounds	45	68	90	150	240	370	585	750	1020	1200
Torque Newton/Meters	60	90	120	205	325	500	795	1020	1385	1630

Bolt Dia. Millimeters	10	12	14	16	20	24	30	36	42
Torque Newton/Meters	30	50	80	120	240	400	880	1360	2410

Service Problems (cont.)

3. In addition, these torques should be used on other fasteners in assembly of the valve. It must be remembered that the fasteners should be well lubricated to attain the proper preload with these figures. Should the leak fail to stop after tightening, it can be concluded that there is an imperfect pressure seal and that the valve will have to be opened to be examined. (Note: Regardless of the cause of failure, disassembled pressure seal valves should always be reassembled with a **new** pressure seal gasket. These are available from stock.) 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 may be caused by foreign material, corrosion or erosion on the sealing angle. Rockwell pressure seal gaskets are designed with a blunt lower end to minimize accidental or handling damage. However, since the gaskets are made of very soft low carbon steel with a soft malleable coating they should be handled carefully.
2. **Incomplete Seal Between Body Bore and Gasket-**An incomplete seal at the body bore and gasket O.D. may be caused by surface imperfections in the body wall due to corrosion or erosion; an out of round condition of the bore; or defects in the metal at the sealing surface, such as surface nicks and cuts or discontinuities in the metal. Such defects may represent a deeper flaw in the cast metal that actually bypasses the pressure seal gasket.

   When a gasket is removed, examine the sealing surfaces very carefully. Look for lack of contact rather than the vertical score marks caused by pulling the gasket out of the bore. In use, a pressure seal gasket is deformed on the angular surface and the O.D., and is actually mashed into a sealing position. In removal, further deformation takes place in the form of score marks on the O.D. This will be cause enough to replace the gasket.

Gate and Seat Leakage

A leak existing at the seat and gate of a properly 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 lines, a downstream pipe that remains hot beyond the usual length of time and conductivity range.

First, try opening the valve slightly to flush any foreign material from the seating surfaces and then fully close the valve. If this doesn't stop the leakage, then one or more of the following may be the cause:

1. Foreign material has been imbedded into the seating surfaces preventing a seal.
2. Foreign material has scratched or cut the seating surface.
3. An obstruction such as a tool or other foreign material has been lodged across or between the seats and preventing the gate from closing.
4. The valve seat has been steam or water cut by not fully closing the valve during a previous operation.

If the valve cannot be isolated and repaired as soon as possible, schedule the work to be done at the next outage.

Body or Bonnet Wall Leak

This is a leak through the pressure containing parts of the valve. A leak occurring through the bonnet should be readily detectable because of the lack of insulation. On the body, because of the heavy insulation, a small leak may go unnoticed for a time on a hot line because the piping evaporates the leakage.

Lubrication

In order to obtain long service life and maximum reliability, valves require periodic lubrication of the bearings and stem threads the same as for any machinery with rotating parts.

All handwheel actuated Rockwell Equiwedge gate valves are equipped with low friction bearings, needle bearings in the smaller sizes and tapered roller bearings in the larger sizes. These valves have a lube fitting for convenient relubrication. Both the stem threads and the bearings can be relubed through this fitting. In addition, it is advisable to clean the stem first while in the open position and apply fresh grease to the threads, then repeat while in the closed position.

For valves that are operated infrequently, relubrication at least once a year is recommended. The recommended lubricant for both bearings and stem threads is Rycon EP 2, manufactured by the American Oil Company. This is an extreme pressure, temperature lubricant of high quality. Use of other lubricants should be avoided.

For valves that are operated frequently, the lubricant should be replenished at both the bearings and stem threads every three months or at shorter intervals depending on the severity of the service.

Valve Body Repairs
Body Bore Gasket Seal Area Repair

Rockwell Class 600 Equiwedge gate valves have the seal area for the pressure seal just below the top of the body bore. The seal surface is inlayed with 18-8 stainless steel on all valves size 16 and larger. Repairs of defects found in this area may be made as indicated below.

Rockwell Class 900, 1500, and 2500 Equiwedge gate valves have the seal area just below the gasket retainer groove. The seal surface is inlayed with 18-8 stainless steel on all valves in these pressure classes.

To make a reliable pressure-tight seal, this area, whether inlayed or not, must be smooth, round, and without any appreciable taper. Upon normal disassembly of the valve the gasket has a heavy press fit against this bore and will leave some vertical score marks when withdrawn. These marks can be removed by applying emery cloth to the surface by hand. If there is any doubt about the resultant surface, a portable hone should be used to refinish the bore. This same tool can be used to remove score marks up to .010" **(.25mm)** in depth. If the score mark is greater than .010" **(.25mm)** or if some other type of defect is revealed by inspection, welding will be required for repair.

When it is necessary to repair the seal area by welding, note the following:

1. Place a round piece of sheet metal into the bore down to the shoulder above the guide grooves and tape in place. This will protect the guide surfaces and seats from weld spatter and other debris.

2. Using a small hand grinder, grind out the defect to clean, sound metal.

3. When the defect is removed, use a small blunt edged chisel to displace the metal around the defect edges inward toward the bore center. The displaced metal around the edge of the defect will counteract the effects of any undercut made by welding.

4. Weld using a small TIG torch and bare wire filler metal that matches the body or inlay material. Preheat is required only when welding on low alloy steels of the WC6, WC9, and C5 types. No preheat is necessary when welding carbon steel or the 18-8 inlay. The preheat temperature for the low alloy steels is 300 F min. - 400 F max. **(150 C-205 C).**

5. Lay the weld in thin, even layers, cleaning each layer before proceeding to the next. The last layer of weld should blend in with the base metal upset around the edge of the defect so that no weld under-cut will be present when the bore is finished. The weld metal should be about 1/16" **(2mm)** above the original surface. Thermal stress relieving is not recommended.

6. With a hand grinder carefully grind the weld to within .010" **(.25mm)** of the finished bore. A simple template cut from sheet metal having the same arc as the body bore diameter and a straight edge can be used to check the grinding operation. Final finishing can be done with a portable Sunnen hone.

7. Clean the body of all dirt, chips, spatter, and grinding dust and remove the sheet metal protector. A new pressure seal gasket should be used upon reassembly.

Table 1
Welding Rod Recommendations

Material To Be Welded	Rod Recommendation AWS Class*
Carbon Steel 1. ASTM-A216—Grade WCB 2. ASTM-A105—Grade II	AWS 5.1 E7018
Carbon-Molybdenum Steel 1. ASTM-A217—Grade WC1	AWS 5.5 E7018-A1
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC6 2. ASTM-A182—Grade F11	AWS 5.5 E8018-B2
Chromium-Molybdenum Steel 1. ASTM-A217—Grade WC9 2. ASTM-A182—Grade F22	AWS 5.5 E9018-B3
18-8 Mo Stainless Steel 1. ASTM-A351—Grade CF8M 2. AISI—Type 316	AWS 5.4 E316-15 or E316-16

*Weld metal deposit chemistry and procedures should conform to the requirements of Section IX of the Boiler Code. See table 2.

Table 2 **Classification of Weld-Deposit Material - in inches (mm)**

P No.	Material Covered	Type of Weld Deposit	Weld Deposit Analysis					Electrode Coatings
			Chromium	Molybdenum	Nickel	Manganese	Silicon	
P-1	Carbon steels such as: A216, Grades WCA and WCB; A352, Grades LCB; A27, all grades A216, Grade WCC A356, Grade 1 A486, Class 70	carbon steel	—	—	—	1.60 **(40.6)** max	0.50-1.00 **(13-25)**	
P-3	Steels with less than ¾ percent chromium and total alloy less than 2 percent such as: A217, Grade WC1: A351, Grade LC1 A356, Grade 2 A356, Grade 5	carbon-molybdenum	0.50 **(12.7)** max	0.40-0.65 **(10-17)**	—	1.25 **(31.8)** max[a]	0.50 **(12.7)** max[a]	
P-4	Steels with chromium ¾ to 2 percent and alloy steels with total alloy less than 2¾ percent such as: A217, Grades WC4, WC5, and WC6 A356, Grades 6 and 8 A389, Grades C23 and C24 A487, Class 9N	chromium-molybdenum (1½ to 2 percent chromium)	0.50-2.00 **(13-51)**	0.40-0.65 **(10-17)**	—	1.00 **(25.4)** max	1.00 **(25.4)** max	F-1 F-2[a] F-3[a] F-4[a] XX20 XX12 XX10 XX15 XX24 XX13 XX11 XX16 XX27 XX14 XX18 XX28
P-5	Total alloy content less than 10 percent such as: A217, Grades WC9, C5, and C12 A356, Grade 10 A487, Class 8N	chromium-molybdenum (2 to 10 percent)	2.0-10.0 **(51-254)**	0.4-1.5 **(10-38)**	—	1.00 **(25.4)** max	2.00 **(50.8)** max	
P-8	High-alloy steel, austenitic, such as: A351, Grades CF-3, CF-3A, CF-3M, CF-8, CF-8A, CF-8M, CF-8C, CH-8, CH-10, CH-20, and CF-10MC A744, Grades CF-3, CF-3M, CF-8, CF-8M, CF-8C	chromium-nickel weld metals having more than 1 percent ferrite	AISI Types 302, 304, 308, 309, 316, 317, 318, 347, and 309Cb					F-5 XX15 XX16
	A351, Grades CK-20, HK-30, HK-40, HT-30, and CN-7M A744, Grade CN-7M	chromium nickel-weld metal fully austenitic	AISI Types 310, 310Cb, 310Mo, and 330					F-5 XX15 XX16

[a] Performance qualification of a welder under any F number up to and including F-4 shall quality a welder for all lower numbers.

Repair Procedures (cont.)

Body Wall Repairs
There are six basic steps in repairing a casting defect: (1) grind out the defect to sound metal, (2) preheat the area to be welded (only WC6, WC9, and C5 castings require preheat to 300 F **(150 C)** min. and 400 F **(205 C)** max.), (3) weld, (4) grind the surface of the weld to surrounding contour, (5) stress relieve, and (6) perform non-destructive test of the weld repair. Non-destructive test might entail radiography, magnetic particle examination, liquid penetrant test, or visual examination of the repair surface with the aid of a power glass.
Castings that have been in water service may contain water in the defect so heating on one side to drive out the water is advisable. By finding the entrance and exit of a leak, the casting can be repaired by plugging both sides.
Locally heating a casting for preheat and postheat requirements might distort the part and do irreparable harm. A decision should be made at the start on what course to take. Stress relieving on small weld repairs may cause more dimensional harm than the metallurgical gain.
Welding rods should match the casting chemistry. See tables No. 1 & 2 for Welding Rod Recommendations.

Body Guide Repairs
The body guide grooves guide the gate through about 95% of the valve stroke and allow only 5% of the valve stroke to thrust against the seating surfaces. It is important that the side faces of the groove be smooth and free of gouges and burrs. A flat file can be used to remove any burrs and raised edges.

Seat Repairs
The seats in a gate valve may require repair when the seating surfaces allow fluid to pass. This may be due to erosion of the surfaces caused by not closing the valve tightly or seating on foreign material. Verification of such conditions may be obtained by a seat blueing test or by close visual examination.
To correct these conditions seat refinishing will be necessary. A Dexter gate valve refinishing fixture will speed up repairs. See Appendix B for a discussion on use of the Dexter equipment.

Gate Repairs
Gate repairs to the seating surface can be done on a flat cast iron lapping plate. The lapping plate should be large enough so that the seating surface contacts the full diameter with sufficient additional surface allowing the gate to be pushed at least ⅓ of its diameter in any direction. Clover compound "A", Norton 320 mixed with olive or sperm oil, or for rough lapping, Carborundum H20 may be used. See illustration No. 6A.
Gate guide repairs can be done by rubbing the surface with a square steel block wrapped with emery cloth.

Valve Gate on Lapping Plate

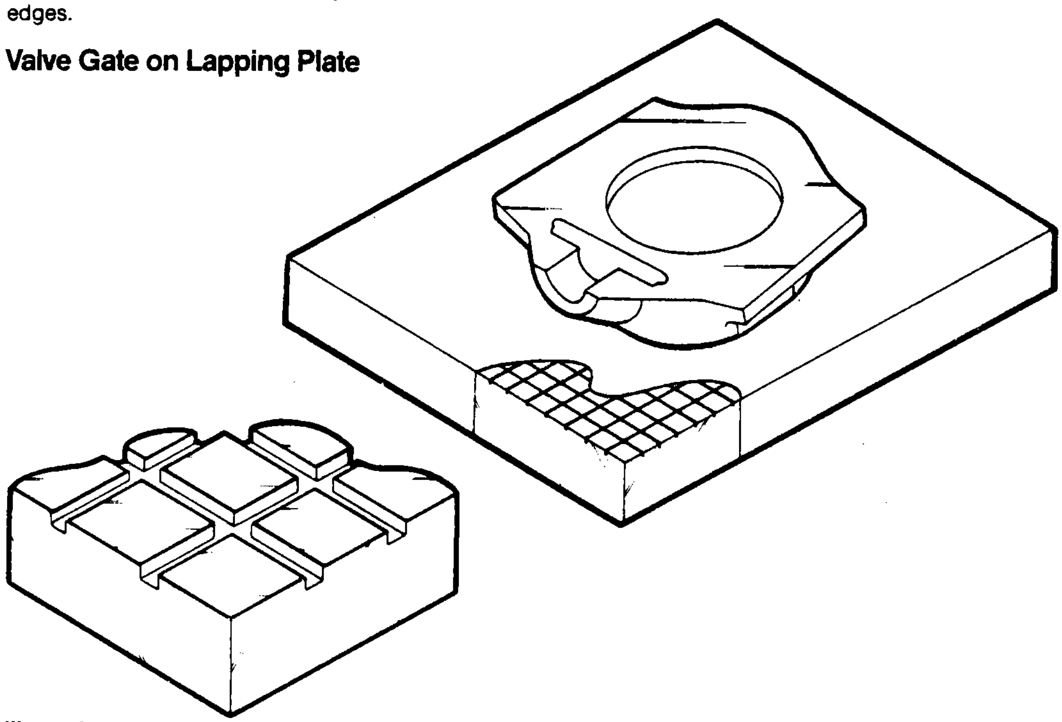


Illustration No. 6A

Repair Procedures (cont.)

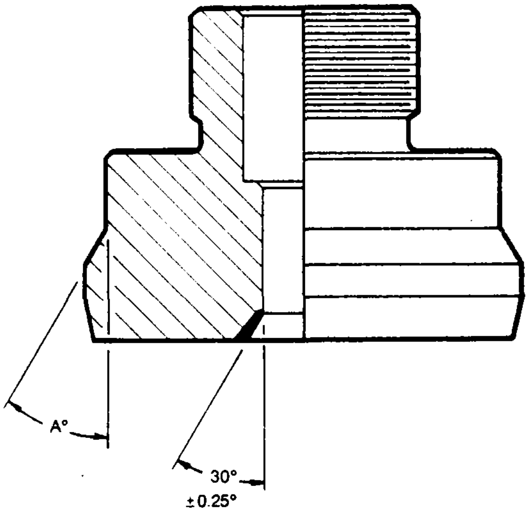
Bonnet Repairs

The valve bonnet provides several functions as follows: closure of the pressure vessel, a packing chamber to seal the stem, a backseat area sealed with the stem so the valve can be repacked under pressure, and a sealing arrangement to prevent leakage to the atmosphere.

Rockwell Equiwedge gate valves have a number of different angles machined on the bonnet to accommodate the pressure seal gasket. These angles are shown in illustration No. 6B.

If the gasket sealing surface of the bonnet has been damaged by corrosion, erosion or careless handling, this surface can be machined in a lathe. Chuck the bonnet, indicate true the large diameter and the bottom face before cutting the angle. The angle should be generated using a high speed or carbide cutting tool. Remove as little stock as possible to clean up. The surface finish should be held to 63 micro inch **(1.6 micrometer)** or better.

Pressure Seal Bonnet Angles



	Class 600	Class 900	Class 1500	Class 2500
A	25° +0.5° -0.0°	35° +0.5° -0.0°	35° +0.5° -0.0°	45° +0.5° -0.0°

Illustration No. 6B

Backseat

The backseating surface is inlayed with hardfacing. Any machining on this surface must be done with carbide tools. The included angle of the backseat is 60° and the tolerance on the half angle is ±0.25°. The surface finish should be held to 63 micro inch **(1.6 micrometer)** or better. Machining of this surface can be done in the same setup as machining the pressure seal angle. Once again the angle should be generated using a carbide cutting tool.

Porosity in Bonnet

In most gate valve sizes and pressure classes, the bonnet is made from a steel casting. Steel castings are subject to various types of defects such as shrinkage or porosity. Weld repair any defect in the bonnet wall the same as a body. If extensive repairs are required, remachining of the packing chamber, backseat, and pressure seal angle may be required because of distortion of these surfaces.

Stem Repairs

The basic function of a valve stem is to actuate the valve open or closed. Because it penetrates a pressure boundry, it must provide a diameter for the packing to seal leakage to the atmosphere and provide a seal in the fully open or backseated position so that packing may be replaced under pressure. Stems are made of high quality martensitic stainless steel or other stainless alloy and hardened to withstand the high stresses. Welding is not recommended. Only cosmetic repairs to the packing diameter and machining of the backseat should be attempted. The angle on the backseat of the stem is 28° - 0.50° + 0.25°. First contact is made at the top of the conical surface. Valve stems must be concentric and free from score marks on the packing diameter and backseat area to perform the functions listed above. When a stem is bent or deeply scored on the packing diameter, it should be replaced.

Field Repair Equipment

Available from the Rockwell plant at Raleigh, North Carolina are some basic tools for repairing valves in the field. This equipment was developed for customer use on a rental basis. Contact your local Rockwell sales representative for more information. A partial list of this equipment follows:

1. Four sizes of Dexter seat refinishing machines complete with refinishing plates for valve sizes 2½ thru 28. (See Appendix B)

2. Two sizes of portable boring machines capable of reboring the pressure seal area in body on valves size 10 and larger. (See Appendix B)

Disassembly Procedure for Equiwedge Gate Valves

Introduction

Step-by-step disassembly procedures are described below for all types of Rockwell Equiwedge pressure seal gate valves, including those with manual and motor actuators. **It is important that the following instructions be read and understood before any specific disassembly work is attempted.**

First determine the problem area. Maintenance problems can be divided into three major areas, and the area involved will affect the disassembly procedure. These areas, in general, are:

Area 1 - The handwheel, or a manual or electric motor actuator.

Area 2 - The yoke assembly including the yoke, yoke bushing, and bearings.

Area 3 - The valve internals including the bonnet, body, pressure seal gasket, stem, gate, and seats.

If the problem is in Area 1, usually a manual or electric actuator will be involved and not a handwheel; see Appendix A.

If the problem is in Area 2, it will be necessary to remove the valve actuator only if the valve is handwheel actuated or has a **torque-only** manual or electric actuator. See procedure on pages 24 and 25 and select the proper one.

If the problem is in Area 3, two methods are available. In method 1 the yoke and actuator assembly may be removed from the valve body as a unit. This saves time, but requires adequate clearance. In method 2 the actuator and yoke are removed separately.

If problems are suspected to exist in any combination of Area 1, 2 or 3, then each of the respective procedures must be followed.

CAUTION

AS A GENERAL REMINDER, MAKE SURE ALL THE PRESSURE IS RELIEVED, BOTH UPSTREAM AND DOWNSTREAM, BEFORE DISASSEMBLY WORK IS STARTED. Exceptions to this rule are noted below.

1. For service in Area 1
If pressure is to be maintained in the valve, backseat to full open position. The actuator, both manual or electrical, torque-only and torque and thrust types, may be removed. The blowout force on the stem due to pressure in the line will keep the stem on the backseat.

2. For service in Area 2
If pressure is to be maintained in the valve, the yoke may be removed on Types III, IV, and V. The blowout force on the stem due to pressure in the line will keep the stem on the backseat. UNDER NO CIRCUMSTANCES SHOULD THE YOKE BE REMOVED ON TYPES I AND II WHILE UNDER PRESSURE.

3. For service in Area 3
Close the valve fully and then open ⅛"**(3mm)**. SERVICE AREA 3 WITHOUT PRESSURE IN LINE.

Disassembly Procedure of Bonnet Types Area 3

Step-by-step disassembly instructions are described below for each of the five basic bonnet types. All of the following bonnet disassembly instructions are arranged in accordance with the general comments on page 12. Study these pages carefully before beginning. As disassembly progresses, place match marks on parts so that the same orientation can be maintained when reassembled.

Type I, Size 2½ - 3 Class 600, Figure Numbers 1611, 1611Y, 1711, or 1711Y Equiwedge Gate Valves

Refer to illustration 7.

1. With the valve in the partially open position loosen, the gland bolt nuts and tap the gland (this should relieve any pressure trapped in the valve).
2. Carefully loosen the yoke hex socket head cap screws. In case any trapped pressure remains in valve after step 1, it will now be relieved. Remove the yoke cap screws.
3. Loosen the bonnet hex socket head cap screws.
4. Remove the gland bolt nuts.
5. Rotate the bonnet retainer counter clockwise on the central bonnet thread. Close the valve, which when the gate contacts the seat, will raise the yoke about ½" **(13mm)**. Pry up the gasket retainer and place three ⅜" **(10mm)** shims between the gasket retainer and the body at equal intervals. Now tighten the bonnet retainer cap screws in a star pattern to jack the pressure seal gasket out of the body. Be careful not to cock the bonnet. This step may have to be repeated with thicker shims to finally break the gasket loose. See the note below.
6. Once the bonnet is loose, the yoke can be removed by turning the handwheel to close the valve. When the threads of the yoke bushing disengage, lift the yoke assembly over the stem and set on a clean plywood board or bed of clean rags.
7. The stem, bonnet, and gate assembly can now be removed, **but be careful to either clamp the gate halves or hold them securely** while withdrawing parts. See illustration No. 17 page 23. This is necessary because when the gate halves are disengaged from the guide grooves in the body, they can fall off the stem. Place the assembly on a bed of rags.

Note: These instructions have been sequenced for a valve in a horizontal pipeline with the stem in the vertical, up position. With a different stem orientation, the steps may have to be slightly modified. For example, in step 5 if the valves were in a horizontal pipe with the stem down when the gasket came free, all the parts would fall; so at least two of the yoke cap screws should be engaged into the body (at least three threads) to prevent this lack of control. This precaution should also be observed for other stem orientations.

Valve Type I

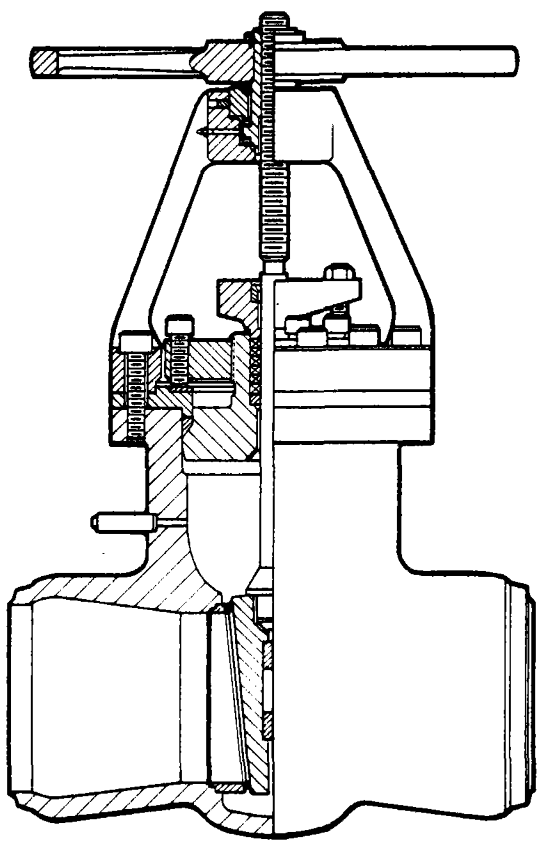


Illustration No. 7

Disassembly Procedure of Bonnet Types Area 3 (cont.)

Type II Sizes 4 - 28 Class 600, Figure Numbers 1611, 1611Y, 1711 or 1711Y Equiwedge Gate Valves

See illustrations 8 and 9.

1. With the valve in a partially open position remove the handwheel. The handwheel *nut is* locked in position with a small nylock set screw. This set screw must be loosened first before attempting to remove the handwheel nut. The handwheel is keyed to the yoke bushing. Remove the handwheel nut, handwheel and key and set aside.

2. Loosen the gland bolt nuts and tap the gland loose from the packing chamber. This should relieve any pressure that may be trapped in the valve.

3. Carefully loosen the yoke cap screws or hex nuts. In case any trapped pressure remains in the valve after step 2, it will not be relieved. Remove all yoke cap screws or hex nuts.

4. Remove the gland bolt nuts.

5. Loosen the bonnet hex nuts about ⅜" **(10mm)** to ½" **(13mm)**.

6. Close the valve, which when the gate contacts the seat, will raise the yoke. Place three or four shims ⅜" **(10mm)** to ½" **(13mm)** thick equally spaced between the yoke flange and the body. Now tighten the bonnet retainer hex nuts in a star pattern to jack the gasket out of the body. Be careful not to cock the bonnet. This step may have to be repeated with thicker shims to finally break the gasket loose. See Note this page.

7. Once the bonnet is loose the yoke can be removed. Remove the bonnet retainer hex nuts. Sling the yoke through the windows leaving space to turn the yoke bushing and take up slack in a chain hoist. With a strap wrench around the top of the yoke bushing, close the valve, thereby raising the yoke. Keep a slight tension on the chain hoist so that the yoke bushing and stem threads are not damaged. Also, the pull point must be in line with the stem. Raise the yoke in this manner until the threads are disengaged, then lift away the yoke assembly. Set the yoke on a clean plywood board or bed of rags.

8. Valves with stems 1.62" **(41.1mm)** to 2" **(50.8mm)** in diameter are threaded on the top end to accept a ½" - 13 **(M12 x 1.75)** eye bolt and those 2" **(50.8mm)** in diameter or over to accept a ¾" - 10 **(M20 x 2.5)** eye bolt. Screw the eye bolt into the stem and attach a chain hoist. Lift the stem, bonnet, and gate out of the valve but be careful to clamp the gate halves securely while withdrawing the parts (see illustration No. 17 page 23). This is necessary because when the gate halves are disengaged from the body guide grooves, the halves and spacer ring can fall off the stem. Place the assembly on a bed of rags.

Note: These instructions have been sequenced for valve in a horizontal pipeline with the stem in the vertical, up position. With a different stem orientation, the steps may have to be slightly modified. For example, in step 3, if the valve were in a horizontal pipeline with the stem down, when the gasket breaks free in step 6, all the parts would fall; so, at least two of the yoke cap screws or hex nuts need to be partially engaged into/onto the body studs to prevent this. This precaution should also be observed for other stem orientations.

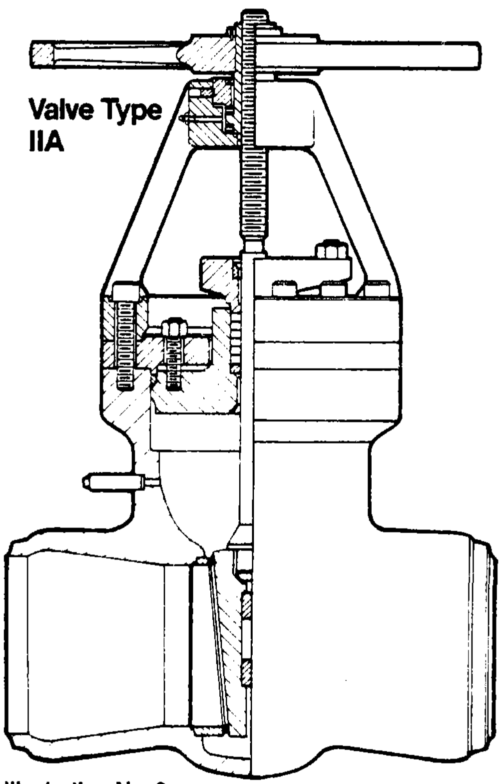


Illustration No. 8

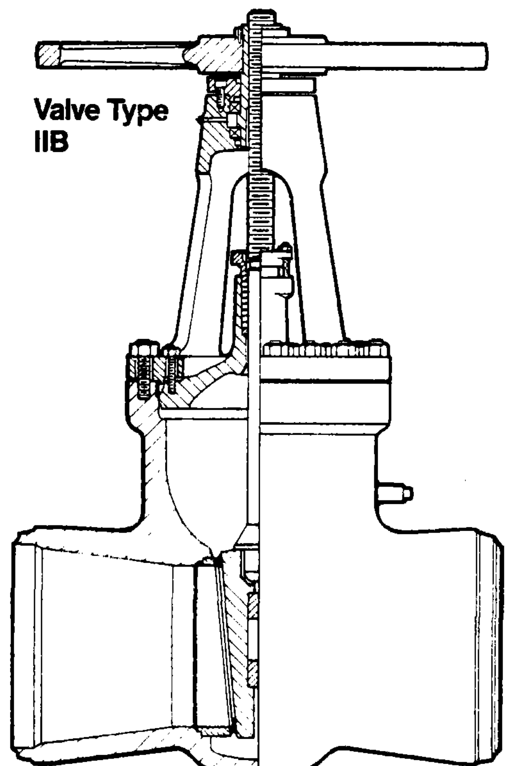


Illustration No. 9

Disassembly Procedure of Bonnet Types Area 3 (cont.)

Type III, Sizes 2½"-3, Classes 900, 1500, 2500 - Figure Numbers 1911, 1911Y, 11511, 11511Y, 12511, 12511Y, 12011, 12011Y, 14311, 14311Y, 14411, or 14411Y

See illustration No. 10.

1. With the valve in a partially open position, loosen the gland nuts and tap the gland to loosen engagement of the gland barrel with the packing chamber. This should relieve any pressure that may be trapped in the valve.

2. Loosen and remove the hex socket head cap screws fastening the yoke to the body. Close the valve and raise the yoke assembly off the body. Continue to close the valve until the stem threads are disengaged from the yoke bushing. Lift the yoke assembly over the stem and set it on a clean plywood board or a bed of rags.

3. Remove the gland nuts and gland and set the parts aside.

4. Loosen the hex socket head cap screws on the bonnet retainer. Unscrew the bonnet retainer from the bonnet and set aside.

5. Using a brass rod and hammer, drive the bonnet down into the body far enough to expose the gasket retainer segmented rings. Now drive the gasket retainer down to gain clearance for removal. The gasket retainer ring is split in three or four pieces; the shortest must be removed from the groove first, then the other two or three.

6. Place the bonnet retainer on top of the body and lift the stem-bonnet assembly up through the gasket and spacer ring. Screw the bonnet retainer onto the bonnet until it is snug against the body. Tighten the bonnet retainer hex socket head cap screws in a star pattern against the body to jack out the gasket. Be careful not to cock the bonnet. This step may have to be repeated by loosening the hex socket head cap screws and by screwing the bonnet retainer down on the bonnet threads to a new position and then tightening the cap screws against the body until the gasket breaks free. See the note below.

7. The stem, bonnet, and gate assembly can now be removed but be careful to either clamp the gate halves together or hold them securely while withdrawing parts (see illustration No. 17, page 23). This is necessary because when the gate halves are disengaged from the guide grooves in the body, they can fall off the stem. Place the assembly on a bed of rags.

Note: These instructions have been sequenced for a valve in a horizontal pipeline with the stem in the vertical, up position. With a different stem orientation the steps will have to be slightly modified. For example, in step 6, if the valve were in a horizontal pipeline with the stem down when the gasket comes free, all parts would fall; some provision must be made to support the stem-bonnet assembly when the gasket breaks loose.

Valve Type III

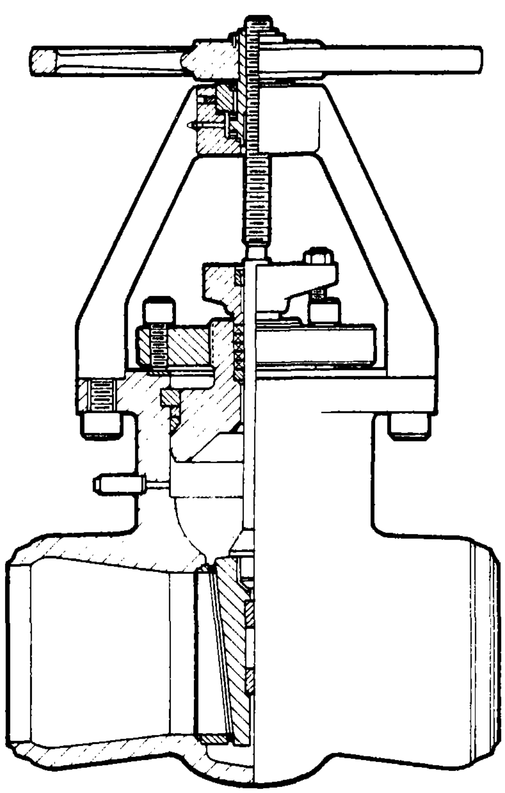


Illustration No. 10

Disassembly Procedure of Bonnet Types Area 3 (cont.)

Types IV & V, Sizes 4"-24, Classes 900, 1500, 2500 - Figure numbers 1911, 1911Y, 11511, 11511Y, 12511, 12511Y, 14311, 14311Y, 12011, 12011Y, 14411 or 14411Y.

See illustrations No. 11 and 12.

1. With the valve in a partially open position, loosen the gland nuts and tap the gland to loosen engagement of the gland barrel with the packing chamber. This should relieve any pressure that may be trapped in the valve.

2. The handwheel nut is locked in position with a small nylock set screw. Loosen the set screw then remove the handwheel nut. The handwheel is keyed to the yoke bushing so remove the handwheel and key and set them aside.

3. Loosen and remove the yoke cap screws or yoke lock ring bolts. If the valve is equipped with a yoke lock ring, it will be necessary to pry it off by using a cold chisel, tapping it into one of the splits to disengage the clamp rings.

4. Sling the yoke through opposite windows leaving space to turn the yoke bushing and take up slack in the chain hoist. With a strap wrench around the top of the yoke bushing, turn the valve to close. When the gates contact the seats, the yoke will rise. Continue turning until the yoke bushing threads are disengaged from the stem. Carefully lift the yoke over the stem and set aside on a plywood board or a bed of rags.

5. Remove the gland bolts and gland. Loosen and remove the bonnet retainer nuts and lift off the bonnet retainer. Set the parts aside.

6. Place an eyebolt in the threaded end of the stem. With a chain hoist mounted in line with the stem and fastened to the eyebolt, pull the stem firmly against the backseat. With clean rags and a vacuum, clean the top of the valve and exposed surfaces of the bonnet and gasket retainer segments.

7. Slack off the chain hoist and with a brass bar and hammer, and drive the bonnet down so that the gasket retainer segments are fully exposed.

8. Using the same tools, drive the gasket retainer segments down to the bottom of the groove (about 1/16" **[2mm]**) in the body.

9. Remove the gasket retainer segments and set them aside.

10. Place the bonnet retainer back on the body and with a chain hoist and lift the stem and bonnet so that the bonnet contacts the gasket. Screw nuts onto the bonnet studs and tighten in a star pattern to jack out the gasket. Be careful not to cock the bonnet.

Note: The stem should not be used to remove the pressure seal gasket.

11. When the bonnet assembly breaks loose, use a chain hoist to lift the assembly from the valve body, but be careful to clamp the gate halves securely before fully withdrawing the parts (see illustration No. 17). This is necessary because when the gate halves are disengaged from the body guide grooves, the gate halves and spacer ring can fall off the stem. Place the assembly on a bed of rags.

Note: These instructions have been sequenced for a valve in a horizontal pipeline with the stem in the vertical, up position. With a different stem orientation the steps will have to be slightly modified. For example, in step 6, if the valve was in a horizontal pipeline with the stem down when the gasket comes free, all the parts would fall; some provision must be made to support the stem-bonnet assembly when the gasket breaks loose.

Valve Type IV

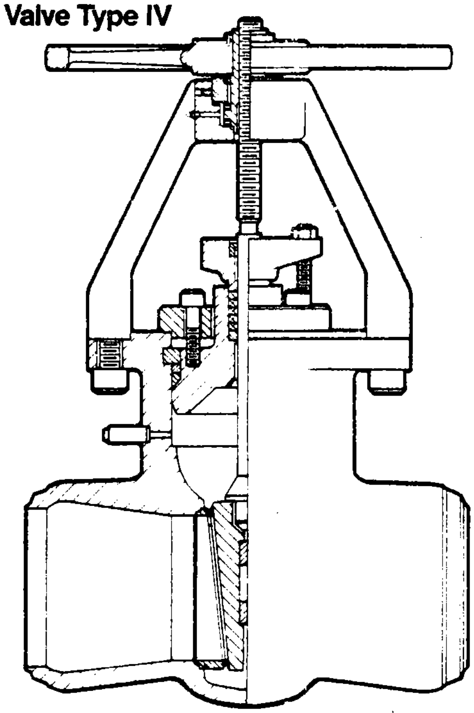


Illustration No. 11

Valve Type V

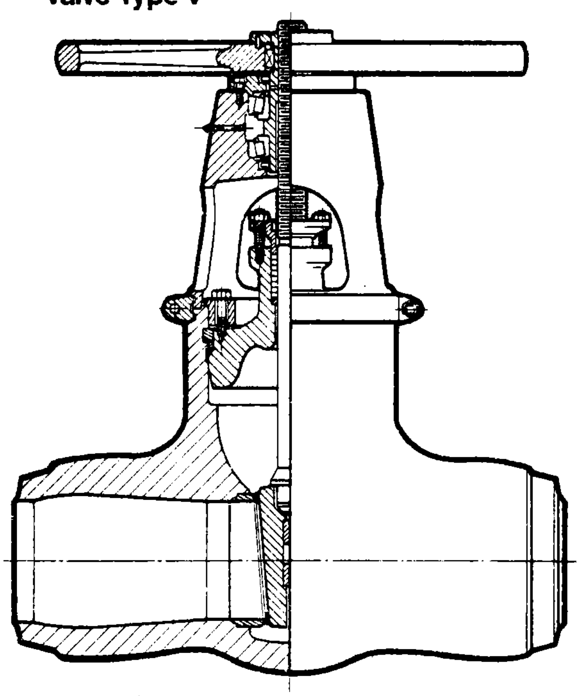


Illustration No. 12

Reassembly Procedures for Equiwedge Gate Valves

Introduction

The reassembly procedures in this manual are not as detailed as the disassembly procedures since, in most cases, just the reverse procedure is used. However, step-by-step instructions are provided for each of the five 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 rust and dirt should be removed from all parts with a wire brush and emery cloth. Oil and grease should be removed with a suitable solvent to prevent any foreign material from collecting on the sealing and seating surfaces.

2. All threaded parts should be relubricated, such as cap screws, nuts, studs, and bonnet retainer threads, with a product such as "Never-Seez". The stem threads should be washed with solvent, dried, and a new application of high temperature EP (extreme pressure) grease applied to the threads. See page 7 for recommendations.

3. An important feature of Rockwell Equiwedge gate valves is the two piece gate with a spacer ring between the two halves, illustrated in figure 13A. This spacer can be increased in thickness to compensate for material removed from the seats and gates by normal or extensive refinishing of these surfaces. This is a unique design feature. For every .005" **(.13mm)** (total) that is removed from the seating surfaces, the gate seats lower in the body approximately 0.032"**(.81mm)**. This amount of metal removal will not require any adjustment to the gate spacer ring thickness.

But, for example, if 0.050" **(1.27mm)** were removed from the combined seating surfaces, the gate will seat 0.312" **(7.92mm)** lower in the body and this wear can be compensated for by making a new spacer ring. In addition, the guide rails on each gate half will require grinding by half the amount added to the spacer ring to restore an adequate amount of clearance. The gate spacer ring material is stainless steel type 410 heat treated to 26 to 32 RC.

Stem-Gate-Spacer Ring Assembly

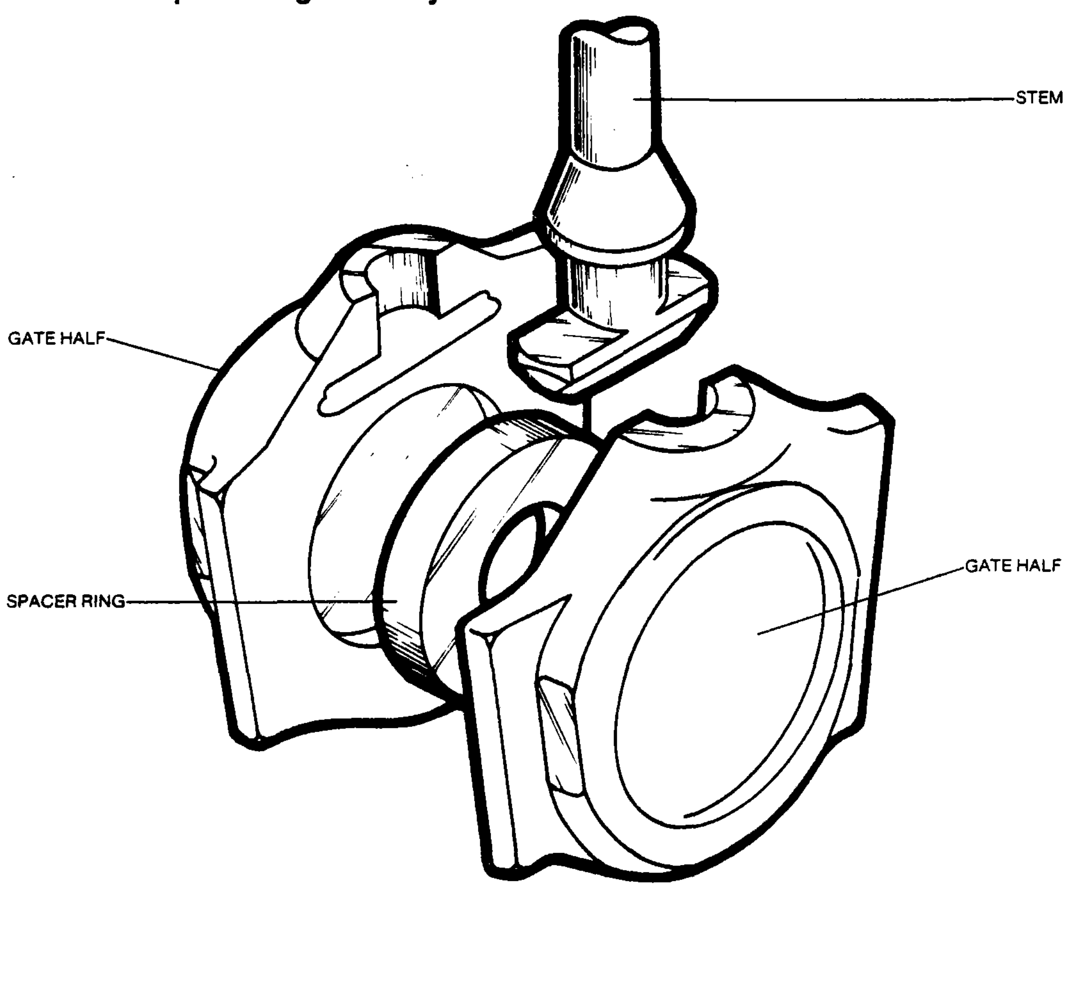


Illustration No. 13A

Exploded View

Part Names for Exploded View of Typical Rockwell Equiwedge Gate Valves

1. Body
2. Test Nipple
3. Seat Ring
4. Gate
5. Gate Spacer Ring
6. Stem
7. Hex Nut
8. Yoke Lock Ring
9. Stud
10. Bonnet
11. Pressure Seal Gasket
12. Spacer Ring
13. Segmental Retaining Ring
14. Cap Screws
15. Bonnet Retainer Ring
16. Junk Ring
17. Gland Stud
18. Packing
19. Gland
20. Gland Bushing
21. Gland Nuts
22. Yoke
23. Grease Seal
24. Bearing
25. Key
26. Yoke Bushing
27. Bearing
28. Preload Shim Kit
29. Bearing Retainer
30. Grease Seal
31. Cap Screws
32. Handwheel
33. Handwheel Locknut
34. Set Screw

Typical Exploded View of Rockwell Equiwedge Gate Valve

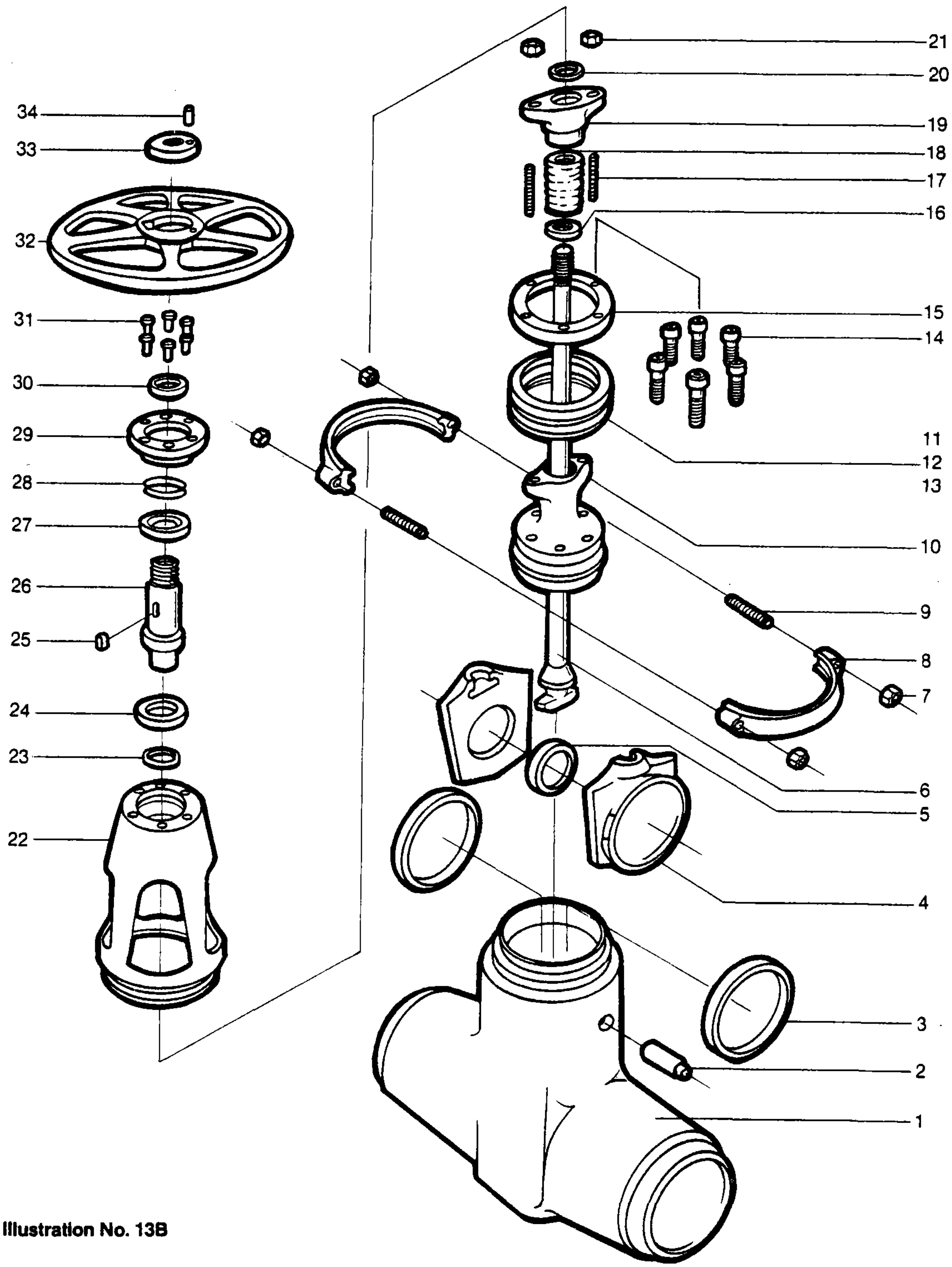


Illustration No. 13B

Reassembly Instructions

The yoke bushing threads should be cleaned in the same manner as the other threaded parts and regreased. The same lubricant should be used to regrease the yoke bushing bearings through the lube fitting. See page 7 for lubricant recommendations. Follow these guidelines:

1. Replace the stem packing.
2. Replace the pressure seal gasket with a new gasket.
3. Observe all match marks assigned during disassembly so that part orientation is maintained.
4. Reassemble stud nuts and cap screws using a torque wrench. See page 6 for recommended torque values.
5. When reassembling the bearings in the yoke assembly, use the following procedure to obtain the proper clearance or preload.

Handwheel Actuated Valves

1. Rockwell Equiwedge gate valves with stems 1⅞" **(47.6mm)** diameter and smaller are equipped with needle bearings. See illustration No. 14. One bearing set is placed below the yoke bushing collar and one set above. All parts are retained by a screwed-in bearing retainer. This bearing retainer has spanner wrench holes on the top face for adjustment and is locked in place with a nylock set screw on the side of the yoke near the top.
2. The needle bearings **should not** have a preload. Rather, a slight amount of clearance is recommended. Tighten down the bearing retainer using a spanner wrench until the bearing retainer is snug, then back it off 15 to 20 degrees. This is equal to 0.004" to 0.005" **(.10mm to .13mm)** clearance.
3. Tighten the set screw and relube through the lube fitting.
4. On valves with stem diameters 2" **(50.8mm)** and greater, the yoke assembly is equipped with tapered roller bearings. One bearing set is placed below the yoke bushing collar and one set is placed above this collar. All parts are retained by a bolted-on bearing retainer.
5. Tapered roller bearings **do** require a preload. See illustration No. 15. Preloading is accomplished by using a shim kit. If the bearings are not to be replaced, use all the shims that were in the original assembly. If the bearings are to be replaced, a new shim kit should be used.

Yoke Assembly With Needle Bearings

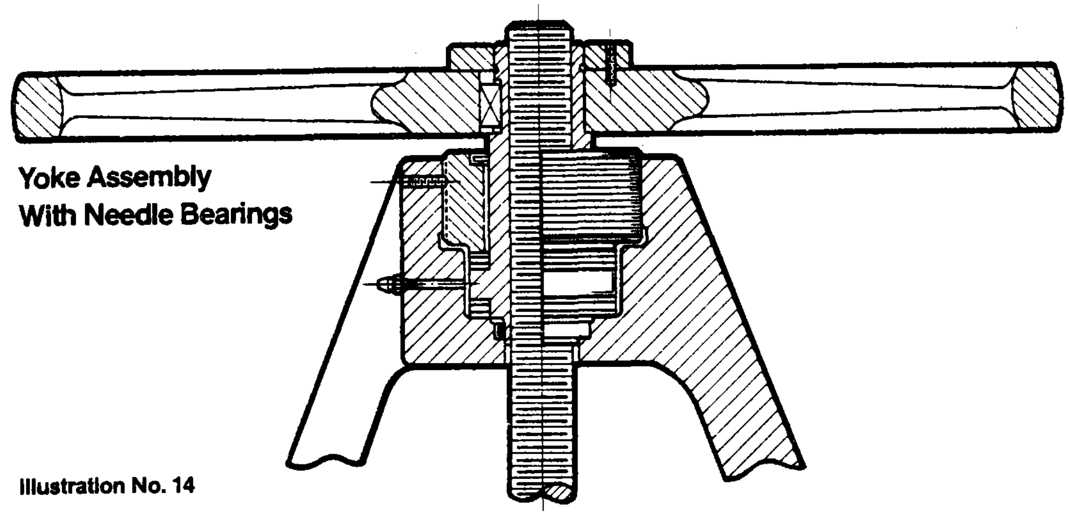


Illustration No. 14

Yoke Assembly With Taper Roller Bearings

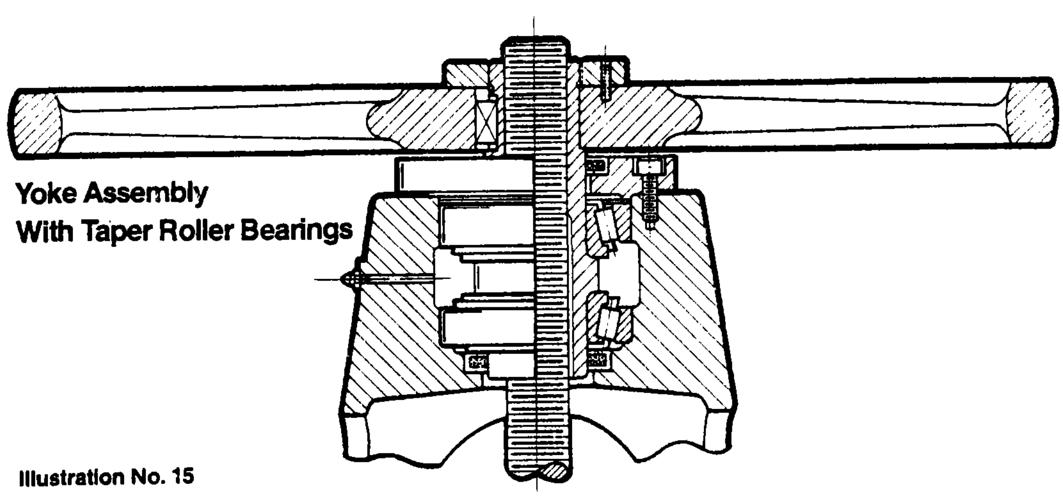


Illustration No. 15

Reassembly Instructions (cont.)

Tapered Roller Bearing Preload Instructions

1. Bearing Assembly - Install the bearings, grease seals and yoke bushing in the yoke.

2. BEARING PRELOAD WARNING - FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN BEARING FAILURE. See illustration No. 16.

a. Use a micrometer to measure the thickness of the bearing retainer flange at each measurement hole. Number each measurement hole with a grease pencil. Record the measurements.

b. Mark the bearing retainer flange and yoke with a grease pencil in order to know the relative position of parts and remove the bearing retainer flange.

c. Use a micrometer to measure the thickness of the "bearing preload washer" and record the measurement.

d. Install a "bearing preload washer" (tool). See Table 3 for dimensions. Install the bearing retainer flange (make certain that mating surfaces are clean) at alignment position marks and align the bolt holes. Install 3 or 4 cap screws to secure the bearing retainer at 90° or 120° intervals. Use a depth micrometer to level the bearing retainer flange and take readings to ensure that the flange remains level as the torque is increased in small increments. The preload torque is indiccated in Table 4 for each applicable cap screw size. Rotate the yoke bushing after each increase in torque.

e. Extend a depth micrometer into each of the holes located in "a" above until it hits the top of the yoke. Record the measurements. Calculate the average dimension and record.

f. Remove the bearing retainer flange, cap screws and bearing preload washer (tool).

g. Add the average dimension recorded in "a" to the measurement recorded in "c" and record the result.

h. Subtract the measurement recorded in "e" from the average dimension recorded in "g" and record the result.

i. Shim stock thickness equal to the result recorded in "h" must be installed between the top bearing and the bearing retainer flange.

Bearing Preload Instruction

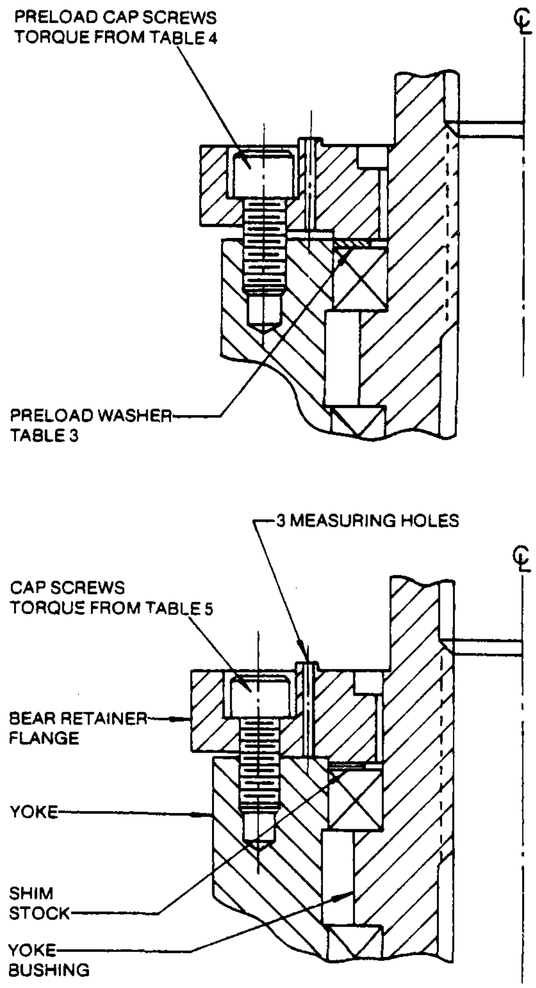


Illustration No. 16

Reassembly Instructions (cont.)

j. Install the bearing retainer flange on the yoke (make certain that the mating surfaces are clean), align the position marks and align the holes in the bearing retainer flange with the holes in the yoke. Install 3 or 4 cap screws at 90° intervals. Use a depth micrometer to level the bearing retainer flange and take readings to ensure that the flange remains level while the torque is increased in small increments. Rotate the yoke bushing after each increase in torque. Apply a preload torque indicated on Table 4 to the cap screws, use a depth micrometer to take measurements and compare the measurements with those taken in step (a) above. If the measurements are the same as those recorded in step "a", then the flange has bottomed on the yoke. If the measurements are greater than "a" measurements, then the flange has not bottomed and the bearing preload procedure should be repeated. Install the remaining cap screws and tighten in a star pattern until the torque indicate in Table 5 is developed. Be careful to keep the bearing retainer flange level while torque is applied to the cap screws.

Table 3

Dimensions For Bearing Preload Washer - in inches (mm)

Valve Stem Diameter	Washer OD ±.005 (±.13)	Washer ID ±.010 (±.25)	Washer Thickness ±.001 (±.03)
2.000 **(50.80)**	5.100 **(129.54)**	4.56 **(115.8)**	.187 **(4.75)**
2.125 **(53.98)**	5.100 **(129.54)**	4.56 **(115.8)**	.187 **(4.75)**
2.250 **(57.15)**	5.687 **(144.45)**	5.15 **(130.8)**	.187 **(4.75)**
2.375 **(60.32)**	6.090 **(154.69)**	5.38 **(136.7)**	.187 **(4.75)**
2.500 **(63.50)**	7.110 **(180.59)**	6.40 **(162.6)**	.187 **(4.75)**
2.625 **(66.68)**	7.075 **(179.70)**	6.36 **(161.5)**	.187 **(4.75)**
2.750 **(69.85)**	6.985 **(177.42)**	6.30 **(160.0)**	.187 **(4.75)**
2.875 **(73.02)**	8.110 **(205.99)**	7.34 **(185.9)**	.187 **(4.75)**
3.000 **(76.20)**	8.985 **(228.22)**	8.12 **(206.2)**	.187 **(4.75)**
3.250 **(82.55)**	9.985 **(253.62)**	9.00 **(228.6)**	.187 **(4.75)**
3.500 **(88.90)**	11.360 **(288.54)**	10.25 **(260.3)**	.187 **(4.75)**
3.750 **(95.25)**	12.485 **(317.12)**	11.25 **(285.8)**	.187 **(4.75)**
4.250 **(107.95)**	12.485 **(317.12)**	11.25 **(285.8)**	.187 **(4.75)**

Table 4

Bearing Retainer Preload Torque

Cap Screws Diameter	Threads Per Inch	Torque In Ft. Pounds	Torque In NM	No. of Cap Screws
¾	10	20	27	3 or 4
⅞	9	35	47	3 or 4
1	8	50	68	4
1¼	7	135	183	4

Table 4A

Cap Screws Diameter	Pitch	Torque in NM	No. of Cap Screws
16	2	120	3 or 4
20	2.5	240	3 or 4
24	3	400	3 or 4
30	3.5	880	4

Table 5

Bearing Retainer Final Torque

Cap Screws Diameter	Threads Per Inch	Torque in Ft. Pounds	Torque in NM
¾	10	165	224
⅞	9	265	360
1	8	405	550
1¼	7	895	1215

Table 5A

Cap Screws Diameter	Pitch	Torque in NM
16	2	120
20	2.5	240
24	3	400
30	3.5	880

Type I Pressure Seal Bonnet

See Illustration No. 10, page 15.

1. Place one gate half on a clean plywood board. Place the stem T-head in the recess in the gate.
2. Place the gate spacer ring into the counterbore in one gate half. Place the other gate half on top, engaging the spacer ring and stem. Holding the gate halves together, lift the stem and lower assembly into the body, engaging the gate guide rails with the grooves in the body. Lower the gate to the seats.
3. Assemble a new pressure seal gasket and the junk ring on the bonnet. Lift the bonnet assembly over the stem and lower it into the body. Be very careful not to mar the pressure seal gasket or other machined surfaces.
4. Place the gasket retainer plate and thrust washer on the body and align cap screw holes on the gasket retainer plate with the body holes.
5. Place the bonnet retainer plate over the stem and start threading onto the bonnet.
6. Place the gland over the stem.
7. Place the yoke over the stem and engage the stem threads by turning the yoke bushing counterclockwise. When the yoke contacts the gasket retainer plate, align the cap screw holes and continue to turn the yoke bushing until the stem contacts the backseat. This will pull the bonnet and gasket up against the gasket retainer and the yoke flange up against the body.
8. Assemble the yoke flange cap screws and tighten in a star pattern using a torque wrench to values as shown in page 6.
9. With the bonnet retainer cap screws flush on the bottom of the bonnet retainer, screw the bonnet retainer down until it contacts the thrust washer. Now back it off ⅛" **(3mm)** and align the gland bolts with the yoke windows.
10. Tighten the bonnet retainer cap screws using a torque wrench in a star pattern to the values shown on page 6. See step 13 below.
11. Repack the packing chamber following instructions on page 6. Place the gland in position and tighten the gland nuts.
12. Reassemble the handwheel, (or actuator) using the reverse of the instructions for disassembly.
13. After the valve is pressurized, retighten the bonnet retainer cap screws using the same torque values in step 10. **This is important.**

Types IIA Pressure Seal Bonnet

See Illustration No. 11

1. Place one gate half, seat face down, on a bed of clean rags or plywood board. Place the stem T-head into the recess in the gate.
2. Place the gate spacer ring into the counterbore in one gate half. Place the other gate half on top, engaging the spacer ring and stem. If necessary, clamp the gate halves together on top of the guide rails using "Kant Twist" type clamps. Install an eye bolt into the top of the stem. Stems 1.62" **(41.1mm)** and larger in diameter are drilled and tapped on the top end. See illustration 17 for clamping arrangement.
3. Carefully lift the stem-gate assembly using a hoist if necessary to avoid scratching the stem or gate surfaces, and lower the assembly part way into the body with the guide rails fully engaged with the guide grooves. Remove the clamps and lower the assembly until the gate contacts the seats.
4. Assemble a new pressure seal gasket and the junk ring onto the bonnet. Lift the bonnet over the stem, using a hoist if necessary, and lower it into the body. Be very careful not to mar the pressure seal gasket or other machined surfaces.
5. Place the bonnet retainer plate on the body if it is a separate part, and align the cap screw holes with the body. Omit this step if the bonnet retainer is integral with the yoke.
6. Place the gland over the stem.
7. Place the yoke over the stem and engage the stem threads with the yoke bushing by turning the yoke bushing counterclockwise. When the yoke contacts the bonnet retainer plate or body, align the cap screw holes and continue to turn the yoke bushing until the stem contacts the backseat. This will pull the bonnet and gasket up against the gasket retainer and the yoke flange up against the body. While this is being accomplished, the studs in the body and bonnet must be aligned with the holes in the yoke (or bonnet retainer plate).
8. Assemble the yoke cap screws or nuts and tighten in a star pattern using a torque wrench to the values shown on page 6.
9. Assemble the nuts on the bonnet studs and tighten in a star pattern using a torque wrench to the values shown on page 6. See step 12 below.
10. Repack the packing chamber following the instructions on page 6. Place the gland in position over the studs and tighten the gland nuts.
11. Reassemble the handwheel, (or actuator) using the reverse of the instructions for disassembly.
12. After the valve is pressurized, retighten the bonnet retainer nuts using same torque values as in Step 9. **This is important.**

Type III Pressure Seal Bonnet

See Illustration No. 11

1. Place one gate half on a clean plywood board. Place the stem T-head into the recess in the gate.
2. Place the gate spacer ring into the counterbore in one gate half. Place the other gate half on top, engaging the spacer ring and stem. Holding the gate halves together, lift the stem and lower the assembly into the body engaging the gate guide rails with the groove in the body. Lower the gate to the seats.
3. Assemble a new pressure seal gasket, the spacer ring and junk ring on the bonnet. Lift the bonnet assembly over the stem and lower into the body. Be very careful not to mar the pressure seal gasket or other machined surfaces.
4. Assemble the gasket retainer segments into the groove.

Reassembly Instructions (cont.)

5. Place the thrust washer on the body, and the bonnet retainer plate on top of the body. Lift the stem assembly up so that the bonnet penetrates the gasket retainer segments and engages the threads of the bonnet retainer and bonnet. The bonnet retainer cap screw should be engaged so they are flush. Lift the stem assembly up and screw the bonnet retainer down until it contacts the body. Now back it off about ⅛" **(3mm)** and align the gland bolts for correct orientation.
6. Place the gland over the stem.
7. Place the yoke over the stem and engage the stem threads by turning the yoke bushing counter-clockwise. When the yoke contacts the body, align the cap screw holes and continue to turn the yoke bushing until the stem contacts the backseat firmly. This will pull the bonnet, gasket, and spacer ring up against the bonnet retainer and the yoke up against the body.
8. Assemble the yoke flange cap screws and tighten the cap screws using a torque wrench to the values shown on page 6. See step 12 below.
9. Tighten the bonnet retainer cap screws in a star pattern using a torque wrench to the values shown on page 6.
10. Repack the packing chamber, following the instructions on page 6. Place the gland in position and tighten the gland nuts.
11. Reassemble the handwheel, (or actuator) using the reverse of the instructions for disassembly.
12. After the valve is pressurized, retighten the bonnet retainer cap screws, step 8, using the same torque values. **This is important.**

Type IV & V Pressure Seal Bonnet

See Illustrations No. 12 & 13
1. Place one gate half seat face down on a bed of clean rags or plywood board. Place the stem T-head into the recess in the gate.
2. Place the gate spacer ring into the counterbore in one gate half. Place the other gate half on top, engaging the spacer ring and stem. Clamp the gate halves together near the top of the guide rails. Place an eyebolt in the top end of the stem. Stems 1.62" **(41.1mm)** and larger are drilled and tapped on the top end. See illustration No. 17 for clamping arrangement.
3. Carefully lift the stem-gate assembly, using a hoist in the eyebolt if necessary, so as to avoid scratching the stem or gate surfaces. Lower the assembly part way into the body with the gate guide rails engaged with the body guide groove. Remove the clamps and lower the assembly until the gate contacts the seats.
4. Assemble a new pressure seal gasket, the spacer ring, junk ring and gland on the bonnet. Lift the bonnet using a hoist if necessary, and place it over the stem and lower into the body. Be very careful not to mar the pressure seal gasket or other machined surfaces.
5. Install the gasket retainer ring segments in the body groove. Place the bonnet retainer over the stem onto the top of the body.
6. Lift the stem and bonnet assembly up through the gasket retainer and realign the studs with the bonnet retainer and match marks.
7. Assemble the nuts on the bonnet retainer studs and snug them up.
8. Lift the yoke assembly over the stem and engage the stem threads by turning the yoke bushing counterclockwise. When the yoke contacts the body, align the bolt holes (or match mark) and continue to turn the yoke bushing until the stem contacts the backseat firmly.
9. Install the cap screw (or yoke lock ring) and tighten the cap screws (or studs and nuts) to the torque values shown on page 6. See step 13 below.
10. Tighten the bonnet retainer nuts carefully using a torque wrench in a star pattern to the values shown on page 6.
11. Install new packing following the instructions on page 6. Place the gland in position and tighten the gland bolts evenly.
12. Reassemble the handwheel (or actuator) using the reverse of the instructions for disassembly.
13. After the valve has been pressurized, retighten the bonnet retainer nuts to the same torque values used in step 10. **This is important.**

Clamping For Securing Gate Halves During Assembly/Disassembly

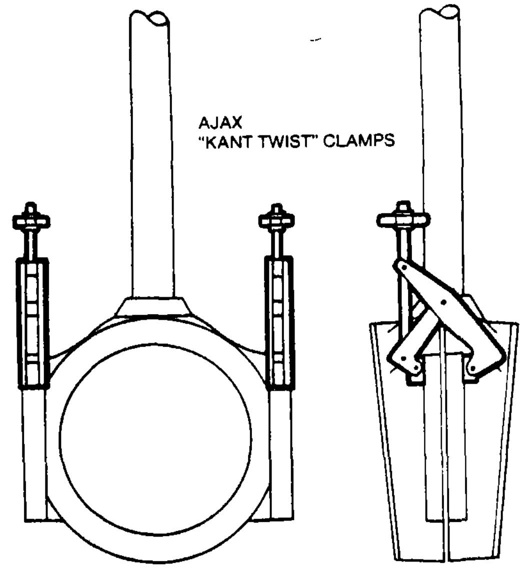


Illustration No. 17

Procedures For Removing Manual And Electro-mechanical Actuators From Valve Yokes

Rockwell Equiwedge pressure seal gate valves are often equipped with a variety of manual and/or electro-mechanical actuators. A number of these are illustrated in this section. Basically, there are two types of actuators:

(a) Those which take both torque and thrust forces.

(b) Those which supply only the torque to open or close the valve.

In type (a), the actuator is equipped with a stem nut and thrust bearings that can withstand the thrust and torque loads imposed. THIS TYPE SHOULD NOT BE REMOVED WITH PRESSURE IN THE VALVE.

In type (b), the actuator is connected to the valve yoke bushing by a key or spline, or by other means, and delivers only the torque load.

The most common is type (a) because of the non-revolving, rising stem. This type is used in both manual and electro-mechanical actuators.

TYPE (a) TORQUE AND THRUST ACTUATOR DISASSEMBLY

SMB Limitorque units through Size 3 - Illustration No. 18
Rotork Units - Illustration No. 19
Torkmatic units (Manual) - Illustration No. 20
Auma units - Illustration No. 21

Follow these guidelines:

1. Position the valve gate just off the seat.
2. Disconnect the electrical wiring to the actuator.
3. Make sure the packing gland nuts are tight.
4. Position a chain hoist of suitable capacity to support the actuator so that the handwheel can be rotated. The pull point must be directly in line with the stem.
5. Remove all nuts or cap screws from the under side of the yoke flange.
6. Turn the actuator handwheel to close the valve. This will cause the actuator to rise and unthread the stem nut from the stem. As this takes place, the weight of the actuator should be taken by the hoist to prevent damage to the stem threads.
7. When the stem threads are disengaged, lift the actuator clear of the stem and place it down on a clean area for further disassembly, if required. If there is additional work to do on the valve, refer to the proper valve type and proceed to disassemble the valve.

Limitorque Units SMB 1 Thru SMB 3

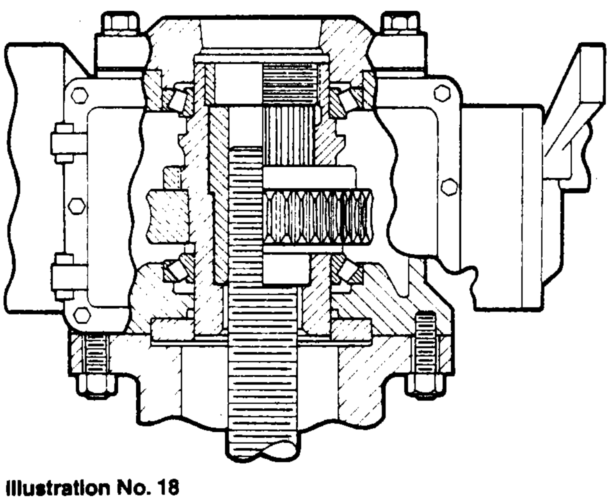


Illustration No. 18

Rotork Actuator

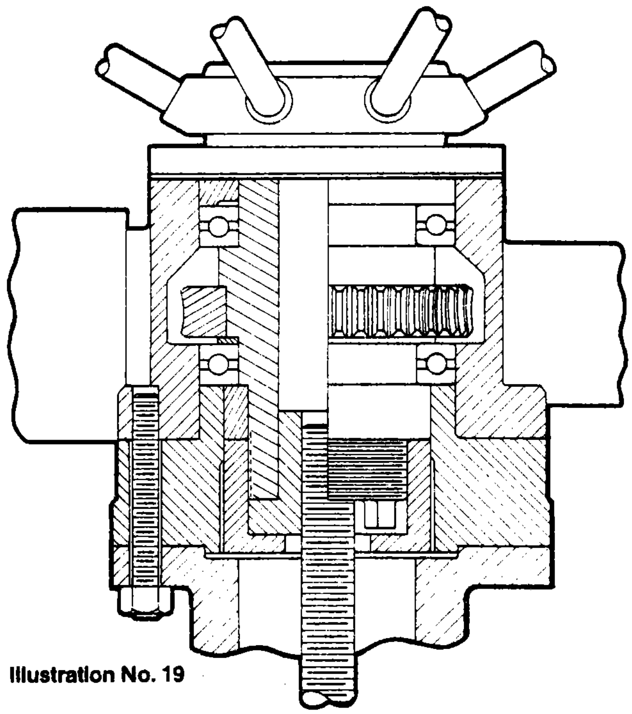


Illustration No. 19

Appendix A (cont.)

TYPE (b) TORQUE ONLY DISASSEMBLY PROCEDURE
Limitorque units SMB 4T, SMB 5T - Illustration No. 22
Rotork - Illustration No. 19
AUMA - Illustration No. 23

1. Position the valve gate just off the seat.
2. Disconnect the electrical wiring to the actuator.
3. Position a chain hoist of adequate capacity to the actuator. The pull point must be directly in line with the valve stem.
4. Remove all nuts or cap screws from under the flange.
5. Using a hoist, raise the actuator above the yoke bushing and position away. If the actuator is keyed to the yoke bushing, remove the key so it will not be lost.

If there is further work to do on the valve, refer to the proper valve type and proceed with disassembly.

CAUTION:
UPON REASSEMBLY OF A VALVE EQUIPPED WITH AN ELECTRO-MECHANICAL ACTUATOR, THE OPEN AND CLOSED LIMIT SWITCHES MUST BE RESET. PLEASE REFER TO THE MAINTENANCE MANUAL PROVIDED BY THE ACTUATOR MANUFACTURER FOR APPROPRIATE INSTRUCTIONS.

WARNING
SHOULD IT BECOME NECESSARY TO CHANGE THE TORQUE SWITCH SETTING FOR ANY REASON, YOUR LOCAL ROCKWELL REPRESENTATIVE SHOULD BE CONTACTED IN ORDER THAT A CORRECT NEW SETTING CAN BE OBTAINED FROM THE FACTORY.

The torque switch of the motor actuated valve is set during factory assembly to close the valve against the specified differential pressure and requires the same special attention for resetting.

Torkmatic Manual Actuator

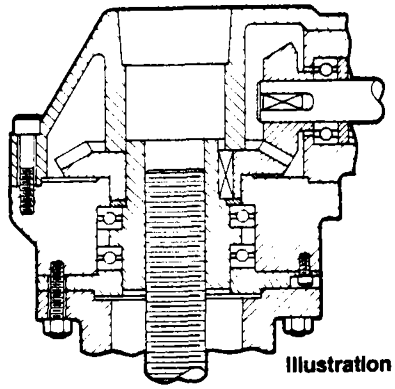


Illustration No. 20

Limitorque Units SMB-4T & SMB-5T

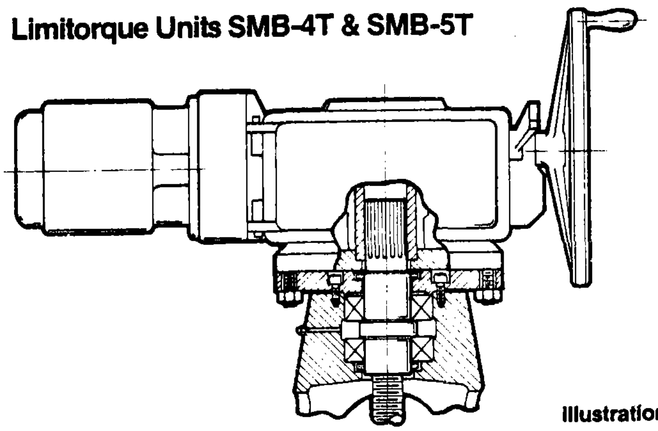


Illustration No. 22

Auma Actuator

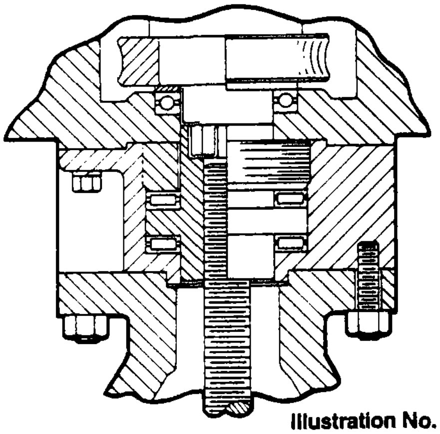


Illustration No. 21

Auma Actuator

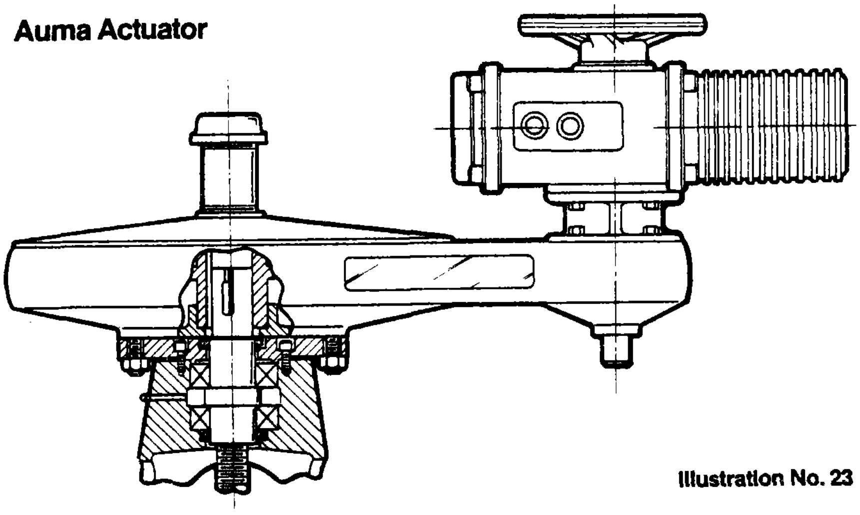


Illustration No. 23

Appendix B

Valve Tools Available For Rental

The following tools are available from the Rockwell Raleigh plant on a rental basis:

Dexter Seat Refinishing Machines for valves sizes 3 to 28. See illustration no. 24.

Portable boring machines that can be used to machine the pressure seal area of the body in case of damage or because of weld repair. See illustration no. 25.

Contact your local Rockwell Representative for details on cost and availability.

A group of skilled service representatives is also available to assist in repairs.

Typical Dexter Gate Valve Seat Refinishing Machine

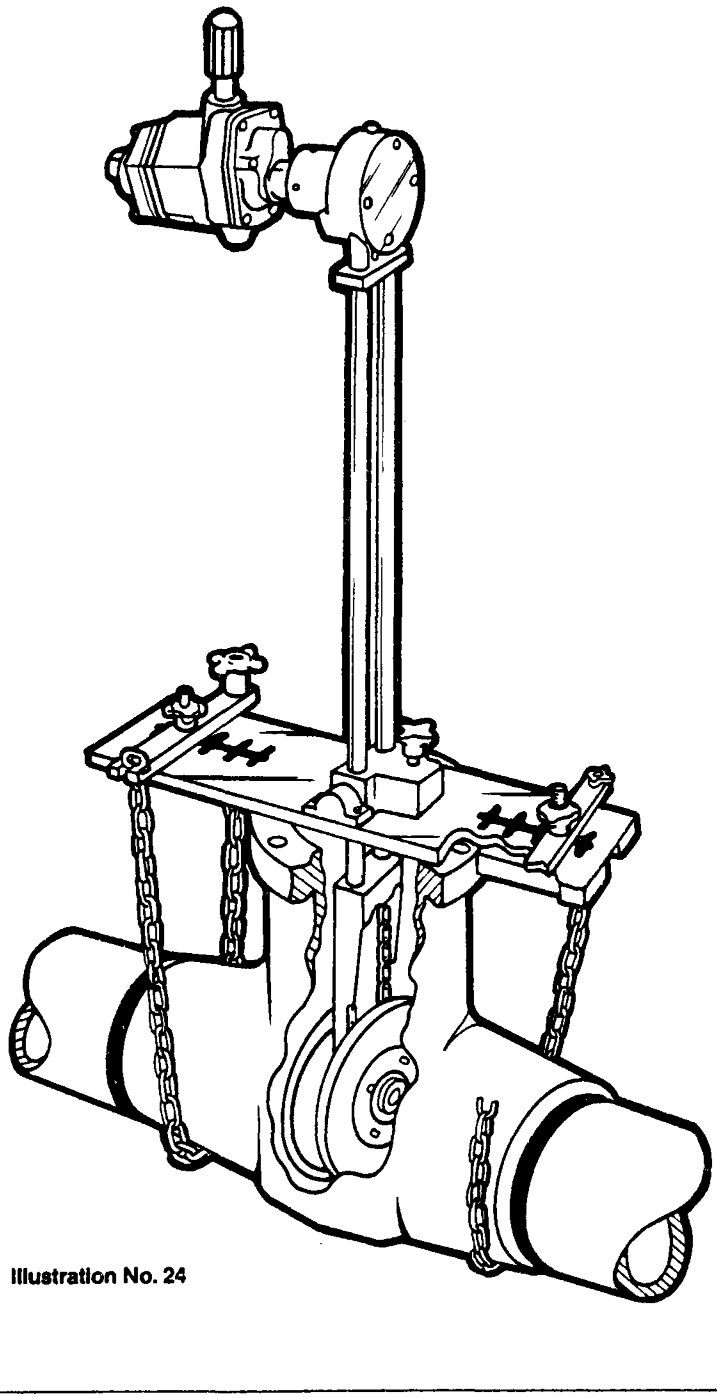


Illustration No. 24

Portable Boring Machine Attached To Gate Valve Body

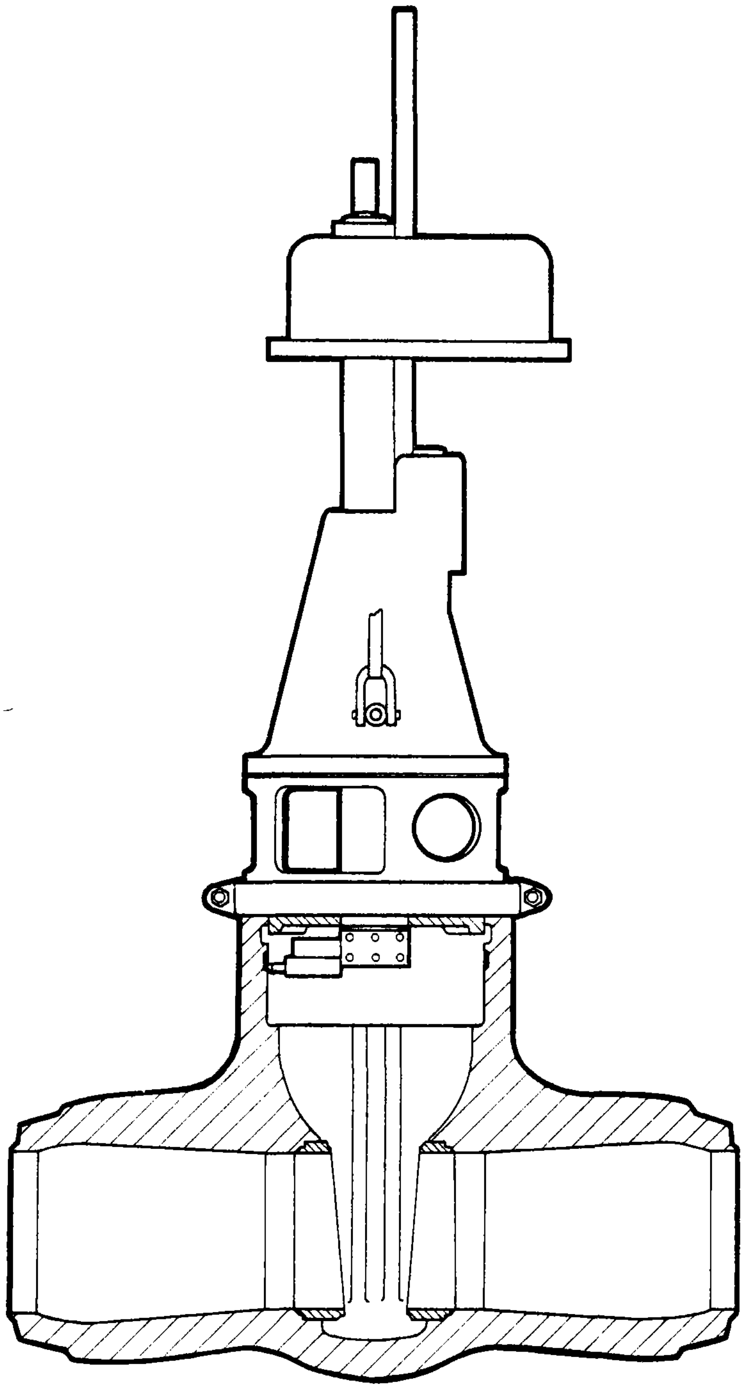


Illustration No. 25

TERMS AND CONDITIONS

Freight Allowance: All prices are F.O.B. factory. We will attempt to route shipments in the method which will result in the lowest cost unless otherwise instructed. All shipments will be made collect unless stipulated otherwise on the purchase order in which case you will be invoiced for all transportation charges.

Terms: Terms of payment are net thirty (30) days.

All prices subject to change without notice. Prices quoted do not include Federal, State or Municipal, Sales or Use, Occupation or Privilege Taxes, based on or measured by sales, which tax, or taxes, will be added to prices where applicable.

Payment: Should be made to the office from which invoice is issued, in funds free of exchange or collection charges.

Design: We reserve the right to make alterations in design without notice.

Shipments: All statements of prospective date of shipments are estimated. We use our best efforts to ship within the time estimated.

Force Majeure: The consequences, direct or indirect, of labor troubles, fires, accidents, floods, hostilities, shortage of transportation, failure, suspension or curtailment of production due to shortage of supply of raw materials, or other economic factors, Government acts or requirements and any and all like or different causes beyond the control of the parties hereto shall excuse performance by either party to the extent by which performance is prevented thereby. Rockwell may, during any period of shortage due to any of said causes, prorate its supply of such products among all its buyers in such manner as may be deemed equitable in the sole judgment of Rockwell.

Claims: Must be made within ten days after receipt of products.

Cancellations: Firm orders which have been accepted are subject to cancellation or changes in specifications only on the basis of our being reimbursed for costs incurred.

Returns: Returned materials will be accepted only if shipped with our permission and in accordance with our regulations governing such returns. In issuing credits for returned material, we reserve the right to deduct a handling charge.

Inspection: When orders are accepted subject to buyers' inspection, the products must be inspected and accepted before shipment is made.

Warranty: Rockwell warrants its products only against defects in materials and workmanship. Rockwell's liability and customer's exclusive remedy under this warranty or any warranty extends for a period of one (1) year from the date of Rockwell's shipment and is expressly limited to repayment of the purchase price, repair, or replacement, at Rockwell's option, during said period, upon proof satisfactory to Rockwell and upon customer's returning and prepaying all charges on such products to factory or warehouse designated by Rockwell. THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, WITH RESPECT TO QUALITY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.

How to Order Valves: In transmitting orders or inquiries for Rockwell Equiwedge gate valves, it is essential that a complete specification be given so that the exact valve may be identified. If the size and figure number only are stated, it will be assumed that the valve is standard in all respects.

Handwheels are furnished at no additional charge with all gear operated valves.

A complete description of a particular valve requires that the following information be furnished: Size • Pressure Classification • Flange or butt welding ends (including outside diameter, wall thickness or inside diameter, and grade of pipe) • Accessories, if any.

It is also highly desirable that a full description of the working conditions be supplied: minimum and maximum line temperature and pressure; nature of fluid to be handled; whether any unusual condition of corrosion, shock or abrasion is likely to be present; frequency of operation (cycles per hour/cycles per day); maximum differential pressure against which the valve is to be operated; and whether the valve is normally open or closed.

Patents: The essential features of the valves and accessories described in this catalog are protected by patents and patent applications of U.S. and foreign countries.

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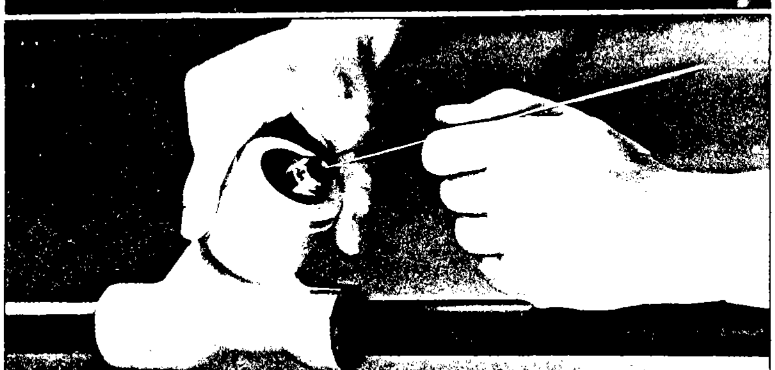
Rockwell Univalve® Maintenance Manual

Rockwell



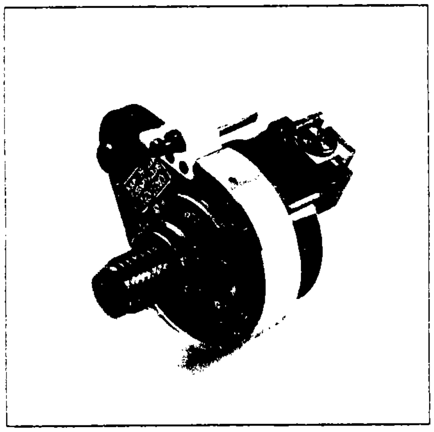
...products of Flow Control Division

Index

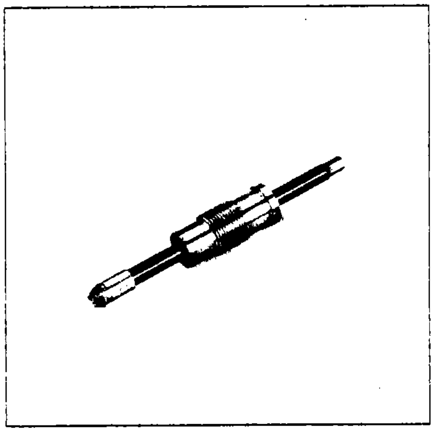
Three New Tools For Faster In-Line Repairs of Rockwell Univalves

The new Rockwell Univalves aren't likely to require any maintenance or repair work until they've been in service for quite a few years. But sooner or later—depending on the nature of the line fluids, frequency of operation and time in service—Univalve seats and disks may need to be repaired.

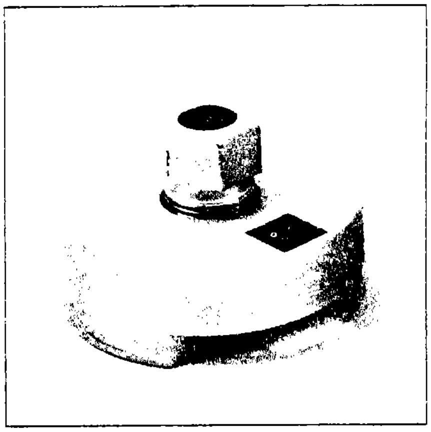
For fast, one-man, in-line repair of Rockwell Univalves, three new lightweight, portable tools are now available: Seal Weld Cutting Machine, Seat Refinishing Tool and Bonnet Torquing Tool. Following are illustrations and descriptions of each tool.



• The **Seal Weld Cutting Machine** has the ability to cut both fillet and canopy welds. By removing the handwheel and yoke, then installing the machine, seal welds can be cut leaving a suitable weld prep. The machine is operated by one person and uses conventional plant air. For more information on the new Seal Weld Cutting Machine, refer to Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine".



• The **Seat Refinishing Tool** is a self-centering head of multiple tungsten carbide cutters on a spindle which is hand-operated with a speed wrench for complete seat refinishing. Lapping or other finishing work is not required to produce finished seats.
Seat damage such as that produced by foreign materials in the line fluid can be repaired quickly.



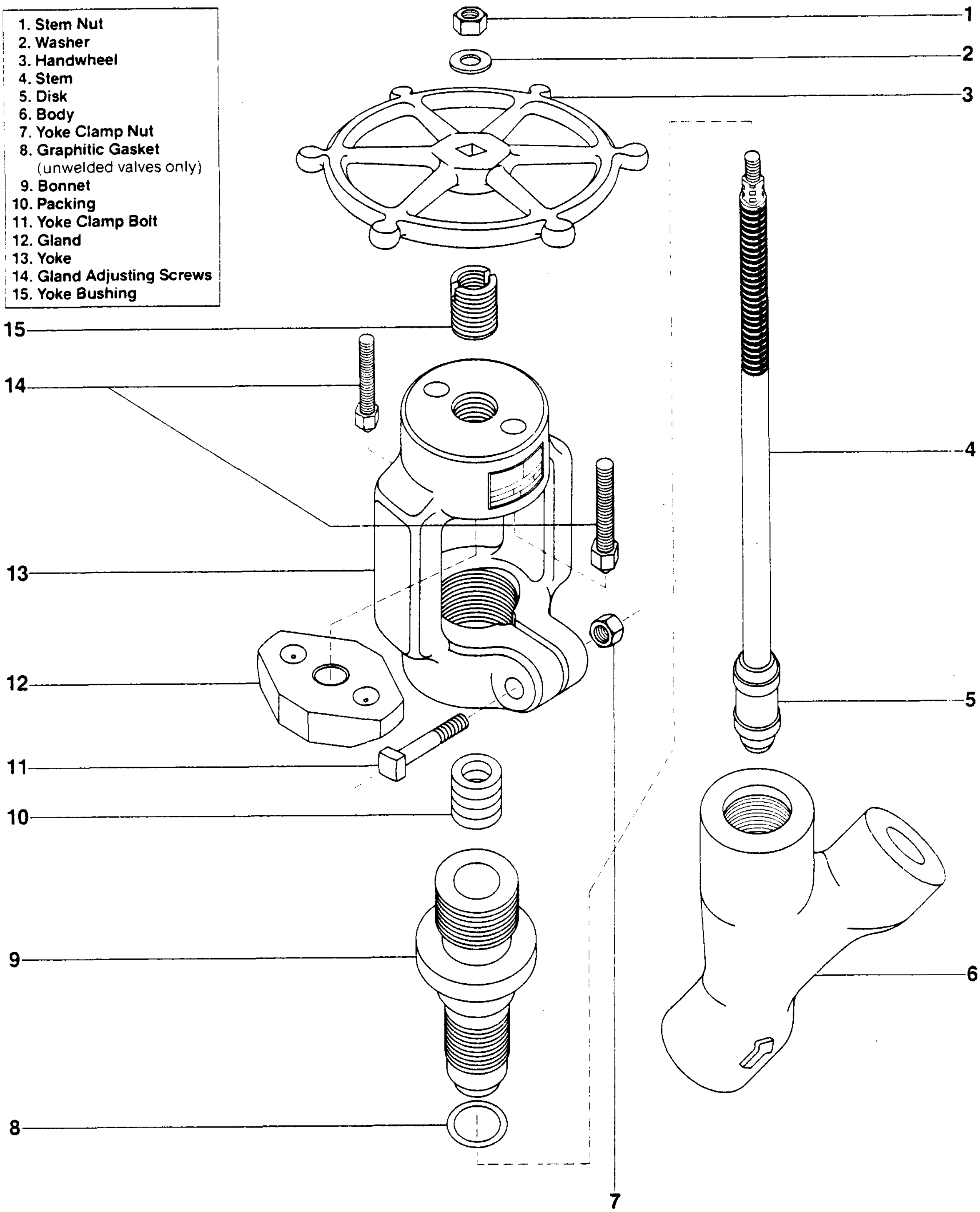
• The **Bonnet Torquing Tool** is essentially a torque wrench adapter that is used to remove and reassemble the bonnet of an unwelded Univalve.
The tool facilitates reassembly of the bonnet with the required torque—correctly applied—to ensure that the graphitic body-bonnet gasket is properly loaded to again establish a leak-tight seal. The tool may also be used to assemble and disassemble seal-welded valves.

Rockwell Customer Service

Consult your Rockwell representative for information on obtaining the new repair tools.
As always, field sales and service personnel are available to assist with maintenance and repairs involving any Rockwell valves. And they are backed up by factory-trained specialists to lend additional assistance whenever needed.
An improved low-maintenance Univalve design...new tools for fast in-line repairs... and reliable Rockwell service!

Exploded View

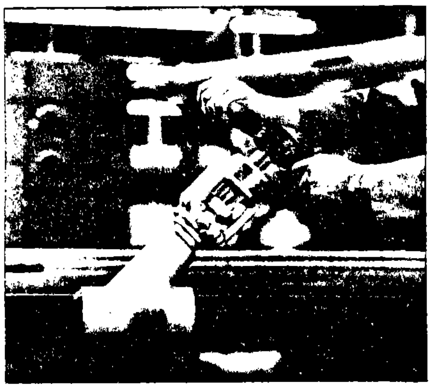
1. Stem Nut
2. Washer
3. Handwheel
4. Stem
5. Disk
6. Body
7. Yoke Clamp Nut
8. Graphitic Gasket (unwelded valves only)
9. Bonnet
10. Packing
11. Yoke Clamp Bolt
12. Gland
13. Yoke
14. Gland Adjusting Screws
15. Yoke Bushing



Disassembling The Univalve

CAUTION
Line pressure must be relieved before disassembling the valve.

STEP 1
Double-check to make sure that line pressure has been relieved before disassembling the valve.

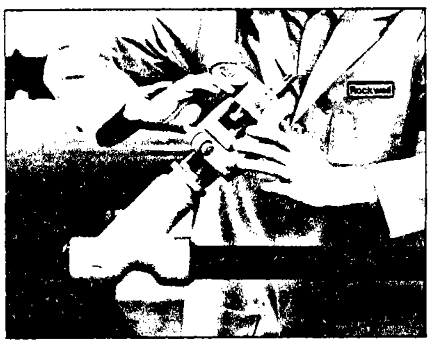


STEP 2
The valve should be in the open position and **not** against the body seat or backseat.

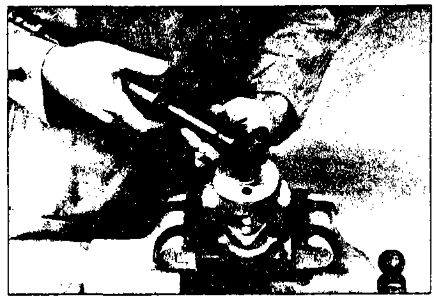
STEP 3
If the valve is manually operated, remove the lock nut and washer that attach the handwheel or impactor handle to the valve stem. Remove the handwheel or handle.
If the valve is motor operated, remove the actuator from the valve stem.

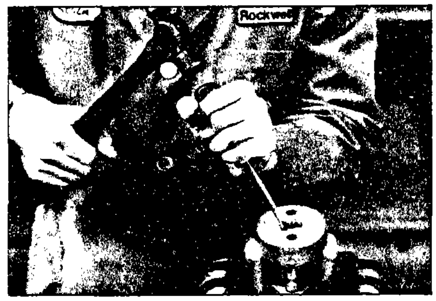
STEP 4
Loosen the two gland adjustment screws that rest against the packing gland by threading them higher into the yoke.

STEP 5
Loosen the yoke clamp bolt and nut. It is not necessary to completely remove them.



STEP 6
Remove the yoke assembly by unscrewing it from the bonnet A gentle tap with a hammer might be necessary before the yoke will unscrew away from the bonnet. You may find it easier to remove the yoke by placing the handwheel on the stem to prevent the stem from rotating. When the yoke is even with the top of the stem, and you can no longer use the valve handwheel or handle to hold the stem, you will need to grasp the lower portion of the stem between the yoke and bonnet. If the yoke is turning freely, a cloth may be adequate to hold the stem. If this is not adequate, a strap wrench that will not damage the stem surface should be used.





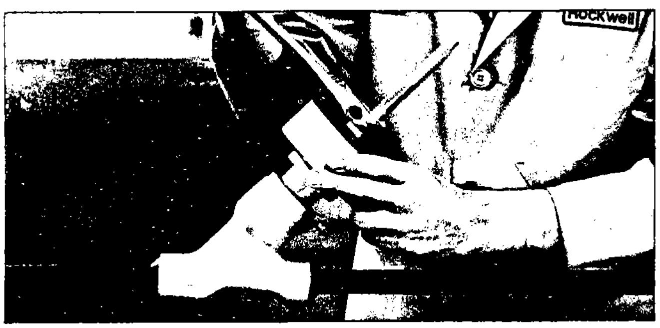
STEP 7
If the yoke bushing is damaged and must be removed, insert a ⅛" (or smaller) abrasive grinding wheel into the slot on top of the bushing. Using a standard grinding tool, work the grinder downward to remove yoke metal that was upset into the bushing during the valve assembly. Periodically during the grinding process, try to turn the bushing within the yoke to test how loose it is becoming. Once loosened, use a screwdriver in the slot to turn the bushing downward so that it is released through the bottom of the yoke.
To reinsert a new bushing, thread it into the yoke so that the top of the bushing is flush with the top of the yoke. Using a chisel and hammer, tap the yoke metal into the bushing slot creating an offset so that the bushing is tight within the yoke.

STEP 8
If the valve is unwelded, chip the atmospheric seal with a hammer and screwdriver (or other sharp instrument) and wire brush the seal area clean.

Disassembling The Univalve (cont'd.)

STEP 9

If the valve to be repaired is seal-welded, prepare the Seal Weld Cutting Machine for the weld cutting operation. Correct procedures for preparation, set-up and operation of the Seal Weld Cutting Machine can be found in Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine". If a cutting machine is not available, use one of the alternate methods shown on page 8.



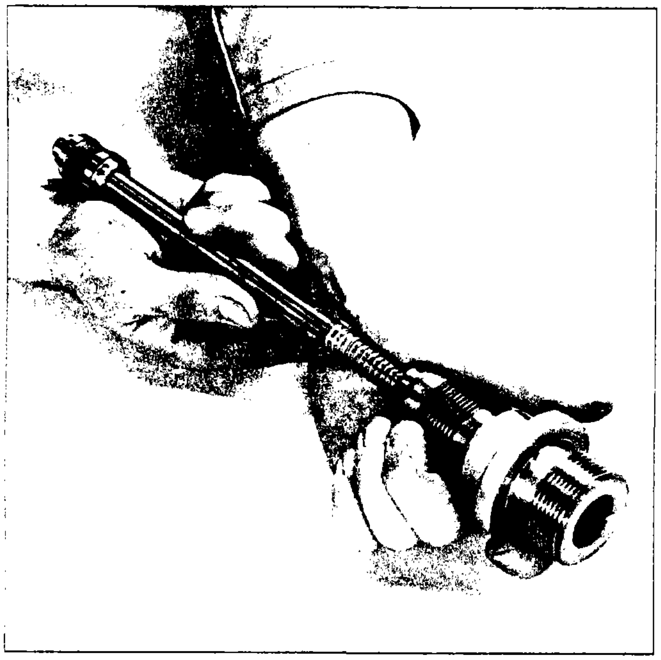
STEP 10

Refer to the chart on page 11 to select the proper torquing collar assembly (consisting of lock nut and collar). Screw the torquing collar clockwise on to the bonnet until it bottoms. A left-hand threaded lock nut is used to lock the torquing tool to the bonnet. Use a size ¾" drive with a breaker bar or torque wrench to turn the tool counterclockwise to remove the bonnet. After the valve has been reassembled, separate the lock nut and collar by turning the nut clockwise and the collar counterclockwise. If the valve has a graphitic body bonnet seal, a torque wrench should be used on the collar to properly load the bonnet. See chart on page 10.

STEP 11

Remove the valve bonnet-stem-disk assembly if the valve being repaired is a stop valve (figure XXX2X). The disk in a stop-check valve (figure XXX6X) and the bonnet insert in welded class 4500 valves (figure 96X2X/96X6X) may be removed by forming a short piece of soft wire into the shape of an L and lifting up in the disk bore.

Disassembling The Univalve (cont'd.)

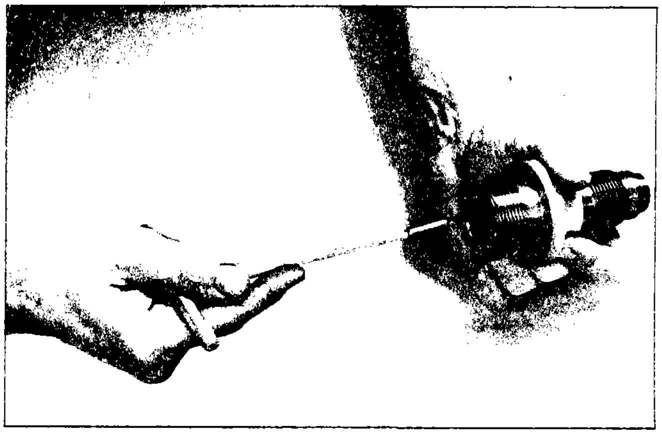


STEP 12

Remove the stem from the bonnet. It may be necessary to rotate the stem through the packing before it can be removed.

STEP 13

If the valve is unwelded, the graphitic gasket must be replaced by cutting it away from the valve bonnet. Care should be taken to not damage machined surfaces.

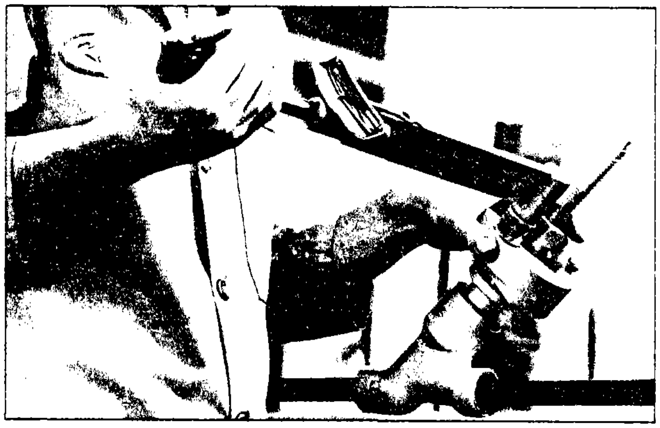


STEP 14

Using a packing removal tool, remove the valve packing. Standard Univalve packing contains four packing rings assembled as follows:

Top Ring—Crane 187-1X, zinc washer, **2nd Ring**—Graphite Ring, zinc washer, **3rd Ring**—Graphite Ring, zinc washer and **Bottom Ring**—Crane 187-1X

Class 4500 valves have four rings of Crane 187-IX packing—not a combination of Crane and Graphite. Stainless steel Univalves are equipped with a metal junk ring in the bottom of the packing chamber.



STEP 15

It is recommended that the graphitic gasket be replaced when an unwelded valve is disassembled for service work. The gasket should be slipped on to the bonnet and placed snugly against the off set. Then the bonnet should be carefully placed in the valve body.

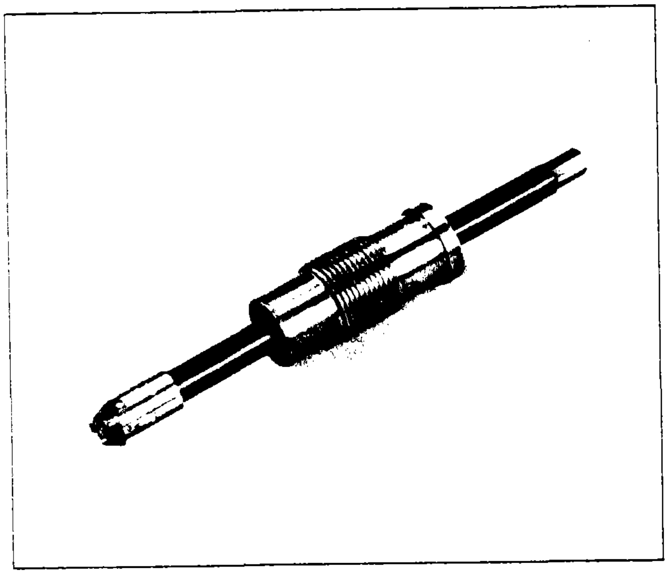
If the valve is unwelded, a new atmospheric seal should be applied. This can be done by spreading the sealing compound evenly around the body bonnet joint area with a putty knife (or similar flat, straight object). The compound will start to harden at room temperature in about 10 minutes, and will attain maximum stiffness in about 18 hours. The atmospheric seal compound for your Univalve is manufactured by Rockwell and should be purchased through your Rockwell representative.

If the valve is a welded type, the assembly needs only to be hand-tightened so that the bonnet fits snugly against the body. For canopy-welded valves, reweld using the gas tungsten arc process. For fillet-welded valves, reweld with the shielded metal arc process.

Servicing Rockwell Univalves

Although seat and disk damage to Rockwell Univalves is unlikely, severe service conditions and entrained solids in the line fluid may cause seat or disk damage. Outlined below are step-by-step procedures for fast, in-line repairs using the new Seat Refinishing Tool.

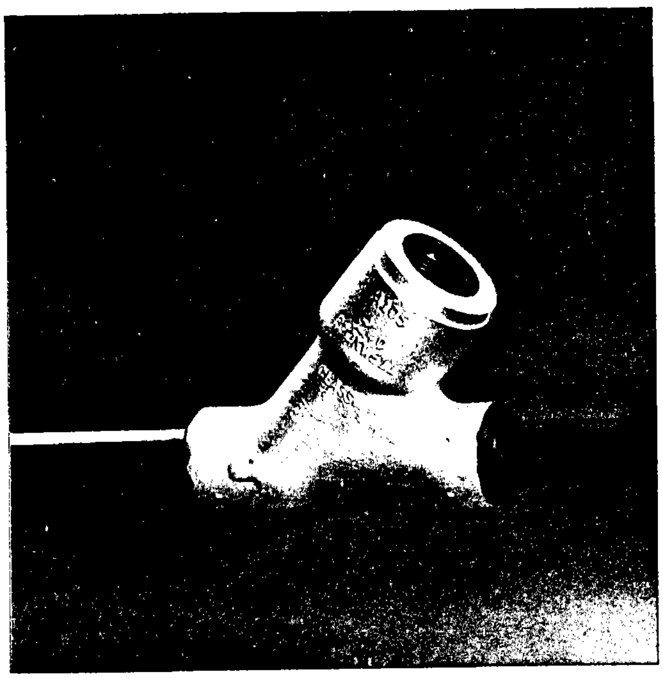
CAUTION
Line pressure must be relieved before making any repairs.



STEP 1
See pages 4-6 for proper disassembly procedures before performing repairs on the Univalves. Then, using the chart on page 15, select the proper Seat Refinishing Tool Arrangement for performing repairs on the seat area.

STEP 2
Take appropriate caution to make sure the inlet and outlet valve ports are blocked to prevent removed seat material from entering the line. Then, screw the Seat Refinishing Tool Assembly into the body while holding the shaft up to prevent tool and seat contact. The guide needs only to be hand-tightened.

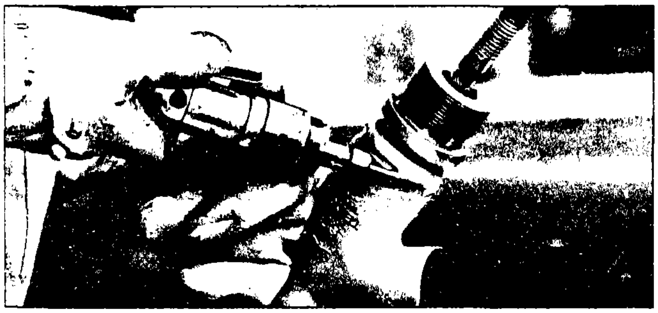
STEP 3
The Seat Refinishing Tool is now ready for operation. Use a speed wrench to operate the tool. This manual process is fast, and means that a special air motor is not necessary. The tool assembly can easily be removed to inspect the seat and determine if more seat refinishing is required.



STEP 4
When a repair of the seat is finished, use a portable vacuum to remove loose chips.

Alternate Weld-Cutting Methods For Repairing Univalves

CAUTION
Line pressure must be relieved before making any repairs.

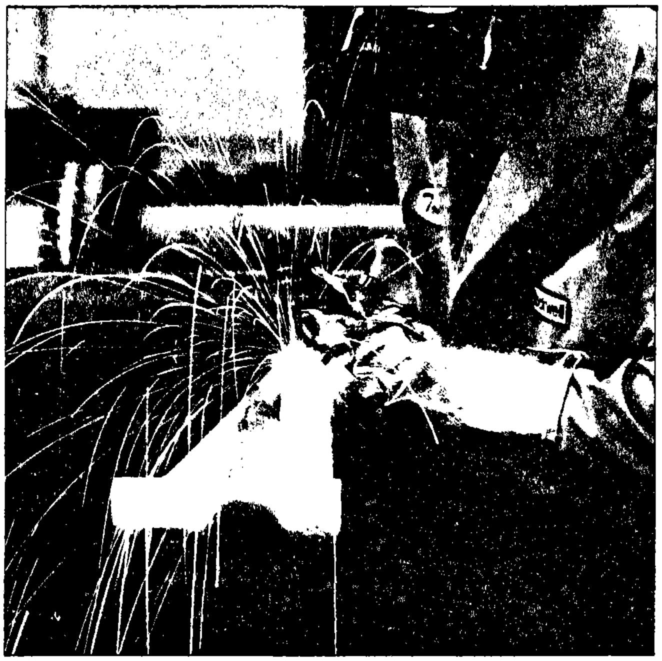


Grinding A Weld (for canopy seal Univalves) stainless steel valves

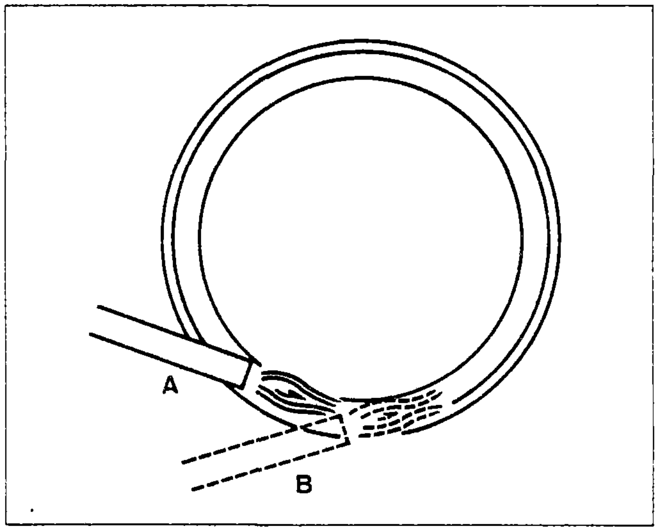
Open valve to backseat. Using a standard grinding wheel, remove the weld by grinding from the top of the body face and bonnet outside diameter (see photo). Continue this process around the valve until all weld is removed where the body and bonnet are joined together.
Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen the threads joining the body and bonnet.

Scarfing A Weld (for fillet-welded Univalves) carbon steel and low alloy valves

1. *Air-arc method*
   Open valve to backseat. Using air-arc equipment, make a series of cuts in the valve weld (see photo and sketch). Continue making the cuts until the valve weld takes on a grooved, scarfed-out appearance. The cuts should be deep—a gap between the body and bonnet will appear.
   Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen the threads joining the body and bonnet.



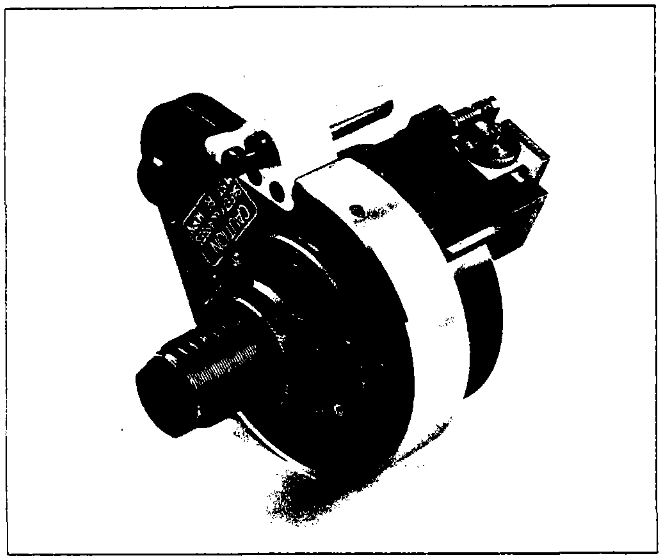
2. Oxy-acetylene method
   Open valve to backseat. Using an oxy-acetylene torch equipped with a scarfing tip, make a series of cuts in the weld until it takes on a scarfed-out, grooved appearance. The cuts should be deep—a gap between the body and bonnet will appear. Clean the valve with a wire brush. A penetrating oil may be used where permissible to loosen threads joining the body and bonnet.



Sketch shows sequence of cuts necessary to remove fillet weld by both oxy-acetylene and Arc-Air methods. Place scarfing torch or welding electrode tangent to the bonnet as indicated in position A. When metal reaches cutting temperature, start blowing oxygen or air while moving torch backward. Weld metal should be blown away until the gap between body and bonnet is exposed. Move torch counterclockwise to position B—repeat until entire fillet weld is removed and gap is continuous. DO NOT REMOVE EXCESS MATERIAL FROM BONNET OR UPPER BODY FACE.

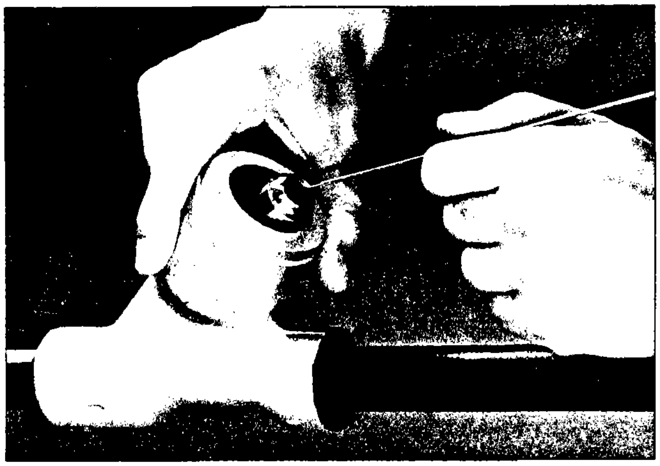
Servicing Univalve Check Valves

CAUTION
Line pressure must be relieved before servicing the valve.

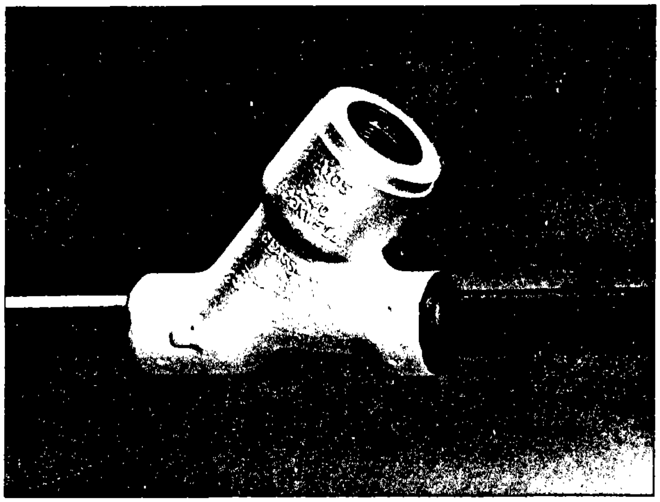


STEP 1
If the check valve to be repaired is seal-welded, prepare the Seal Weld Cutting Machine for the weld cutting operation. Correct procedures for preparation, set-up and operation of the Seal Weld Cutting Machine can be found in Rockwell bulletin V-371, "Rockwell Univalve Seal Weld Cutting Machine". If a cutting machine is not available, use one of the alternative methods shown on page 8.

STEP 2
Once a seal-welded valve has been cut, it is ready for disassembly. If the check valve is unwelded, remove the atmospheric seal with a hammer and screwdriver (or other sharp instrument) and wire brush the seal area clean. Unscrew the valve cover from the body using the flats provided.

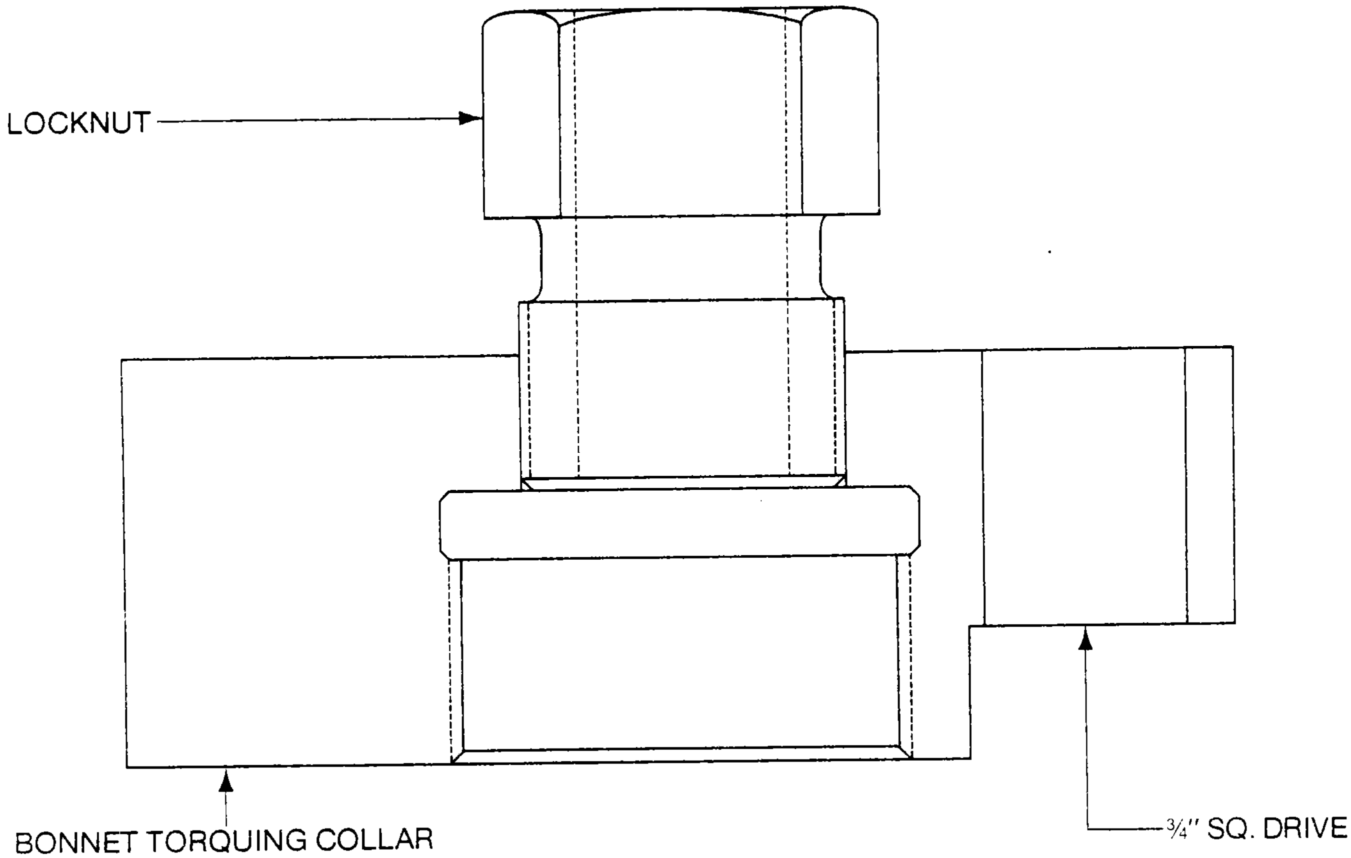


STEP 3
Remove the check valve spring and disk from the body bore. A short piece of soft wire formed into an L shape may be used to assist in disk removal by engaging it in the groove inside the disk.



STEP 4
The check valve is now ready for internal work. See the section entitled "Servicing Rockwell Univalves" (page 7) for correct repair procedures.

Bonnet Torquing Collar Assembly



Recommended Yoke Lock Bolt Torque

Bolt Dia.	Min. Torque
⅜ (9.5)	16/20 (22/27)
7/16 (11.1)	30/34 (41/46)

Recommended Gland Bolt Torque

Bolt Dia.	Min. Torque
⅜ (9.5)	9 (12)
7/16 (11.1)	15 (20)
½ (12.7)	20 (27)
9/16 (14.3)	30 (41)
⅝ (15.9)	40 (54)

Unwelded Univalve Bonnet Gasket Torques

Figure No.	Valve Size								
	½	¾	1	1¼	1½	2	2½	3	4
36220. 36224. 36228 36264. 36268 36270. 36274. 36278	50/60 (68/81)	50/60 (68/81)	50/60 (68/81)	90/105 (122/142)	90/105 (122/142)	140/155 (190/210)	260/290 (353/393)	260/290 (353/393)	400/440 (542/597)
66220. 66224. 66228 66264. 66268 66270. 66274. 66273	50/60 (68/81)	50/60 (68/81)	50/60 (68/81)	90/105 (122/142)	90/105 (122/142)	260/290 (353/393)	400/440 (542/597)	400/440 (542/597)	400/440 (542/597)
96224. 96228 96264. 96268 96274. 96278	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	110/120 (149/163)	430/475 (583/644)	430/475 (583/644)	430/475 (583/644)	430/475 (583/644)

Bolt diameters are in inches (millimeters are shown in parenthesis).
Torque values are in ft-lbs (newton meters are shown in parenthesis).

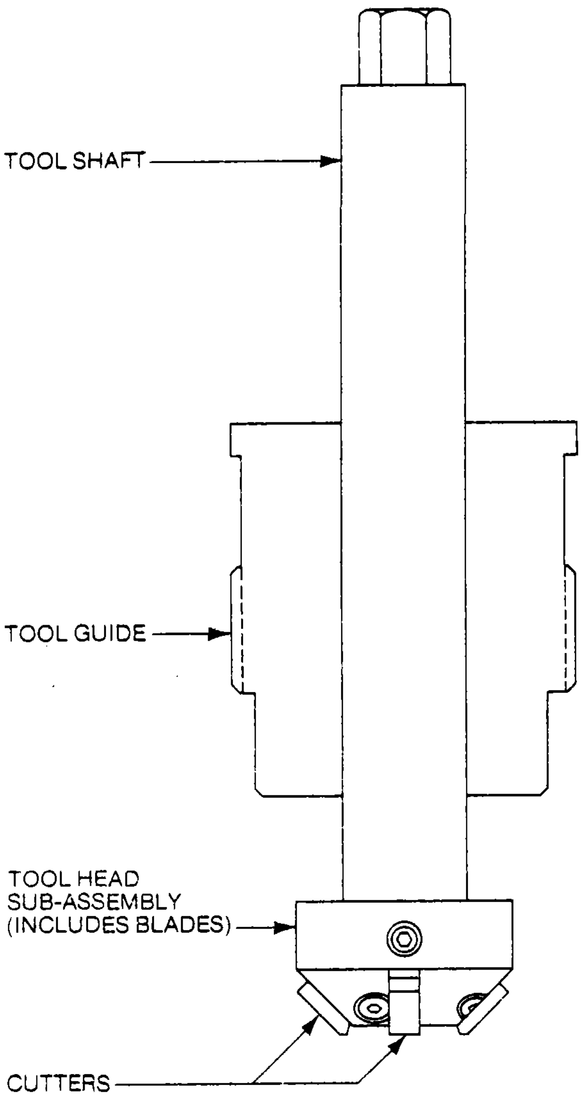
Bonnet Torquing Collar Assembly (cont'd.)

Size	Figure Number*	Bonnet Torquing Collar Assembly	Bonnet Torquing Collar	Locknut
¼	**361**	876744	875869	875852
¼	**362**	876744	875869	875852
½	**361**	876744	875869	875852
½	**362**	876744	875869	875852
¾	**361**	876744	875869	875852
¾	**362**	876744	875869	875852
1	**361**	876745	875870	875852
1	**362**	876744	875869	875852
1¼	**361**	876746	875871	875853
1¼	**362**	876746	875871	875853
1½	**361**	876746	875871	875853
1½	**362**	876746	875871	875853
2	**361**	876747	876031	875854
2	**362**	876746	875871	875853
2½	**361**	876748	876035	875854
2½	**362**	876749	876033	875854
3	**361**	876748	876035	875854
3	**362**	876749	876033	875854
4	**361**	876750	876036	875854
4	**362**	876750	876036	875854
¼	**661**	876744	875869	875852
¼	**662**	876744	875869	875852
½	**661**	876744	875869	875852
½	**662**	876744	875869	875852
¾	**661**	876744	875869	875852
¾	**662**	876744	875869	875852
1	**661**	876745	876870	875852
1	**662**	876744	875869	875852
1¼	**661**	876746	875871	875853
1¼	**662**	876746	875871	875853
1½	**661**	876746	875871	875853
1½	**662**	876746	875871	875853
2	**661**	876749	876033	875854
2	**662**	876749	876033	875854
2½	**661**	876750	876036	875854
2½	**662**	876750	876036	875854
3	**661**	876750	876036	875854
3	**662**	876750	876036	875854
4	**661**	876750	876036	875854
4	**662**	876750	876036	875854
¼	**961**	876751	876032	875854
¼	**962**	876751	876032	875854
½	**961**	876751	876032	875854
½	**962**	876751	876032	875854
¾	**961**	876751	876032	875854
¾	**962**	876751	876032	875854
1	**961**	876751	876032	875854
1	**962**	876751	876032	875854
1¼	**961**	876751	876032	875854
1¼	**962**	876751	876032	875854
1½	**961**	876751	876032	875854
1½	**962**	876751	876032	875854
2	**961**	876752	876037	875854
2	**962**	876752	876037	875854
2½	**961**	876752	876037	875854
2½	**962**	876752	876037	875854
3	**961**	876752	876037	875854
3	**962**	876752	876037	875854
4	**961**	876752	876037	875854
4	**962**	876752	876037	875854

* These numbers are the first three digits of the valve figure number.

Seat Refinishing Tool Assembly

Univalve - Carbon Steel



Size	Fig. No.*	Refinishing Tool Assembly	Refinishing Tool Guide	Refinishing Tool Shaft	Refinishing Tool Head Assembly	Replacement Cutters†	No. of Replacement Cutters on Head Assembly
¼	**361**	876708	875920	875942	876111	—	—
¼	**362**	876708	875920	875942	876111		
½	**361**	876708	875920	875942	876111	—	—
½	**362**	876708	875920	875942	876111		
¾	**361**	876708	875920	875942	876111	—	—
¾	**362**	876708	875920	875942	876111		
1	**361**	876709	875920	875942	876112	—	—
1	**362**	876708	875920	875942	876111		
1¼	**361**	876710	875922	875942	876113	876703	3
1¼	**362**	876710	875922	875942	876113	876703	3
1½	**361**	876711	875921	875943	876114	876703	5
1½	**362**	876710	875922	875942	876113	876703	3
2	**361**	876712	875924	875943	876115	876703	5
2	**362**	876713	875923	875943	876114	876703	5
2½	**361**	876714	875926	875944	876116	876703	7
2½	**362**	876715	875925	875944	876115	876703	5
3	**361**	876714	875926	875944	876116	876703	7
3	**362**	876715	876725	875944	876115	876703	5
4	**361**	876716	875927	875944	876116	876703	7
4	**362**	876716	875927	875944	876116	876703	7
¼	**661**	876708	875920	875942	876111	—	—
¼	**662**	876708	875920	875942	876111		
½	**661**	876708	875920	875942	876111	—	—
½	**662**	876708	875920	875942	876111		
¾	**661**	876708	875920	875942	876111	—	—
¾	**662**	876708	875920	875942	876111		
1	**661**	876709	875920	875942	876112	—	—
1	**662**	876708	875920	875942	876111		
1¼	**661**	876710	875922	875942	876113	876703	3
1¼	**662**	876710	875922	875942	876113	876703	3
1½	**661**	876710	875922	875942	876113	876703	3
1½	**662**	876710	875922	875942	876113	876703	3
2	**661**	876715	875925	875944	876115	876703	5
2	**662**	876715	875925	875944	876115	876703	5
2½	**661**	876716	875927	875944	876116	876703	7
2½	**662**	876716	875927	875944	876116	876703	7
3	**661**	876716	875927	875944	876116	876703	7
3	**662**	876716	875927	875944	876116	876703	7
4	**661**	876716	875927	875944	876116	876703	7
4	**662**	876716	875927	875944	876116	876703	7
¼	**961**	876777	876772	875942	876112	—	—
¼	**962**	876777	876772	875942	876112		
½	**961**	876777	876772	875942	876112	—	—
½	**962**	876777	876772	875942	876112		
¾	**961**	876777	876772	875942	876112	—	—
¾	**962**	876777	876772	875942	876112		
1	**961**	876777	876772	875942	876112	—	—
1	**962**	876777	876772	875942	876112		
1¼	**961**	876777	876772	875942	876112	—	—
1¼	**962**	876777	876772	875942	876112		
1½	**961**	876777	876772	875942	876112	—	—
1½	**962**	876777	876772	875942	876112		
2	**961**	876715	875925	875944	876115	876703	5
2	**962**	876715	875925	875944	876115	876703	5
2½	**961**	876715	875925	875944	876115	876703	5
2½	**962**	876715	875925	875944	876115	876703	5
3	**961**	876715	875925	875944	876115	876703	5
3	**962**	876715	875925	875944	876115	876703	5
4	**961**	876715	875925	875944	876115	876703	5
4	**962**	876715	875925	875944	876115	876703	5

* These numbers are the first three digits of the valve figure number.

†Where a dash is indicated, replacement cutters are not available. For new cutters, the entire head assembly must be replaced.

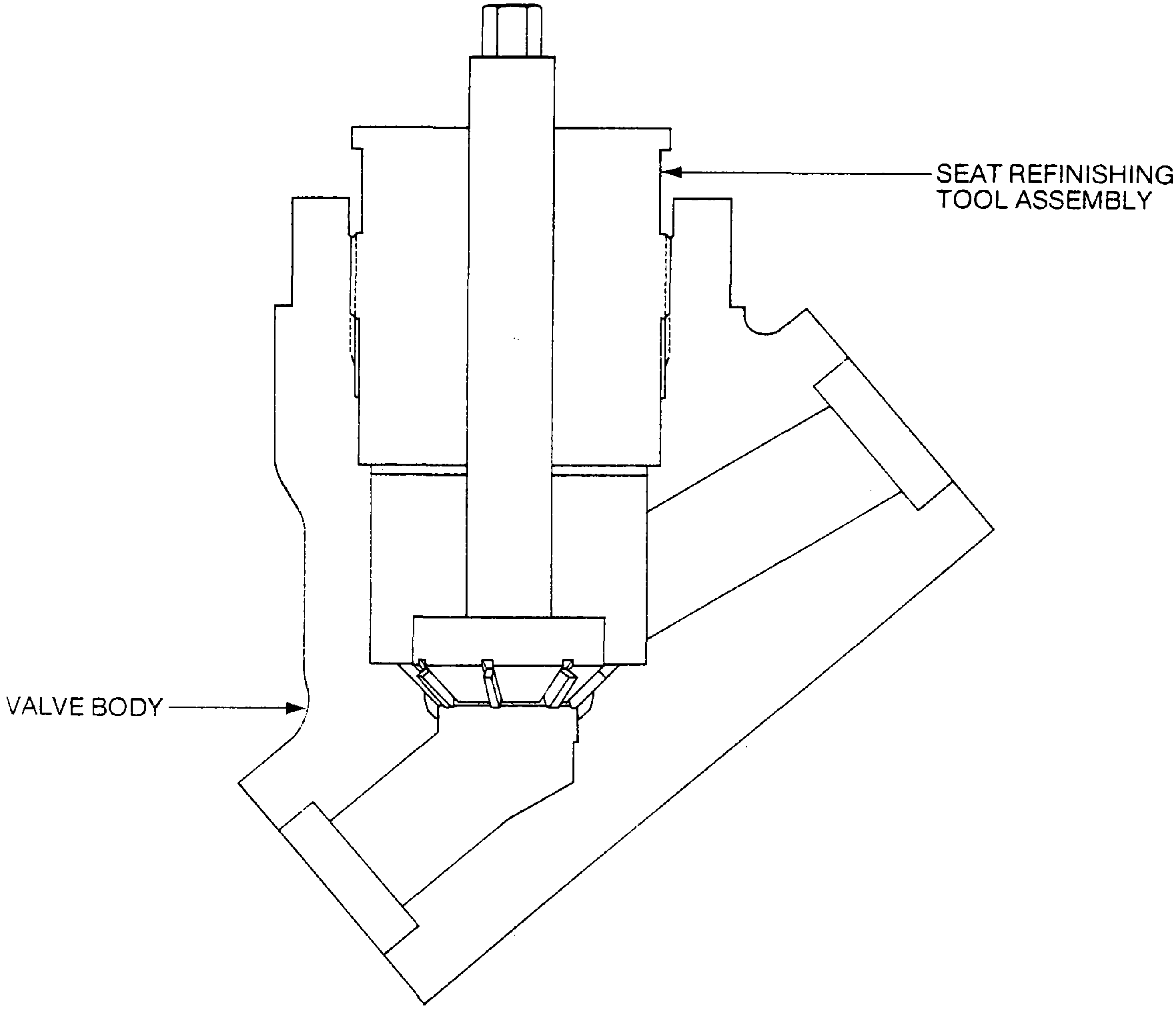
Univalve - Stainless Steel

Size	Fig. No.*	Refinishing Tool Assembly	Refinishing Tool Guide	Refinishing Tool Shaft	Refinishing Tool Head Assembly	Replacement Cutters†	No. of Replacement Cutters on Head Assembly
¼	**361**	876717	875929	875942	876111	—	—
¼	**362**	876717	875929	875942	876111		
½	**361**	876717	875929	875942	876111	—	—
½	**362**	876717	875929	875942	876111		
¾	**361**	876717	875929	875942	876111	—	—
¾	**362**	876717	875929	875942	876111		
1	**361**	876718	875929	875942	876112	—	—
1	**362**	876717	875929	875942	876111		
1¼	**361**	876719	875930	875942	876113	876703	3
1¼	**362**	876719	875930	875942	876113	876703	3
1½	**361**	876720	875931	875943	876114	876703	5
1½	**362**	876719	875930	875942	876113	876703	3
2	**361**	876721	875933	875943	876115	876703	5
2	**362**	876722	875918	875943	876114	876703	5
2½	**361**	876723	875917	875944	876116	876703	7
2½	**362**	876724	875934	875944	876115	876703	5
3	**361**	876723	875917	875944	876116	876703	7
3	**362**	876724	875934	875944	876115	876703	5
4	**361**	876725	875936	875944	876116	876703	7
4	**362**	876725	875936	875944	876116	876703	7
¼	**661**	876717	875929	875942	876111	—	—
¼	**662**	876717	875929	875942	876111		
½	**661**	876717	875929	875942	876111	—	—
½	**662**	876717	875929	875942	876111		
¾	**661**	876717	875929	875942	876111	—	—
¾	**662**	876717	875929	875942	876111		
1	**661**	876718	875929	875942	876112	—	—
1	**662**	876717	875929	875942	876111		
1¼	**661**	876719	875930	875942	876113	876703	3
1¼	**662**	876719	875930	875942	876113	876703	3
1½	**661**	876719	875930	875942	876113	876703	3
1½	**662**	876719	875930	875942	876113	876703	3
2	**661**	876724	875934	875944	876115	876703	5
2	**662**	876724	875934	875944	876115	876703	5
2½	**661**	876725	875936	875944	876116	876703	7
2½	**662**	876725	875936	875944	876116	876703	7
3	**661**	876725	875936	875944	876116	876703	7
3	**662**	876725	875936	875944	876116	876703	7
4	**661**	876725	875936	875944	876116	876703	7
4	**662**	876725	875936	875944	876116	876703	7
¼	**961**	876779	876773	875942	876112	—	—
¼	**962**	876779	876773	875942	876112		
½	**961**	876779	876773	875942	876112	—	—
½	**962**	876779	876773	875942	876112		
¾	**961**	876779	876773	875942	876112	—	—
¾	**962**	876779	876773	875942	876112		
1	**961**	876779	876773	875942	876112	—	—
1	**962**	876779	876773	875942	876112		
1¼	**961**	876779	876773	875942	876112	—	—
1¼	**962**	876779	876773	875942	876112		
1½	**961**	876779	876773	875942	876112	—	—
1½	**962**	876779	876773	875942	876112		
2	**961**	876724	875934	875944	876115	876703	5
2	**962**	876724	875934	875944	876115	876703	5
2½	**961**	876724	875934	875944	876115	876703	5
2½	**962**	876724	875934	875944	876115	876703	5
3	**961**	876724	875934	875944	876115	876703	5
3	**962**	876724	875934	875944	876115	876703	5
4	**961**	876724	875934	875944	876115	876703	5
4	**962**	876724	876934	875944	876115	876703	5

* These numbers are the first three digits of the valve figure number.

† Where a dash is indicated, replacement cutters are not available. For new cutters, the entire head assembly must be replaced.

Typical Univalve Seat Refinishing Tool Arrangement



Typical Univalve Seat Refinishing Tool Arrangement (cont'd.)

Size	Figure Number*	Material†	Tool Assembly
¼	361	CS	876708
¼	362	CS	876708
¼	361	SS	876717
¼	362	SS	876717
½	361	CS	876708
½	362	CS	876708
½	361	SS	876717
½	362	SS	876717
¾	361	CS	876708
¾	362	CS	876708
¾	361	SS	876717
¾	362	SS	876717
1	361	CS	876709
1	362	CS	876708
1	361	SS	876718
1	362	SS	876717
1¼	361	CS	876710
1¼	362	CS	876710
1¼	361	SS	876719
1¼	362	SS	876719
1½	361	CS	876711
1½	362	CS	876710
1½	361	SS	876720
1½	362	SS	876719
2	361	CS	876712
2	362	CS	876713
2	361	SS	876721
2	362	SS	876722
2½	361	CS	876714
2½	362	CS	876715
2½	361	SS	876723
2½	362	SS	876724
3	361	CS	876714
3	362	CS	876715
3	361	SS	876723
3	362	SS	876724
4	361	CS	876716
4	362	CS	876716
4	361	SS	875725
4	362	SS	876725
¼	661	CS	876708
¼	662	CS	876708
¼	661	SS	876717
¼	662	SS	876717
½	661	CS	876708
½	662	CS	876708
½	661	SS	876717
½	662	SS	876717
¾	661	CS	876708
¾	662	CS	876708
¾	661	SS	876717
¾	662	SS	876717
1	661	CS	876709
1	662	CS	876708
1	661	SS	876718
1	662	SS	876717
1¼	661	CS	876710
1¼	662	CS	876710
1¼	661	SS	876719
1¼	662	SS	876719
1½	661	CS	876710
1½	662	CS	876710
1½	661	SS	876719
1½	662	SS	876719

*These numbers are the first three digits of the valve figure number.
†CS denotes carbon steel material
SS denotes stainless steel material.

Size	Figure Number*	Material†	Tool Assembly
2	661	CS	876715
2	662	CS	876715
2	661	SS	876724
2	662	SS	876724
2½	661	CS	876716
2½	662	CS	876716
2½	661	SS	876725
2½	662	SS	876725
3	661	CS	876716
3	662	CS	876716
3	661	SS	876725
3	662	SS	876725
4	661	CS	876716
4	662	CS	876716
4	661	SS	876725
4	662	SS	876725
¼	961	CS	876777
¼	962	CS	876777
¼	961	SS	876779
¼	962	SS	876779
½	961	CS	876777
½	962	CS	876777
½	961	SS	876779
½	962	SS	876779
¾	961	CS	876777
¾	962	CS	876777
¾	961	SS	876779
¾	962	SS	876779
1	961	CS	876777
1	962	CS	876777
1	961	SS	876779
1	962	SS	876779
1¼	961	CS	876777
1¼	962	CS	876777
1¼	961	SS	876779
1¼	962	SS	876779
1½	961	CS	876777
1½	962	CS	876777
1½	961	SS	876779
1½	962	SS	876779
2	961	CS	876715
2	962	CS	876715
2	961	SS	876724
2	962	SS	876724
2½	961	CS	876715
2½	962	CS	876715
2½	961	SS	876724
2½	962	SS	876724
3	961	CS	876715
3	962	CS	876715
3	961	SS	876724
3	962	SS	876724
4	961	CS	876715
4	962	CS	876715
4	961	SS	876724
4	962	SS	876724

*These numbers are the first three digits of the valve figure number.
†CS denotes carbon steel material.
SS denotes stainless steel material.

Low alloy valves are the same as carbon steel material.

TERMS AND CONDITIONS

Freight Allowance: All prices are F.O.B. factory. We will attempt to route shipments in the method which will result in the lowest cost unless otherwise instructed. All shipments will be made collect unless stipulated otherwise on the purchase order in which case you will be invoiced for all transportation charges.

Title and risk of loss for damage to the goods passes to the customer upon delivery to the carrier.

Terms: Terms of payment, net 30 days.

Prices: List prices are subject to discount, minimum order $50.00 net value. All prices subject to change without notice. Prices quoted do not include Federal, State or Municipal, Sales or Use, Occupation or Privilege Taxes, based on or measured by sales, which tax, or taxes, will be added to prices where applicable.

Design: We reserve the right to make alterations in design without notice.

Shipments: All statements of prospective date of shipments are estimated. We use our best efforts to ship within the time estimated.

Force Majeure: The consequences, direct or indirect, of labor troubles, fires, accidents, floods, hostilities, shortage of transportation, failure, suspension or curtailment of production due to shortage of supply of raw materials, or other economic factors, Government acts or requirements and any and all like or different causes beyond the control of the parties hereto shall excuse performance by either party to the extent by which performance is prevented thereby. Rockwell may, during any period of shortage due to any of said causes, prorate its supply of such goods among all its buyers in such manner as may be deemed equitable in the sole judgment of Rockwell.

Claims: Must be made within ten days after receipt of goods.

Returns: Returned materials will be accepted only if shipped with our permission and in accordance with our regulations governing such returns. In issuing credits for returned material, we reserve the right to deduct a handling charge. No credit will be issued for goods having less than $50.00 net value after deduction of handling charge.

Cancellations: Firm orders which have been accepted are subject to cancellation or changes in specifications only on the basis of a minimum charge subject to increase to cover additional costs.

Inspection: When orders are accepted subject to buyers' inspection, the goods must be inspected and accepted before shipment is made.

How to Order: In transmitting orders or inquiries for Rockwell Edward valves, it is essential that complete specifications be given so that the exact value may be identified. Normally the information would include quantity, size and figure number and in some cases, body material. It is also highly desirable, when other than standard conditions exist, that a full description of the working conditions be supplied: pressure and temperature ranges, nature of fluid to be handled, and whether any unusual conditions of corrosion, shock or abrasion is likely to be present.

Warranty: Rockwell warrants its products only against defects in materials and workmanship. Rockwell's liability and customer's exclusive remedy under this warranty or any warranty extends for a period of one (1) year from the date of Rockwell's shipment and is expressly limited to repayment of the purchase price, repair, or replacement, at Rockwell's option, during said period, upon proof satisfactory to Rockwell and upon customer's returning and prepaying all charges on such products to factory or warehouse designated by Rockwell. THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, WITH RESPECT TO QUALITY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.

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ATLANTA, GEORGIA
(Doraville—30340)
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458-2263 Area Code 404

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620-8840 Area Code 312

DALLAS, TEXAS 75247
2934 Iron Ridge
P.O. Box 47767
631-1890 Area Code 214

HOUSTON, TEXAS 77092
5400 Mitchelldale Street
682-6651 Area Code 713

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70 South Orange Avenue
533-0511 Area Code 201

LOS ANGELES, CALIFORNIA
(Orange—92668)
P.O. Box 5100
171 South Anita Drive, Suite 210
978-6811 Area Code 714

NEW ORLEANS, LOUISIANA 70119
2609 Canal Street
P.O. Box 19438
822-2524 Area Code 504

NEW YORK, NEW YORK
(See LIVINGSTON, NEW JERSEY listing)
In New York, Call (212) 563-4055

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(King of Prussia—19406)
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1150 First Avenue
337-9025 Area Code 215

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247-3200 Area Code 412

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Telephone: Burnham (06286) 63711

For France:
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56 rue des Acacias
75017 Paris, France
Telex: RVSAPAR 640 658 F
Telephone: (1) 380.36.27

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ROCKWELL INTERNATIONAL
FLOW CONTROL DIVISION
400 N. Lexington Avenue
Pittsburgh, Pa. 15208
Cable Address: ROCKWL INT PGH
Telex: 866241
Telephone: (412) 247-3318

Representatives Throughout The World

Rockwell International

...where science gets down to business

Flow Control Division
400 North Lexington Avenue
Pittsburgh, Pennsylvania 15208

AA10M-4/81

Printed in U.S.A

4.7.5 Subcooler Water Isolation Valve

4.7.5.1 Identification

Tag Number	Description
V-CO-301-301	Subcooler Water Isolation Valve
V-CO-302-302	Subcooler Water Isolation Valve

4.7.5.2 Description

Manufacturer	:	Rockwell Edward, Pittsburg, Penn.
Part Number	:	4 inch Fig. 4016
Rocketdyne Specification No.	:	SP42-085 (following)
Material	:	Body: Carbon Steel
Weight	:	314 lb.

4.7.5.3 Prescribed Service

Water or Steam

4.7.5.4 Vendor

Rockwell Edward

4.7.5.5 Special Cautions

See Rockwell Edward Maintenance Manual V-377 RI (See paragraph 4.7.4.11)

4.7.5.6 Periodic Service

See Rockwell Edward Maintenance Manual V-377 RI (See paragraph 4.7.4.11)

4.7.5.7 Parts List

See Rockwell Edward Maintenance Manual V-377 RI (See paragraph 4.7.4.11)

4.7.5.8 Special Tools

See Rockwell Edward Maintenance Manual V-377 RI (See paragraph 4.7.4.11)

4.7.5.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-377 RI (See paragraph 4.7.4.11)

4.7.5.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-085
T. L. HYDE	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 1-24-80
E G Spencer 2/18/80		SUPERSEDES SPEC. DATED:
J G Absalom 2-18-80	SPECIFICATION	REV. LTR. / PAGE 1 of 2

TITLE

THERMAL STORAGE HEATER WATER ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THWIS-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	BUTTERFLY, GATE, OR GLOBE (IN LINE)
CONNECTIONS:	4 INCH RF FLANGE (ASTM A106 GRADE B, SCHEDULE 80 PIPE)
MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER, AND STEAM AT 1550 PSIG MAXIMUM AND 675 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	900 LB
CAPACITY:	Cv = 83 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F,

4.7.6 Flash Tank Steam Isolation Valve

4.7.6.1

Identification Tag Number	Description
V-CO-303-305	Flash Tank Steam Isolation Valve
V-CO-304-306	Flash Tank Steam Isolation Valve

4.7.6.2 Description

Manufacturer	: Rockwell Edward, Pittsburgh, Penn
Part Number	: 4 inch Fig. 1911 (WC6) Y
Rocketdyne Specification No.	: SP42-086 (following)
Material	: See stamping on valve body
Weight	: 225 lb.

4.7.6.3 Prescribed Service

Water and Steam

4.7.6.4 Vendor

Rockwell Edward

4.7.6.5 Special Cautions

See Rockwell Edward Maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.6.6 Periodic Service

See Rockwell Edward Maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.6.7 Parts List

See Rockwell Edward Maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.6.8 Special Tools

See Rockwell Edward Maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.6.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.6.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-086
T. L. HYDE	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation**	DATE 1-24-80
E G Spencer 2/18/80	**Rocketdyne Division**	SUPERSEDES SPEC. DATED:
J H Olsen 2-18-80	Canoga Park, California	REV. LTR.
	SPECIFICATION	PAGE 1 of 2

TITLE

THERMAL STORAGE FLASH TANK ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

NUMBER	REVISION LETTER	PAGE
SP42-086		2

TAG NUMBER:	TFWIS-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	4 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER, AND STEAM AT 1550 PSIG MAXIMUM AND 675 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	900 LB
CAPACITY:	Cv = 404 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.7 Flash Tank Water Isolation Valve

4.7.7.1 Identification

Tag Number	Description
V-CO-15-307	Flash Tank Water Isolation Valve

4.7.7.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	6 inch Fig. 318Y
Rocketdyne Specification NO.	:	SP42-080 (following)
Material	:	Body: Carbon Steel
Weight	:	278 lb.

4.7.7.3 Prescribed Service

Water

4.7.7.4 Vendor

Rockwell Edward, Pittsburgh, Penn.

4.7.7.5 Special Cautions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.7.4.11)

4.7.7.6 Periodic Service

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.7.4.11)

4.7.7.7 Parts List

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.7.4.11)

4.7.7.8 Special Tools

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.7.4.11)

4.7.7.9 Maintenance Instructions

See Rockwell Edward Maintenance Manual V-380 (See paragraph 4.7.4.11)

4.7.7.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-080
J. W. LEWELLEN	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation**	DATE 3-19-80
E C Spencer 3/25/80	**Rocketdyne Division**	SUPERSEDES SPEC. DATED: 1-24-80
J. G. Absalom 3/25/80	Canoga Park, California	REV. LTR. B
	SPECIFICATION	PAGE 1 of 2

TITLE

THERMAL STORAGE FLASH TANK ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

ø TAG NUMBER:	TFWIS AND TFSIS (COMPONENTS SHALL BE TAG IDENTIFIED)
ø TYPE:	GLOBE OR GATE (IN LINE)
ø CONNECTIONS:	6 INCH BUTTWELD TO ASTM A106 GRADE B, SCHEDULE 40 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
ø LINE FLUID:	WATER/STEAM AT 165 PSIG MAXIMUM AND 650 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ø ANSI RATING:	300 LB
ø CAPACITY:	Cv-400 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
ø	2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3-1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
	3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7 Manual Valves

4.7.8 Identification / Description

Tag No.	Butterfly
V-CO-(SCE)-1	Block Valve for LV-74D-2
V-CO-(SCE)-2	Block Valve for LV-74D-2
V-CO-(SCE)-3	Block Valve for LV-74B
V-CO-(SCE)-4	Block Valve for LV-74B

4.7.8.1 Description

Manufacturer: Lunkenheimer
Part No.: 4700

4.7.8.2 Maintenance Instructions

See following valve specification data sheet.

DIVISION USAGE					
MM	P	PP	SH	FI	SP
	X				

Stearns-Roger

Engineering Standard

ISSUED 10/14/76

REVISED 5/2/79

VALVE SPECIFICATION SHEET V102*

TYPE BUTTERFLY (TAPPED LUGS).

RATING 150 PSIG BUBBLE-TIGHT BI-DIRECTIONAL DEAD END SERVICE RATING AT 180°F MAXIMUM.**

ENDS TAPPED ANSI B1.1, UNC, TO FIT CLASS 125 ANSI B16.1 OR CLASS 150 ANSI B16.5 FLANGES.***

BODY SEMI-STEEL

BONNET ____________________

BODY & BONNET BOLTING ____________________

DISC BRONZE, OR STEEL WITH WELDED NICKEL EDGE.

STEM 316 SS WITH PERMANENT SELF-LUBRICATING CORROSION-RESISTANT BEARINGS AND 316 SS EXTERNAL SHEAR PINS.

SEAT BUNA-N OR HYCAR (MOLDED-IN).

SEALS (Or Packing) BUNA-N OR HYCAR.

OPERATOR 2" - 6": LEVER W/THROTTLING PLATE
8" - 20": ENCLOSED ROTARY SCREW TYPE ACTUATOR W/POSITION INDICATOR.
24" & LARGER: ENCLOSED WORM GEAR OPERATOR W/POSITION INDICATOR.

NOTES:
* THREE DIGIT DESIGNATION.
** CHECK MANUFACTUER'S RECOMMENDATIONS FOR HIGHER PRESSURE-TEMPERATURE SERVICE, AND VACUUM SERVICE.
*** CHECK FACE TO FACE DIMENSION. MAY NOT BE INTERCHANGEABLE.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	23N	2" - 12"	
DEMCO	SERIES NE	2" - 12"	
DEMCO	SERIES NF	14" - 24"	
DEZURIK	632L	2" - 20"	
GRINNELL	IWL-LUG	2" - 24"	
KEYSTONE	122	2" - 20"	
LUNKENHEIMER	4700	2" - 12"	
TRW MISSION	3100	2" - 12"	
	4100	14" - 20"	

CUSTOMER	VALVE NUMBER V102*
ORDER NO.	

FORM 20-40

4.7.13 CP #9 Furnished Valves

4.7.13.1 <u>Identification</u>

The following manual valves were furnished by the Waldinger Corp. CP #9.

4.7.13.2 <u>Description of Information</u>

These sheets include Stearns-Roger Valve specification and the applicable catalog cut sheet from the vendor.

VALVE SPECIFICATION SHEET V410*

ISSUED 6/1/76
REVISED 8/1/79

TYPE	GATE.
RATING	CLASS 150, ANSI B16.5.
ENDS	FLANGED, RF, CLASS 150, ANSI B16.5.
BODY	316 SS, ASTM A351, GR. CF8M OR A182, GR. F316.
BONNET	(BOLTED) ASTM A351, GR. CF8M OR A182, GR. F316.
BODY & BONNET BOLTING	ASTM A193, GR. B8M (316 SS).
DISC	316 SS, ASTM A182, GR. F31, DOUBLE WEDGE.
STEM	316 SS, ASTM A182, GR. F316, OS & Y.
SEAT	316 SS, INTEGRAL.
SEALS (Or Packing)	TEFLON.
OPERATOR	HANDWHEEL.

*THREE DIGIT DESIGNATION

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	61276	1/2" - 8"	
JENKINS	1327RF	1/2" - 8"	
PACIFIC	8550-12	1/2" -12"	
POWELL	2495A	1/4" - 2"	
STOCKHAM	15-OF(316 RF)	1/2" - 6"	

CUSTOMER

ORDER NO.

VALVE NUMBER V410*

FORM 40

Design Data and Features:

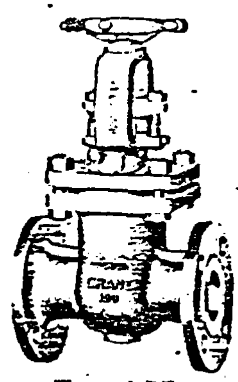
- Patented split-wedge disc has dual halves which rotate to eliminate galling, seizing and premature wearing of seat surface.
- Two-piece packing gland equalizes the loading on TFE packing.
- All valves have TFE packing and TFE gaskets.
- These valves are regularly furnished in the stainless steel indicated adjacent to the Catalog number, but also are available in other austenitic stainless steels.
- Valves comply with applicable requirements of ANSI B16.5, ANSI B16.10, ANSI B16.34, API 603, and MSS SP-42.
- Socket welding end valves will regularly be furnished as threaded bodies with ends bored for socket welding, unless otherwise specified.
- Butt welding end valves are available on special order.
- Valves 1¼" and larger will be tapped at the bottom boss and fitted with a plug for drain or flushing connection when specified.
- Valves can be furnished with by-passes when ordered.
- Stainless steel drip shields and plastic splatter shields are available.

CRANE

GATE VALVE CLASS 150 ½" to 8"

OS&Y Bolted Bonnet

Split Wedge Disc



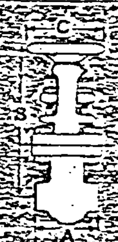
Flanged, RF

Pressure-Temperature Rating
Stainless Steel ASTM A351 Grade CF-8M
275 psi @–20F to 100F

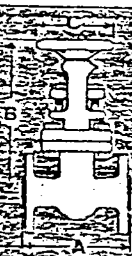
See page 5 for ratings of other materials and temperatures

Catalog Numbers	Body Material	Body Ends
L 61270 & L 61270-AL	CF-3M	Threaded
L 61273 & L 61273-AL	CF-3M	Socket weld
61275 & 61275-AL	CF-8M	Flanged, FF
→ 61276 & 61276-AL	CF-8M	Flanged, RF
21270 & 21270-AL	CN-7M	Threaded
21275 & 21275-AL	CN-7M	Flanged, FF
21276 & 21276-AL	CN-7M	Flanged, RF

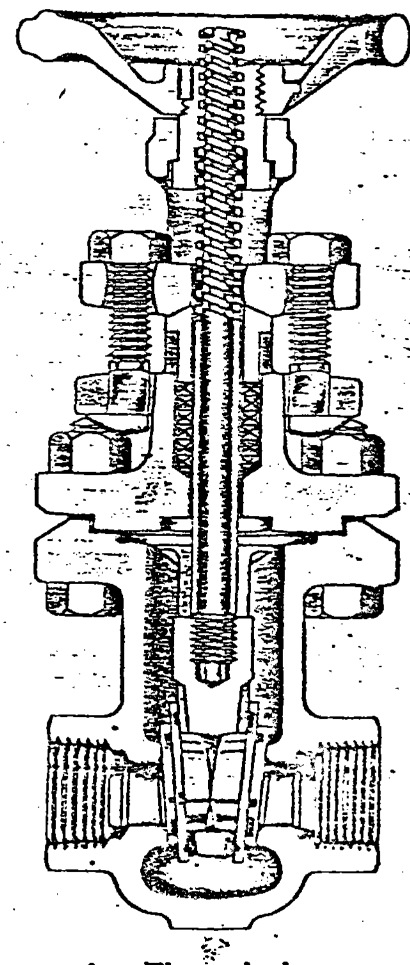
FF abbreviation means Flat Faced. RF abbreviation means Raised Face.



Weights and Dimensions



Valve N.P.S.	Weight—Pounds: Threaded & Socket Weld	Weight—Pounds: Flanged	Dimensions—Inches: A Threaded & Socket Weld	Dimensions—Inches: A Flanged	B	C
½	4.5	6.5	2.62	4.25	6.50	3.0
¾	5.7	8.2	2.88	4.62	7.50	3.5
1	8.1	11.6	3.25	5.00	9.00	4.0
1¼	17.6	—	4.25	—	12.00	5.0
1½	17.6	22.3	4.25	6.50	12.00	5.0
2	23.6	33.0	4.50	7.00	13.50	5.0
2½	—	45.4	—	7.50	15.50	7.0
3	—	62.5	—	8.00	18.00	8.0
4	—	93.0	—	9.00	23.00	9.0
6	—	167.0	—	10.50	31.25	10.0
8	—	280.0	—	11.50	38.88	12.0



Threaded

Engineering Standard

(NC) 1/6/81

VALVE SPECIFICATION SHEET V492*

ISSUED 10/14/76

REVISED

TYPE	GATE.
RATING	CLASS 150, ANSI B16.5.
ENDS	SOCKET WELD, ANSI B16.11.
BODY	316L SS, ASTM A351, GR. CF3M, OR A182, GR. F316L.
BONNET	(BOLTED) 316 SS, ASTM A351, GR. CF8M OR A182, GR. F316.
BODY & BONNET BOLTING	ASTM A193, GR. B8M (316 SS).
DISC	316 SS, ASTM A182, GR. F316, DOUBLE WEDGE.
STEM	316 SS, ASTM A182, GR. F316, OS & Y.
SEAT	INTEGRAL.
SEALS (Or Packing)	TEFLON.
OPERATOR	HANDWHEEL.

* THREE DIGIT DESIGNATION.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
ALOYCO/WALWORTH	114	1/2" - 2"	
PACIFIC	S-8552	1/2" - 2"	
POWELL	2494A-SWE	1/4" - 2"	
STOCKHAM	15-OSW(316)	1/2" - 2"	

CUSTOMER

ORDER NO.

VALVE NUMBER V492*

FORM 40

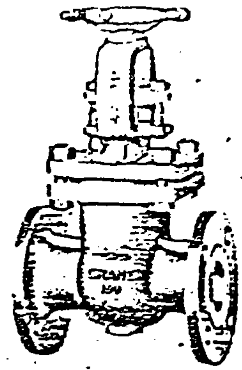
Design Data and Features:

- Patented split-wedge disc has dual halves which rotate to eliminate galling, seizing and premature wearing of seat surface.
- Two-piece packing gland equalizes the loading on TFE packing.
- All valves have TFE packing and TFE gaskets.
- These valves are regularly furnished in the stainless steel indicated adjacent to the Catalog number, but also are available in other austenitic stainless steels.
- Valves comply with applicable requirements of ANSI B16.5, ANSI B16.10, ANSI B16.34, API 603, and MSS SP-42.
- Socket welding end valves will regularly be furnished as threaded bodies with ends bored for socket welding, unless otherwise specified.
- Butt welding end valves are available on special order.
- Valves 1¼" and larger will be tapped at the bottom boss and fitted with a plug for drain or flushing connection when specified.
- Valves can be furnished with by-passes when ordered.
- Stainless steel drip shields and plastic splatter shields are available.

GATE VALVE CLASS 150 ½" to 8"

OS&Y Bolted Bonnet

Split Wedge Disc



Flanged, RF

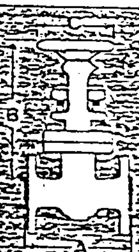
Pressure-Temperature Rating
Stainless Steel ASTM A351 Grade CF-8M
275 psi @–20F to 100F

See page 5 for ratings of other materials and temperature

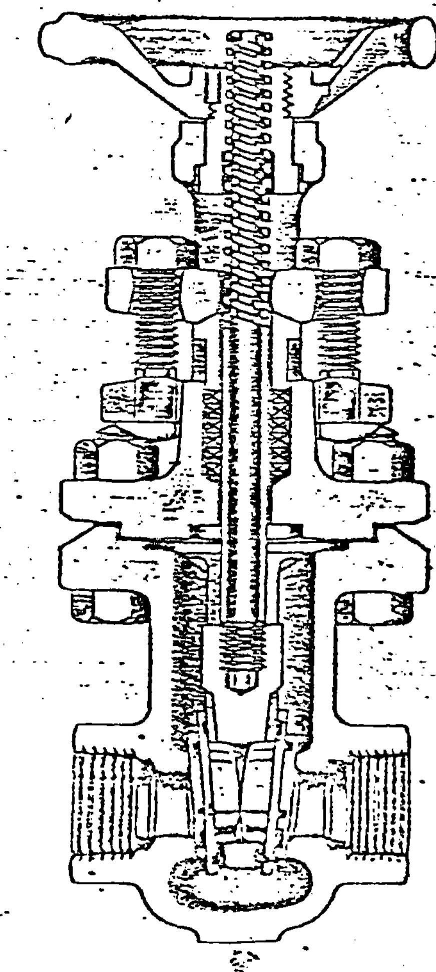
Catalog Number	Body Material	Body Ends
L 61270 & L 61270-AL	CF-3M	Threaded
→ L 61273 & L 61273-AL	CF-3M	Socket weld
61275 & 61275-AL	CF-8M	Flanged, FF
61276 & 61276-AL	CF-8M	Flanged, RF
21270 & 21270-AL	CN-7M	Threaded
21275 & 21275-AL	CN-7M	Flanged, FF
21276 & 21276-AL	CN-7M	Flanged, RF

FF abbreviation means Flat Faced. RF abbreviation means Raised Face.

Weights and Dimensions



Valve N.P.S.	Weight—Pounds: Threaded & Socket Weld	Weight—Pounds: Flanged	Dimensions—Inches: A: Threaded & Socket Weld	Dimensions—Inches: A: Flanged	B	C
½	4.5	6.5	2.62	4.25	6.50	3.0
¾	5.7	8.2	2.88	4.62	7.50	3.5
1	8.1	11.6	3.25	5.00	9.00	4.0
1¼	17.6	—	4.25	—	12.00	5.0
1½	17.6	22.3	4.25	6.50	12.00	5.0
2	23.6	33.0	4.50	7.00	13.50	5.0
2½	—	45.4	—	7.50	15.50	7.0
3	—	62.5	—	8.00	18.00	8.0
4	—	93.0	—	9.00	23.00	9.0
6	—	167.0	—	10.50	31.25	10.0
8	—	280.0	—	11.50	38.88	12.0



Threaded

4.7.13-6

| X | | | | |

Engineering Standard

1/6/81

VALVE SPECIFICATION SHEET V577*

ISSUED 10/14/76
REVISED

TYPE	GLOBE.
RATING	CLASS 150, ANSI B16.5.
ENDS	SOCKET WELD, ANSI B16.11.
BODY	316L SS, ASTM A351, GR. CF3M OR A182, GR. F316L.
BONNET	(BOLTED) 316 SS, ASTM A351, GR. CF8M OR A182, GR. F316.
BODY & BONNET BOLTING	ASTM A193, GR. B8M (316 SS).
DISC	316 SS, ASTM A182, GR. F316 (PLUG TYPE).
STEM	316 SS, ASTM A182, GR. F316. OS & Y.
SEAT	316 SS, INTEGRAL.
SEALS (Or Packing)	TEFLON.
OPERATOR	HANDWHEEL.

*THREE DIGIT DESIGNATION.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
ALOYCO/WALWORTH	314	1/2" - 2"	
PACIFIC	S-702	1/2" - 1 1/2"	
POWELL	2474A-SWE	1/4" - 3"	
STOCKHAM	15 GPSW-(316)	1/2" - 2"	

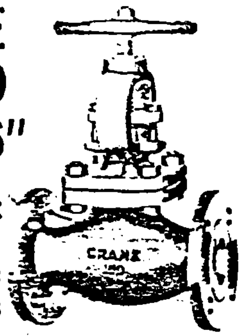
CUSTOMER

ORDER NO.

4.7.13-6

VALVE NUMBER V577*

GLOBE VALVE CLASS 150 ½" to 6"



Flanged, RF

OS&Y Bolted Bonnet

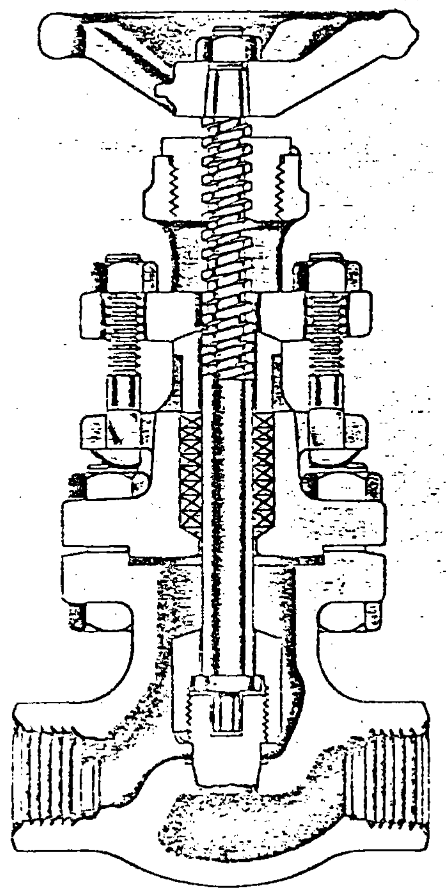
Plug Type Disc
Metal-to-Metal Seats

Pressure-Temperature Rating
Stainless Steel ASTM A351 Grade CF-8M
275 psi @–20F to 100F

See page 5 for ratings of other materials and temperatures

Design Data and Features:

- Exclusive tapered plug provides easy seating of narrow ball to flat seats—reduces chatter under high velocities—minimizes wear, erosion and corrosion.
- Long stem guides disc squarely into the seat—applies stem thrust close to seating surface for positive closure.
- Two-piece packing gland equalizes the loading on TFE packing.
- Easy-to-read indicator is available when specified.
- Outside stem threads are free from damage by corrosion and sediment in line fluids.
- Integral seats eliminate possibility of leak path behind seat rings.
- These valves are regularly furnished in the stainless steel indicated adjacent to the Catalog number, but also are available in other austenitic stainless steels.
- These valves comply with the applicable requirements of ANSI B16.5, ANSI B16.10, ANSI B16.34, and MSS SP-42.
- Socket welding end valves will regularly be furnished as threaded bodies with ends bored for socket welding, unless otherwise specified.
- Butt welding end valves are available on special order.
- Stainless steel drip shields and plastic splatter shields are available.

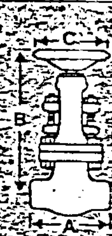


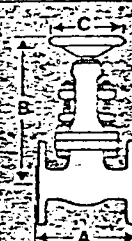
Threaded

Catalog Number	Body Material	Body Ends
L 61370 & L 61370-GL	CF-3M	Threaded
→ L 61373 & L 61373-GL	CF-3M	Socket weld
61375 & 61375-GL	CF-8M	Flanged, FF
61376 & 61376-GL	CF-8M	Flanged, RF
21370 & 21370-GL	CN-7M	Threaded
21375 & 21375-GL	CN-7M	Flanged, FF
21376 & 21376-GL	CN-7M	Flanged, RF

FF abbreviation means Flat Faced. RF abbreviation means Raised Face.

Weights and Dimensions





Valve N.P.S.	Weight—Pounds		Dimensions—Inches			
			A			
	Threaded & Socket Weld	Flanged	Threaded & Socket Weld	Flanged	B	C
½	4.5	6.3	3.38	4.25	6.50	3.0
¾	5.8	7.5	3.75	4.62	8.00	3.5
1	7.0	9.4	4.25	5.00	8.38	3.5
1¼	15.0	—	5.50	—	10.25	5.0
1½	15.0	18.4	5.50	6.50	10.25	5.0
2	22.0	30.0	6.50	8.00	12.00	6.0
2½	—	46.0	—	8.50	13.50	8.0
3	—	62.0	—	9.50	14.88	9.0
4	—	97.0	—	11.50	17.62	10.0
6	—	183.0	—	16.00	19.75	12.0

Engineering Standard

(NC) 1/6/80

C-101	VALVE SPECIFICATION SHEET V2020	ISSUED 7/20/71 REVISED 10/28/75

TYPE CHECK, SWING.

RATING 200# @ 100° F.

ENDS THREADED, ANSI B2.1, NPT.

BODY BRONZE, ASTM B61 OR B62.

BONNET (CAP, THREADED) BRONZE, ASTM B61 OR B62.

BODY & BONNET BOLTING ———

DISC BRONZE, RENEWABLE.

STEM ———

SEAT INTEGRAL, BRONZE.

SEALS (Or Packing) ———

OPERATOR ———

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
HAMMOND	IB940	1/4" - 3"	
JENKINS	92A	1/4" - 3"	
JENKINS (CANADA)	92	1/4" - 3"	
KENNEDY	440	1/4" - 3"	
LUNKENHEIMER	2144	3/8" - 3"	
MILWAUKEE	509M	1/4" - 3"	
POWELL	578	1/4" - 3"	
STOCKHAM	B-319	1/4" - 3"	
WALWORTH	406	1/4" - 3"	

CUSTOMER

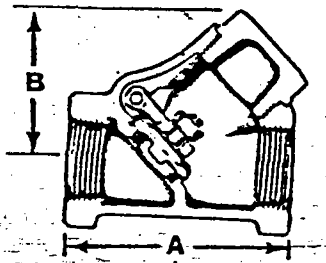
ORDER NO.

VALVE NUMBER V2020

FORM 40

SWING CHECK VALVE CLASS 200 ¼" to 3"

Temp. F.	Psi Non-Shock
−20 to 150°	400
200	375
250	350
300	325
350	300
400	275
450	250
500	225
550	200



Y Pattern Regrinding

No. 36, Threaded

Design Data and Features

- Excellent for use on steam lines and non-shock water, or gas service.
- Y pattern body design provides for minimum pressure d: due to full area flow opening.
- Valve can be reground without removing body from line.
- Install horizontally, or vertically for upward flow, but alwa with pressure under the disc. An arrow cast on the body in cates correct direction of flow.
- Conforms to MSS SP-80 and Military Spec MIL-V-184: Style A, Type III valves and with material and design r quirements of Federal Spec WW-V-51d, Class C, Type valves.

PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Cap	All	Bronze	B61
Hinge	All	Bronze	B61
Disc	¼"-¾"	Brass	B16 Alloy 360
	1"-3"	Bronze	B61

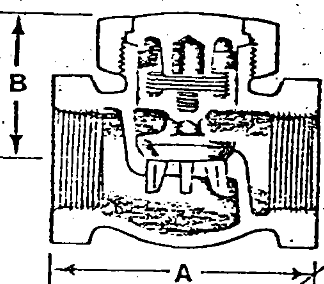
Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches A	B
¼	0.6	2.12	1.50
⅜	0.6	2.12	1.50
½	0.8	2.50	1.75
¾	1.4	3.00	2.12
1	2.4	3.75	2.50
1¼	3.6	4.25	3.00
1½	5.6	5.00	3.50
2	9.2	6.00	4.25
2½	14.5	6.88	5.00
3	23.0	8.12	6.00

CRANE LIFT CHECK VALVE CLASS 300 ¼" to 3"

RATINGS Non-Shock

Temp. F.	Psi ¼"-2"	Psi 2½"-3"
−20-150°	1000	600
200	920	560
250	830	525
300	740	490
350	650	450
400	560	410
450	480	375
500	390	340
550	300	300



No. 366E Threaded

Design Data and Features:

- Proven dependable on general services for steam and non shock water, oil, or gas lines.
- Features a piston type disc which is especially suited fo services where pulsations in line are apt to cause an ordi nary check valve to hammer. Designed with dashpot above the disc to provide an effective cushion.
- Can be reground without removing body from line. To fa cilitate regrinding, the top of the disc is tapped with pipe threads so a nipple can be inserted.
- Complies with MSS SP-80.

PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Disc	All	Bronze	B61
Cap	¼"-½"	Brass	B16 Alloy 360
	¾"-3"	Bronze	B61

Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches A	B
¼	0.4	1.82	1.00
⅜	0.6	2.00	1.12
½	0.9	2.50	1.38
¾	1.5	2.94	1.88
1	2.6	3.50	2.00
1¼	4.2	4.06	2.38
1½	5.4	4.62	2.62
2	10.8	5.75	3.25
2½	15.6	6.88	3.88
3	24.0	8.00	4.50

1/6/81

ISSUED 7/20/71
REVISED 10/28/75

C-101 VALVE SPECIFICATION SHEET V2022

TYPE ✓ CHECK, SWING. (Y-PATTERN).

RATING ✓ 400# @ 100° F.

ENDS ✓ THREADED, ANSI B2.1, NPT.

BODY ✓ BRONZE, ASTM B61 OR B62.

BONNET ✓ (CAP, THREADED) BRONZE, ASTM B61 OR B62.

BODY & BONNET BOLTING ________

DISC ✓ BRONZE

STEM ________

SEAT ✓ INTEGRAL, REGRINDING.

SEALS (Or Packing) ________

OPERATOR ________

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG NO.	SIZE RANGE	REMARKS
CRANE	36	1/4" - 3"	
ITT GRINNELL	3350	1/4" - 2"	
HAMMOND	IB949	1/4" - 3"	RENEWABLE DISC.
JENKINS	762A	1/4" - 3"	CONVENTIONAL PATTERN
JENKINS (CANADA)	449	1/4" - 3"	CONVENTIONAL PATTERN
LUNKENHEIMER	554Y	1/4" - 3"	RENEWABLE DISC.
POWELL	560Y	1/4" - 3"	
STOCKHAM	B-345	1/4" - 2"	
WALWORTH	420	1/4" - 3"	

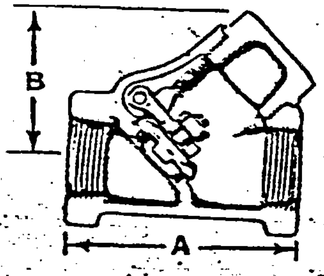
OK

CUSTOMER

ORDER NO. VALVE NUMBER V2022

SWING CHECK VALVE CLASS 200 ¼" to 3"

	Non-Shock
−20 to 150°	400
200	375
250	350
300	325
350	300
400	275
450	250
500	225
550	200



Y Pattern Regrinding

No. 36, Threaded

Design Data and Features

- Excellent for use on steam lines and non-shock water or gas service.
- Y pattern body design provides for minimum pressure d due to full area flow opening.
- Valve can be reground without removing body from line
- Install horizontally, or vertically for upward flow, but alw with pressure under the disc. An arrow cast on the body i cates correct direction of flow.
- Conforms to MSS SP-80 and Military Spec MIL-V-184 Style A, Type III valves and with material and design quirements of Federal Spec WW-V-51d, Class C, Type valves.

PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Cap	All	Bronze	B61
Hinge	All	Bronze	B61
Disc	¼"-¾"	Brass	B16 Alloy 360
	1"-3"	Bronze	B61

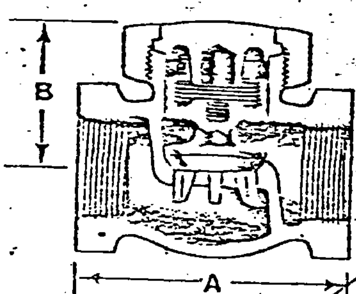
Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches A	B
¼	0.6	2.12	1.50
⅜	0.6	2.12	1.50
½	0.8	2.50	1.75
¾	1.4	3.00	2.12
1	2.4	3.75	2.50
1¼	3.6	4.25	3.00
1½	5.6	5.00	3.50
2	9.2	6.00	4.25
2½	14.5	6.88	5.00
3	23.0	8.12	6.00

CRANE LIFT CHECK VALVE CLASS 300 ¼" to 3"

RATINGS Non-Shock

Temp. F.	Psi ¼"-2"	Psi 2½"-3"
−20-150°	1000	600
200	920	560
250	830	525
300	740	490
350	650	450
400	560	410
450	480	375
500	390	340
550	300	300



No. 366E Threaded

Design Data and Features:

- Proven dependable on general services for steam and nor shock water, oil, or gas lines.
- Features a piston type disc which is especially suited fc services where pulsations in line are apt to cause an ord nary check valve to hammer. Designed with dashpot abov the disc to provide an effective cushion.
- Can be reground without removing body from line. To fa cilitate regrinding, the top of the disc is tapped with pip threads so a nipple can be inserted.
- Complies with MSS SP-80.

PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Disc	All	Bronze	B61
Cap	¼"-½"	Brass	B16 Alloy 360
	¾"-3"	Bronze	B61

Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches A	B
¼	0.4	1.82	1.00
⅜	0.6	2.00	1.12
½	0.9	2.50	1.38
¾	1.5	2.94	1.88
1	2.6	3.50	2.00
1¼	4.2	4.06	2.38
1½	5.4	4.62	2.62
2	10.8	5.75	3.25
2½	15.6	6.88	3.88
3	24.0	8.00	4.50

Schlumberger
Engineering Standard

(NC) 1/6/81

C-101 VALVE SPECIFICATION SHEET V2055

ISSUED 07/21/71
REVISED 10/28/75

TYPE ✓ CHECK, SWING.

RATING ✓ 200# @ 100° F.

ENDS ✓ SOLDER JOINT. ANSI B16.18.

BODY ✓ BRONZE - ASTM B61 OR B62.

BONNET ✓ (CAP, THREADED) BRONZE, ASTM B61 OR B62.

BODY & BONNET BOLTING ________

DISC ✓ BRONZE, RENEWABLE.

STEM ________

SEAT ✓ INTEGRAL. BRONZE.

SEALS (Or Packing) ________

OPERATOR ________

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	1342	1/2" - 3"	
ITT GRINNELL	3300 SJ	3/8" - 2"	
HAMMOND	1B941	3/8" - 3"	
JENKINS	1222	3/8" - 3"	
JENKINS (CANADA)	92P	3/8" - 3"	
LUNKENHEIMER	2145	1/2" - 2"	
POWELL	1825	1/2" - 2"	
STOCKHAM	B-309	3/8" - 2"	
WALWORTH	406 SJ	3/8" - 2"	
MILWAUKEE	1509	3/8" - 2"	

OK

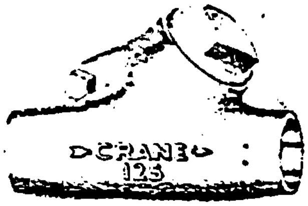
CUSTOMER

ORDER NO. 4.7.13-12

VALVE NUMBER V2055

FORM 40

CRANE SWING CHECK VALVE 1/4" to 3"



No. 1342

Y Pattern ■ Screwed Cap
No. 37, Threaded, Bronze Disc
Class 125

Composition Disc
No. 41, Threaded
200 psi @ 200 F Non-Shock Water

Bronze Disc
→ No. 1342, Solder Joint
125 psi Steam or
200 psi @ 200 F Non-Shock Water

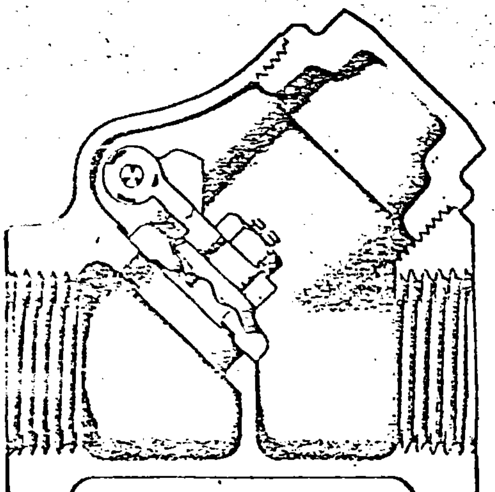
- No. 37 has threaded ends and a bronze disc. Recommended for non-shock water, oil or gas. Can be reground while the valve remains in the line.
- No. 41 has threaded ends and a composition disc, rated for 200 psi non-shock cold water, oil or gas. With its composition disc the valve is an excellent choice where maintenance and minimum down time is a requirement.
- **No. 1342 has solder-joint ends with a bronze disc. It is identical to No. 37 in all other respects. It is recommended for 125 psi saturated steam, and 200 psi non-shock cold water.**
- **Valves are of the compact Y-pattern body design with integral seat, two-piece hinge disc construction, and free-to-rotate disc.**
- **Installation in vertical or horizontal position is permissible. Always install with pressure under the disc.**
- **An arrow cast on the side of the body indicates the correct direction of flow.**
- **All valves comply with material and design requirements of Military Spec MIL-V-18436, Style A Type III valves, and Federal Spec WW-V-51d Class A, Type IV valves.**
- **Solder-joint end valves comply with ANSI B16.18.**
- **All valves comply with MSS SP-80.**
- **Caution:** Before installing solder-joint valves, be sure solder or brazing alloy melting point is high enough to withstand line pressure and temperature conditions and is compatible with fluid media.

RATINGS No. 37

Temp. F.	Psi Non-Shock
−20 to 150°	200
200	185
250	170
300	155
350	140
406	125
450	120

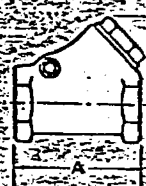
PRINCIPAL PARTS & MATERIALS

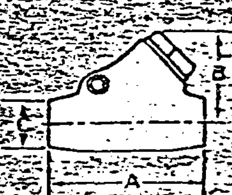
Part	Sizes	Material	ASTM
Body	All	Bronze	B62
Cap	All	Bronze	B62
Disc #41	All	Composition	—
Disc #37 & #1342	1/4"–3/4"	Brass	B16 Alloy 360
	1"–3"	Bronze	B62



No. 37

Weights and Dimensions





Valve N.P.S.	Weight—Pounds 37	41	1342	Dimensions—Inches 37 & 41 A	37 & 41 B	1342 A	1342 B	1342 C	1342 DoB
1/4	0.5	0.5	—	1.94	1.50	—	—	—	—
3/8	0.5	0.5	—	1.94	1.50	—	—	—	—
1/2	0.6	0.6	0.6	2.18	1.62	2.68	1.62	5/8	.54
3/4	1.0	1.0	1.0	2.75	2.00	3.62	2.00	7/8	.78
1	1.8	1.8	1.8	3.18	2.50	4.25	2.50	1 1/8	.90
1 1/4	2.4	2.4	3.0	3.82	3.00	4.82	3.00	1 3/8	.96
1 1/2	3.5	3.5	3.5	4.32	3.50	5.56	3.50	1 5/8	1.10
2	5.5	5.5	5.9	5.12	4.00	6.88	4.00	2 1/8	1.34
2 1/2	9.0	—	9.0	6.12	4.75	7.75	4.75	2 5/8	1.46
3	13.5	—	14.2	7.25	5.62	9.18	5.62	3 1/8	1.66

DoB—Depth of Bore. 4.7.13-13

MM	P	PP	SH	FI	SP

Stearns-Roger
Engineering Standard

NC 1/6/80

C-101	VALVE SPECIFICATION SHEET V2160	ISSUED 7/22/71 REVISED 10/28/75

TYPE CHECK, SWING. ✓

RATING ANSI 125# ANSI B16.1 ✓

ENDS FLANGED, F.F., 125# ANSI B16.1. ✓

BODY IRON, ASTM A126, CLASS A OR B. ✓

BONNET (CAP, BOLTED) IRON, ASTM A126, CLASS A OR B. ✓

BODY & BONNET BOLTING ASTM A307, GR. B. ✓

DISC BRONZE, RENEWABLE. ✓

STEM ______________

SEAT BRONZE, RENEWABLE. ✓

SEALS ______________
(Or Packing)

OPERATOR ______________

TO CONFORM TO ANSI B16.10. ✓

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
ITT GRINNELL	6300	2" - 6"	
CRANE	373	2" - 14"	
HAMMOND	IR1124	2" - 12"	
JENKINS	624	2" - 12"	
JENKINS (CANADA)	587	2" - 14"	
LUNKENHEIMER	1790	2" - 12"	
MILWAUKEE	2974	2" - 12"	
POWELL	559	2" - 14"	
STOCKHAM	G931	2" - 8"	
WALWORTH	8928F	2" - 10"	
WALWORTH	928F	12" - 14"	

CK

CUSTOMER	
ORDER NO. 4.7.13-14	VALVE NUMBER V2160

FORM 40

Design Data and Features:

Bronze trim valves are for steam, water, non-corrosive oil and gas and other fluids that do not corrode bronze.

All iron valves are for gases, oils and other fluids not corrosive to iron.

Valves may be installed in horizontal or vertical pipe lines. In vertical lines, or any angle from horizontal, they can be used for upward flow only.

Body and cap are Ferrosteel which conforms to ASTM A126, Class B Standards. This is a high grade cast iron. Sizes 18" and larger are ASTM A126, Class C cast iron designated as High Tensile Iron.

Body is designed to provide ample flow area around disc when wide open. Disc cannot stick in open position. Tapped and plugged opening in each of two bosses on body provide easy access to either end of hinge and also simplify field changeover to lever and weight operation.

In bronze trim valves, disc is solid bronze in sizes 6" and smaller and bronze-faced iron in larger sizes. All have replaceable bronze seat rings, hinge-pin and bushings.

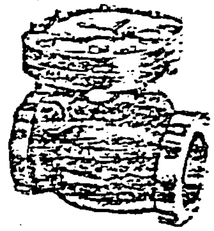
Seating surfaces in all iron valves are cast integral with the body and disc. Hard wearing Exelloy hinge-pin is supported by an iron bushing at each end of the valve body.

Design prohibits galling or scoring of seating surfaces because the disc meets the flat seat squarely on closing with no rubbing action.

Flanged valves conform to applicable requirements of ANSI B16.10 and B16.1 for Class 125 cast iron swing check valves. All flanges are plain faced, with a smooth finish.

All valves conform to MSS-SP 71.

CRANE SWING CHECK VALVE CLASS 125 • 2" to 24"



RATINGS

Temp. F.	Psi, Non-Shock		
	Sizes 2-12"	Sizes 14,16"	Sizes 18-24"
−20 to 150*	200	150	150
200	190	145	135
225	180	140	130
250	175	140	125
275	170	135	120
300	165	130	110
325	155	130	105
350	150	125*	100
375	145	....	...
400	140	....	...
425	130	....	...
450	125	....	...

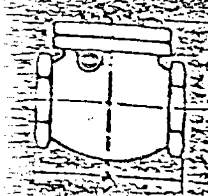
*Maximum is 125 psi saturated steam (353 F.).

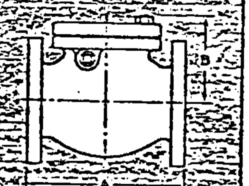
Bolted Cap

Bronze Trim
No. 372, Threaded
No. 373, Flanged

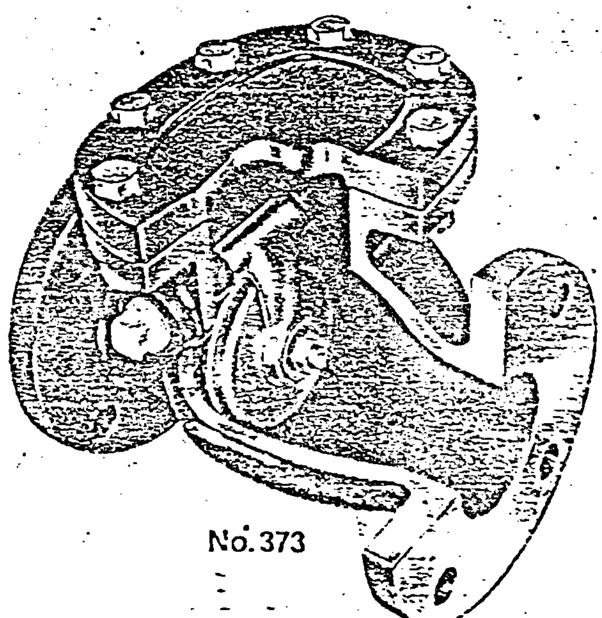
All Iron
No. 372½, Threaded
No. 373½, Flanged

Weights and Dimensions





Valve I.P.S.	Weight—Pounds				Dimensions—Inches		
	372	372½	373	373½	Threaded A	Flanged A	B
2	[illegible]	18	25	25	6.12	8.00	4.50
2½	22	—	34	34	7.25	8.50	5.38
3	29	29	44	44	8.00	9.50	5.88
4	54	54	75	75	9.25	11.50	6.62
5	—	—	103	—	—	13.00	7.75
6	—	—	127	127	—	14.00	8.25
8	—	—	230	230	—	19.50	10.25
10	—	—	440	440	—	24.50	12.00
12	—	—	660	660	—	27.50	13.75
[illegible]	—	—	960	—	—	31.00	16.00
[illegible]	—	—	1420	—	—	36.00	18.00
18	—	—	1575	—	—	36.00	17.50
20	—	—	2170	—	—	40.00	19.50
24	—	—	3000	—	—	48.00	20.50



No. 373

4.7.13-15

Stearns-Roger

Engineering Standard

(NC) 1/6/81

C-101	VALVE SPECIFICATION SHEET	V2163	ISSUED 10/11/71 REVISED 10/20/78

TYPE CHECK, SWING.

RATING 175# WATER.

ENDS FLANGED, F.F., 125# ANSI B16.1.

BODY CAST IRON, ASTM A126, CLASS B.

BONNET (CAP) BOLTED. CAST IRON, ASTM A126, CLASS B.

BODY & BONNET BOLTING ASTM A307, GR. B

DISC BRONZE, ASTM B62.

STEM ______

SEAT BRONZE, ASTM B62.

SEALS (Or Packing) ______

OPERATOR ______

UNDERWRITERS LISTED & FACTORY MUTUAL APPROVED

CHECK FACE TO FACE DIMENSION. MAY NOT BE INTERCHANGEABLE

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

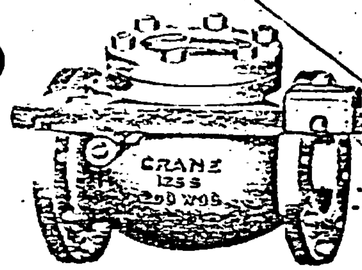
MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	375	2-1/2"-10"	
DRESSER MFG. CO.	M&H #250F	2-1/2"-14"	(14", 150# WATER)
EDDY-IOWA	F-5347	4" - 12"	
KENNEDY	126	2-1/2"-12"	
MUELLER	A-2120-6	2-1/2"-14"	(14", 150# WATER)
NIBCO	908-B	2-1/2"-12"	
STOCKHAM	G-939	2-1/2"-12"	
WALWORTH	8883F	2-1/2"-12"	

CUSTOMER 4.7.13-16

ORDER NO.

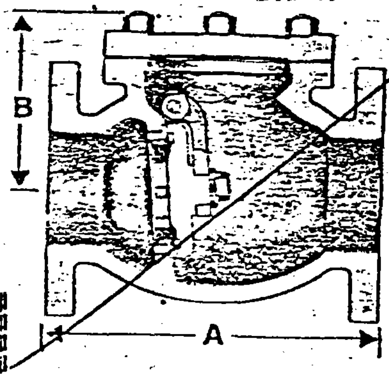
VALVE NUMBER: V2163

SWING CHECK VALVE CLASS 125 • 2" to 12"



Bolted Cap
Bronze Trim
Outside Lever & Weight
No. 383, Flanged

- Recommended where quick action is necessary to avoi sudden reversal of flow in steam, water and non-corrosiv oil and gas lines and other services with fluids not cor rosive to bronze.
- Weight can be installed to balance the disc when applica tions require that it open under minimum pressure. Posi tioning and setting of lever and weight are easily accom plished in field. Lever can be rotated through 360° and i adjustable in 15° increments.
- Valves may be installed in horizontal or vertical pipe lines They can also be furnished for downward flow, or fo angular lines, provided sound engineering practices arc not violated.
- For installations where outside levers are not practical, use Crane tilting disc check valves shown on pages 30 and 31
- Body, cap and all internal parts are identical with No. 37: swing check valves shown on page 25. In No. 383, the Exelloy hinge-pin extends out of one side of the body through a special stuffing box.
- Valves agree with applicable requirements of ANSI B16.1 and B16.10. Flanges are plain faced, with a smooth finish.



RATINGS

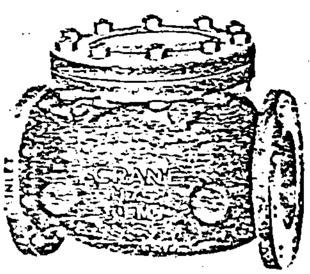
Temp. F.	Psi, Non-Shock
-20 to 150°	200
200	190
225	180
250	175
275	170
300	165
325	155
350	150
375	145
400	140
425	130
450	125

Weights and Dimensions

Valve N.P.S.	Weight Pounds	Dimensions Inches		Valve N.P.S.	Weight Pounds	Dimensions Inches	
	383	A	B		383	A	B
2	30	8.00	4.50	6	137	14.00	8.25
2½	40	8.50	5.38	8	240	19.50	10.25
3	54	9.50	5.88	10	475	24.50	12.00
4	85	11.50	6.62	12	710	27.50	13.75

CRANE U/L LISTED SWING CHECK VALVE 2½" to 10"

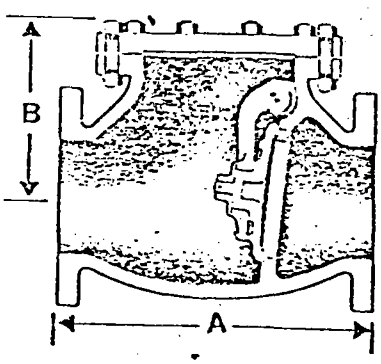
FD



Bolted Cap
Bronze Trim
No. 375, Flanged ←
175 CWP

Design Data and Features:

- Designed especially for fire protection service. Listed by Underwriters' Laboratories, Inc., and Factories Mutual Laboratories.
- Valves may be installed horizontally or vertically for up-ward flow but are not recommended for "interconnection service".
- Ferrosteel body and cap are high grade cast iron conforming to ASTM A126, Class B.
- Disc is solid bronze in sizes 6" and smaller and bronze-faced iron in 8" and 10" with a bronze collar where it engages the hinge. For the 8" and 10" sizes, the hinge is malleable iron with a bronze hinge-pin bushing and disc-hub bushing. Replaceable seat ring and hinge-pin are bronze.
- Plain faced, smooth finished end flanges conform to ANSI B16.1, Class 125 requirements.



Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches	
	375	A	B
2½	60	10.00	6.25
3	71	11.00	6.75
4	113	13.00	7.50
6	193	16.00	9.25
8	310	18.00	11.25
10	504	22.00	13.50

4.7.13-17

Engineering Standard

(NC) 1/6/81

C-101	VALVE SPECIFICATION SHEET V2275	ISSUED 7/22/71 REVISED 10/28/75

TYPE CHECK, SWING.

RATING CLASS 150, ANSI B16.5.

ENDS FLANGED, R.F., CLASS 150, ANSI B16.5.

BODY STEEL, ASTM A216, GR. WCB OR ASTM A105.

BONNET (CAP, BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.

BODY & BONNET BOLTING ASTM A193 GR. B7.

DISC 13% CR. S.S.

STEM ______

SEAT 13% CR. S.S., RENEWABLE.

SEALS (Or Packing) ______

OPERATOR ______

TO CONFORM TO ANSI B16.10 AND, WHERE APPLICABLE, TO API 600.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	147X	2" - 14"	
JENKINS	1025B-2	2" - 12"	
KEROTEST	371D	1 1/2" - 14"	
LUNKENHEIMER	1572-C	1 1/2" - 10"	
LUNKENHEIMER (CANADA)	1759-2	2" - 12"	
PACIFIC	180-1	1 1/2" - 14"	
PERSTA (CANADA)	6561.1A	2" - 14"	
POWELL	1561A-P140	1" - 14"	
STOCKHAM	15-SF-1	2" - 12"	
WALWORTH	5341-AA	2" - 14"	UT TRIM.
WALWORTH (CANADA)	5341-AA	2" - 14"	
NEWMAN-HATTERSLEY (CANADA)	981	2" - 14"	

CUSTOMER		
ORDER NO.	4.7.13-18	VALVE NUMBER V2275

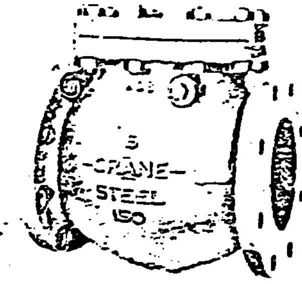
FORM 40

Design Data and Features:

- These valves comply with applicable requirements of Standards: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34.
- Material—carbon steel. Other materials available when specified—Crane No. 5, 7, 9, LCB and "Arctic" steels. See page 3 for specifications and recommendations.
- Trim—X or XU—suitable for a broad spectrum of services to 1100F. Other trims available when specified include: L or LU and A or AU. See pages 3 and 22 for trim description and service recommendations.
- Outside weight and lever to assist in rapid closing or for sensitive balance at low velocities is available on valves up to 8" in size.
- Drilling templates are shown on page 51.
- Flange and facing dimensions are shown on page 46.
- Ring joint facing (page 48) can be supplied when specified.
- Butt-welding ends are bored to match Standard pipe unless otherwise specified. See page 45.
- Corrugated metal gasket in male and female bonnet joint assures positive seal against leakage.
- For test information, see page 54.

CRANE

SWING CHECK VALVE CLASS 150 • 2" to 16"



No. 147

Bolted Cap

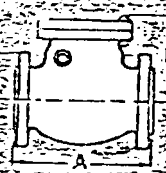
No. 148, Threaded

→ No. 147, Flanged

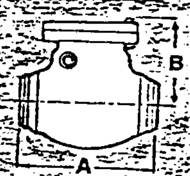
No. 147½, Butt-Welding

Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
285 psi @–20F to 100F

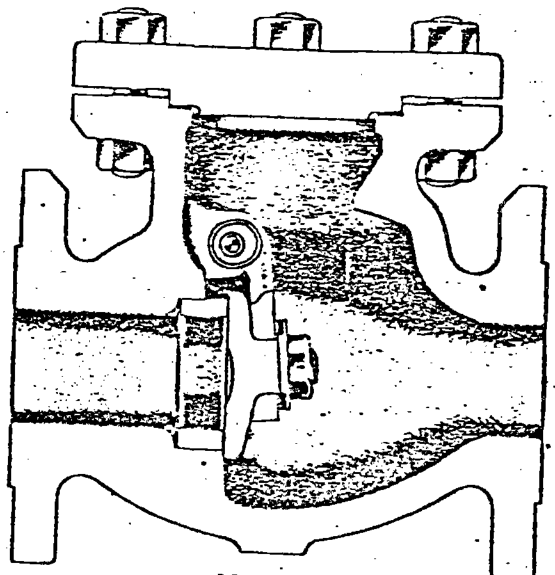
See page 55 for ratings of other materials and temperatures



Weights and Dimensions



Valve N.P.S.	Weight—Pounds			Dimensions—Inches			
				A			B
	148	147	147½	148	147	147½	
2	27	35	25	8.0	8.0	8.0	5.00
2½	40	53	40	8.5	8.5	8.5	5:50
3	50	70	50	9.5	9.5	9.5	6.00
4	96	115	92	11.5	11.5	11.5	7.00
5	—	140	120	—	13.0	13.0	8.00
6	—	200	165	—	14.0	14.0	9.00
8	—	390	350	—	19.5	19.5	10.25
10	—	470	370	—	24.5	24.5	13.56
12	—	635	560	—	27.5	27.5	15.56
14	—	1200	1010	—	31.0	31.0	18.38
16	—	1450	1250	—	30.0	30.0	20.62



No. 147

Stearns-Roger

Engineering Standard

(NC) 1/6/81

C101	VALVE SPECIFICATION SHEET V2731	ISSUED 06/10/71 REVISED 10/02/78

TYPE CHECK, PISTON.

RATING 800# API 602.

ENDS SOCKET WELD, ANSI B16.11.

BODY STEEL, ASTM A105.

BONNET (CAP, BOLTED) STEEL, ASTM A105.

BODY & BONNET BOLTING ASTM A193, GR. B7.

DISC 13% CR. S.S. (SPRING ACTUATED).

STEM ____________

SEAT INTEGRAL, STELLITE FACED.

SEALS (Or Packing) ____________

OPERATOR ____________

TO CONFORM, WHERE APPLICABLE, TO API 602.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
ANVIL	4031	1/4" - 2"	
EDWARD	838Y	1/4" - 2"	
HAMMOND	FS1809W	1/4" - 2"	
HANCOCK	5580W-XSL	1/4" - 2"	
LUNKENHEIMER	2317W	1/4" - 2"	
R-P & C	F91-DE-SL	1/4" - 2"	LIFT.
SMITH	C80SW	1/4" - 2"	LIFT.
VOGT	SW-701	1/4" - 2"	

CUSTOMER

ORDER NO.

4.7.13-20

VALVE NUMBER V2731

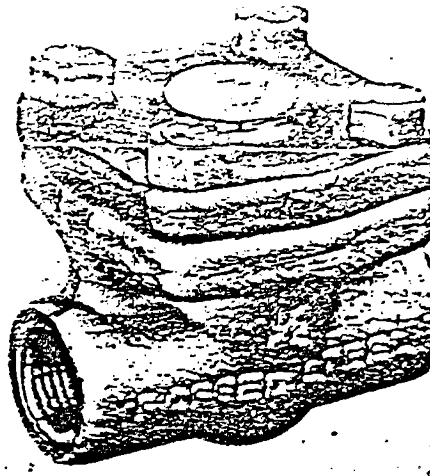
FORM 49

STEEL VALVES

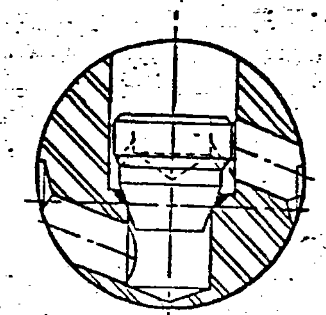
F-90 Screwed End Sizes: 1/4" Thru 2"

F-91 Socket Weld End ←

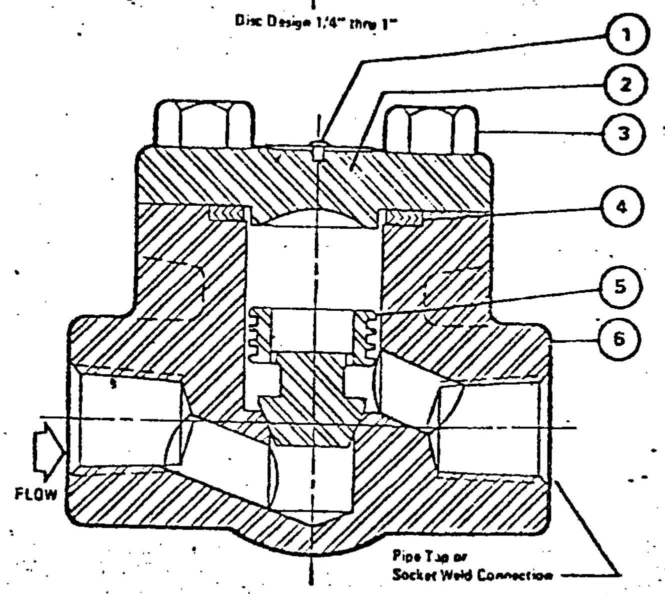
PISTON CHECK VALVE
BOLTED CAP
800 P.S.I. @ 850°F.
(For Horizontal Installation Only)



WORKING PRESSURE (NON-SHOCK)
600 PSI @ 900°F STEAM-OIL
800 PSI @ 850°F STEAM-OIL
2000 PSI @ —20°F TO 100°F



Disc Design 1/4" thru 1"



MATERIALS OF CONSTRUCTION

No.	Part	Material	A.S.T.M. Spec.	Remarks
1	Nameplate	Aluminum	—	Commercial
2	Cap	Forged Steel	A105	
3	Bolt. Cap	Alloy Steel	A193	Grade B7
4	Gasket	Stainless Steel Asbestos Filled		Spiral Wound
5	Disc	Stainless Steel		Type 420 (500 BHN)
6	Body	Forged Steel	A105	

Recommended Spare Parts

TRIM SELECTION CHART

Figure Number	Body & Bonnet	Disc & Integral Seat	Bonnet Gasket
F 90 DE	A-105	CR 13*	304-ASB
F 90 A	A-105	316 S.S.	304-ASB
F 90 M	A-105	Monel	Monel-ASB
90 -	A-105	Monel	Monel-TEF

*Integral seat Stellite-Faced
: F 91 also available in above trims.

Valves with Teflon gasket are limited to 500° F service.

DIMENSIONAL SPECIFICATIONS

Size	Face to Face	Center to Top	Gasket Size 1/8 Thick	Dia. of Port Opening	Socket Weld Bore*	Socket Weld Depth*	Approx. Weight
1/4	3	2	1 37/64 x 1 1/4	1/4	.555	3/8	3 1/4
3/8	3	2	1 37/64 x 1 1/4	5/16	.690	3/8	3 1/4
1/2	3	2	1 37/64 x 1 1/4	3/8	.855	3/8	3 1/4
3/4	3 1/2	2 3/8	1 37/64 x 1 1/4	1/2	1.055	3/8	3 1/4
1	4 3/8	2 7/8	1 13/16 x 1 15/32	3/4	1.330	1/2	3 3/4
1 1/4	6	3 5/8	2 3/16 x 1 27/32	1	1.675	1/2	5 1/2
1 1/2	6	3 5/8	2 5/16 x 1 27/32	1 1/4	1.915	1/2	11
2	7	4 1/2	2 59/64 x 2 3/8	1 1/2	2.406	5/8	14 1/2

*Conforms to ANSI B16.11

R.P.&C Valve, Inc.
8150 West Ridge Road, • Fairview, Pennsylvania 16415
One of the White Consolidated Industries

Stearns-Roger
Engineering Standard

RC
1/6/81

C-101

VALVE SPECIFICATION SHEET V3226

ISSUED 11/03/71
REVISED 3/25/75

TYPE CHECK, SWING.

RATING CLASS 150, ANSI B16.5.

ENDS SOCKET-WELD, ANSI B16.11.

BODY 316L S.S., ASTM A351, GR. CF3M OR A182, GR. F316L.

BONNET (CAP) BOLTED. ASTM A351, GR. CF8M OR A182, GR. F316.

BODY & BONNET BOLTING ASTM A193, GR. B8M (316 S.S.).

DISC 316 S.S., ASTM A182, GR. F316.

STEM ______________________

SEAT 316 S.S., INTEGRAL.

SEALS (Or Packing) ______________________

OPERATOR ______________________

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
ALOYCO/WALWORTH	374	½" - 2"	
POWELL	2341A-SWE	½" - 2"	
STOCKHAM	15-SSW(316)	½" - 2"	
PACIFIC	S-1102	½" - 1½"	SPLIT BODY.

CUSTOMER 4.7.13-22

ORDER NO.

VALVE NUMBER. V3226

SWING CHECK VALVE CLASS 150 ½" to 2"

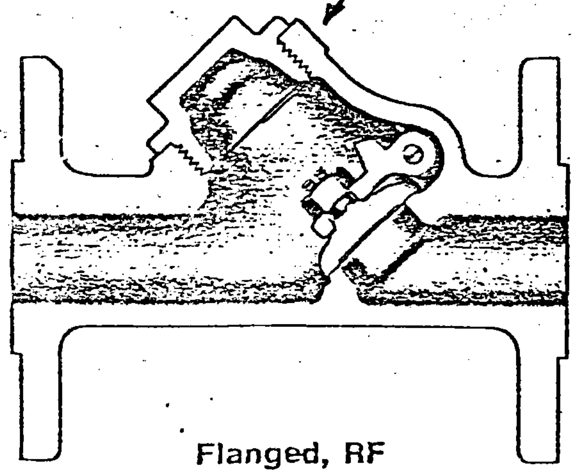
Threaded

Threaded Cap
"Y" Pattern
Metal-to-Metal Seats

Pressure-Temperature Rating
Stainless Steel ASTM A351 Grade CF-8M
275 psi @—20F to 100F

See page 5 for ratings of other materials and temperatures

SPEC V3226 Requires Bolted Bonnet



Flanged, RF

Design Data and Features:

- Access opening in line with the seat so seating surfaces, which are integral with the body, can be reground while the valve is in line. The disc can be rotated with a screwdriver to control wear.
- Seating surfaces with flat contact area of disc and seat assures tight seal against backflow.
- Installs horizontally or vertically. When in the vertical position, flow must be upward.
- These valves are regularly furnished in the stainless steel indicated adjacent to the Catalog number, but also are available in other austenitic stainless steels.
- These valves comply with the applicable requirements of ANSI B16.5, ANSI B16.34, and MSS SP-42.

* Bored to socket weld

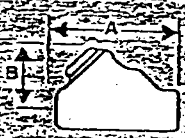
No. 8m is Downgrade from 3m

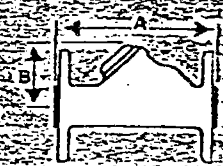
should be socket weld

Catalog Number	Body Material	Body Ends
→ 61600	CF-8M	Threaded
61605	CF-8M	Flanged, FF
61606	CF-8M	Flanged, RF
21600	CN-7M	Threaded
21605	CN-7M	Flanged, FF
21606	CN-7M	Flanged, RF

FF abbreviation means Flat Faced. RF abbreviation means Raised Face.

Weights and Dimensions





Valve N.P.S.	Weight—Pounds		Dimensions—Inches		
			A		B
	Threaded	Flanged	Threaded	Flanged	
½	1.0	2.8	3.00	4.50	1.88
¾	1.6	4.5	3.50	5.00	2.12
1	2.9	6.0	4.25	5.75	2.75
1¼	4.6	—	5.50	—	3.50
1½	6.1	12.0	5.50	7.25	3.50
2	9.0	20.0	6.50	8.50	4.25

Y-C
TCO
KCN

Stearns-Roger
Engineering Standard

NC 1/6/81

C-101	VALVE SPECIFICATION SHEET V3240	ISSUED 8/16/71 REVISED 3/25/75

TYPE — CHECK, SWING.

RATING — STANDARD CLASS 300, ANSI B16.34.

ENDS — BUTT WELD, 10" AND UNDER - SCH. 40.
12" AND ABOVE - STD. WT. (.375" W.T.).

BODY — ALLOY STEEL (1¼ CR - ½ MO) ASTM A217, GR. WC6 OR A182, GR. F11.

BONNET — (CAP, BOLTED), (1 1/4 CR - 1/2 MO) ASTM A217, GR. WC6 OR A182, GR. F11.

BODY & BONNET BOLTING — ASTM A193, GR. B16.

DISC — STELLITE FACED.

STEM — __________

SEAT — STELLITE FACED, RENEWABLE.

SEALS (Or Packing) — __________

OPERATOR — __________

TO CONFORM TO ANSI B16.10.

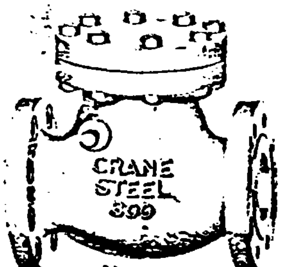
Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	159 1/2U7	2" - 12"	
JENKINS	2026 G9	2" - 10"	
LUNKENHEIMER	3073U(WC6)	1½" - 10"	
PACIFIC	380-7WE	1½" - 12"	
POWELL	3061A-WE-P100	1" - 12"	
STOCKHAM	30-SW-13	2" - 12"	
WALWORTH	5344WEHF	2" - 12"	

CUSTOMER 4.7.13-24
ORDER NO.
VALVE NUMBER V3240

CLASS 300 • 2" to 16"



No. 159

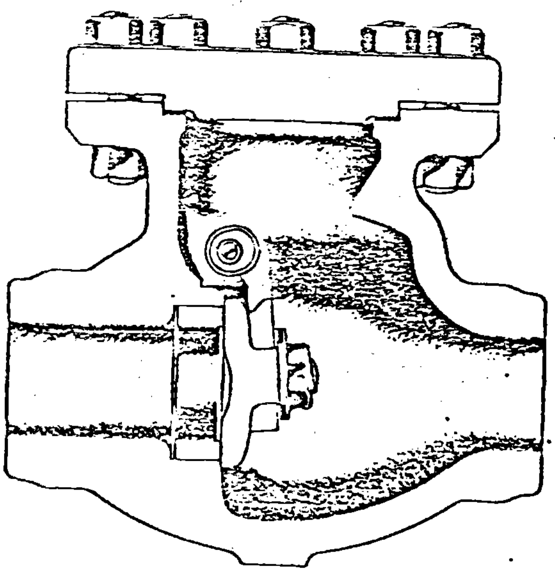
Bolted Cap

No. 158, Threaded
No. 159, Flanged
No. 159½, Butt-Welding ←

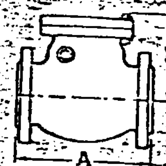
Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
740 psi @ –20F to 100F

See page 55 for ratings of other materials and temperatures

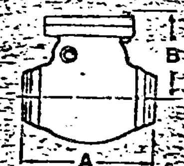
- These valves comply with applicable requirements of Standards: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34.
- Material—carbon steel. Other materials available when specified—Crane No. 5, 7, 9, LCB and "Arctic" steels. See page 3 for specifications and recommendations.
- Trim—X or XU—suitable for a broad spectrum of services to 1100F. Other trims available when specified include: L or LU and A or AU. See pages 3 and 22 for trim description and service recommendations.
- Outside weight and lever to assist in rapid closing or for sensitive balance at low velocities is available on valves up to 8" in size.
- Drilling templates are shown on page 50.
- Flange and facing dimensions are shown on page 46.
- Ring joint facing (page 48) can be supplied when specified.
- Butt-welding ends are bored to match Standard pipe unless otherwise specified. See page 45.
- Corrugated metal gasket in male and female bonnet joint assures positive seal against leakage.
- For test information, see page 54.
- For details on butt-welding ends, see page 45.



No. 159½



Weights and Dimensions



Valve N.P.S.	Weight—Pounds			Dimensions—Inches			
				A			B
	158	159	159½	158	159	159½	
2	49	60	47	9.50	10.50	10.50	6.75
2½	70	90	60	10.75	11.50	11.50	8.00
3	100	115	87	11.75	12.50	12.50	8.50
4	—	185	140	—	14.00	14.00	9.75
5	—	250	240	—	15.75	15.75	10.75
6	—	330	280	—	17.50	17.50	11.75
8	—	620	510	—	21.00	21.00	14.00
10	—	640	590	—	24.50	24.50	13.75
12	—	950	720	—	28.00	28.00	16.10
14	—	1340	1150	—	30.00	30.00	18.38
16	—	1650	1220	—	33.00	33.00	20.50

Stearns-Roger
Engineering Standard

C-101

NC 1/6/81

VALVE SPECIFICATION SHEET V5018

ISSUED Jun 30/71
REVISED 2/9/76

TYPE GATE.

RATING 175#, COLD WATER.

ENDS THREADED, ANSI B2.1, NPT.

BODY BRONZE, ASTM B61.

BONNET (THREADED) BRONZE, ASTM B61.

BODY & BONNET BOLTING

DISC BRONZE, WEDGE.

STEM BRONZE, O.S. & Y.

SEAT BRONZE, INTEGRAL.

SEALS (Or Packing) ASBESTOS.

OPERATOR HANDWHEEL.

UNDERWRITERS APPROVED

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	459-CU	3/4" - 2"	
JENKINS	275-U	3/4" - 2"	
STOCKHAM	B-133-SU	3/4" - 2"	
KENNEDY	66	1/2" - 2"	

CUSTOMER

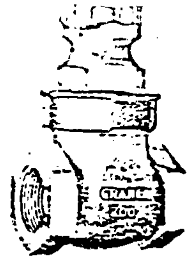
ORDER NO. 4.7.13-26

VALVE NUMBER V5018

FORM 40

VALVE CLASS 200 ½" to 2"

Solid Wedge Disc OS&Y Yoke Bonnet



No. 459, Threaded

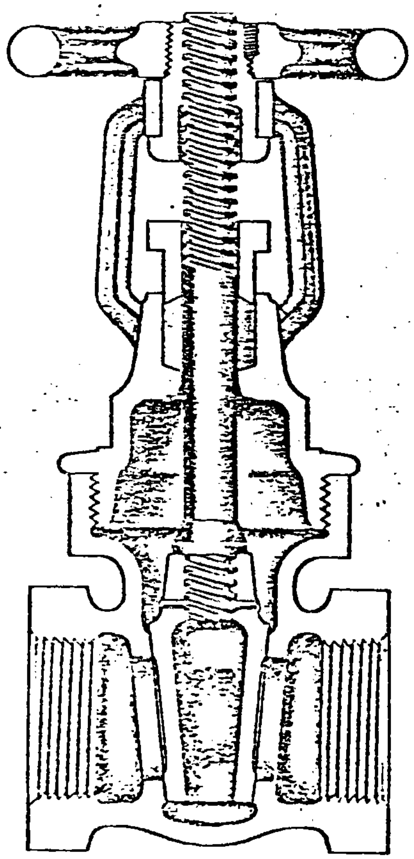
RATINGS

Temp. F.	Psi Non-Shock
−20 to 150°	400
200	375
250	350
300	325
350	300
400	275
450	250
500	225
550	200

- Recommended for steam, non-shock water, oil, or gas service.
- All sizes (except ½-inch) are listed by Underwriters' Laboratories Inc., and Factory Mutual Laboratories (all sizes) for water service in fire protection systems at pressures up to 175 psi.
- Ideally designed for services where line fluids might affect inside stem threads. Exposed stem threads are easy to lubricate to ease operation and prevent wear.
- Wide face easy-grip hexagon ends on body prevent damage to the valve during installation.
- Full diameter seat openings assure straight-thru flow.
- Rising stem indicates position of the disc at a glance.
- Large stuffing box is filled with long-lasting asbestos graphite packing providing a tight stem seal.
- Each valve has a backseat in the interior of the bonnet below the packing.

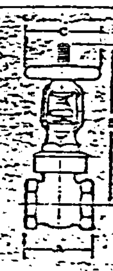
PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Yoke Bonnet	All	Bronze	B61
Disc	All	Bronze	B61
Stem	All	Bronze	B62 Mod.
Yoke Bushing	All	Brass	B16 Alloy 360



No. 459.

Weights and Dimensions



Valve N.P.S.	Weight—Pounds	Dimensions—Inches A	B	C
½	3.5	2.62	6.38	3.32
¾	3.4	2.62	6.38	3.32
1	4.4	3.00	7.38	3.62
1¼	6.8	3.50	8.75	3.88
1½	9.8	4.00	9.75	4.38
2	16.0	4.75	11.62	4.82

"B" dimension is with valve open

Engineering Standard

1/6/81

C-101	VALVE SPECIFICATION SHEET V5028	ISSUED Jun 30/71 REVISED 2/9/76

TYPE GATE ✓

RATING 400# @100°F. ✓

ENDS THREADED, ANSI B2.1, NPT.

BODY BRONZE, ASTM B61 ✓ OR B62.

BONNET (UNION) BRONZE, ASTM B61 ✓ OR B62.

BODY & BONNET BOLTING ____________

DISC NICKEL-COPPER ALLOY, SOLID WEDGE. ✓

STEM BRONZE, RISING (INSIDE SCREW). ✓

SEAT BRONZE, INTEGRAL. ✓

SEALS (Or Packing) ASBESTOS. TFE impregnated ✓

OPERATOR HANDWHEEL. ✓

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
JENKINS	270 UN	1/4" - 2"	MONEL SEAT, RENEWABLE.
POWELL	375	1/4" - 3"	
WALWORTH	37	1/4" - 2"	
~~STOCKHAM~~	~~B-135~~	~~1/4" - 3"~~	
HAMMOND	IB652	1/4" - 2"	
ITT GRINNELL	3110	1/4" - 2"	
NIBCO	T-154-A	1/4" - 2"	OK

CUSTOMER

ORDER NO. 4.7.13-28

VALVE NUMBER V5028

FORM 40

200 lb. swp bronze gate

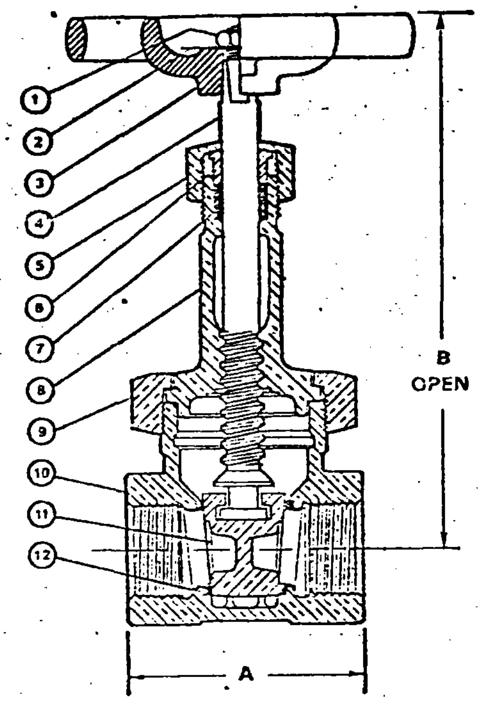
Block Pattern • Union Bonnet • Rising Stem • Solid Wedge

200 PSI Saturated Steam

400 PSI Non-Shock Cold Water, Oil, or Gas

NIBCO™
BRONZE AND IRON VALVES

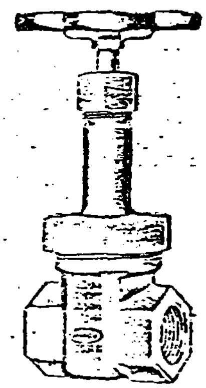
Federal Specification: WW-V-54 Class C; Type II (T-154-SS)



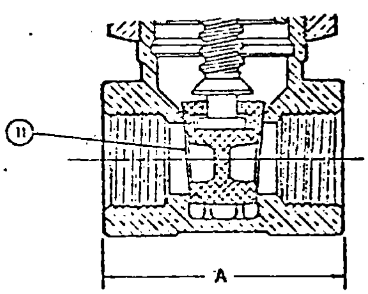
T-154-SS F.S.P.S. to F.S.P.S.

MATERIAL LIST

PART	SPECIFICATION
1. Handwheel Nut	Zinc Plated Steel with Clear Chromate or Bronze ASTM B-16
2. Identification Plate	Aluminum
3. Handwheel	Malleable Iron ASTM A-47-61 or Aluminum-ASTM B-85 Alloy 13-B
4. Stem	Silicon Bronze ASTM B-371-62 Alloy A (Rod) or ASTM B-198 Alloy 13B
5. Packing Nut	Bronze ASTM B-62 or ASTM B-145-5A
6. Packing Gland	Bronze ASTM B-62 or ASTM B-145-5A
7. Packing	Teflon Impregnated Asbestos
8. Bonnet	Bronze ASTM B-61
9. Union Nut	Bronze ASTM B-61
10. Body	Bronze ASTM B-61
11. Wedge	Bronze ASTM B-61 (T-154-SS) Copper-Nickel Alloy ASTM B-149-11B (T-154-A)
12. Seat Rings	Stainless Steel Type 410 (T-154-SS)



T-154-SS
T-154-A ←
threaded



T-154-A F.S.P.S. to F.S.P.S.

DIMENSIONS — WEIGHTS — QUANTITIES

Nominal Size	Dimensions T-154-SS A	T-154-SS B	T-154-A A	T-154-A B	Approx. Net Wt. T-154-SS	Approx. Net Wt. T-154-A	Master Carton Qty.
¼†	—	—	1⅞	4¹³/₁₆	—	1.0	50
⅜†	—	—	2¹/₁₆	4¹³/₁₆	—	1.0	50
½	2⅜	5⅜	2⁵/₁₆	5⅜	1.5	1.4	40
¾	2¹¹/₁₆	6⁵/₁₆	2⁷/₁₆	6⁵/₁₆	2.2	2.1	30
1	3⅛	7⁹/₁₆	2⅞	7⁹/₁₆	3.5	3.3	20
1¼	3⁷/₁₆	8¾	3⅛	8¾	4.8	4.8	10
1½	3¾	10¼	3⅝	10½	6.1	6.2	10
2	4¼	12½	3⅞	12½	11.2	11.6	5

†No packing gland, packing only in these sizes. T-154-A meets Federal Specification these sizes.

NIBCO INC., ELKHART, INDIANA

4.7.13-29

P	PP	CH	FI	SP

Stearns-Roger
Engineering Standard

NC
1/6/81

C-101

VALVE SPECIFICATION SHEET V5063

ISSUED Jun 30/71
REVISED 2/9/76

TYPE ✓ GATE.

RATING ✓ 200# @100°F.

ENDS ✓ SOLDER-JOINT, ANSI B16.18.

BODY ✓ BRONZE, ASTM B61 OR B62.

BONNET ✓ (THREADED) BRONZE, ASTM B61 OR B62.

BODY & BONNET BOLTING ______

DISC ✓ BRONZE, SOLID WEDGE.

STEM ✓ BRONZE, RISING.

SEAT ✓ BRONZE, INTEGRAL.

SEALS (Or Packing) ✓ ASBESTOS.

OPERATOR ✓ HANDWHEEL.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
JENKINS	1242	3/8" - 3"	
POWELL	1821	1/4" - 3"	
WALWORTH	55-SJ	3/8" - 3"	
CRANE	1334	3/8" - 3"	
LUNKENHEIMER	2132	1/2" - 2"	
STOCKHAM	B-109	3/8" - 3"	
MILWAUKEE	1149	3/8" - 3"	
HAMMOND	IB635	3/8" - 3"	
ITT GRINNELL	3010SJ	3/8" - 3"	
NIBCO	S-111	3/8" - 3"	ok

CUSTOMER

ORDER NO. 4.7.13-30 VALVE NUMBER V5063

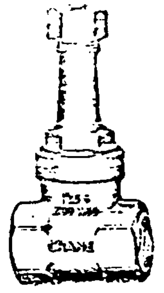
FORM 40

GATE VALVE
¼" to 3"

Rising Stem
Screwed Bonnet
Solid Wedge Disc

No. 428, Threaded
Class 125

No. 1334, Solder End
125 SWP/200 psi,
Non-Shock Water @ 200F



No. 428

No. 1334

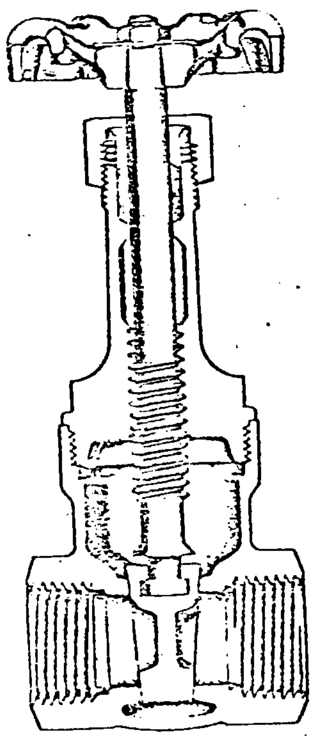
RATINGS No. 428

Temp. F.	Psi Non Shock
−20 to 150°	200
200	185
250	170
300	155
350	140
406	125
450	120

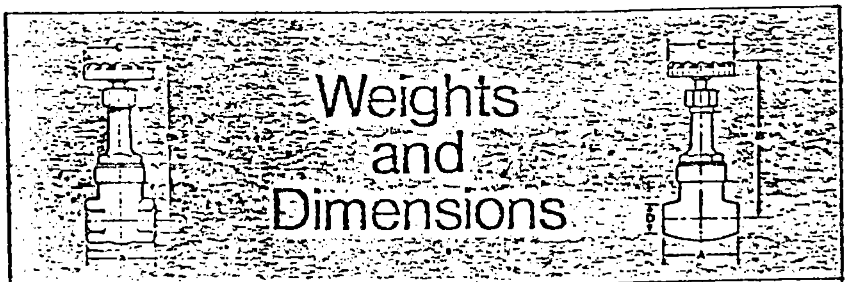
- No. 428 can be used for steam, non-shock water, oil, or gas.
- Cylindrically-shaped body combines strength with light weight. Seats are reinforced against wedging action of disc. Wide face easy-grip hexagon ends on No. 428 prevent damage to the valve during installation.
- Full diameter seat openings assure straight-thru flow.
- Long lasting, quality TFE impregnated asbestos packing filled in the deep stuffing box provides a tight stem seal.
- Solder-end valves conform to ANSI B16.18.
- Both valves in all sizes conform to MSS SP-80, and meet material and design requirements of Federal Specification WW-V-54d, Class A, Type II valves.
- Caution: Before installing solder-joint valves, be sure solder or brazing alloy melting point is high enough to withstand line pressure, temperature conditions, and compatible with fluid media.
- Each valve has a backseat in the interior of the bonnet below the packing.

PRINCIPAL PARTS & MATERIALS

Part	Sizes	Material	ASTM
Body	All	Bronze	B62
Bonnet	All	Bronze	B62
Disc	¼"-2"	Bronze	B62
	2½"-3"	Bronze	B61
Stem	¼"-⅜"	Bronze	B62 Mod.
	½"-1"	Bronze	B99 Alloy 651
	1¼"-3"	Bronze	B584 Alloy 876



No. 428



Weights and Dimensions

Valve N.P.S.	Weight—Pounds 428	Weight—Pounds 1334	Dimensions—Inches A 428	A 1334	B 428	B 1334	C	D	DoB 1334
¼	0.9	—	1.80	—	4.50	—	1.75	—	—
⅜	0.9	0.7	1.80	1.68	4.50	4.50	1.75	½	.40
½	1.2	1.0	2.12	2.00	5.25	5.25	2.06	⅝	.54
¾	1.9	1.7	2.25	2.56	6.50	6.50	2.56	⅞	.78
1	2.5	2.7	2.80	3.00	7.75	7.75	2.75	1⅛	.90
1¼	4.0	3.9	3.00	3.25	9.25	9.25	3.06	1⅜	.96
1½	5.5	5.0	3.25	3.75	10.50	10.50	3.62	1⅝	1.10
2	8.5	9.2	3.68	4.44	12.75	12.75	4.75	2⅛	1.34
2½	15.5	15.0	4.50	5.00	15.25	15.25	5.38	2⅝	1.46
3	26.0	24.2	5.12	5.75	18.00	18.00	7.00	3⅛	1.66

DoB—Depth of Bore

"B" dimension is with valve open

4.7.13-31

Engineering Standard

1/6/81

C-101	VALVE SPECIFICATION SHEET V5190	ISSUED 06/30/71 REVISED 10/20/79

TYPE GATE.

RATING 175# WATER. (2" THRU 12"), 150# WATER (14").

ENDS FLANGED, F.F. 125# ANSI B16.1

BODY C.I., ASTM A126, CLASS A OR B. (12" & SMALLER)
A126, CLASS B OR C (14")

BONNET (BOLTED) C.I., ASTM A126, CLASS A OR B (12" & SMALLER)
A126, CLASS B OR C (14")

BODY & BONNET BOLTING ASTM A307, GR. B

DISC DOUBLE DISC, BRONZE FACED.

STEM BRONZE, OS&Y

SEAT RENEWABLE, BRONZE

SEALS (Or Packing) ASBESTOS

OPERATOR HANDWHEEL.

UNDERWRITER LISTED & FACTORY MUTUAL APPROVED

CHECK FACE TO FACE DIMENSION, MAY NOT BE INTERCHANGEABLE

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
AMERICAN-DARLING	52FM-UA	4" - 14"	
CRANE	467	2-1/2"-12"	SOLID WEDGE DISC.
DARLING (CANADA VALVE)	52FM	4" - 12"	
DRESSER MFG. CO.	M&H #81-F	2-1/2"-14"	
EDDY-IOWA/CLOW	F-5556	4" - 12"	
HAMMOND	IR1154	2-1/2"-12"	SOLID WEDGE DISC.
JENKINS	825-A	2-1/2"-8"	SOLID WEDGE DISC.
KENNEDY	68	2-1/2"-14"	
MUELLER CO.	A-2073-6	2-1/2"-14"	
NIBCO	F-607-0	2-1/2"-12"	SOLID WEDGE DISC.
STOCKHAM	G-634	2-1/2"-12"	SOLID WEDGE DISC.

CUSTOMER

ORDER NO.

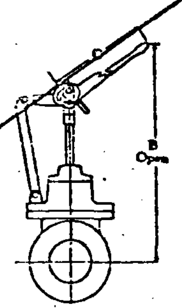
4.7.13-32

VALVE NUMBER V5190

QUICK-OPENING WEDGE GATE VALVES CLASS 125 3" to 8"

Bronze Trim
No. 471, Flanged
Operating Differential Pressures Limited to
125 psi for 3"
100 psi for 4" and 6"
75 psi for 8"

- Ferrosteel body and bonnet are high grade cast iron conforming to ASTM A126, Class B.
- Bronze stem with tee-head disc/stem connection prevents lateral strain on stem and maintains more accurate disc control.
- Disc is solid bronze in 3" size. Other sizes are Ferrosteel with rolled in bronze seating faces.
- Precision machined bronze seat rings are screwed into the body and can be removed for replacement when necessary.
- Self-lubricating TFE impregnated asbestos packing in stick form is contained in an injection type stuffing box with a reservoir. Packing can be added—anytime—even when the valve is under full rated line pressure.
- Sudden closure on liquid lines may cause "water hammer." If "hammer" is severe, a cushioning device may be necessary. See comments on "shock", page 3.
- Valves have ANSI B16.1 end flanges and ANSI B16.10 face-to-face dimensions, Class 125.



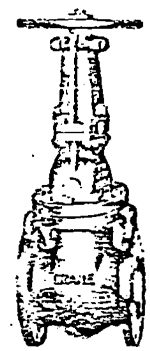
Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches		
	471	Face to Face	B	C
3	60	8.00	24.50	12.00
4	98	9.00	29.38	15.50
6	166	10.50	40.12	22.50
8	283	11.50	51.00	29.00

CRANE U/L LISTED WEDGE GATE VALVE 2½" to 12"

OS & Y—Bronze Trim
No. 467

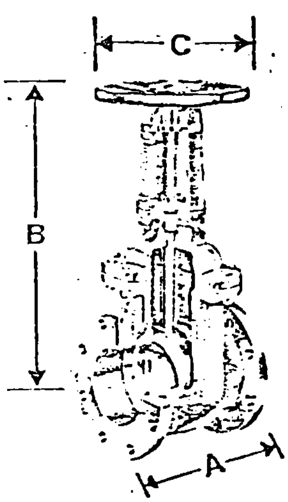
175 CWP, Non-Shock



(10 and 12-inch)

FP

- Designed expressly for fire protection service. Listed by Underwriters' Laboratories, Inc., and Factories Mutual Laboratories. Similar in design to No. 465½ shown on page 10.
- Body and bonnet material is ASTM A126, Class B cast iron.
- Bronze stem with Acme double threads has tee-head disc/stem connection which prevents lateral strain on stem.
- Tapered solid wedge disc is guided throughout its travel to improve disc life by eliminating premature contact with the screwed-in bronze seat rings. Disc is solid bronze in sizes 3" and smaller. In larger sizes, bronze faces are rolled into the Ferrosteel discs.
- Sizes 8" and smaller feature injection type stuffing box which permits adding of TFE impregnated asbestos packing with a twist of a wrench. Conventional stuffing box is standard on sizes 10" and 12".
- Valves comply with applicable requirements of ANSI B16.1 and B16.10.



Weights and Dimensions

Valve N.P.S.	Weight—Pounds	Dimensions—Inches		
	467	A	B	C
2½	48	7.50	15.38	8.00
3	60	8.00	17.00	8.00
4	100	9.00	21.62	10.00
6	170	10.50	30.00	12.00
8	290	11.50	38.00	14.00
10	530	13.00	50.75	20.00
12	720	14.00	58.00	20.00

"B" dimension is with valve open.

(NC) 1/6/81

C-101

VALVE SPECIFICATION SHEET V7568

ISSUED 6/29/71
REVISED 10/13/77

TYPE	GLOBE. (REDUCED PORT).
RATING	API CLASS 800.
ENDS	SOCKET-WELD, ANSI B16.11.
BODY	STEEL, ASTM A216, GR. WCB OR ASTM A105.
BONNET	(BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.
BODY & BONNET BOLTING	ASTM A193, GR. B7.
DISC	13% CR. S.S., "500" BRINELL, (PLUG TYPE).
STEM	13% CR. S.S., OS & Y.
SEAT	STELLITE.
SEALS (Or Packing)	ASBESTOS W/WIRE INSERT.
OPERATOR	HANDWHEEL.

TO CONFORM, WHERE APPLICABLE, TO API 602.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
BONNEY FORGE (ITALY)	HL-310-T	1/2" - 2"	
HANCOCK	5500 W	1/4" - 2"	
JENKINS	8G80W	1/4" - 2"	
JENKINS (CANADA)	8G80W	1/4" - 2"	
LUNKENHEIMER	1717W	1/4" - 2"	
R-P&C	F81-DE	1/4" - 2"	
SMITH	G80SW	1/4" - 2"	
VOGT	SW12141	1/2" - 2"	

CUSTOMER

ORDER NO. 4.7.13-34

VALVE NUMBER V7568

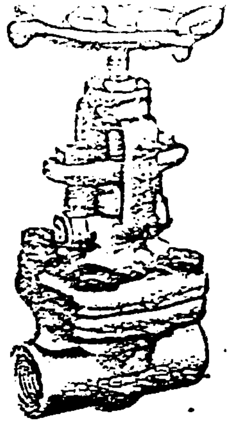
FORM 40

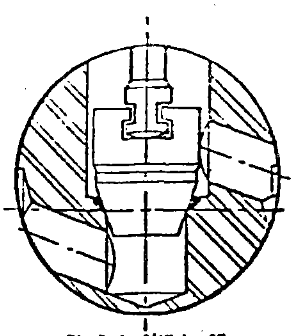
STEEL VALVES

F-80 Screwed End
F-81 Socket Weld ←

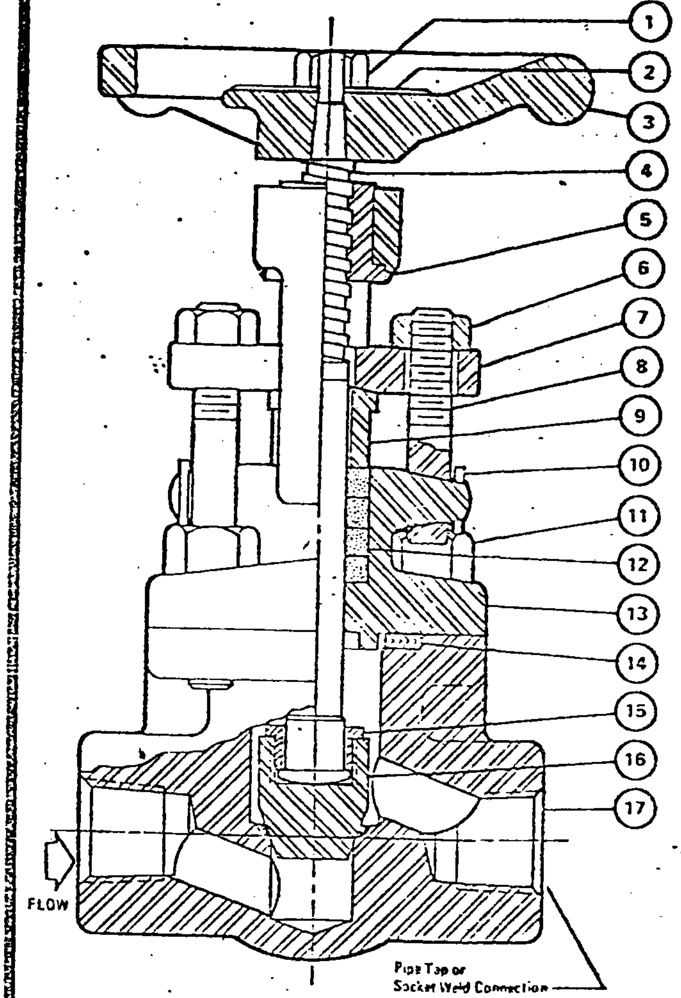
Sizes: 1/4" Thru 2"

&Y GLOBE VALVE
BOLTED BONNET
800 P.S.I. @ 850°F.





WORKING PRESSURE (NON-SHOCK)
600 PSI @ 900°F STEAM-OIL
800 PSI @ 850°F STEAM-OIL
2000 PSI @ −20°F TO 100°F



MATERIALS OF CONSTRUCTION

No.	Part	Material	A.S.T.M. Spec.	Remarks
1	Handwheel Nut	Carbon Steel		Lock Nut
2	Nameplate	Etched Aluminum		
3	Handwheel	Malleable Iron	A47	Grade 32510
4	Stem	416 Stn. Steel		250 BHN Heat Treat
5	Operating Nut	Stainless Steel		Grade 410
6	Gland Nuts	303 Stn. Steel		Grade 8F
7	Gland	Steel		Grade 1025
8	Gland Eye Bolts	Stainless Steel		Grade 410
9	Gland Follower	416 Stn. Steel		
10	Retaining Washer	Carbon Steel		Grade 1018
11	Bonnet Bolt	Alloy Steel	A193	Grade B7
12	Packing	Wire Inserted Molded Asbestos		John Crane 187-I or Equivalent
	Bonnet	Forged Steel	A105	
14	Gasket	Stainless Steel Asbestos Filled		Spiral Wound
15	Disc Nut	Stainless Steel		Grade 416
16	Disc	Stainless Steel		Grade 420 (500 BHN)
17	Body	Forged Steel	A105	

Recommended Spare Parts

TRIM SELECTION CHART

Figure Number	Body & Bonnet	Stem, Disc & Integral Seat	Bonnet Gasket	Packing
F 80 DE	A-105	CR 13*	304-ASB	JC-187-I
F 80 A	A-105	316 S.S.	304-ASB	JC-187-I
F 80 M	A-105	Monel	Monel-ASB	JC-187-I
F 80 MT	A-105	Monel	Monel-TEF	Teflon
F 80 TF	A-105	Monel**-TEF	Monel-TEF	Tef-V-Rings

*Steilite-Faced Seat.
**Monel-Faced Seat, Teflon inserted disc, Monel stem
Valves with Teflon trim are limited to 500° F service.
Note: F 81 also available in above trims.

DIMENSIONAL SPECIFICATIONS

Size	Handwheel Dia.	Face to Face	Center to Top (Open)	Gasket Size 1/8 Thick	Dia. of Port Opening	Stuffing Box Depth	Packing Size (Square)	Socket Weld Bore*	Socket Weld Depth*	Approx. Weight
1/4	3 7/8	3	6 3/8	1 37/64 x 1 1/4	1/4	31/32	1/8	.555	3/8	4
3/8	3 7/8	3	6 3/8	1 37/64 x 1 1/4	5/16	31/32	1/8	.690	3/8	4
1/2	3 7/8	3	6 3/8	1 37/64 x 1 1/4	3/8	31/32	1/8	.855	3/8	4
3/4	3 7/8	3 1/2	6 5/8	1 37/64 x 1 1/4	1/2	31/32	1/8	1.065	1/2	4 1/2
1	4 1/2	4 3/8	8 1/4	1 13/16 x 1 11/32	3/4	1 1/4	1/8	1.330	1/2	7
1 1/4	5 1/2	6	9 1/4	2 5/16 x 1 27/32	1	1 3/8	5/32	1.675	1/2	14
1 1/2	5 1/2	6	9 1/4	2 5/16 x 1 27/32	1 1/4	1 3/8	5/32	1.915	1/2	13 1/2
2	6 1/2	7	11	2 57/64 x 2 3/8	1 1/2	1 3/8	3/16	2.406	5/8	19

forms to ANSI B16.11

RP&C Valve, Inc.
8150 West Ridge Road. • Fairview, Pennsylvania 16415
One of the Waite Consolidated Industries

Engineering Standard

C-101

VALVE SPECIFICATION SHEET V6012

1/6/81

ISSUED Jun 29/71
REVISED 6/4/75

TYPE GATE (REDUCED PORT).

RATING CLASS 800 API.

ENDS SOCKET-WELD. ANSI B16.11.

BODY STEEL, ASTM A216, GR. WCB OR ASTM A105.

BONNET (BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.

BODY & BONNET BOLTING ASTM A193, GR. B7.

DISC 13% CR. S.S., SOLID WEDGE.

STEM 13% CR. S.S., OS & Y.

SEAT STELLITE FACED (RENEWABLE).

SEALS (Or Packing) ASBESTOS.

OPERATOR HANDWHEEL.

TO CONFORM TO API 602.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
BONNEY FORGE (ITALY)	HL 110-T	1/2" - 2"	
HANCOCK	950 W	1/4" - 2"	
JENKINS	8800W	1/4" - 2"	
LUNKENHEIMER	1117-W	1/4" - 2"	
R-P & C	F57-DE	1/4" - 2"	
SMITH	800 SW	1/4" - 2"	
VOGT	SW12111	1/4" - 2"	
HAMMOND	FS1801-W	1/4" - 2"	

CUSTOMER

ORDER NO. 4.7.13-36

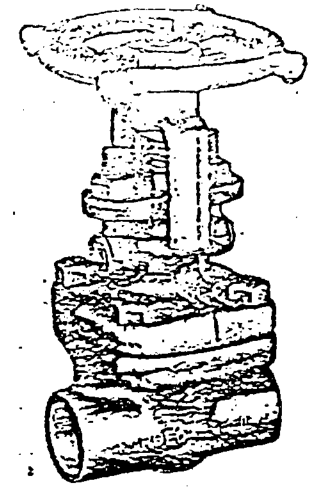
VALVE NUMBER V6012

[illegible] FORGED STEEL VALVES

FO-56 Screwed Ends — Sizes: ¼" Thru 2"

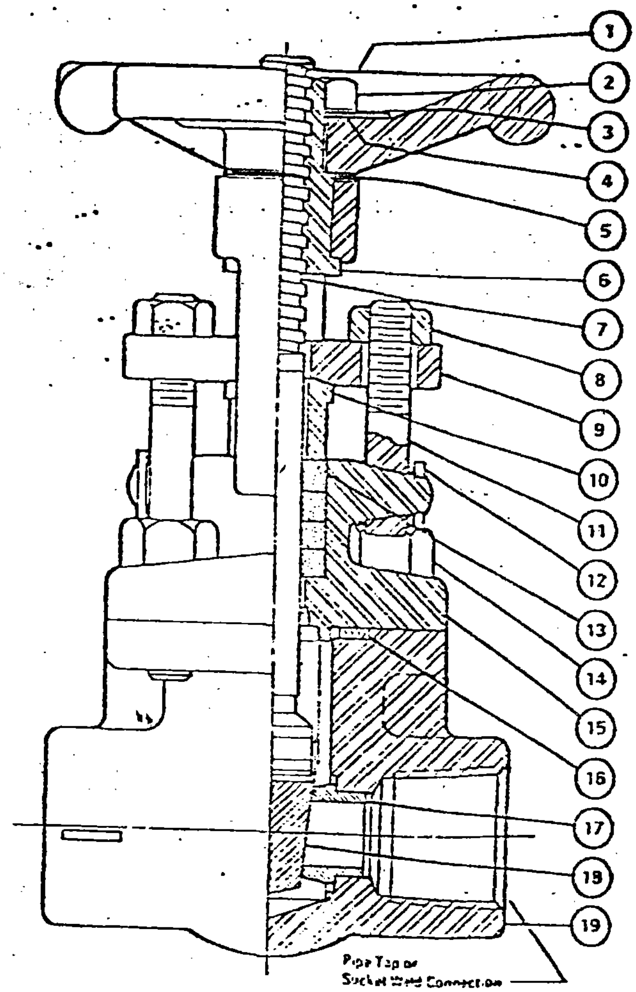
[illegible]-57 Socket Weld Ends ←

OS&Y GATE VALVE
BOLTED BONNET
FULL PORT
800 P.S.I. @ 850°F.



WORKING PRESSURE (NON-SHOCK)
600 PSI @ 900°F STEAM-OIL
800 PSI @ 850°F STEAM-OIL
2000 PSI @ −20°F TO 100°F

DESIGNED TO A.P.I. 602



MATERIALS OF CONSTRUCTION

No.	Part	Material	A.S.T.M. Spec.	Remarks
1	Handwheel	Malleable Iron	A47	Grade 32510
2	Handwheel Nut	Steel		
3	Internal Tooth Washer	Steel		
4	Nameplate	Etched Aluminum		
5	Thrust Washer	Stn. Steel		Hardened
6	Operating Nut*	416 Stn. Steel		
7	Stem*	416 Stn. Steel		250 BHN Heat Treat
8	Gland Nuts	303 Stn. Steel	A194	Grade 8F
9	Gland	Steel		Grade 1025
10	Gland Follower	416 Stn. Steel		
11	Gland Eyebolts	410 Stn. Steel		Hardened & Tempered
12	Retaining Washer	Carbon Steel		Grade 1018
[illegible]	Packing	Wire Inserted Molded Asbestos		John Crane 187-I or equivalent
[illegible]	Bonnet Bolts	Alloy Steel	A193	Grade B7
15	Bonnet	Carbon Steel	A105	
16	Bonnet Gasket	Stainless Steel Asbestos Filled		Spiral Wound
17	Seat Rings	410 Stn. Steel		With Hard Facing (HF) Stellite
18	Wedge	420 Stn. Steel		Heat-Treated 500 Brinell
19	Body	Forged Steel	A105	

*Operating Nut and Stem Thread Lubricated
Recommended Spare Parts

TRIM SELECTION CHART

Figure Number	Body & Bonnet	Stem, Disc & Seat	Bonnet Gasket	Packing
FO 56 DE	A-105	CR 13*	304-ASB	JC-187-I
FO 56 A	A-105	316 S.S.	304-ASB	JC-187-I
FO 56 M	A-105	Monel	Monel-ASB	JC-187-I
FO 56 MT	A-105	Monel	Monel-TEF	Teflon

*Stellite Faced Seat Rings
Note: FO 57 also available in above trims.

Valves with Teflon gasket & packing are limited to 500°F service.

DIMENSIONAL SPECIFICATIONS

Size	Handwheel Dia.	Face to Face	Center to Top (Open)	Gasket Size ⅓ Thick	Dia. of Port Opening	Stuffing Box Depth	Packing Size (Square)	Socket Weld Bore*	Socket Weld Depth*	Approx. Weight
¼	4	3	6¼	1 17/32 x 1¼	9/32	1	⅛	.555	⅜	4
⅜	4	3	6¼	1 17/32 x 1¼	25/64	1	⅛	.690	⅜	4
½	4	3½	6½	1 27/32 x 1¼	½	1	⅛	.855	⅜	4½
¾	4½	4	8½	1 13/16 x 1 11/32	¾	1¼	5/32	1.065	½	6½
1	5½	4⅜	9	2 5/16 x 1 27/32	1	1⅜	5/32	1.330	½	12
1¼	5½	4¾	9½	2 5/16 x 1 27/32	1¼	1⅜	5/32	1.645	½	13½
[illegible]	6½	5½	11½	2 21/32 x 2⅛	1½	1⅜	3/16	1.915	½	19½
2	8½	5½	13	3 11/32 x 2⅝	2	1½	¼	2.406	⅝	25½

*Conforms to ANSI B16.11

R-P&C Valve Inc.

8150 West Ridge Road. • Fairview, Pennsylvania 16415

4.7.13-37 *One of the White Consolidated Industries*

MA	P	FP	SH	FI	SP

Stearns-Roger
Engineering Standard

NC 1/6/81

C-101

VALVE SPECIFICATION SHEET V5191

ISSUED 6/30/71
REVISED 2/9/76

TYPE GATE. ✓

RATING 125# ANSI B16.1. ✓

ENDS FLANGED F.F., 125# ANSI B16.1. ✓

BODY C.I., ASTM A126, CLASS A OR B (12" & SMALLER) ✓
CLASS B OR C (14" & LARGER). ✓

BONNET (BOLTED) C.I., ASTM A126, CLASS A OR B (12" & SMALLER) ✓
CLASS B OR C (14" & LARGER). ✓

BODY & BONNET BOLTING ASTM A307, GR. B. ✓

DISC SOLID WEDGE, BRONZE FACED.

STEM BRONZE, OS & Y. ✓

SEAT BRONZE, RENEWABLE. ✓

SEALS (Or Packing) ASBESTOS. ✓

OPERATOR HANDWHEEL. ✓

TO CONFORM TO ANSI B16.10.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	465-1/2	2" - 24"	
HAMMOND	IR1140	2" - 24"	
JENKINS	651 A	2" - 24"	
JENKINS (CANADA)	454	2" - 24"	
LUNKENHEIMER	1430	2" - 24"	
MILWAUKEE	2885	2" - 12"	
POWELL	1793	2" - 24"	
STOCKHAM	G-623	2" - 24"	
WALWORTH	8726F	2" - 12"	
WALWORTH	726F	14" - 24"	
ITT GRINNELL	6020	2" - 12"	
NIBCO	F-617-0	2" - 16"	

OK

CUSTOMER

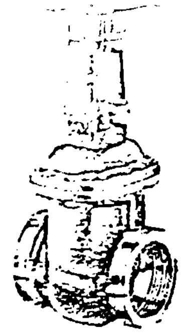
ORDER NO. 4.7.13-38

VALVE NUMBER V5191

FORM 40

CRANE WEDGE GATE VALVE CLASS 125 2" to 8"

Outside Screw & Yoke

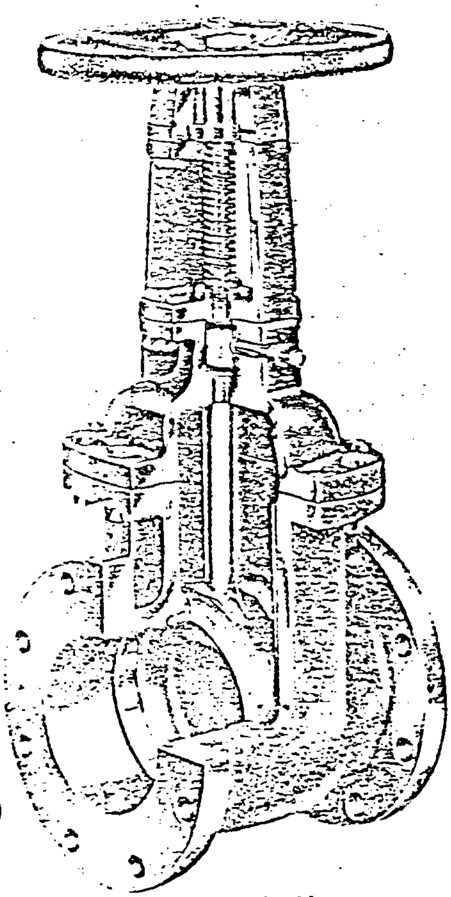


RATINGS

Temp. F.	psi
−20 to 150°	200
200	190
225	180
250	175
275	170
300	165
325	155
350	150
375	145
400	140
425	130
450	125

All Iron
No. 475½, Flanged

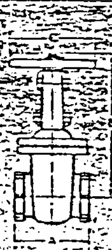
Bronze Trim
No. 464½, Threaded
No. 465, Flanged
No. 465½, Flanged ←



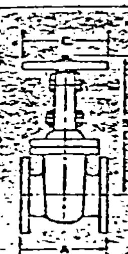
No. 465½

Design Data and Features:

- Bronze trim valves are recommended for steam, water, air and non-corrosive oil or gas. All have bronze seat rings and the discs are solid bronze in sizes 3" and smaller. In larger sizes, bronze faces are rolled into the discs. No. 464½ and No. 465½ have bronze stems. No. 465 valves have nickel-plated steel stems.
- All iron valves with integral seats and nickel-plated steel stem are recommended for oil, gas, gasoline, or fluids that corrode bronze but not iron or steel.
- Ferrosteel body and bonnet are high grade cast iron conforming to ASTM A126, Class B.
- Injection type stuffing box allows self-lubricating TFE impregnated asbestos packing to be added anytime—even when valve is under full rated line pressure. Turning the injector screw forces packing from reservoir into the stuffing box which reduces maintenance time and expense. When reservoir supply is depleted, a new packing stick is quickly and easily inserted.
- Stem with Acme double threads has tee-head disc/stem connection which prevents lateral strain on stem for smooth, easy operation.
- Tapered disc is guided throughout its travel to improve disc life by eliminating premature contact with the seating surfaces.
- All valves are regularly supplied with handwheels, but manual gear, hydraulic or motor operator can be supplied when specified.
- All valves comply with MSS SP-70. Flanged valves have ANSI B16.10, Class 125 iron wedge gate face-to-face dimensions. End flanges conform to ANSI B16.1, Class 125.
- Bronze trim valves except No. 465 meet Federal Spec. WW-V-58b, Type I, Class 1 material and design requirements.



Weights and Dimensions



Valve N.P.S.	Weight—Pounds				Dimensions—Inches			
	464½	465	465½	475½	Threaded A	Flanged A	Flanged B	Flanged C
2	28	33	33	33	5.38	7.00	13.00	7.0
2½	39	48	48	48	6.62	7.50	15.38	8.0
3	48	60	60	60	7.00	8.00	17.00	8.0
3½	—	—	67	—	—	8.50	17.00	8.0
4	80	100	100	100	8.00	9.00	21.62	10.0
5	—	—	138	138	—	10.00	25.50	10.0
6	—	170	170	170	—	10.50	30.00	12.0
8	—	290	290	290	—	11.50	38.00	14.0

"B" dimension is with valve open.

Engineering Standard

(ID) 1/6/81

C-101	VALVE SPECIFICATION SHEET V5214	ISSUED 5/23/74 REVISED 2/9/76

TYPE — GATE-AWWA.

RATING — 200# WATER (2" - 12") 150# WATER (14" - 36").

ENDS — FLANGED F.F., CLASS 125 ANSI B16.1.

BODY — C.I., ASTM A126, CLASS A (12" & SMALLER)
A126, CLASS B (14" - 36").

BONNET — (BOLTED) C.I., ASTM A126, CLASS A (12" & SMALLER).
A126, CLASS B (14" - 36").

BODY & BONNET BOLTING — ASTM A307, GR. B.

DISC — DOUBLE DISC, BRONZE FACED.

STEM — BRONZE, NON-RISING.

SEAT — BRONZE, RENEWABLE.

SEALS (Or Packing) — "O" RING. BUNA-N.

OPERATOR — 2" SQUARE OPERATING NUT.

CHECK FACE TO FACE DIMENSION

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
AMERICAN-DARLING	52	2" - 36"	
DARLING (CANADA VA. LTD)	52	2" - 36"	
KENNEDY	561X	2" - 36"	
STOCKHAM	G-745-0	2" - 12"	

CUSTOMER	
ORDER NO. 4.7.13-40	VALVE NUMBER V5214

FORM 40

2"-12" — 200 lbs. Cold Water
14"-36" — 150 lbs. Cold Water

- Inside Screw
- Parallel Seats
- Double Disc

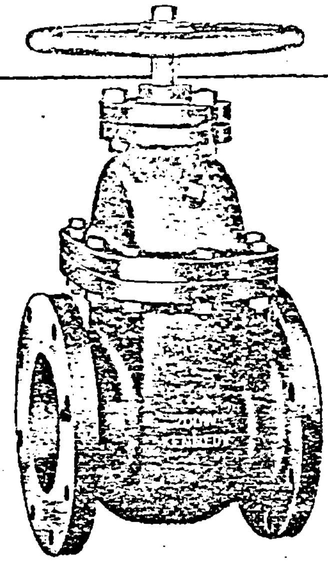


FIG. 561X
Flanged Ends
Also available with Operating Nut.

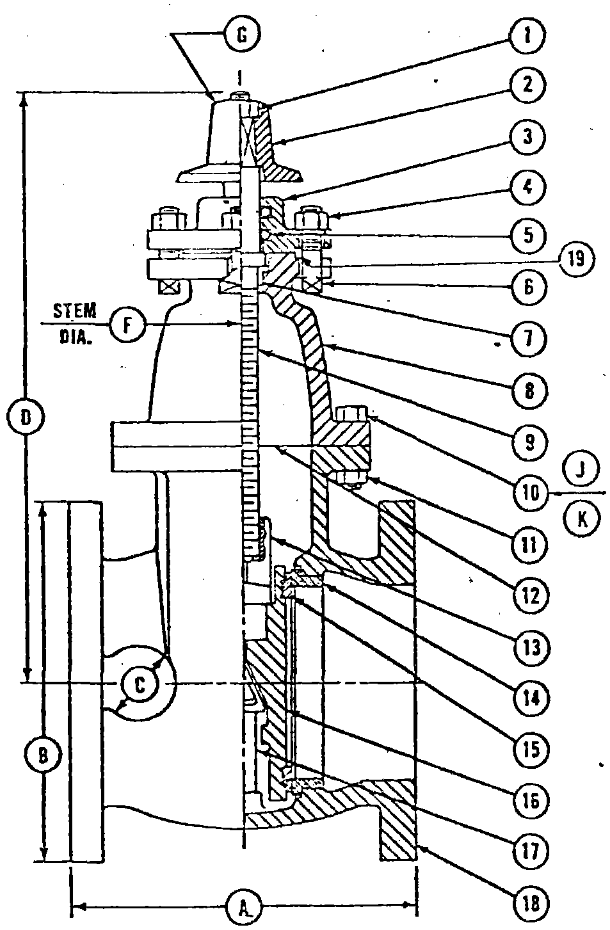
HYDROSTATIC TEST PRESSURE: 3"—12": 400 psi.
14"—36": 300 psi.

Part No.	DESCRIPTION	MATERIAL	A.S.T.M. SPEC.
1	Hex Nut	Steel (Rust Proof)	A-307 Grade B
2	Operating Nut	Cast Iron	A-126 Class B
3	Stuffing Box	Cast Iron	A-126 Class B
4	Bonnet Stuffing Box Nut	Steel (Rust Proof)	A-307 Grade B
5	"O" Rings	Rubber	
6	T-Head Bolt	Steel (Rust Proof)	A-307 Grade B
*7	Bonnet Bushing	Bronze	B-62
8	Bonnet	Cast Iron	A-126 Class B
9	Stem	Mang. Bronze	B-132 Alloy A
10	Bonnet Bolt	Steel (Rust Proof)	A-307 Grade B
11	Bonnet Nut	Steel (Rust Proof)	A-307 Grade B
12	Gasket	Asbestos	
13	Stem Nut	Mang. Bronze	B-132 Alloy A
14	Seat Ring	Bronze	B-62
15	Disc Ring	Bronze	B-62
16	Disc	Cast Iron	A-126 Class B
17	Wedge Pin	Bronze	B-62
18	Body	Cast Iron	A-126 Class B
19	Stuffing Box Gasket	Asbestos	

*Bonnet Bushing 14" through 36"

SIZE	a	A	B	C	D	F	G	H	J	K
2		7	6	1¾	8 9/16	¾	8	6	4	⅜
2½		7½	7	1¾	11¼	¾	8	7	6	⅜
3		8	7½	1¾	12 7/16	1⅛	10	10½	6	½
4		9	9	1¾	13 13/16	1⅛	10	14	8	½
5		10	10	1¾	18 9/16	1⅛	10	17	8	½
6		10½	11	2¼	17⅝	1¼	12	20	10	½
8		11½	13½	2½	21⅝	1⅜	14	26½	12	⅝
10		13	16	2¼	25⅜	1½	16	32½	14	⅝
12		14	19	2½	29½	1⅝	18	38	16	⅝
14		15	21	2½	33¾	1¾	18	45	16	¾
16	24½	16	23½	—	39 15/16	1⅞	20	51	20	¾
18	25½	17	25	—	47 7/16	2	20	57½	20	¾
20	25¾	18	27½	—	53 9/16	2⅛	24	63¾	22	¾
24	31	20	32	—	59¼	2⅜	30	76½	24	⅞
30	31	31	38¾	—	**77¾	2¾	**30	293	32	1
35	37½	37½	46	—	**88¾	3	**30	288	36	1⅛

a = With Bypass; A = Without Bypass; ** With Spur Gear.
G = DIAMETER OF HANDWHEEL J = NUMBER OF BOLTS
H = NUMBER OF TURNS TO OPEN K = DIA. OF BOLTS



BODY MARKING	BONNET MARKING
SIZE	A.W.W.A. YEAR
200W	
KENNEDY	

FIG. 561X WEIGHT — POUNDS

SIZE	2"	2½"	3"	4"	5"	6"	8"	10"	12"
WT.	34	47	66	105	135	163	270	310	579
SIZE			14"	16"	18"	20"	24"	30"	36"
WT.			740	1220	1418	1845	2625	5654	8834*

*APPROXIMATE

FLANGED END IS 125 LB. AMERICAN STANDARD END FLANGE DRILLING

A.W.W.A. Spec. — C500

Engineering Standard

C-101	VALVE SPECIFICATION SHEET V5386	ISSUED 6/16/71 REVISED 6/4/75

1/6/81

TYPE	GATE.
RATING	CLASS 150, ANSI B16.5.
ENDS	FLANGED, R.F., CLASS 150, ANSI B16.5.
BODY	STEEL, ASTM A216, GR. WCB OR ASTM A105.
BONNET	(BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.
BODY & BONNET BOLTING	ASTM A193 GR. B7.
DISC	13% CR. S.S., SOLID WEDGE, PLAIN OR FLEXIBLE.
STEM	13% CR. S.S., OS & Y.
SEAT	NICKEL-COPPER ALLOY.
SEALS (Or Packing)	ASBESTOS.
OPERATOR	HANDWHEEL.

TO CONFORM TO ANSI B16.10 AND API 600.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
			ACCEPTABLE STANDARD TRIM
CRANE	47XR	2" - 24	XU TRIM 2"-12", XC 14"-24".
HATTERSLEY (ENGLAND)	481	2" - 24"	
JENKINS	1009-B3	2" - 24"	8F TRIM 2"-12", #2 14"-24".
KEROTEST	11K	1 1/2" - 24"	
LUNKENHEIMER	1502-N	2" - 24"	#1512 (UNIV. TRIM, 2"-12").
LUNKENHEIMER (CANADA)	1751-6	1 1/2" - 24"	
PACIFIC	150-3	1 1/2" - 24"	
PERSTA (CANADA)	7601.AM	2" - 24"	
POWELL	1503-P140	2" - 24"	N TRIM 2"-12", P140 14"-24".
STOCKHAM	15-OF-4	2" - 24"	
TRIANGLE (ENGLAND)	1822-13	2" - 24"	
WALWORTH	5202-AAA	2" - 24"	UT TRIM.
WALWORTH (CANADA)	5202-AAA	2" - 24"	

CUSTOMER

ORDER NO. 4.7.13-42

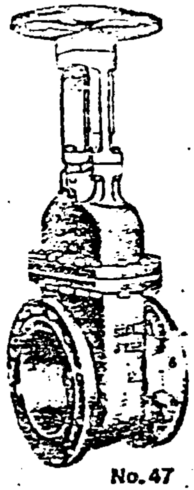
VALVE NUMBER V5386

FORM 40

Design Data and Features:

- These valves comply with applicable requirements of Standards: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34, API 600.
- Solid wedge disc with tee-head disc-stem connection—prevents lateral strain on stem, assures accurate seating.
- Seal welded seat rings—eliminate leak path behind rings.
- Material—carbon steel. Other materials available when specified—Crane No. 5, 7, 9, LCB and "Arctic" steels. See Page 3 for specifications and service recommendations.
- Trim—XU (universal) suitable for broad spectrum of services. Other trims available when specified—U, A, & LU. See Page 3 for descriptions and recommendations.
- Drilling templates are shown on page 50.
- Flange and facing dimensions are shown on page 46.
- Ring joint facing (page 48) can be supplied when specified on sizes 24" and smaller.
- Ends of butt-welding valves 24" and smaller are bored to match Standard pipe unless otherwise ordered. For larger sizes, specify diameter of bore (I.D. of pipe). See page 45.
- Yoke sleeves with anti-friction bearings can be furnished when specified. The number of handwheel turns required to operate valves so furnished is unchanged, but the effect on operating torque is the same as application of a two-to-one gear.
- Location of by-passes, taps and drains, see page 44.
- Valve Operators—Converto Gear, see page 56.
  Teledyne Motor Operators, see page 60.
  Other operators, see page 65.
- Corrugated soft metal bonnet joint gasket assures positive seal against leakage.
- For test information—page 54.

GATE VALVE CLASS 150 18" to 30"

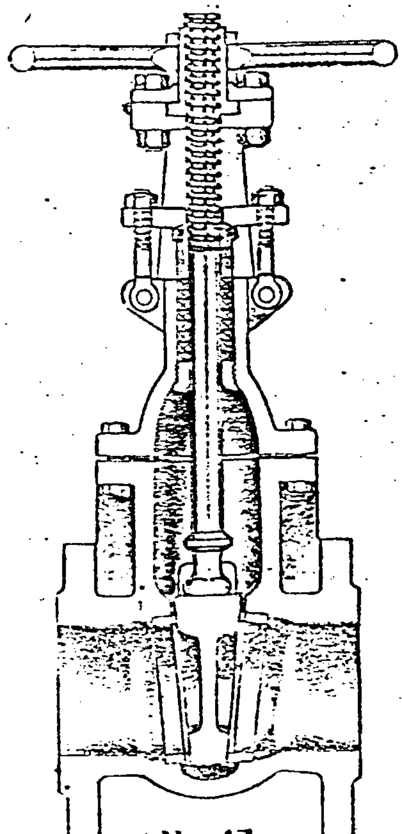

No. 47

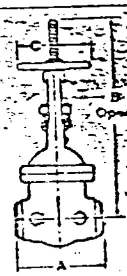
OS&Y Bolted Bonnet
Solid Wedge Disc

No. 47, Flanged
No. 47½, Butt-Welding

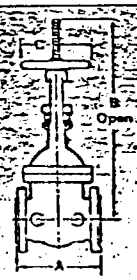
Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
285 psi @ –20F to 100F

See page 55 for ratings of other materials and temperatures


No. 47



Weights and Dimensions



Valve N.P.S.	Weight—Pounds		Dimensions—Inches			
	47	47½	A 47	A 47½	B	C
18	1735	1510	17.0	26.0	81.00	30.0
20	2125	1855	18.0	28.0	89.00	30.0
24	3120	2500	20.0	32.0	104.00	36.0
30	4250	3245	24.0	24.0	127.62	36.0

4.7.13-43

Engineering Standard

(NC) 1/6/81

C-101

VALVE SPECIFICATION SHEET V5482

ISSUED 6/30/71
REVISED 6/4/75

TYPE GATE.

RATING STANDARD CLASS 150, ANSI B16.34.

ENDS BUTT-WELD, ANSI B16.25, 10" AND UNDER - SCH 40.
12" AND ABOVE - STD WT (.375" W.T.).

BODY STEEL, ASTM A216 GR. WCB OR ASTM A105.

BONNET (BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.

BODY & BONNET BOLTING ASTM A193, GR.B7.

DISC 13% CR. S.S., SOLID WEDGE, PLAIN OR FLEXIBLE.

STEM 13% CR. S.S., OS & Y.

SEAT NICKEL-COPPER ALLOY.

SEALS (Or Packing) ASBESTOS.

OPERATOR HANDWHEEL.

TO CONFORM TO ANSI B16.10 AND API 600.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

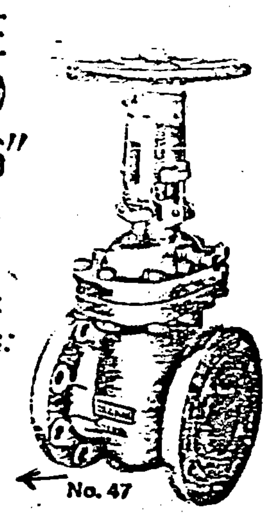
MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
			ACCEPTABLE STANDARD TRIM
CRANE	47 1/2XR	2" - 24"	XU TRIM 2"-12", XC 14"-24".
JENKINS	2009-B3	2" - 24"	8F TRIM 2"-12", #2 14"-24".
LUNKENHEIMER	1503-N	2" - 24"	#1513 (UNIV. TRIM, 2"-12").
LUNKENHEIMER (CANADA)	1571X-6	2" - 24"	
PACIFIC	150-3-WE	1 1/2" - 24"	
POWELL	1503 WE-P140	2" - 24"	N TRIM 2"-12", P140 14"-24".
STOCKHAM	15-OW-4	2" - 24"	
WALWORTH	5202WE-AAA	2" - 24"	UT TRIM.
WALWORTH (CANADA)	5202WE-AAA	2" - 24"	

OK

CUSTOMER	
ORDER NO. 4.7.13-44	VALVE NUMBER V5482

FORM 40

GATE VALVE CLASS 150 2" to 16"

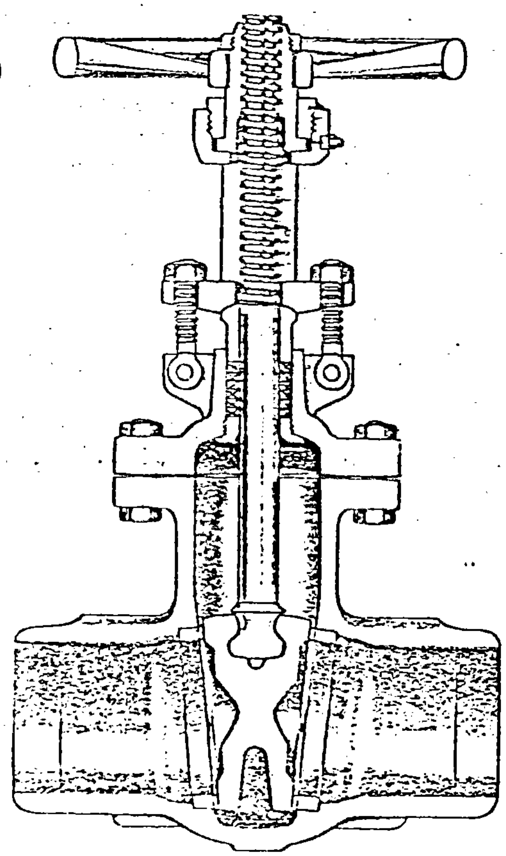


OS&Y Bolted Bonnet Flexible Wedge Disc:

No. 46, Threaded
No. 47, Flanged
No. 47½, Butt-Welding

Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
285 psi @ −20F to 100F

See page 55 for ratings of other materials and temperatures

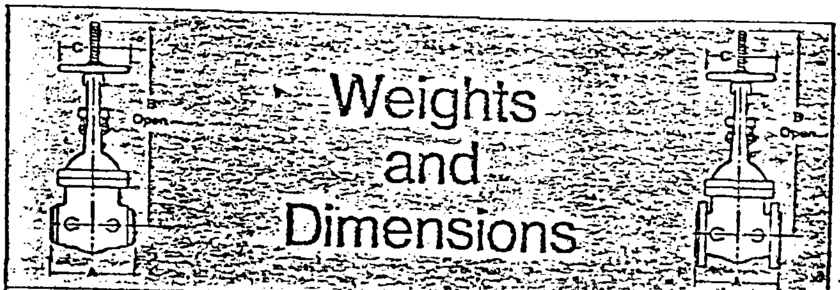


No. 47½

Design Data and Features:

- These valves comply with applicable requirements of Standards: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34, API 600.
- Flexible disc—absorbs pipe line strains—avoids sticking in closed position.
- Seal welded seat rings—eliminate leak path behind rings.
- Material—carbon steel. Other materials available when specified—Crane No. 5, 7, 9, LCB and "Arctic" steels. See Page 3 for specifications and service recommendations.
- Trim—XU (universal) suitable for broad spectrum of services. Other trims available when specified—U, A, & LU. See Page 3 for descriptions and recommendations.
- Drilling templates are shown on page 50.
- Flange and facing dimensions are shown on page 48.
- Ring joint facing (page 48) can be supplied when specified.
- Butt-welding ends are bored to match Standard pipe unless otherwise specified. See page 45.
- Yoke sleeves with anti-friction bearings can be furnished when specified on 10 through 16" sizes. Torque required to operate valves so furnished is about one-half of that required with plain bearing yoke sleeves.
- Location of by-passes, taps and drains, see page 44.
- Valve Operators—Converto Gear, see page 56. Teledyne Motor Operators, see page 60. Other operators, see page 65.
- For test information—page 54.
- These valves can be used for "block and bleed" service and "hot tapping." See page 44.

Weights and Dimensions



Valve N.P.S.	Weight—Pounds 46	47	47½	Dimensions—Inches A 46	A 47	A 47½	B	C
2	40	46	45	6.25	7.0	8.50	15.75	8.0
2½	60	70	60	7.00	7.5	9.50	16.50	8.0
3	63	76	62	7.38	8.0	11.12	18.88	9.0
4	85	110	95	8.00	9.0	12.00	23.00	10.0
5	—	155	140	—	10.0	15.00	27.88	12.0
6	—	175	165	—	10.5	15.88	31.00	12.0
8	—	310	260	—	11.5	16.50	38.75	14.0
10	—	455	410	—	13.0	18.00	46.75	16.0
12	—	650	580	—	14.0	19.75	55.00	18.0
14	—	860	730	—	15.0	22.50	60.50	20.0
16	—	1120	960	—	16.0	24.00	66.75	20.0

4.7.13-46

Engineering Standard

(UC) 1/6/81

C-101	VALVE SPECIFICATION SHEET V5715	ISSUED 9/6/72 REVISED 3/12/75

TYPE GATE.

RATING STANDARD CLASS, 300, ANSI B16.34.

ENDS BUTT-WELD, ANSI B16.25. 10" & UNDER-SCH. 40. 12" & OVER-STD. WT. (375" W.T.)

BODY STEEL, ASTM A216, GR. WCB OR ASTM A105.

BONNET (BOLTED) STEEL, ASTM A216, GR. WCB OR ASTM A105.

BODY & BONNET BOLTING ASTM A193, GR. B7.

DISC 13% CR. S.S., SOLID WEDGE, PLAIN OR FLEXIBLE.

STEM 13% CR. S.S., OS & Y.

SEAT NICKEL-COPPER ALLOY.

SEALS (Or Packing) ASBESTOS.

OPERATOR HANDWHEEL.

TO CONFORM TO ANSI B16.10 AND API 600.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
			ACCEPTABLE STANDARD TRIM
CRANE	33 1/2XR	2" - 24"	XU TRIM THRU 12", XC 14"-24".
JENKINS	2010-3	2" - 20"	SF TRIM THRU 12", #2 14"-20".
LUNKENHEIMER	3003 N	2" - 16"	#3013 (UNIV. TRIM, 2"-12").
LUNKENHEIMER (CANADA)	1938X-6	2" - 24"	
PACIFIC	350-3-WE	1 1/2" - 24"	
POWELL	3003WE-P140	2" - 24"	N TRIM 2"-12", P140 14"-24".
STOCKHAM	30-OW-4	2" - 18"	
WALWORTH	5206WE-AAA	2" - 24"	UT TRIM.
WALWORTH (CANADA)	5206WE-AAA	2" - 24"	

CUSTOMER	
ORDER NO. 4.7.13-48	VALVE NUMBER V5715

Design Data and Features:

…ese valves comply with applicable requirements of Stand-…rds: ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34, …I 600.

…le disc—absorbs pipe line strains—avoids sticking in …sed position.

…ermanent, swing-type eye bolts—prevent loss while eas-…g service of stuffing box.

…eal welded seat rings—eliminate leak path behind rings.

…aterial—carbon steel. Other materials available when spe-…fied—Crane No. 5, 7, 9, LCB and "Arctic" steels. See …age 3 for specifications and service recommendations.

…rim—XU (universal) suitable for broad spectrum of serv-…es. Other trims available when specified—U, A, & LU. See …age 3 for descriptions and recommendations.
…rilling templates are shown on page 50.
…ange and facing dimensions are shown on page 46.
…ng joint facing (page 48) can be supplied when specified.
…her facings (page 48) can be supplied when specified.

…tt-welding ends are bored to match Standard pipe unless …erwise specified. See page 45.

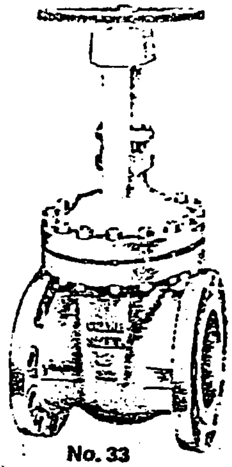
…oke sleeves with anti-friction bearings can be furnished when …ecified on 10 through 16" sizes. Torque required to operate …ves so furnished is about one-half of that required with plain …earing yoke sleeves.

…cation of by-passes, taps and drains, see page 44.

…alve Operators—Converto Gear, see page 56.
…ledyne Motor Operators, see page 60.
…her operators, see page 65.

…st information—page 54.

…ese valves can be used for "block and bleed" service …nd "hot tapping." See page 44.


No. 33

GATE VALVE CLASS 300 2" to 16"

OS&Y Bolted Bonnet Flexible Wedge Disc

No. 32, Threaded
No. 33, Flanged
No. 33½, Butt-Welding ←

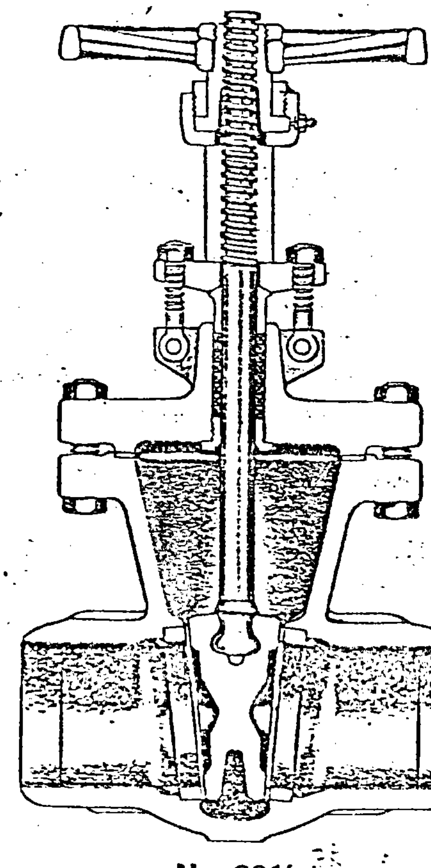
Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
740 psi @ −20F to 100F

See page 55 for ratings of other materials and temperatures

Weights and Dimensions

Valve I.P.S.	Weight—Pounds 32	33	33½	Dimensions—Inches A 32	A 33	A 33½	B	C
[illegible]	60	74	49	7.0	8.50	8.50	18.00	8.0
…½	80	80	74	8.0	9.50	9.50	19.00	8.0
[illegible]	90	108	85	9.0	11.12	11.12	19.88	9.0
[illegible]	130	165	120	11.0	12.00	12.00	23.75	10.0
[illegible]	—	235	185	—	15.00	15.00	28.38	12.0
[illegible]	—	320	245	—	15.88	15.88	32.50	14.0
[illegible]	—	500	410	—	16.50	16.50	40.75	16.0
[illegible]	—	760	625	—	18.00	18.00	49.50	18.0
[illegible]	—	1020	890	—	19.75	19.75	57.25	20.0
[illegible]	—	1380	1220	—	30.00	30.00	61.25	20.0
[illegible]	—	1960	1620	—	33.00	33.00	71.50	24.0

4.7.13-47


No. 33½

1/6/01

C-101	VALVE SPECIFICATION SHEET V6864	ISSUED Jun 25/71 REVISED 5/29/75

TYPE GLOBE. ✓

RATING 200# SWP, 400# WOG. ✓

ENDS THREADED, ANS B2.1, NPT.

BODY BRONZE, ASTM B61. ✓

BONNET (UNION) BRONZE, ASTM B61. ✓

BODY & BONNET BOLTING ____________

DISC BRONZE. ✓

STEM BRONZE, RISING. ✓

SEAT BRONZE, INTEGRAL, REGRINDING. ✓

SEALS (Or Packing) ~~ASBESTOS~~. graphited ✓

OPERATOR HANDWHEEL. ✓

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	70	1/8"-3" ok	
JENKINS	750	1/8"-2"	
JENKINS (CANADA)	2086	1/4"-3"	
KENNEDY	134	1/4"-3"	
LUNKENHEIMER	407	1/8"-2"	
POWELL	110	1/4"-3"	
~~STOCKHAM~~	~~B37~~	~~1/4"-3"~~	
WALWORTH	160	1/4"-3"	
HAMMOND	IB411	1/8" - 3"	

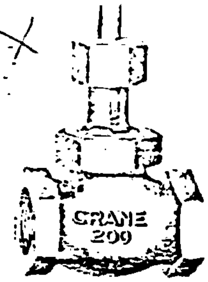
CUSTOMER	
ORDER NO. 4.7.13-48	VALVE NUMBER V6864

FORM 40

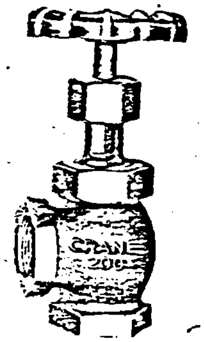
GLOBE AND ANGLE VALVES CLASS 200

1/8" to 2"

Union Bonnet
Globe
No. 70, Threaded
Angle
No. 701, Threaded



No. 70



No. 701

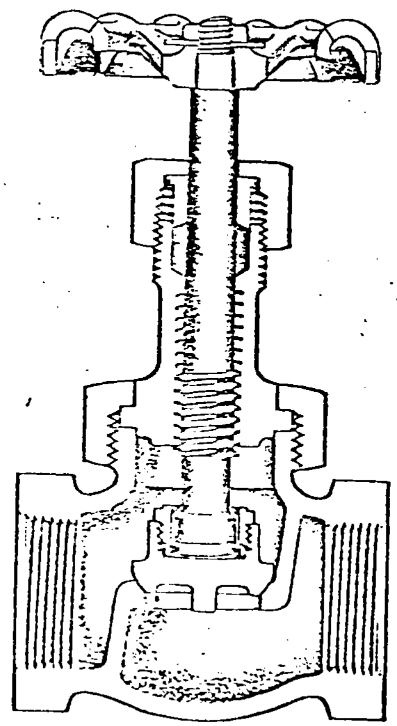
RATINGS

Temp. F.	Psi Non-Shock
−20 to 150°	400
200	375
250	350
300	325
350	300
400	275
450	250
500	225
550	200

- Recommended for steam and non-shock water, oil or gas services at pressures up to 400 psi non-shock.
- Maintenance and down time are kept to a minimum, since seats can be reground without removing the valve from the line.
- Compact union bonnet construction with bonnet ring provides additional reinforcement of the bonnet joint and facilitates dismantling and reassembly of valve; also centers and guides the valve trimmings when valves are being reground.
- On valves ½" and smaller, the disc is integral with the stem; larger size discs swivel on the stem.
- Asbestos graphite packing is filled into a deep stuffing box providing a tight stem seal. Valve sizes ½" and larger are gland equipped.
- Each valve has a backseat in the interior of the bonnet below the packing.
- Complies with MSS SP-80.

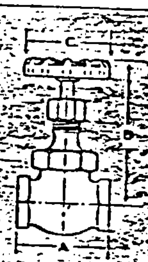
PRINCIPAL PARTS & MATERIALS

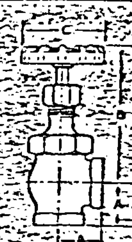
Part	Sizes	Material	ASTM
Body	All	Bronze	B61
Bonnet	1/8"-3/8"	Brass	B16 Alloy 360
	½"-2"	Bronze	B61
Disc	1/8"-½"	Bronze	B99 Alloy 651
	¾"-2"	Bronze	B61
Stem #70	1/8"-¾"	Bronze	B99 Alloy 651
	1"-2"	Bronze	B584 Alloy 876
Stem #701	1/8"-¼"	Bronze	B62 Mod.
	3/8"-¾"	Bronze	B99 Alloy 651
	1"-2"	Bronze	B584 Alloy 876



No. 70

Weights and Dimensions





Valve N.P.S.	Weight—Pounds 70	Weight—Pounds 701	Dimensions—Inches 70 A	Dimensions—Inches 701 A	B	C
1/8	0.6	—	1.68	—	3.50	1.75
¼	0.6	0.5	1.68	.82	3.50	1.75
3/8	0.8	0.6	1.94	1.00	3.88	2.06
½	1.2	1.1	2.25	1.18	4.25	2.56
¾	2.0	1.9	2.75	1.38	5.00	2.75
1	3.0	3.0	3.32	1.68	5.75	3.06
1¼	5.0	—	3.88	—	6.62	3.62
1½	7.0	7.0	4.50	2.25	7.62	4.06
2	11.0	11.0	5.25	2.62	8.38	4.75

"B" dimension is with valve open

4.7.13-49

Stearns-Roger

Engineering Standard

NC

1/6/81

C-101	VALVE SPECIFICATION SHEET V6479	ISSUED 6/4/71 REVISED 6/4/75

TYPE GATE.

RATING STANDARD CLASS 300, ANSI B16.34.

ENDS BUTT WELD, 10" AND UNDER - SCH. 40,
12" AND ABOVE - STD WT. (0.375" W.T.).

BODY ALLOY STEEL, (1½ CR - ½ MO) ASTM A217, GR. WC6.

BONNET (BOLTED) ALLOY STEEL, (1½ CR - ½ MO) ASTM A217, GR. WC6.

BODY & BONNET BOLTING ASTM A193, GR. B16.

DISC STELLITE FACED. SOLID WEDGE, PLAIN OR FLEXIBLE.

STEM 13% CR. S.S., OS & Y.

SEAT STELLITE FACED.

SEALS (Or Packing) ASBESTOS W/INCONEL WIRE INSERT.

OPERATOR HANDWHEEL.

TO CONFORM TO ANSI B16.10.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
CRANE	33½-U7	2" - 24"	
JENKINS	2010-9	2" - 18"	
LUNKENHEIMER	3003U	1 1/2" - 16"	
PACIFIC	350-7-WE	1 1/2" - 24"	
POWELL	3003WE-P100	2 1/2" - 24"	
STOCKHAM	30-OW-13	2" - 18"	
WALWORTH	5206WE-HF	2" - 24"	

CUSTOMER

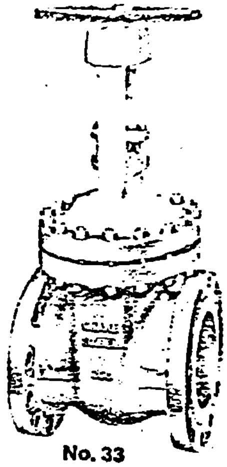
ORDER NO. 4.7.13-50

VALVE NUMBER V6479

FORM 40

sign Data and Features:

- e valves comply with applicable requirements of Stand- : ANSI-B16.5, ANSI-B16.10, ANSI-B16.25, ANSI-B16.34, 600.
- disc—absorbs pipe line strains—avoids sticking in position.
- manent, swing-type eye bolts—prevent loss while eas- service of stuffing box.
- welded seat rings—eliminate leak path behind rings.
- erial—carbon steel. Other materials available when spe- ed—Crane No. 5, 7, 9, LCB and "Arctic" steels. See e 3 for specifications and service recommendations.
- —XU (universal) suitable for broad spectrum of serv- Other trims available when specified—U, A, & LU. See e 3 for descriptions and recommendations.
- ing templates are shown on page 50.
- ge and facing dimensions are shown on page 46.
- joint facing (page 48) can be supplied when specified.
- er facings (page 48) can be supplied when specified.
- welding ends are bored to match Standard pipe unless erwise specified. See page 45.
- e sleeves with anti-friction bearings can be furnished when ified on 10 through 16" sizes. Torque required to operate es so furnished is about one-half of that required with plain ng yoke sleeves.
- ation of by-passes, taps and drains, see page 44.
- e Operators—Converto Gear, see page 56.
- dyne Motor Operators, see page 60.
- er operators, see page 65.
- information—page 54.
- e valves can be used for "block and bleed" service "hot tapping." See page 44.



No. 33

GATE VALVE CLASS 300 2" to 16"

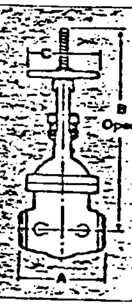
OS&Y Bolted Bonnet
Flexible Wedge Disc

No. 32, Threaded
No. 33, Flanged
No. 33½, Butt-Welding

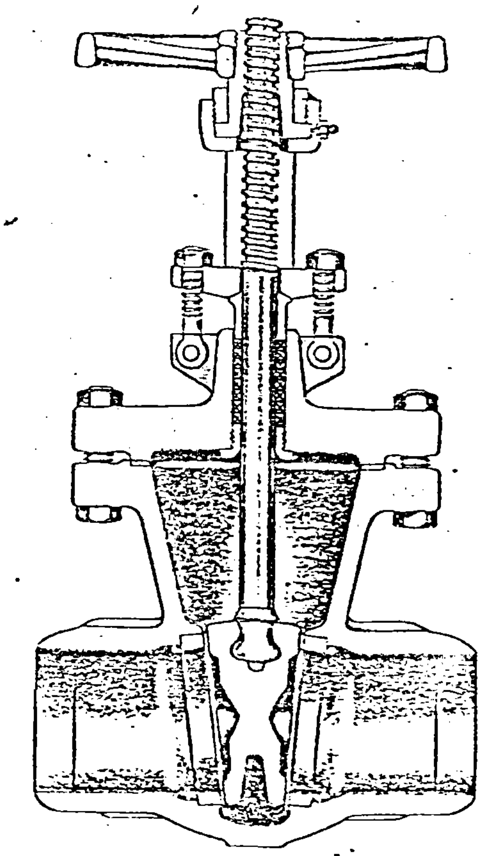
Pressure-Temperature Rating
Carbon Steel, ASTM A216 Grade WCB
740 psi @ –20F to 100F

See page 55 for ratings of other materials and temperatures

Weights and Dimensions



	Weight—Pounds			Dimensions—Inches				
				A				
	32	33	33½	32	33	33½	B	C
	60	74	49	7.0	8.50	8.50	18.00	8.0
	80	80	74	8.0	9.50	9.50	19.00	8.0
	90	108	85	9.0	11.12	11.12	19.88	9.0
	130	165	120	11.0	12.00	12.00	23.75	10.0
	—	235	185	—	15.00	15.00	28.38	12.0
	—	320	245	—	15.88	15.88	32.50	14.0
	—	500	410	—	16.50	16.50	40.75	16.0
	—	760	625	—	18.00	18.00	49.50	18.0
	—	1020	890	—	19.75	19.75	57.25	20.0
	—	1380	1220	—	30.00	30.00	61.25	20.0
	—	1960	1620	—	33.00	33.00	71.50	24.0



No. 33½

4.7.13-51

Engineering Standard

(NC) 1/6/81

C-101	VALVE SPECIFICATION SHEET V7950	ISSUED 06/14/72 REVISED 09/29/78

TYPE	GLOBE.
RATING	CLASS 1500, ANSI B16.5.
ENDS	SOCKET WELD, ANSI B16.11.
BODY	STEEL, ASTM A216, GR. WCB OR ASTM A105.
BONNET	(WELD) STEEL, ASTM A216, GR. WCB OR ASTM A105.
BODY & BONNET BOLTING	
DISC	PLUG TYPE, STELLITE FACED.
STEM	13% CR. S.S., OS & Y.
SEAT	STELLITE, INTEGRAL.
SEALS (Or Packing)	ASBESTOS W/INCONEL WIRE INSERT.
OPERATOR	HANDWHEEL.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
EDWARD/ROCKWELL	3624	1/2" - 3"	
HANCOCK	7150W	1/4" - 2"	
KEROTEST	21600	1/2" - 4"	
R-P & C	F210	1/2" - 2"	
VOGT	SW6723	1/2" - 2"	
YARWAY	5515B	1/4"-2-1/2"	

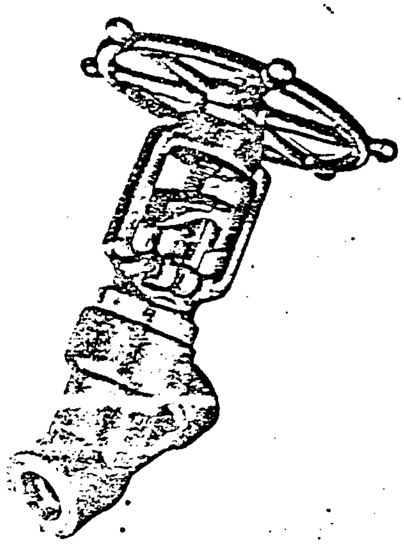
CUSTOMER

ORDER NO. 4.7.13-52

VALVE NUMBER V7950

FORM 40

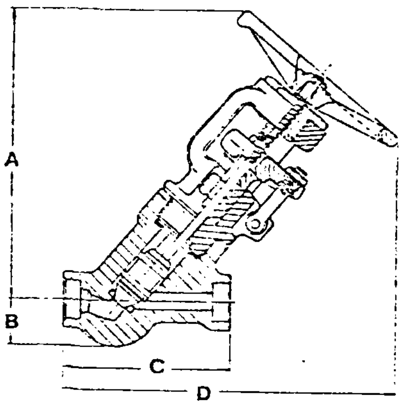
R-P&C CLASS 1500
Y-PATTERN GLOBE VALVES



Designed for the most demanding power and process applications, these rugged Y-Pattern valves are constructed from the finest materials. Their close tolerances and engineered specifications are maintained through an established quality control program featuring final inspection and testing. The following tables provide preliminary selection and specifying information. Additional information is available from our factory application specialists.

SELECTION DATA
R-P&C CLASS 1500 Y-PATTERN VALVES

PRESSURE	MATERIAL	END CONNECTION	BACKSEAT DESIGN	MODEL NO.
1500 psi @ 830°F	Forged Carbon steel ASTM A105	Socket weld	Integral	F210E
			Loose	F212E
		Butt weld	Integral	F220E
			Loose	F222E
		Screwed	Integral	F200E
			Loose	F202E
1500 psi @ 980°F	Chrome-moly Alloy steel ASTM A182-F22	Socket weld	Integral	K210E
			Loose	K212E
		Butt weld	Integral	K220E
			Loose	K222E
		Screwed	Integral	K200E
			Loose	K202E
1500 psi @ 1100°F	Stainless steel ASTM A182-F316	Socket weld	Integral	S210E
			Loose	S212E
		Butt weld	Integral	S220E
			Loose	S222E
		Screwed	Integral	S200E
			Loose	S202E



AVAILABLE IN THESE SIZES

SIZE	DIMENSIONS			
	A OPEN	B	C	D OPEN
1/2	9-5/32	1-3/32	4-1/2	9-23/32
3/4	9-5/32	1-3/32	4-1/2	10-3/32
1	11-5/32	1-1/4	5-7/16	11-17/32
1-1/2	14-29/32	1-7/8	8-1/4	16-3/4
2	17-1/16	2-7/32	10-1/2	20

Engineering Standard

1/6/81

C-101	VALVE SPECIFICATION SHEET V7970	ISSUED 08/10/71 REVISED 09/29/79

TYPE GLOBE (REDUCED PORT).

RATING API CLASS 800.

ENDS SOCKET WELD, ANSI B16.11.

BODY ALLOY STEEL (1-1/4 CR.- 1/2 MO) ASTM A217, GR. WC6 OR A182, GR. F11.

BONNET (BOLTED) ALLOY STEEL, (1-1/4 CR - 1/2 MO) ASTM A217, GR. WC6 OR A182, GR. F11.

BODY & BONNET BOLTING ASTM A193, GR. B16.

DISC STELLITE FACED, PLUG DISC.

STEM 13% CR. S.S., OS & Y.

SEAT STELLITE FACED.

SEALS (Or Packing) ASBESTOS W/WIRE INSERT.

OPERATOR HANDWHEEL.

TO CONFORM, WHERE APPLICABLE, TO API 602.

Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
HANCOCK	5500W-445-201	1/4" - 2"	
PACIFIC	7662-7 (F11)	1/4"-1-1/2"	
R-P & C	K-210	1/2" - 2"	
SMITH	G80K	1/2" - 2"	
VOGT	SW12351	1/2" - 2"	

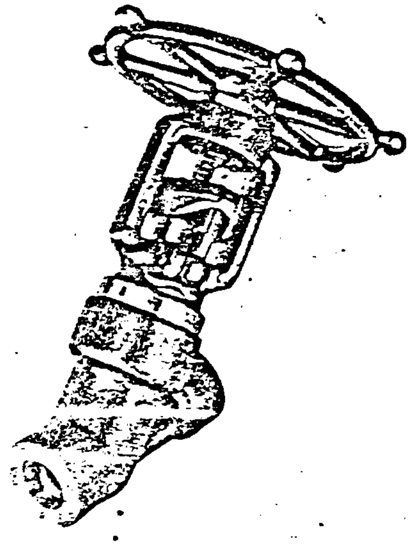
CUSTOMER

ORDER NO. 4.7.13-54

VALVE NUMBER V7970

FORM 40

R-P&C CLASS 1500
Y-PATTERN GLOBE VALVES



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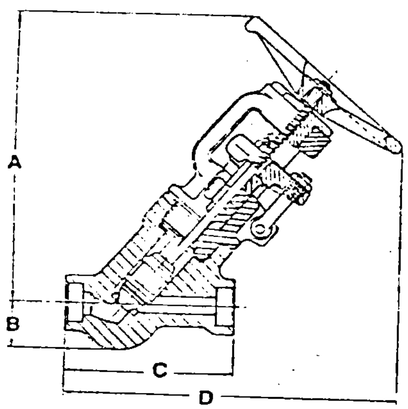
SELECTION DATA
R-P&C CLASS 1500 Y-PATTERN VALVES

PRESSURE	MATERIAL	END CONNECTION	BACKSEAT DESIGN	MODEL NO.
1500 psi @ 830°F	Forged Carbon steel ASTM A105	Socket weld	Integral	F210E
			Loose	F212E
		Butt weld	Integral	F220E
			Loose	F222E
		Screwed	Integral	F200E
			Loose	F202E
1500 psi @ 980°F	Chrome-moly Alloy steel ASTM A182-F22	Socket weld	Integral	K210E
			Loose	K212E
		Butt weld	Integral	K220E
			Loose	K222E
		Screwed	Integral	K200E
			Loose	K202E
1500 psi @ 1100°F	Stainless steel ASTM A182-F316	Socket weld	Integral	S210E
			Loose	S212E
		Butt weld	Integral	S220E
			Loose	S222E
		Screwed	Integral	S200E
			Loose	S202E



AVAILABLE IN THESE SIZES

SIZE	DIMENSIONS A OPEN	B	C	D OPEN
1/2	9-5/32	1-3/32	4-1/2	9-23/32
3/4	9-5/32	1-3/32	4-1/2	10-3/32
1	11-5/32	1-1/4	5-7/16	11-17/32
1-1/2	14-29/32	1-7/8	8-1/4	16-3/4
2	17-1/16	2-7/32	10-1/2	20

Engineering Standard

NC 1/6/81

C-101	VALVE SPECIFICATION SHEET V7972	ISSUED 08/06/71 REVISED 5/29/75

TYPE GLOBE

RATING 1500# @1050°F.

ENDS SOCKET WELD, ANS B16.11.

BODY ALLOY STEEL (2½CR-1 MO) ASTM A217, GR. WC9 OR A182, GR. F22.

BONNET (SEAL WELD OR INTEGRAL) ALLOY STEEL, (2½CR-1 MO) ASTM A217, GR. WC9 OR A182, GR. F22.

BODY & BONNET BOLTING

DISC STELLITE FACED.

STEM 13% CR. S.S., OS & Y.

SEAT STELLITE FACED.

SEALS (Or Packing) ASBESTOS W/WIRE INSERT.

OPERATOR HANDWHEEL

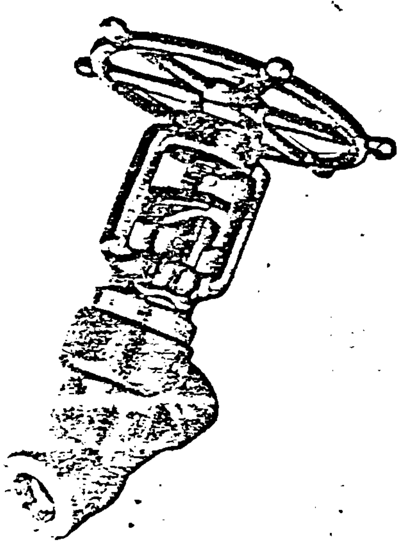
Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
HANCOCK	7150-F22	½" - 2"	
EDWARD/ROCKWELL	3624(F22)	½" - 3"	
VOGT	SW-6793	½" - 2"	
YARWAY	5515B	½" - 2½"	

CUSTOMER	VALVE NUMBER V7972
ORDER NO. 4.7.13-56	

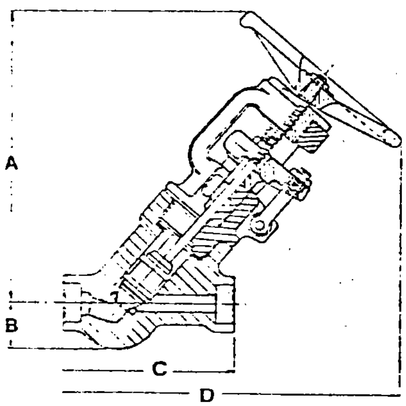
R-P&C CLASS 1500 Y-PATTERN GLOBE VALVES



Designed for the most demanding power and process applications, these rugged Y-Pattern valves are constructed from the finest materials. Their close tolerances and engineered specifications are maintained through an established quality control program featuring final inspection and testing. The following tables provide preliminary selection and specifying information. Additional information is available from our factory application specialists.

SELECTION DATA
R-P&C CLASS 1500 Y-PATTERN VALVES

PRESSURE	MATERIAL	END CONNECTION	BACKSEAT DESIGN	MODEL NO.
1500 psi @ 830°F	Forged Carbon steel ASTM A105	Socket weld	Integral	F210E
			Loose	F212E
		Butt weld	Integral	F220E
			Loose	F222E
		Screwed	Integral	F200E
			Loose	F202E
1500 psi @ 980°F	Chrome-moly Alloy steel ASTM A182-F22	Socket weld	Integral	K210E
			Loose	K212E
		Butt weld	Integral	K220E
			Loose	K222E
		Screwed	Integral	K200E
			Loose	K202E
1500 psi @ 1100°F	Stainless steel ASTM A182-F316	Socket weld	Integral	S210E
			Loose	S212E
		Butt weld	Integral	S220E
			Loose	S222E
		Screwed	Integral	S200E
			Loose	S202E



AVAILABLE IN THESE SIZES

SIZE	DIMENSIONS			
	A OPEN	B	C	D OPEN
1/2	9-5/32	1-3/32	4-1/2	9-23/32
3/4	9-5/32	1-3/32	4-1/2	10-3/32
1	11-5/32	1-1/4	5-7/16	11-17/32
1-1/2	14-29/32	1-7/8	8-1/4	16-3/4
2	17-1/16	2-7/32	10-1/2	20

Engineering Standard

(NC) 1/6/81

C-101	VALVE SPECIFICATION SHEET V7974	ISSUED 06/00/71 REVISED 09/29/78

TYPE	GLOBE.
RATING	2500# @ 1050°F.
ENDS	SOCKET WELD, ANSI B16.11.
BODY	ALLOY STEEL (2-1/4 CR - 1 MO) ASTM A217, GR. WC9 OR A182, GR. F22.
BONNET	(WELD) ALLOY STEEL, ASTM A217, GR. WC9 OR A182, GR. F22.
BODY & BONNET BOLTING	
DISC	STELLITE FACED.
STEM	13% CR. S.S.
SEAT	STELLITE FACED.
SEALS (Or Packing)	ASBESTOS W/WIRE INSERT.
OPERATOR	HANDWHEEL.

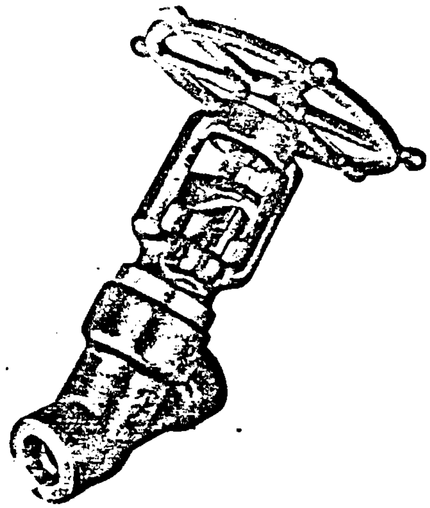
Unless noted, the description above will override the Manufacturer's figure number in case of differences.

ACCEPTABLE VALVE EQUIVALENTS

MANUFACTURER	FIG. NO.	SIZE RANGE	REMARKS
HANCOCK	7250W-F22	1/4" - 2"	
EDWARD/ROCKWELL	6624-F22	1/2"-2-1/2"	"Y" PATTERN
R-P & C	K-260	1/2" - 2"	"Y" PATTERN
VOGT	SW6793	1/2" - 2"	
YARWAY	5525B	1/2"-2-1/2"	"Y" PATTERN

CUSTOMER		
ORDER NO.	4.7.13-58	VALVE NUMBER V7974

R-P&C FORGED ALLOY STEEL VALVES



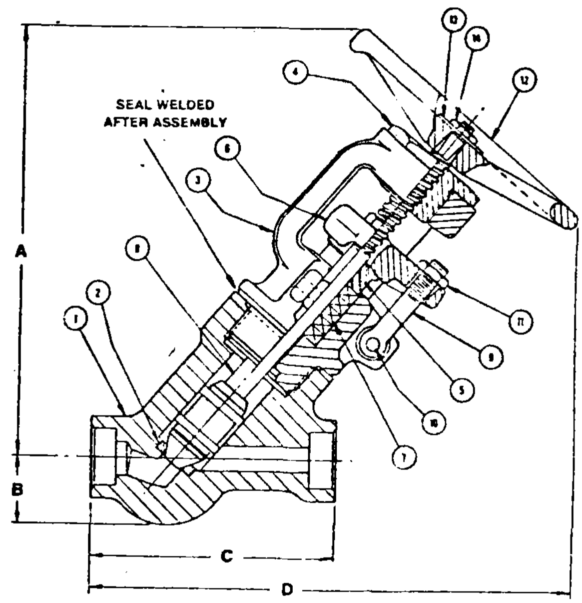
K 250-E SCREWED END
K 260-E SOCKET WELD
K 270-E BUTT WELD

Sizes: ½" Thru 2"

CHROME MOLY—ASTM A-182 Grade F22 (2¼% Chrome 1% Moly)

OS&Y GLOBE VALVE, INCLINED STEM, INTEGRAL BACKSEAT, SEAL WELDED BONNET, REGULAR PORT. CLASS 2500

WORKING PRESSURE (NON-SHOCK)
2500 PSI @ 985° F. STEAM-OIL
6250 PSI @ —20° TO 100°F.
FOR HIGHER TEMPERATURES, CONSULT FACTORY



MATERIALS OF CONSTRUCTION

No.	Part	Material	A.S.T.M. Spec.	Remarks
1-2	Body Assembly			
1	Body	Chrome Moly	A182	Grade F22
2	Seat Ring	H.F. Material		
3-11	Bonnet Assembly			
3	Bonnet	Chrome Moly	A182	Grade F22
4	Operating Nut	Bronze		
5	Gland Follower	416 Stn. Steel		
6	Gland Flange	Forged Steel	A105	
* 7	Packing	Wire Inserted Molded Asbestos		John Crane 187-I or Equivalent
8	Stem Assembly	416 Stn. Steel/ H.F. Material		
9	Eyebolt	Steel GR.B7	A193	
10	Eyebolt Pin	18-8 Stn. Steel		
11	Gland Nut	Steel GR.2H	A194	
12	Handwheel	Malleable Iron	A47	Grade 32510
13	Nameplate	Etched Aluminum		
14	Handwheel Nut	Stainless Steel		

*RECOMMENDED SPARE PARTS.

END CONNECTIONS:

TYPE	CONFORMS TO
SCREWED	ANSI B2.1
SOCKET WELD	ANSI B16.11
BUTT WELD	ANSI B16.25

DIMENSIONAL SPECIFICATIONS

NOTE: Dimensions shown are subject to change. Contact factory for certified prints (exact dimensions) when required

Size	A (Open)	B	C	D (Open)	Handwheel Diameter	Dia. Port Opening	CV Flow Coefficient	Weight Lbs.
1/2	9-5/32	1-3/32	4-1/2	9-23/32	6	7/16	5	12
3/4	11-5/32	1-1/4	5-7/16	11-17/32	6	9/16	6	15
1	11-5/32	1-1/4	5-7/16	11-17/32	7	13/16	12	18
1-1/2	14-29/32	1-7/8	8-1/4	16-3/4	12	1-1/4	30	45
2	17-1/16	2-7/32	9-1/2	20	14	1-1/2	60	60

On Butt Weld Only the Port Opening is determined by Customer Requirements for Schedule of Pipe Bore.

R-P&C Valve
8150 West Ridge Road • Fairview, Pennsylvania 16415
Division of White Consolidated Industries, Inc

4.7.15 Feedwater Inlet Valve
Preheater Panel Water Outlet Valve

4.7.15.1

Identification Tag Number	Description
V-FW-200-201	Feedwater Inlet Valve
V-FW-228-203	Preheater Panel Water Outlet Valve

4.7.15.2 Description

Manufacturer	:	Valtek, Springville, Utah
Part Number	:	Mark one body assembly
Rocketdyne Specification No.	:	SP42-014
Material	:	Body: Carbon Steel
Weight	:	610 lb.

4.7.15.3 Prescribed Service

4.7.15.4 Vendor

Valtek

4.7.15.5 Special Cautions

See Valtek Maintenance Bulletins (See paragraph 4.7.4.11)

4.7.15.6 Periodic Service

None

4.7.15.7 Parts List

See Parts List (following)

4.7.15.8 Special Tools

None

4.7.15.9 Maintenance Instructions

See Valtek Maintenance Bulletin (See paragraph 4.7.4.11)

4.7.15.10 Acceptance Tests

None

RWIV, RPWOV

VALTEK PARTS LIST REVISION NO. 014
SEP 26, 1980, SLSGAIL

SERIAL NO. V18292-001 TAG NO. V-FW-200-201
V-FW-228-203

4." MARK I BODY SUB-ASSEMBLY
1500# 3.38" SPUD 1.50" STEM DIA.
ANGLE, STD SEAL, FLOW OVER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY ANGLE, 4", 900/1500#............	1	...026716.001.041		
12	YOKE HALF-RING, 3.75 X 3.00, 0.25 THI	4	...003984.029.002		
20	SEAT RING, 4", CV 195................	1	...001210.150.000	**	122.3
30	SEAT RETAINER, 4", 1500#.............	1	...003051.150.000		
40	BONNET, 4", 3.38" SPUD...............	1	...004005.029.041		
43	ADAPTER, YOKE, 3.38" SPUD............	1	...007841.029.041		
50	PLUG, 4", LIN........................	1	...008621.150.000	**	465.0
55	SEAT GASKET, SPIRAL, 4.87 X 4.50.....	1	...001242.832.000	**	6.4
58	BONNET GASKET, SPIRAL, 5.68 X 5.18...	1	...001240.832.000	**	8.1
70	BONNET FLANGE, 4", 1500#.............	1	...004006.018.041		
80	GLAND FLANGE, 1.50" STEM, 3.38" SPUD.	1	...001969.029.041		
82	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.0
83	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
86	GUIDE LINER, 1.50" STEM, GRAFOIL.....	3	...009472.842.000	**	11.0
87	GUIDE RETAINER, 1.50" STEM, GRAFOIL..	1	...009475.150.000		
88	PACKING SET, STD VEE, 1.50" STEM.....	1	...020755.925.000	**	15.2
93	PKG SPR, 1.50" STEM, 4.00 L..........	1	...020903.150.000		
94	PKG SPR, 1.50" STEM, 2.00 L..........	1	...004615.150.000		
95	PKG SPR, 1.50" STEM, 1.00 L..........	1	...020902.150.000		
96	PKG SPR, 1.50" STEM, 0.50 L..........	1	...004684.150.000		
105	SCREW, DRIVE, #4.....................	2	...007516.012.002		
107	YOKE BOLT, 5/8"-11, 2.25 L...........	4	...001283.015.002		
108	BONNET FLANGE STUD, 1-1/4"-8, 5.50 L.	8	...003680.012.002		
109	PACKING BOX STUD, 5/8"-11, 5.50 L....	2	...003892.012.002		
114	BONNET FLANGE NUT, 1-1/4"-8, H D.....	8	...002383.014.002		
117	PACKING BOX NUT, 5/8"-11, H D........	4	...005110.014.002		
126	PLATE, FLOW ARROW, MK 1 & 2..........	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST   REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V18292-001   TAG NO.

MANUAL SERIES H-D MANUAL ACTUATOR
3.38" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.	UNIT PRICE
201	YOKE, 3.38" SPUD, TORKMATIC..........	1	...026313.300.040	
202	ACTUATOR, TORKMATIC B-20.............	1	...022186.999.000	
211	ACTUATOR STEM, LIMITORQUE, TORKMATIC.	1	...026197.159.000	
213	STROKE PLATE, 2-1/2" STROKE..........	1	...001252.603.000	
235	BOLT, 5/8"-11, 3.50 L................	4	...016370.010.002	
249	CLAMP, STEM, 100/200 SQ. INCH........	1	...026196.300.040	
251	PLATE, TAG...........................	1	...002223.153.000	
252	SERIAL PLATE.........................	1	...002438.153.000	
256	HANDWHEEL NUT, TORKMATIC.............	1	...026326.999.000	
333	SCREW, PAN HEAD, #4-40...............	4	...001118.012.002	
345	STEM CLAMP LOCKNUT, 1/2"-13..........	1	...006806.013.002	
380	BOLT, 1/2"-13, 3.75 L................	1	...001731.010.002	
402	SCREW, DRIVE, #4.....................	2	...007516.012.002	

** RECOMMENDED SPARE PART

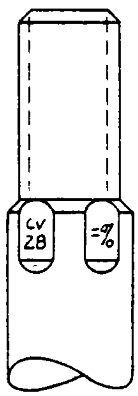
VALTEK

MARK ONE

Standard Materials of Construction
Estimating Shipping Weights

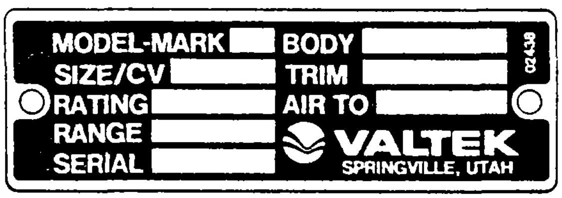
Part Identification

Whenever we can, we visibly number the part with ink or etching equipment. This identifies the part number and material used. On the plug stem flats we etch Cv, flow characteristic, part number, and material.



Name Plate

Valves are equipped with stainless steel name plates. An example is illustrated below.



Estimating Shipping Weights

Globe and Angle, Flanged Valves with Cylinder Actuators and Positioners

	Weight in Pounds						Add For Std.
Size In.	150#	300#	600#	900#	1500#	2500#	Ext. Bonnet
½ - ¾	40	40	40				5
1	50	50	50	100	120	150	5
1½	65	65	65	170	180	210	5
2	75	75	75	200	220	300	5
3	160	170	180	400	430	500	15
4	240	250	265	590	610	940	20
6	360	570	600	1000	1170	1400	40
8	590	790	830				65
10	1050	1405	1600				90

Add 30# for diaphragm actuators on ½ - 2" valves.

Add for oversize cylinder actuators.

Original size	Oversize	Add
25	50	30#
50	100	90#
100	200	125#

Standard Materials of Construction

Part	Material
Body & Bonnet	Cast Iron, Ductile Iron, Steel, 304, 304L, 316, 316L, 347 Stainless Steel, Bronze, Alloy 20, Hastelloy 'B' and 'C', Nickel, Monel, Inconel, Chrome - Moly, and Titanium.
Separable Line & Bonnet Flanges	Steel
Retaining Rings	Zinc Plated Steel
Plug	316 Stainless Steel, or same as Alloy body
Retainer	316 Stainless Steel, or same as Alloy body
Seat Ring	316 Stainless Steel or same as Alloy body
Guides	Bronze, Glass loaded Teflon, Grafoil, Stellite
Packing	Teflon V-Ring, Teflon Asbestos, Graphite Asbestos, and Grafoil.
Packing Spacer	316 Stainless Steel, or same as Alloy body
Seat Ring and Bonnet Gaskets	Stainless Steel and asbestos spiral wound or Teflon
Body Bolts	Zinc Plated Steel
Gland Flange	Precision Cast Stainless Steel
Gland Flange Nuts & Bolts	Zinc Plated Steel
Yoke Clamp Bolts	Zinc Plated Steel
Yoke Clamp	Precision Cast Stainless Steel

PREPARED BY		NUMBER SP42-014
J. W. Lewellen	FSCM NO. 02602	TYPE Equipment
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 11-29-79
11-30-79		SUPERSEDES SPEC. DATED:
11-30-79	**SPECIFICATION**	REV. LTR. / PAGE 1 of

TITLE

MANUAL WATER SHUTOFF VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RWIV AND RPWOV (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	ANGLE
CONNECTIONS:	4 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 160 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER AT 2200 PSIA MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
CAPACITY:	Cv = 145 MINIMUM
LEAKAGE:	INTERNAL - 30 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.17 Desuperheater Steam Isolation Valve

4.7.17.1 Identification

Identification Tag Number	Description
V-MS-3-301	Desuperheater Steam Isolation Valve

4.7.17.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penn.

Part Number : 6 inch Fig. 12511 (WC9)Y

Rocketdyne Specification No. : SP42-081

Material : Body: Alloy Steel WC9

Weight : 715 lb.

4.7.17.3 Prescribed Service

Steam

4.7.17.4 Vendor

Rockwell Edward

4.7.17.5 Special Cautions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.17.6 Periodic Service

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.17.7 Parts List

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.17.8 Special Tools

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.17.9 Maintenance Instructions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.17.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-081
T. L. HYDE	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	Rockwell International Corporation	DATE 1-24-80
E G Spencer 2/18/80	Rocketdyne Division	SUPERSEDES SPEC. DATED:
J. G. Absalom 2-18-80	Canoga Park, California	REV. LTR.
	SPECIFICATION	PAGE 1 of 2

TITLE

THERMAL STORAGE DESUPERHEATER STEAM ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDSIS-1 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	6 INCH BUTT WELD TO ASTM A335 GRADE P22, SCHEDULE XXS PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	STEAM AT 1775 PSIG MAXIMUM AND 985 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	2500 LB
CAPACITY:	Cv = 1023 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 4 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.18 Desuperheater Steam Isolation Valve

4.7.18.1 Identification

Tag Number	Description
V-MS-4-302	Desuperheater Steam Isolation Valve
V-MS-4-304	Desuperheater Steam Isolation Valve

4.7.18.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	6 inch Fig. 1911 (WC6) Y
Rockedyne Specification No.	:	SP42-082
Material	:	Body: Alloy Steel WC9
Weight	:	530 lb.

4.7.18.3 Prescribed Service

Steam

4.7.18.4 Vendor

Rockwell Edward

4.7.18.5 Special Cautions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.18.6 Periodic Service

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.18.7 Parts List

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.18.8 Special Tools

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.18.9 Maintenance Instructions

See Rockwell Edward maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.18.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-082
T. L. HYDE	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 1-24-80
E G... 2/18/80	Canoga Park, California	SUPERSEDES SPEC. DATED:
J. H. Absalom 2-18-80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

THERMAL STORAGE DESUPERHEATER STEAM VALVE OUTLET

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDSIS-2, TDSIS-3 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	6 INCH BUTT WELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	STEAM AT 1550 PSIG MAXIMUM AND 675 F MAXIMUM
AMBEINT TEMPERATURE:	16 TO 113 F
ANSI RATING:	900 LB
CAPACITY:	Cv = 1957 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.34 Charging Pump Interconnect Oil Isolation Valve

4.7.34.1

Identification Tag Number	Description
V-TO-301-309	Charging Pump Interconnect Oil Isolation Valve

4.7.34.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	8 inch Fig. 1611 Y
Rocketdyne Specification No.	:	SP42-075
Material	:	See stamping on valve body
Weight	:	667 lb.

4.7.34.3 Prescribed Service

Oil

4.7.34.4 Vendor

Rockwell Edward

4.7.34.5 Special Cautions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.34.6 Periodic Service

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.34.7 Parts List

See Rockwell Edward maintenance Manual V-475 (See paragraph 4.7.4.11)

4.7.34.8 Special Tools

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.34.9 Maintenance Instructions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.34.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-075
T. L. HYDE	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 1-17-80
E. C. Spencer 2/15/80	Canoga Park, California	SUPERSEDES SPEC. DATED
J. H. Abrahams 2-18-80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

THERMAL STORAGE MANUAL ISOLATION VALVES

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THFIS-1-2, THFIS-2-2, TPFOV-1, TPFOV-2, THFIS-1-1 THFIS-2-1, TFEIS-1, TFEIS-2, TFCIS-1, TFCIS-2 TFCIS-3, TSFIS-1, TSFIS-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	BUTTWELD TO 8" SCHEDULE 40 PIPE (ASTM A106 GRADE B)
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID	OIL (CALORIA HT43) AT 115 PSIG MAXIMUM AND 600 F MAXIMUM
AMBEINT TEMPERATURE:	16 TO 113 F
ANSI RATING:	600 LB
CAPACITY:	Cv - 5350 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.35 Oil Isolation Valves

4.7.35 1

Identification Tag Number	Description
V-TO-4-310	Subcooler Oil Isolation Valve
V-TO-9-312	Condenser Oil Isolation Valve
V-TO-5-311	Subcooler Oil Isolation Valve
V-TO-9-313	Condenser Oil Isolation Valve
V-TO-10-314	Extraction Pump Oil Isolation Valve
V-TO-10-315	Extraction Pump Oil Isolation Valve
V-TO-21-322	Preheater Oil Outlet Valve
V-TO-21-323	Preheater Oil Outlet Valve
V-TO-12-317	Superheater Oil Isolation Valve
V-TO-13-320	Superheater Oil Isolation Valve

4.7.35.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number:	:	8 inch Fig. 1611 Y
Rocketdyne Specification No.	:	SP42-075
Material	:	See stamping on valve body
Weight	:	667 lb.

4.7.35.3 Prescribed Service

Oil

4.7.35.4 Vendor

Rockwell Edward

4.7.35.5 Special Cautions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.35.6 Periodic Service

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.35.7 Parts List

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.35.8 Special Tools

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.35.9 Maintenance Instructions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.35.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-075
T. L. HYDE	Rockwell International Corporation	TYPE EQUIPMENT
APPROVALS	Rocketdyne Division	DATE 1-17-80
2/15/80	Canoga Park, California	SUPERSEDES SPEC. DATED
2-18-80	SPECIFICATION	REV. LTR.
		PAGE 1 of 2

TITLE

THERMAL STORAGE MANUAL ISOLATION VALVES

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131 H 1 REV 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	THFIS-1-2, THFIS-2-2, TPFOV-1, TPFOV-2, THFIS-1-1 THFIS-2-1, TFEIS-1, TFEIS-2, TFCIS-1, TFCIS-2 TFCIS-3, TSFIS-1, TSFIS-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	BUTTWELD TO 8" SCHEDULE 40 PIPE (ASTM A106 GRADE B)
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID	OIL (CALORIA HT43) AT 115 PSIG MAXIMUM AND 600 F MAXIMUM
AMBEINT TEMPERATURE:	16 TO 113 F
ANSI RATING:	600 LB
CAPACITY:	Cv - 5350 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.36 TU Aux. Manifold Oil Isolation Valve

4.7.36.1 Identification

Tag Number	Description
V-TO-22-330	TU Aux. Manifold Oil Isolation Valve
V-TO-22-324	TU Aux. Manifold Oil Isolation Valve

4.7.36.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body

Specification No. : SP42-077

Material : Body: Carbon Steel

Weight : 240 lb.

4.7.36.3 Prescribed Service

Oil

4.7.36.4 Vendor

Valtek

4.7.36.5 Special Cautions

4.7.36.6 Periodic Service

None

4.7.36.7 Parts List

Following

4.7.36.8 Special Tools

None

4.7.36.9 Maintenance Instructions

See Valtek bulletin #1

4.7.36.10 Acceptance Tests

None

TFAIS-1, -2

VALTEK PARTS LIST   REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19167-001   TAG NO. V-TO-22-330
V-TO-22-324

4." MARK I   BODY SUB-ASSEMBLY
150# 2.62" SPUD 1.12" STEM DIA.
STD SEAL, FLOW OVER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 4", 150/600#....................	1	...001199.001.041		
10	END FLANGE, 4", 150#..................	2	...001200.018.041		
11	END FLANGE HALF-RING, 5.80 X 4.56, 0.	4	...001203.029.002		
20	SEAT RING, 4", CV 195.................	1	...001210.150.000	**	122.39
30	SEAT RETAINER, 4", 600#..............	1	...001218.150.000		
40	BONNET, 4", 2.62" SPUD...............	1	...001249.029.041		
50	PLUG, 4", LIN.........................	1	...001999.150.000	**	342.69
55	SEAT GASKET, SPIRAL, 4.87 X 4.50.....	1	...001242.832.000	**	6.43
58	BONNET GASKET, SPIRAL, 5.68 X 5.18...	1	...001240.832.000	**	8.13
70	BONNET FLANGE, 4", 600#..............	1	...001216.018.041		
76	HALF-CLAMP, YOKE, 2.62" SPUD.........	2	...001790.150.000		
80	GLAND FLANGE, 1.12" STEM, 2.62/2.88"	1	...001788.150.000		
82	GUIDE LINER, 1.12" STEM, GRAFOIL.....	2	...007601.842.000	**	10.41
83	GUIDE RETAINER, 1.12" STEM, GRAFOIL..	1	...007844.150.000		
86	GUIDE LINER, 1.12" STEM, GRAFOIL.....	2	...007601.842.000	**	10.41
87	GUIDE RETAINER, 1.12" STEM, GRAFOIL..	1	...007844.150.000		
88	PACKING SET, STD SQUARE, 1.12" STEM..	1	...024244.929.000	**	T B A
93	PKG SPR, 1.12" STEM, 2.00 L..........	1	...020905.150.000		
94	PKG SPR, 1.12" STEM, 1.00 L..........	1	...005264.150.000		
95	PKG SPR, 1.12" STEM, 0.50 L..........	1	...007314.150.000		
96	PKG SPR, 1.12" STEM, 0.25 L..........	1	...020904.150.000		
105	SCREW, DRIVE, #4.....................	2	...007516.012.002		
107	YOKE BOLT, 3/8"-16, 2.00 L...........	2	...001860.010.002		
108	BONNET FLANGE STUD, 1-1/8"-8, 4.88 L.	4	...001570.012.002		
109	PACKING BOX BOLT, CARRIAGE, 1/2"-13..	2	...005207.009.002		
114	BONNET FLANGE NUT, 1-1/8"-8, H D.....	4	...001571.014.002		
117	PACKING BOX NUT, 1/2"-13.............	2	...001730.013.002		
118	YOKE LOCKNUT, 3/8"-16................	2	...003834.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2..........	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST   REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19167-001   TAG NO.

MANUAL SERIES H-B MANUAL ACTUATOR
2.62" SPUD 2.5" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, MANUAL, 2.62" SPUD..............	1	...008326.300.040		
213	STROKE PLATE, 2-1/2" STROKE...........	1	...001252.603.000		
235	BOLT, 5/16"-18, 2.00 L................	1	...001171.010.002		
247	BELLOWS, STEM, MANUAL HB..............	1	...008331.652.000	**	6.81
249	CLAMP, STEM, 50 SQ. INCH..............	1	...001173.150.000		
251	PLATE, TAG............................	1	...002223.153.000		
252	SERIAL PLATE..........................	1	...002438.153.000		
256	RETAINING RING, MANUAL HB.............	1	...001582.008.001		
333	SCREW, PAN HEAD, #4-40................	4	...001118.012.002		
345	STEM CLAMP LOCKNUT, 5/16"-18..........	1	...003833.013.002		
370	KEY, HANDWHEEL........................	1	...001472.029.002		
375	BEARING...............................	1	...001576.431.000		
378	GASKET, COVER PLATE, MANUAL HB........	1	...025795.652.000	**	T B A
380	HANDWHEEL STEM, MANUAL HB, 1"-12.....	1	...008383.159.000		
389	COVER PLATE, MANUAL HB................	1	...001589.029.040		
390	FITTING, GREASE, 3/16"................	1	...019161.999.000		
391	HANDWHEEL NUT, MANUAL HB..............	1	...008328.402.000		
393	HANDWHEEL, 18" DIA, MANUAL HB.........	1	...001580.300.040		
401	SCREW, PAN HEAD, #4-40................	2	...001118.012.002		
402	SCREW, DRIVE, #4......................	4	...007516.012.002		

** RECOMMENDED SPARE PART

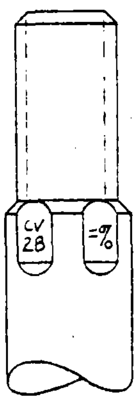
VALTEK

MARK ONE

Standard Materials of Construction
Estimating Shipping Weights

Part Identification

Whenever we can, we visibly number the part with ink or etching equipment. This identifies the part number and material used. On the plug stem flats we etch Cv, flow characteristic, part number, and material.



Name Plate

Valves are equipped with stainless steel name plates. An example is illustrated below.

Estimating Shipping Weights

Globe and Angle, Flanged Valves with Cylinder Actuators and Positioners

Size In.	Weight in Pounds 150#	300#	600#	900#	1500#	2500#	Add For Std. Ext. Bonnet
½ - ¾	40	40	40				5
1	50	50	50	100	120	150	5
1½	65	65	65	170	180	210	5
2	75	75	75	200	220	300	5
3	160	170	180	400	430	500	15
4	240	250	265	590	610	940	20
6	360	570	600	1000	1170	1400	40
8	590	790	830				65
10	1050	1405	1600				90

Add 30# for diaphragm actuators on ½ - 2" valves.

Standard Materials of Construction

Part	Material
Body & Bonnet	Cast Iron, Ductile Iron, Steel, 304 304L, 316, 316L, 347 Stainless Steel, Bronze, Alloy 20, Hastelloy 'B' and 'C', Nickel, Monel, Inconel, Chrome - Moly, and Titanium.
Separable Line & Bonnet Flanges	Steel
Retaining Rings	Zinc Plated Steel
Plug	316 Stainless Steel, or same as Alloy body
Retainer	316 Stainless Steel, or same as Alloy body
Seat Ring	316 Stainless Steel or same as Alloy body
Guides	Bronze, Glass loaded Teflon, Grafoil, Stellite
Packing	Teflon V-Ring, Teflon Asbestos, Graphite Asbestos, and Grafoil.
Packing Spacer	316 Stainless Steel, or same as Alloy body
Seat Ring and Bonnet Gaskets	Stainless Steel and asbestos spiral wound or Teflon
Body Bolts	Zinc Plated Steel
Gland Flange	Precision Cast Stainless Steel
Gland Flange Nuts & Bolts	Zinc Plated Steel
Yoke Clamp Bolts	Zinc Plated Steel
Yoke Clamp	Precision Cast Stainless Steel

Add for oversize cylinder actuators.

Original size	Oversize	Add
25	50	30#
50	100	90#
100	200	125#

PREPARED BY	FSCM NO. 02602	NUMBER
G. J. KRALL	Rockwell International Corporation	SP42-077
APPROVALS	Rocketdyne Division	TYPE: EQUIPMENT
E G Spencer 12/15/81	Canoga Park, California	DATE: 12-15-81
J. G. Absalon 12/15/81	SPECIFICATION	SUPERSEDES SPEC. DATED: 1-17-80
		REV. LTR. A / PAGE 1 of 2

TITLE

THERMAL STORAGE AUXILIARY ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2 78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	TFAIS-1, TFAIS-2 (COMPONENT SHALL BE TAG IDENTIFIED)
φ TYPE:	GLOBE (IN LINE)
φ CONNECTIONS:	TFAIS-1: 4 INCH BUTTWELD TO ASTM A106 SCHD 40 PIPE ON INLET (UNDER THE PLUG) AND 4" RF FLANGE ON OUTLET TFAIS-2: 4 INCH RF FLANGE (ASTM A106 GRADE B SCHEDULE 40 PIPE)
MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT43) AT 115 PSIG MAXIMUM AND 600F MAXIMUM
AMBEINT TEMPERATURE:	16 TO 113 F
ANSI RATING:	150 LB
CAPACITY:	Cv = 187 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESGIN FEATURE:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.37 Oil Isolation Valves

4.7.37.1 Identification

Tag Number	Description
V-TO-3-328	TU Lower Manifold Oil Isolation Valve
V-TO-10-329	TU Upper Manifold Oil Isolation Valve
V-TO-3-301	Charging Pump Oil Filter Isolation Valve
V-TO-3-302	Charging Pump Oil Filter Isolation Valve
V-TO-3-303	Charging Pump Oil Filter Isolation Valve
V-TO-3-304	Charging Pump Oil Filter Isolation Valve

4.7.37.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	10 inch Fig. 1611 Y
Rocketdyne Specification No.	:	SP42-076
Material	:	See stamping on valve body
Weight	:	1114 lb.

4.7.37.3 Prescribed Service

Oil

4.7.37.4 Vendor

Rockwell Edward

4.7.37.5 Special Cautions

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.37.6 Periodic Service

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.37.7 Parts List

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.37.8 Special Tools

See Rockwell Edward maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.37.9 Maintenance Instructions

See Rockwell Edward Maintenance manual V-475 (See paragraph 4.7.4.11)

4.7.37.10 Acceptance Tests

None

PREPARED BY		NUMBER
T. L. HYDE TLH	FSCM NO. 02602	SP42-076
APPROVALS	**Rockwell International Corporation**	TYPE
E. Spencer 3/15/80	**Rocketdyne Division**	EQUIPMENT
[illegible] 3/3/80	Canoga Park, California	DATE 1-17-80
	SPECIFICATION	SUPERSEDES SPEC. DATED:
		REV. LTR. / PAGE 1 of 2

TITLE

THERMAL STORAGE FLUID ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(φ - INDICATES CHANGE)

TAG NUMBER:	TUFEIS, TUFIS, TFFIS-1-1, TFFIS-2-1, TFFIS-1-2, TFFIS-2-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GATE
CONNECTIONS:	BUTTWELD TO 10 INCH, ASTM A106 GRADE B, SCHEDULE 40 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT43) AT 115 PSIG MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	600 LB
CAPACITY:	Cv = 8590 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTMAINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 4 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.38 TU Ullage Gas Isolation Valve

4.7.38.1 Identification

Identification	Description
V-UG-1-401	TU Ullage Gas Isolation Valve

4.7.38.2 Description

Manufacturer	:	Wm. Powell Co. Cincinnati, Ohio
Part Number	:	Fig. 1503N
Rocketdyne Specification No.	:	SP42-118
Material	:	See manufacturer's "Materials" table following
Weight	:	195 lb.

4.7.38.3 Prescribed Service

Gaseous H_2 , N_2

4.7.38.4 Vendor

W. B. Garrison, Long Beach, Ca.

4.7.38.5 Special Cautions

See Powell literature (following)

4.7.38.6 Periodic Service

See Powell literature (following)

4.7.38.7 Parts List

See Powell literature (following)

4.7.38.8 Special Tools

See Powell literature (following)

4.7.38.9 Maintenance Instructions

See Powell literature (following)

4.7.38.10 Acceptance Tests

None

OPERATION and MAINTENANCE of VALVES

1. A gate valve should be used in service where it can always be in a fully open of fully closed position. If the gate, or disc, is kept in an intermediate or partially open position, the bottom of the wedge and the seat will become badly eroded in a short time. Also the wedge will tend to chatter and cause noise in the line.

2. RESEATING a gate valve; be sure and mark the disc so the disc is inserted in the valve body the same way it was removed, otherwise a tight closure may not be obtained.

3. LUBRICATION of valves is especially important, and should be done on a strict schedule. Valves that are opened and closed frequently should be lubricated at least once a month. On O. S. & Y. valves where the stem is uncovered, the screw threads should be kept clean and lubricated. Many valves are equipped with a lubricant fitting in the upper yoke to utilize pressure lubricant gun operation. Stem threads left dry and unprotected will become worn by grit and other abrasives, threatening stem failure.

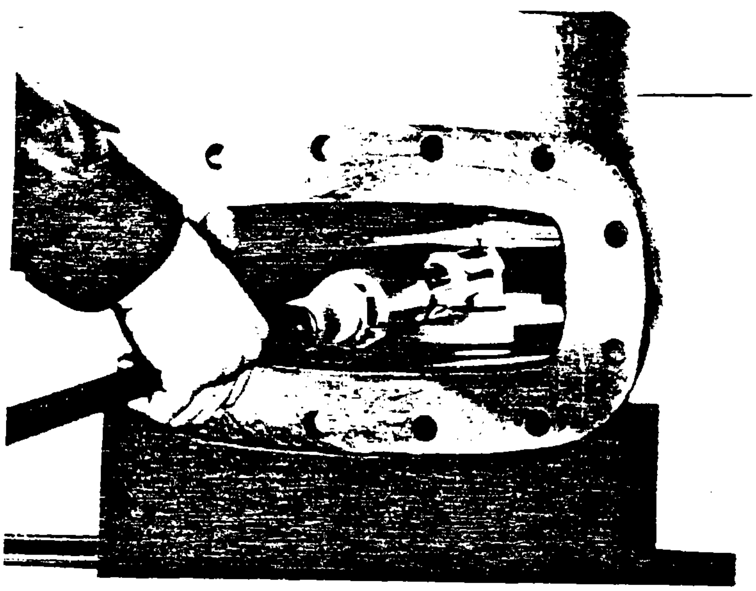
4. Foreign matter on the seat of a globe valve can usually be flushed off the seat by opening the valve slightly, to create a high rate of flow through the small opening provided. If valves do not hold tight, do not use extra leverage, or wrenches on the handwheel, as a valve is easily ruined this way. Instead take the valve apart and inspect the disc and the seat to locate the source of trouble.

5. PACKING leaks should be corrected immediately by tightening the packing nut which compresses the packing. If left unattended long enough corrosive fluids will ruin the stem. This is true on both small and large size valves. If apparent that packing gland has compressed the packing to its limit replace with new packing.

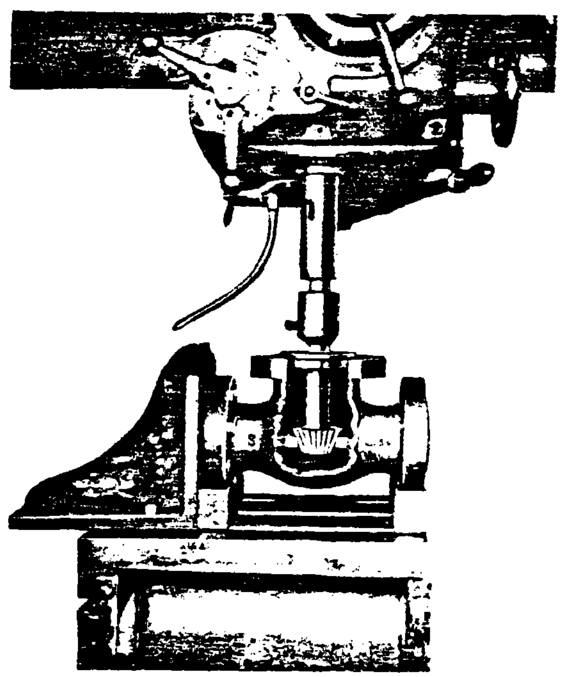
6. REGRINDING renewable seat valves should have union type bonnet construction for easy access, although bolted bonnet and screwed-in bonnet valves can also be reground. Remove the bonnet, by unscrewing bonnet ring, or by removing body bolts on a bolted bonnet. Place an ample amount of grinding compound on the disc, insert a pin in the groove of the disc holder and the hole in the stem, then reassemble bonnet to the body. Screw union bonnet ring to hand tightness, then back off about one complete turn. Now the stem can be used as your regrinding tool. By reversing union bonnet ring only one complete turn you assure yourself of the stem being vertical and the disc and seat in perfect alignment. If the disc is off center or cocked the new reground seat will not be true. Do not overgrind, as unnecessary grinding on the seat and disc defeats the purpose of regrinding a renewable valve. When regrinding is completed remove bonnet ring and bonnet, and thoroughly clean the regrinding compound from the seat and disc. Also remove any scale or corrosive deposits which may have formed in the valve body or bonnet. Be sure and lubricate threads before rejoining union bonnet ring and body for easy removal the next time.

7. Many Powell valves feature a Back Seat shoulder and seat area, which means the valve can be repacked without shutting down the line. These valves require that the valve be opened fully so the shoulder and seat may engage perfectly. However, if any scale or deposits have formed on either surface, you will have difficulty in holding pressure. We do not recommend repacking while under pressure. When removing packing nut use a hex wrench, not a pipe wrench.

LAPPING SEAT FACES OF POWELL GATE VALVE

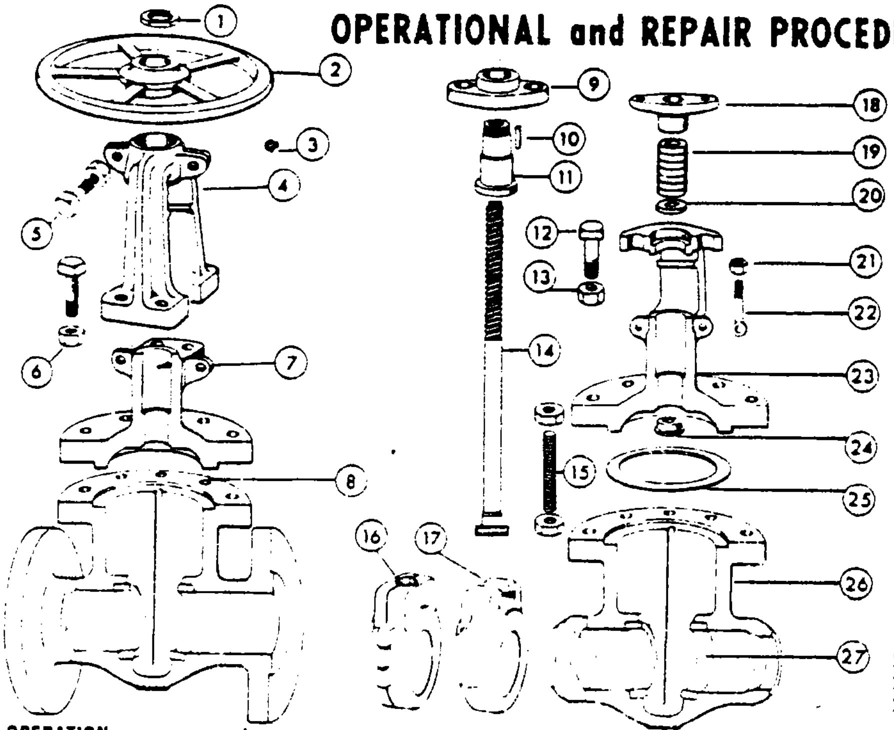


RESEATING A POWELL GLOBE VALVE



BOLTED BONNET O.S. & Y. RISING STEM GATE VALVES

OPERATIONAL and REPAIR PROCEDURE



PARTS IDENTIFICATION

1. Stem Bushing Nut
2. Handwheel
3. Lubricant Fitting
4. Yokearms
5. Yokearm Ear Bolt and Nut
6. Bonnet Bolt and Nut
7. Two-Piece Bonnet
8. Body-Flanged Ends
9. Bearing Cap
10. Handwheel Key
11. Stem Bushing
12. Bearing Cap Bolt
13. Bearing Cap Nut
14. Stem
15. Body Stud and Nuts
16. Split Wedge
17. Solid Wedge
18. Packing Gland
19. Packing
20. Packing Washer
21. Eyebolt Nut
22. Eyebolt
23. One-Piece Bonnet
24. Back Seat Bushing
25. Gasket
26. Body-Welded Ends
27. Seat Ring

OPERATION:

These gate valves are manually operated. To open, turn the handwheel (part 2) in a counterclockwise direction: To close, turn the handwheel (part 2) in a clockwise direction.

INSPECTION:

Periodical inspection and preventative maintenance is not required other than lubricate the stem (part 14) occasionally through the lubricant fitting (part 3).

REPAIR PARTS:

All parts are shown on this page. When ordering repair parts be sure to give valve figure number, size, material and serial number. If applicable, metal other than standard

PROCEDURE FOR REPAIRING:

1. Stuffing Box Leakage. . . If there is leakage around the stuffing box when operating the valve, it is necessary to adjust or replace the packing. Leakage will not show when the valve is completely opened or closed. To adjust the packing, turn the packing gland nuts clockwise alternately with no more than 1/4 turn on each until leakage stops. If leakage continues replace the packing. Caution: If the valve is under pressure, it must be completely opened or closed to repack. We recommend the fully open position:
   a. remove packing gland nuts.
   b. raise packing gland and rest on gland shelf.
   c. remove packing (part 19) with packing hooks.
   d. install new packing
   e. replace packing gland
   f. tighten packing gland nuts evenly on both sides-pull down snug not tight.
2. Seat Leakage. . . If the valve seat leaks, it will be necessary to replace the wedge (parts 16 or 17) or the seat ring (part 27) Caution: Pressure must be completely removed before removing wedge
   a. open valve
   b. remove body-to bonnet nuts (part 15) Complete assembly can now be lifted out of valve body (part 8) or (part 26).
   c. run the stem down (part 14) by turning clockwise.
   d. remove wedge from the stem.
   e. use seat ring wrench and remove seat ring (part 27) by turning counterclockwise. Install new seat ring and reassemble. (Lap the seat face)
3. Damaged Stem (part 14). . . When stem threads become damaged so the valve is inoperable, replace the stem as follows: Caution: All pressure must be completely removed before removing stem.
   a. remove complete bonnet assembly by removing body bonnet nuts (part 15) from body bonnet studs.
   b. remove stem bushing nut (part 1) and handwheel (part 2).
   c. run the stem (part 14) down by turning in a clockwise direction.
   d. rotate stem (part 14) in a clockwise direction until the stem threads are completely out of the threaded portion of upper bushing (part 11).
   e. remove the stem (part 14) by lifting out of the stuffing box.
   f. remove the wedge (part 16 or 17) from the stem (part 14).
   g. install new stem (part 14) and reassemble by reversing above procedure.
4. Replace Stem Bushing. Follow plant procedure for removing valve from service. Pressure must be completely removed before replacing the stem bushing.

I. TWO-PIECE BONNET

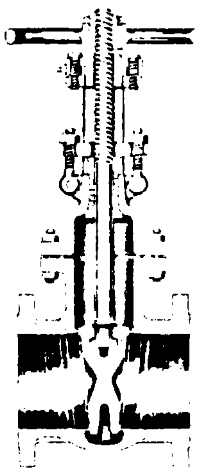
a. open valve approximately five (5) turns.
b. turn bushing (part 11) counterclockwise simultaneously with handwheel (part 2) until bushing (part 11) is free of bonnet (part 7).
c. remove stem bushing nut (part 1) and handwheel (part 2).
d. turn bushing (part 11) counterclockwise and remove from stem.
e. replace bushing (part 11) and reassemble by reversing above procedure.

II. ONE-PIECE BONNET

a. remove stem bushing nut (part 1) by turning counterclockwise.
b. remove handwheel key (part 10) and handwheel (part 2).
c. remove bearing cap bolts (part 12) and bearing cap nuts (part 13).
d. turn bushing (part 11) counterclockwise and remove from stem.
e. replace bushing (part 11) and reassemble by reversing above procedure.

NOTE: Whenever a new stem is installed, it is necessary to replace the packing (part 19). When body and bonnet are separated, a new gasket (part 25) should be installed before reassembly.

CAST STEEL GATE VALVES



Sectional

Fig. 1503N

Flanged
Fig. 1503N WE — Welding
Sizes, 2" through 12"

FEATURES

- Flexible Wedge insures pressure tightness and reduces operating torque needed to open the valve.*Solid Wedges are furnished in valves — 3" and smaller
- Stellite faced Seat Rings are welded into the body. (Sizes 2" and 2½" have pressed-in Seat Rings). This provides a positive no-leak seal of the ring in the valve body and will resist corrosion, erosion and galling — especially at high temperatures
- Redesigned Bonnet permits easy installation of an actuator, adapto gearing, cylinder or motor
- Valves are furnished with a back seat arrangement in the bonnet
- Valves, sizes 2" and 2½" have square bonnets and nested gasket
- Welding End Valves sizes 2½", 3" and 4" are available in forged design

150 Pound

BOLTED FLANGED YOKE-BONNET OUTSIDE SCREW RISING STEM FLANGED and WELDING ENDS

PRESSURE/TEMPERATURE RATINGS

See Materials and Engineering Data Catalog

MATERIALS

DESCRIPTION	MATERIAL	ASTM Spec.
Handwheel Nut	Malleable Iron	A-47, Grade 32510
Handwheel	Malleable Iron	A-47, Grade 32510
Handwheel Key	Steel	A-108, Grade 1020
Stem Bushing Locknut (2"-4")	Malleable Iron	A-47, Grade 32510
Bonnet	Carbon Steel	A-216, Grade WCB
Lubricant Fitting		Commercial
Stem Bushing	Malleable Iron (Black Oxide)	A-47, Grade 32510
Stem	Stainless Steel	†A-182, Grade F6
Eyebolt Nuts	Steel	A-307, Grade B
Gland Flange	Steel	AISI 1030
Gland	Steel	AISI C-12, L-14
Groov-Pins	Steel	Commercial
Eyebolts	Steel	A-307, Grade B
Packing	Asbestos	Commercial
Body Nuts	Steel	A-194, Grade 2H
Back Seat Bushing	Stainless Steel	A-582, Type 416
Body Studs	Steel	A-193, Grade B7
Gasket	Corrugated Iron	Commercial
Body	Carbon Steel	A-216, Grade WCB
Seat Rings	Steel/Stellite Facing	A-519, Grade MT1015
Flexible Wedge* (4")	Stainless Steel	A-351, Grade CA15
(6"-12")	Carbon Steel/12% Chrome Facing	A-216, Grade WCB
Hex Head Cap Screws (6" & 8")	Steel	A-449
Bonnet Cap (6" & 8")	Malleable Iron	A-47, Grade 32510
Bearing Cap (10"-12")	Malleable Iron	A-47, Grade 32510
Yokearm (10"-12")	Carbon Steel	A-216, Grade WCB
Yokearm Nuts (10"-12")	Steel	A-194, Grade 2H
Yokearm Studs (10"-12")	Steel	A-193, Grade B7

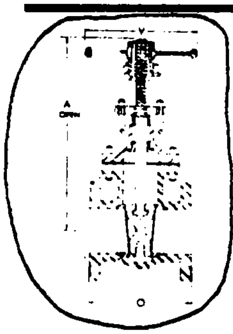
†Or Equal

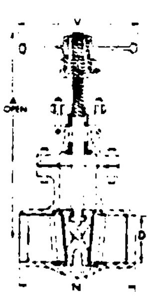
SPECIFICATIONS

- Flanged and Butt Welding End valves have dimensions conforming to ANSI B16.5, B16.10, B16.25, B16.34 and API 600
- Flanged End valves can be furnished with ring joint flanges and have face-to-face dimensions as shown in B16.10-1973, Table 8

ORDERING

- These valves are normally carried in stock
- Screwed-in Seat Rings are available on special order; however, material must be specified





DIMENSIONS (Inches)

Size	2	2½	3	4	5*	6	8	10	12
O	7	7½	8	9	10	10½	11½	13	14
N	8½	9½	11⅛	12	15	15⅞	16½	18	19¾
A	14⅝	15⅞	18⅛	22⅛	31	31	39	47¼	55½
V	8	8	9	10	11	12	14	16	20
D	2.067	2.469	3.068	4.026	5.05	6.065	7.981	10.02	12.00

*Old Style Design: Solid Wedge, Threaded Seat Rings, etc.

WEIGHTS: See Materials and Engineering Data Catalog

PREPARED BY	FSCM NO. 02602	NUMBER SP42-118
J. K. CHENG S.C.	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 4-17-80
[signature] 4-21-80		SUPERSEDES SPEC. DATED:
J. G. Absalom 4/21/80	SPECIFICATION	REV. LTR. / PAGE 1 of 2

TITLE
ULLAGE GAS ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	UGIS-1 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE OR GATE, IN LINE
END CONNECTIONS:	6 INCH RF FLANGE
PIPE MATERALS:	ASTM A106 GRADE B, SCHEDULE 40
MATERIALS	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	GASEOUS H_2, N_2 & HYDROCARBONS @ 10 PSIG & 580°F
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	140 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	150 LB. CLASS
FLOW CAPACITY:	MINIMUM Cv = 380
LEAKAGE:	INTERNAL - ANSI CLASS II (0.5% OF RATED VALVE CAPACITY) EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE • HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.45 Flash Tank Steam Isolation Valve

4.7.45.1 Identification

Tag Number	Description
V-VT-4-301	Flash Tank Steam Isolation Valve

4.7.45.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penn.

Part Number : 6 inch, Fig. 318 Y

Rockeydyne Specification No. : SP42-080

Material : Body: Carbon Steel

Weight : 278 lb.

4.7.45.3 Prescribed Service

Steam

4.7.45.4 Vendor

Rockwell Edward

4.7.45.5 Special Cautions

See Rockwell Edward maintenance manual V-380 (See paragraph 4.7.4.11)

4.7.45.6 Periodic Service

See Rockwell Edward maintenance manual V-380 (See paragraph 4.7.4.11)

4.7.45.7 Parts List

See Rockwell Edward maintenance manual V-380 (See paragraph 4.7.4.11)

4.7.45.8 Special Tools

See Rockwell Edward maintenance manual V-380 (See paragraph 4.7.4.11)

4.7.45.9 Maintenance Instructions

See Rockwell Edward maintenance manual V-380 (See paragraph 4.7.4.11)

4.7.45.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-080
J. W. LEWELLEN	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 3-19-80
E. C. Spencer 3/26/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 1-24-80
J. G. Absalom 3/26/80	**SPECIFICATION**	REV. LTR. B — PAGE 1 of 2

TITLE

THERMAL STORAGE FLASH TANK ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER:	TFWIS AND TFSIS (COMPONENTS SHALL BE TAG IDENTIFIED)
Ø TYPE:	GLOBE OR GATE (IN LINE)
Ø CONNECTIONS:	6 INCH BUTTWELD TO ASTM A106 GRADE B, SCHEDULE 40 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
Ø LINE FLUID:	WATER/STEAM AT 165 PSIG MAXIMUM AND 650 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
Ø ANSI RATING:	300 LB
Ø CAPACITY:	Cv-400 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
Ø	2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3-1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
	3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.47 Condenser Steam Bleed Valve

4.7.47.1 Identification

Tag Number	Description
THSBLV-1 thru -4.	Condenser Steam Bleed Valve

4.7.47.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 inch Fig. 1048 TY
Rocketdyne Specification No.	:	SP42-083 (following)
Material	:	Body: Carbon Steel
Weight	:	14 lb.

4.7.47.3 Prescribed Service

Steam

4.7.47.4 Vendor

Rockwell Edward

4.7.47.5 Special Cautions

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.47.6 Periodic Service

None

4.7.47.7 Parts List

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.47.8 Special Tools

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.47.9 Maintenance Instructions

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.47.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-083
T. L. HYDE	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rocketdyne Division**	DATE 5-6-80
E G Spencer 5/12/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 1-24-80
[signature] 5/13/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 2

TITLE

THERMAL STORAGE HEATER STEAM BLEED VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER: THSBLV-1, THSBLV-2, THSBLV-3, THSBLV-4, TRSIS-1, TRSIS-2, TTSIS-1, TTSIS-2 (COMPONENTS SHALL BE TAG IDENTIFIED)

TYPE: GLOBE (IN LINE)

CONNECTIONS: 1 INCH SOCKETWELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE

MATERIALS: COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS

ACTUATOR: HANDWHEEL

LINE FLUID: STEAM AT 1550 PSIG MAXIMUM AND 675 F MAXIMUM

AMBIENT TEMPERATURE: 16 TO 113 F

ANSI RATING: 1500 LB

CAPACITY: Cv = 1.4 MINIMUM

LEAKAGE: INTERNAL - ANSI CLASS V
EXTERNAL - NO VISIBLE LEAKAGE

PREPARATION FOR DELIVERY: THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

DESIGN FEATURES:

1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.48 Desuperheater Manual Valve

4.7.48.1 Identification

Tag Number	Description
TDCDV	Desuperheater Condensate Drain Valve
TDSBV	Steam Bypass Valve

4.7.48.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 inch Fig. 36224 (F22) T
Rocketdyne Specification No.	:	SP42-073 (following)
Material	:	Body: Chrome Moly
Weight	:	14 lb.

4.7.48.3 Prescribed Service

Water/Steam

4.7.48.4 Vendor

Rockwell Edward

4.7.48.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.48.6 Periodic Service

None

4.7.48.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.48.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.48.9 Maintenance Instructions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.48.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602 **Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California **SPECIFICATION**	NUMBER SP42-073
G. J. KRALL		TYPE EQUIPMENT
APPROVALS		DATE 9-16-80
E. G. Spencer 9/17/80		SUPERSEDES SPEC. DATED: 6-2-80
9/17/80		REV. LTR. C — PAGE 1 of 2

TITLE

DESUPERHEATER MANUAL VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDCDV, TDSBV, and TDCIS-1 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE (IN LINE)
CONNECTIONS:	1 INCH SOCKETWELD TO ASTM A335 GRADE P22, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER OR STEAM AT 1775 PSIG MAXIMUM AND 985 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1690 LB
CAPACITY:	Cv = 6 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.49 Superheater Blanket Steam Isolation Valve

4.7.49.1

Identification Tag Number	Description
TSSWIS-1 and -2	Superheater Blanket Steam Isolation Valve

4.7.49.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 1/2 inch Fig. 848 TY
Rocketdyne Specification No.	:	SP42-084 (following)
Material	:	Body: Carbon Steel
Weight	:	16 lbs.

4.7.49.3 Prescribed Service

Steam / Water

4.7.49.4 Vendor

Rockwell Edward

4.7.49.5 Special Cautions

See Rockwell Edward service manual V-376 (See paragraph 4.7.4.11)

4.7.49.6 Periodic Service

None

4.7.49.7 Parts List

None

4.7.49.8 Special Tools

See Rockwell Edward service manual V-376 (See paragraph 4.7.4.11)

4.7.49.9 Maintenance Instructions

See Rockwell Edward service manual V-376 (See paragraph 4.7.4.11)

4.7.49.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-084
T. L. HYDE	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE EQUIPMENT
APPROVALS		DATE 5-6-80
E G Spencer 5/12/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 1-24-80
[illegible] 5/13/80		REV. LTR. A — PAGE 1 of 2

TITLE

STEAM GENERATOR BLANKET STEAM ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER: TSSWIS-1, TSSWIS-2, TFWIS-3 (COMPONENTS SHALL BE TAG IDENTIFIED)

TYPE: GLOBE (IN LINE)

CONNECTIONS: 1 1/2 INCH SOCKET WELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE

MATERIALS: COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS

ACTUATOR: HANDWHEEL

Ø LINE FLUID: STEAM: AT 450 PSIG MAX. AND 580° F MAX.
WATER: AT 165 PSIG MAX. AND 650° F MAX.

AMBIENT TEMPERATURE: 16 TO 113 F

ANSI RATING: 600 LB

CAPACITY: Cv = 28 MINIMUM

LEAKAGE: INTERNAL - ANSI CLASS V
EXTERNAL - NO VISIBLE LEAKAGE

PREPARATION FOR DELIVERY: THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

DESIGN FEATURES:

1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.50 Desuperheater Water Isolation Valve

4.7.50.1

Identification Tag Number	Description
TOWIS	Desuperheater Water Isolation Valve

4.7.50.2 Description

Manufacturer : Rockwell Edward, Pittsburgh, Penn

Part Number : 1 1/2 inch, Fig. 1048 TY

Rocketdyne Specification No. : SP42-079 (following)

Material : Body: Carbon Steel

Weight : 17 lb.

4.7.50.3 Prescribed Service

Water

4.7.50.4 Vendor

Rockwell Edward

4.7.50.5 Special Cautions

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.50.6 Periodic Service

None

4.7.50.7 Parts List

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.50.8 Special Tools

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.50.9 Maintenance Instructions

See Rockwell Edward Manual V-376 (paragraph 4.7.4.11)

4.7.50.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-079
T. L. HYDE	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 1-24-80
E G Spencer 2/18/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED:
J. G. Olsalom 2-18-80		REV. LTR. / PAGE 1 of 2

TITLE

THERMAL STORAGE WATER ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TDWIS (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE (IN LINE)
CONNECTIONS:	1 1/2 INCH SOCKETWELD TO ASTM A106 GRADE B SCHEDULE 160 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER AT 2185 PSIG MAXIMUM AND 600 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
CAPACITY:	Cv = 16.7 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.51 Flash Tank Water Drain Valve

4.7.51.1 Identification

Identification Tag Number	Description
TFWDV	Flash Tank Water Drain Valve

4.7.51.2 Description

Manufacturer : Valtek, Springville, Utah

Part Number : Mark one body, mark one actuator

Rocketdyne Specification No. : SP42-074 (following)

Material : Body: Carbon Steel

Weight : 50 lb.

4.7.51.3 Prescribed Service

Water

4.7.51.4 Vendor

Waltek

4.7.51.5 Special Cautions

See Valtek maintenance bulletin No. 1 (See paragraph 4.7.4.11)

4.7.51.6 Periodic Service

None

4.7.51.7 Parts List

See Parts List (following)

4.7.51.8 Special Tools

None

4.7.51.9 Maintenance Instructions

See Valtek maintenance bulletin No. 1 (See paragraph 4.7.4.11)

4.7.51.10 Acceptance Tests

None

VALTEK PARTS LIST REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19197-001 TAG NO. TFWDV , TUFDV

1." MARK I BODY SUB-ASSEMBLY
600# 2.00" SPUD 0.56" STEM DIA.
STD SEAL, FLOW OVER

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
1	BODY, 1", 150/600#....................	1	...004230.001.041		
12	YOKE HALF-RING, 2.25 X 1.75, 0.25 THI	2	...001047.029.002		
20	SEAT RING, 1", CV 12..................	1	...001138.150.000	**	73.4
30	SEAT RETAINER, 1", 600#...............	1	...001139.150.000		
40	BONNET, 1", 2.00" SPUD................	1	...002119.029.041		
50	PLUG, 1", LIN.........................	1	...002129.150.000	**	140.7
55	SEAT GASKET, SPIRAL, 1.69 X 1.31.....	1	...001224.832.000	**	4.9
58	BONNET GASKET, SPIRAL, 2.50 X 2.12...	1	...001228.832.000	**	5.3
70	BONNET FLANGE, 1", 150/600#..........	1	...001131.018.041		
76	HALF-CLAMP, YOKE, 2.00" SPUD.........	2	...001133.150.000		
80	GLAND FLANGE, 0.56" STEM, 2.00" SPUD.	1	...008454.150.000		
82	GUIDE LINER, 0.56" STEM, GRAFOIL.....	1	...007603.842.000	**	9.1
83	GUIDE RETAINER, 0.56" STEM, GRAFOIL..	1	...007842.150.000		
86	GUIDE LINER, 0.56" STEM, GRAFOIL.....	1	...007603.842.000	**	9.1
87	GUIDE RETAINER, 0.56" STEM, GRAFOIL..	1	...007842.150.000		
88	PACKING SET, STD SQUARE, 0.56" STEM..	1	...024238.929.000	**	T B A
93	PKG SPR, 0.56" STEM, 1.00 L..........	1	...020910.150.000		
94	PKG SPR, 0.56" STEM, 0.50 L..........	1	...003544.150.000		
105	SCREW, DRIVE, #4.....................	2	...007516.012.002		
107	YOKE BOLT, 5/16"-18, 1.50 L..........	2	...001116.010.002		
108	BONNET FLANGE BOLT, 5/8"-11, 2.00 L..	4	...002455.015.002		
109	PACKING BOX BOLT, GLAND FLANGE, 2.00"	2	...001119.009.002		
117	PACKING BOX NUT, 3/8"-16.............	2	...001155.013.002		
118	YOKE LOCKNUT, 5/16"-18...............	2	...003833.013.002		
126	PLATE, FLOW ARROW, MK 1 & 2..........	1	...002442.153.000		

** RECOMMENDED SPARE PART

VALTEK PARTS LIST   REVISION NO.
SEP 26, 1980, SLSGAIL

SERIAL NO. V19197-001   TAG NO.

MANUAL SERIES H-A MANUAL ACTUATOR
2.00" SPUD .75" STROKE
AIR-TO-OPEN

ITEM	DESCRIPTION	UNIT QTY.	PART NO.		UNIT PRICE
201	YOKE, MANUAL, 2.00" SPUD.............	1	...018470.300.040		
213	STROKE PLATE, 3/4" STROKE............	1	...001156.603.000		
235	BOLT, 5/16"-18, 1.50 L...............	1	...001116.010.002		
247	BELLOWS, STEM, MANUAL HA.............	1	...008088.652.000	**	5.1
249	CLAMP, STEM, 25 SQ. INCH.............	1	...008534.150.000		
251	PLATE, TAG...........................	1	...002223.153.000		
252	SERIAL PLATE.........................	1	...002438.153.000		
256	RETAINING RING, MANUAL HA............	1	...001754.008.001		
333	SCREW, PAN HEAD, #4-40...............	4	...001118.012.002		
345	STEM CLAMP LOCKNUT, 5/16"-18.........	1	...003833.013.002		
370	KEY, HANDWHEEL.......................	1	...001688.029.002		
375	BEARING..............................	1	...001746.431.000		
378	GASKET, COVER PLATE, MANUAL HA.......	1	...025796.652.000	**	T B A
380	HANDWHEEL STEM, MANUAL HA, 1/2"-20...	1	...001751.159.000		
389	COVER PLATE, MANUAL HA...............	1	...001753.029.040		
390	FITTING, GREASE, 3/16"...............	1	...019161.999.000		
391	HANDWHEEL NUT, MANUAL HA.............	1	...008087.402.000		
393	HANDWHEEL, 9" DIA, MANUAL HA.........	1	...001744.600.008		
401	SCREW, PAN HEAD, #4-40...............	2	...001118.012.002		
402	SCREW, DRIVE, #4.....................	4	...007516.012.002		

** RECOMMENDED SPARE PART

PREPARED BY		NUMBER SP42-074
T. L. HYDE TLH	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation**	DATE 5-5-80
5/12/80	**Rocketdyne Division**	SUPERSEDES SPEC. DATED: 1-11-80
5/13/80	Canoga Park, California	REV. LTR. A
	SPECIFICATION	PAGE 1 of 2

TITLE

MANUAL DRAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more element of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV 2-78

(ϕ - INDICATES CHANGE)

Ø TAG NUMBER: TFWDV (COMPONENT SHALL BE TAG IDENTIFIED)

TYPE: GLOBE (IN LINE)

CONNECTIONS: 1 INCH SOCKETWELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE

MATERIALS: COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS

ACTUATOR: HANDWHEEL

LINE FLUID: WATER AT 165 PSIG MAXIMUM AND 360 F MAXIMUM OR
OIL (CALORIA HT43) AT 115 PSIG MAXIMUM AND 600°F MAXIMUM

AMBIENT TEMPERATURE: 16 TO 113 F

ANSI RATING: 150 LB

CAPACITY: Cv = FULL PORT

LEAKAGE: INTERNAL - ANSI CLASS V
EXTERNAL - NO VISIBLE LEAKAGE

PREPARATION FOR DELIVERY: THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

DESIGN FEATURES:

1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.
3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.52 Condensate Vent/Drain Valve

4.7.52.1

Identification Tag Number	Description
TCVV-2	Condensate Vent/Drain Valve

4.7.52.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	3/4 inch, Fig. 848 TY
Rocketdyne Specification No.	:	SP42-113 (following)
Material	:	Body: Carbon Steel
Weight	:	5.5 lb.

4.7.52.3 Prescribed Service

Water/Steam

4.7.52.4 Vendor

Rockwell Edward

4.7.52.5 Special Cautions

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.52.6 Periodic Service

None

4.7.52.7 Parts List

None

4.7.52.8 Special Tools

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.52.9 Maintenance Instructions

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.52.10 Acceptance Tests

None

PREPARED BY		NUMBER
J. K. Cheng J.C.	FSCM NO. 02602	SP42-113
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE Equipment
4/18/80		DATE 4-16-80
J. G. Olsen 4/18/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 2-21-80
		REV. LTR. A — PAGE 1 of 2

TITLE
MEDIUM PRESSURE THERMAL CONDENSATE VENT/DRAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TCVV-2 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL (EXCEPT GATE VALVE NOT PERMISSIBLE)
END CONNECTIONS:	3/4 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER & STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	580 PSIG @ 540°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	600 LB. CLASS
Ø FLOW CAPACITY:	MINIMUM C_v = 6
LEAKAGE:	INTERNAL - BUBBLE TIGHT EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE • HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.53 Condensate Vent/Drain Valve

4.7.53.1

Identification Tag Number	Description
TCVV-3	Condensate Vent/Drain Valve

4.7.53.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn
Part Number	:	3/4 inch, Fig. 1048 TY
Rocketdyne Specification No.	:	SP42-114 (following)
Material	:	Body: Carbon Steel
Weight	:	5.5 lb.

4.7.53.3 Prescribed Service

Water/Steam

4.7.53.4 Vendor

Rockwell Edward

4.7.53.5 Special Cautions

O & M V-376

4.7.53.6 Periodic Service

None

4.7.53.7 Parts List

None

4.7.53.8 Special Tools

O & M V-376

4.7.53.9 Maintenance Instructions

O & M V-376

4.7.53.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-114
J. K. Cheng J.C.	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rockwell Division**	DATE 4-16-80
E G [illegible] 4/18/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 2-21-80
J G Absalom 4/18/80	**SPECIFICATION**	REV. LTR. A
		PAGE 1 of 2

TITLE

HIGH PRESSURE THERMAL CONDENSATE VENT/DRAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

NUMBER	REVISION LETTER	PAGE
SP 42-114	A	2

TAG NUMBER:	TCVV-3 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL (EXCEPT GATE VALVE NOT PERMISSIBLE)
END CONNECTIONS:	3/4 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	WATER & STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	1550 PSIG @ 675°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	1500 LB. CLASS
FLOW CAPACITY:	MINIMUM $C_v = 6$
LEAKAGE:	INTERNAL - BUBBLE TIGHT EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2½ INCH THICK INSULATION AFTER ATTACHMENT TO LINE • HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.54 Condensate Drain Valve

4.7.54.1

Identification Tag Number	Description
TCDV	Condensate Drain Valve

4.7.54.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn
Part Number	:	3/4 inch, Fig. 36224 (F22) T
Rocketdyne Specification No.	:	SP42-115 (following)
Material	:	Body: Chrome Moly
Weight	:	13 lb.

4.7.54.3 Prescribed Service

Steam/Water

4.7.54.4 Vendor

Rockwell Edward

4.7.54.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.54.6 Periodic Service

None

4.7.54.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.54.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.54.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.54.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-115
J. K. Cheng	FSCM NO. 02602	TYPE Equipment
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 6-2-80
E. G. Spencer 6/2/80	SPECIFICATION	SUPERSEDES SPEC. DATED: 4-16-80
6/5/80		REV. LTR. B — PAGE 1 of 2

TITLE

THERMAL CONDENSATE DRAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER:	TCDV, TDCIS-2, TDCIS-3 (Components shall be tag identified)
Ø TYPE:	Globe (in line)
END CONNECTIONS:	3/4 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A335 GRADE P22, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
Ø LINE FLUID:	STEAM OR WATER
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	1775 PSIG @ 985°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	per ANSI B16.34 (1977)
FLOW CAPACITY:	MINIMUM C_v = 6
LEAKAGE:	INTERNAL - BUBBLE TIGHT EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3½ INCH THICK INSULATION AFTER ATTACHMENT TO LINE • HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.55 Oil Vent/Drain Valve

4.7.55.1

Identification Tag Number	Description
TOVV	Oil Vent/Drain Valve

4.7.55.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	3/4 inch, Fig. 848 TY
Rocketdyne Specification No.	:	SP42-116 (following)
Material	:	Body: Carbon Steel
Weight	:	5.5 lb.

4.7.55.3 Prescribed Service

Oil

4.7.55.4 Vendor

Rockwell Edward

4.7.55.5 Special Cautions

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.55.6 Periodic Service

None

4.7.55.7 Parts List

None

4.7.55.8 Special Tools

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.55.9 Maintenance Instructions

See Rockwell Edward service manual V376 (See paragraph 4.7.4.11)

4.7.55.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602 **Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California **SPECIFICATION**	NUMBER SP42-116
J. K. Cheng J.K.C.		TYPE Equipment
APPROVALS		DATE 4-16-80
E G Spencer 4/18/80		SUPERSEDES SPEC. DATED: 2-21-80
J G Absalom 4/18/80		REV. LTR. A
		PAGE 1 of 2

TITLE

THERMAL OIL VENT/DRAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TOVV (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL (EXCEPT GATE VALVE NOT PERMISSIBLE)
END CONNECTIONS:	3/4 INCH SOCKETWELD
PIPE MATERIALS:	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	OIL (CALORIA HT 43, DENSITY = 40.3 $\frac{LB}{CU\ FT}$ @ 600°F)
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	115 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	600 LB. CLASS
FLOW CAPACITY:	MINIMUM C_V = 6
LEAKAGE:	INTERNAL - BUBBLE TIGHT EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE • HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.56 Surge Tank Steam Supply Valve

4.7.56.1 Identification

Tag Number	Description
THSBV-1 & -2	Surge Tank Steam Supply Valve
THSVV-1 & -2	Surge Tank Steam Supply Valve
GIS	Gage Isolation Valve
TLSDV	Bootleg Level Sw. Drain Valve

4.7.56.2 Description

Manufacturer : Circle Seal, Anaheim, Ca.

Part Number : HN491-029

Rocketdyne Specification No. : SP42-055

Material : See Circle Seal Parts List HN491-029 (following)

Weight : 4 lb.

4.7.56.3 Prescribed Service

Steam

4.7.56.4 Vendor

Circle Seal

4.7.56.5 Special Cautions

None

4.7.56.6 Periodic Service

None

4.7.56.7 Parts List

See mfg. parts list HN491-029 (following)

4.7.56.8 Special Tools

None

4.7.56.9 Maintenance Instructions

None

4.7.56.10 Acceptance Tests

None

LTR	C.O.	REVISIONS	DATE	BY	CHK	LTR	C.O.	REVISIONS	DATE	BY	CHK
A	5-0047	ITEM #2 WAS 02026-007-T ITEM #3 WAS 07004-900-S4 ITEM #7 WAS 03001-000-S4	9/15/	RPB							

HN491-029

PARTS LIST

ITEM NO.	QTY REQD PER DASH NO.				PART NUMBER	SIZE	DESCRIPTION	MATERIAL	FINISH
1	1				01028-402-F22	A	BODY	F22 CHRM. MOLY	
2	1				02026-012-T	A	STEM	303 S. STL.	
3	1				07004-005-F22	A	BONNET	F22 CHRM. MOLY	
4	1				03003-001-T1	A	RETAINING RING	316 S. STL.	
5	3				03007-001-L22	A	PACKING J.C. 187-I	ASBESTOS/INC. WIRE	
6	1				03002-003-T	A	FOLLOWER	18-8 S. STL.	
7	1				03001-000-T	A	NUT	18-8 S. STL.	
8	1				05001-003-S4	A	HANDLE	C1215 C. STL.	ZINC PLATED
9	2				06023-003-R4	A	ROLL PIN	410 S. STL.	HARDENED
10	1				09008-000-A1	A	CAUTION TAG	ALUMINUM	
11	1				09007-000-A1	A	TAG	ALUMINUM	

...RAL ...EPRINT FILE

4.7.56-2.

NOTES:

APPROVED	
APPROVED	
APPROVED	
APPROVED	
CHECKED	
DRAWN RPB	4.3.80

CIRCLE SEAL CONTROLS BRUNSWICK TECHNETICS
ANAHEIM, CALIFORNIA 92801

TITLE
HEX PRODUCTS
NEEDLE VALVE ASSEMBLY

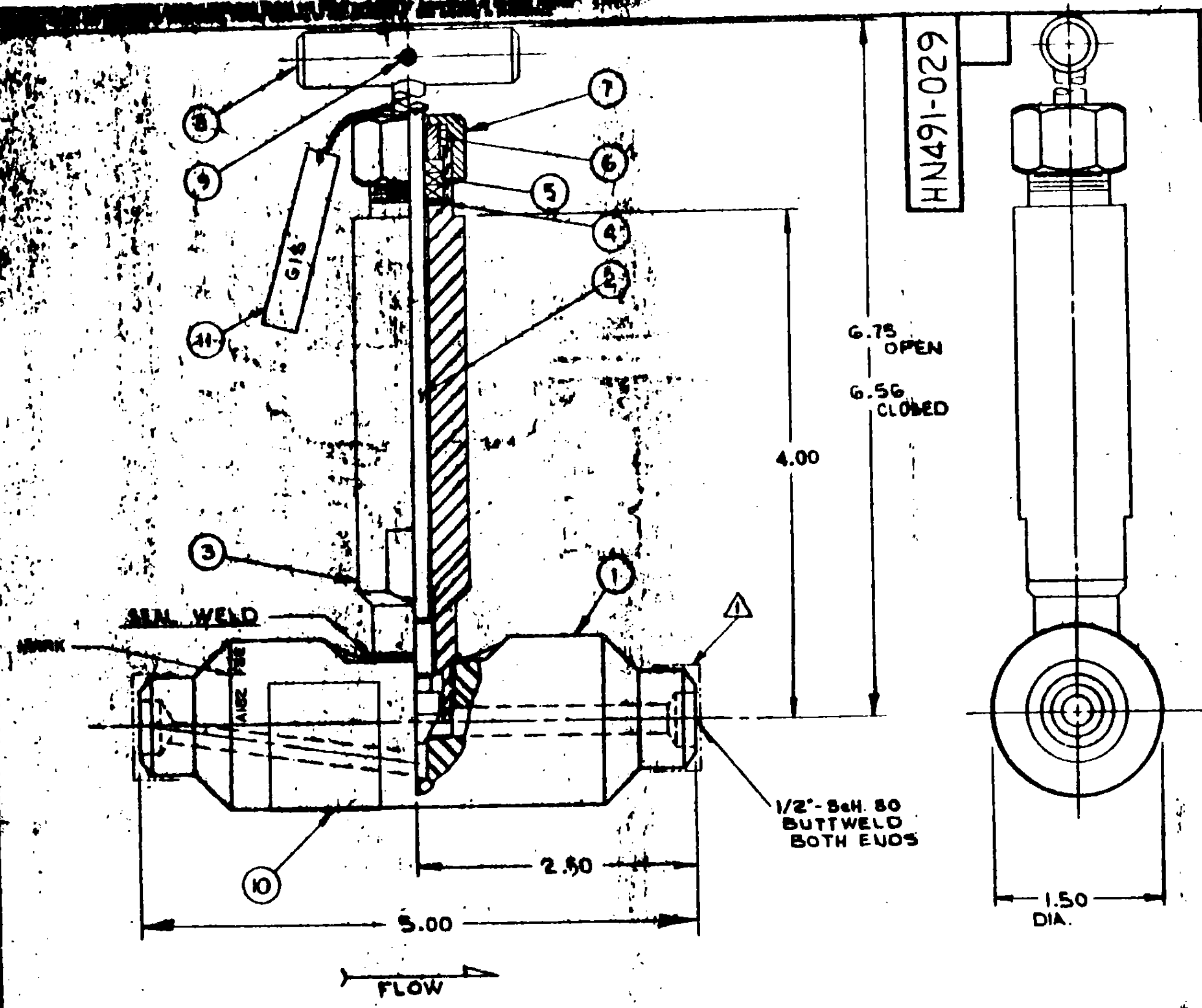
PARTS LIST NO. HN491-029

SIZE A | CODE 91816 | SHEET OF 1

FORM E6-2506A .../79

4.7.56-3

LTR	C.O.	REVISIONS	DATE	BY	APP
—	5-0033	RELEASE	7/28/80	[illegible]	[illegible]
A	5-0047	GEN. REV. TO CONFORM TO B16.34 SPEC.	9/15/80	RPB	[illegible]
	5-0072	NOTE 2, 6925 PSI WAS 9225 PSI	[illegible]	[illegible]	[illegible]



CENTRAL BLUEPRINT FILE

MARKING:

CIRCLE SEAL CONTROLS
HEX PRODUCTS
ANAHEIM, CALIFORNIA
HN491-029
2185 PSI @ 960°F
4610 PSI @ 100°F
TRIM 18-8 S.S.
B16.34
AND "FLOW ARROW"
IN DIRECTION SHOWN.

NOTES:

1. CAP & SEAL ENDS AND SPRAY COAT VALVE ASS'Y. WITH LPS-3 EXTRA-DUTY RUST INHIBITOR.
2. HYDROSTATIC TEST PRESSURE: 6925 PSI W/H_2O, 60 SEC. [illegible]
3. SEAT PRESSURE TEST: 5075 PSI W/H_2O, 60 SEC. MIN. 10CC/MIN. MAXIMUM LEAKAGE PERMITTED.
4. ORIFICE DIA.: .187
5.

SEE PARTS LIST A HN491-029

ITEM	QTY	PART NO.	DESCRIPTION	MATERIAL	FINISH

UNLESS NOTED:
DIMENSIONS IN INCHES
CONCENTRICITY .010 TIR
FILLET RADII .005 - .015
MACH. FINISH 125 ✓
DIM'S AFTER PLATING
REMOVE BURRS

APP [signature]	7/28/80	
APP		
APP		
CHECK AEW	7/25/80	
DRAWN RPB	DATE 7/25/80	

TITLE: NEEDLE VALVE
OUTLINE DIMENSIONED
SCALE FULL

HEX ENGINEERING DIVISION
CIRCLE SEAL CORPORATION
ANAHEIM, CALIFORNIA

CODE 91816 | DRWG NO. HN491-029
WT — LBS | SHEET 1 OF 1

QTY	NEXT ASSY	USED ON	STOCK PER 100 PCS
—	FINAL	—	— —

FORM ES-26088 10/73

PREPARED BY		NUMBER SP42-055
J. W. LEWELLEN	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation**	DATE 4-4-80
5/18/80	**Rocketdyne Division**	SUPERSEDES SPEC. DATED: 9-15-80
9/18/80	Canoga Park, California	REV. LTR. C — PAGE 1 of 2
	SPECIFICATION	

TITLE

GAGE ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

4.7.56-4

TAG NUMBER:	GIS, THSBV-1, THSBV-2, THSVV-1, THSVV-2, TLSDV (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	OPTIONAL
Ø CONNECTIONS:	1/2 INCH, BUTT WELD TO ASTM A335 GRADE P22 AND A106 GRADE B, SCHEDULE 80 PIPE.
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	STEAM OR OIL (EXXON CALORIA HT43) AT 2185 PSIG AND 960 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
Ø ANSI RATING:	ANSI INTERMEDIATE RATING OF 2185 PSIG @ 960°F
CAPACITY:	0.1 INCH DIAMETER (OR EQUIVALENT) MINIMUM FLOW PATH
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.57 Steam Isolation Valve

4.7.57.1 Identification Tag Number / Description

Identification Tag Number	Description
TRSIS-1 & -2	Surge Tank Steam Isolation Valve
TTSIS-1 & -2	Steam Trap Steam Isolation Valve

4.7.57.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 inch, Fig. 1048 TY
Rocketdyne Specification No.	:	SP42-083 (following)
Material	:	Body: Carbon Steel
Weight	:	8 lb.

4.7.57.3 Prescribed Service

Steam

4.7.57.4 Vendor

Rockwell Edward

4.7.57.5 Special Cautions

See Rockwell Edward manual V-376 (paragraph 4.7.4.11)

4.7.57.6 Periodic Service

None

4.7.57.7 Parts List

See Rockwell Edward manual V-376 (paragraph 4.7.4.11)

4.7.57.8 Special Tools

See Rockwell Edward manual V-376 (paragraph 4.7.4.11)

4.7.57.9 Maintenance Instructions

See Rockwell Edward manual V-376 (paragraph 4.7.4.11)

4.7.57.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-083
T. L. HYDE	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	**Rockwell International Corporation** **Rockwell Rocketdyne Division** Canoga Park, California	DATE 5-6-80
E G Spencer 5/12/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 1-24-80
5/13/80		REV. LTR. A — PAGE 1 of 2

TITLE

THERMAL STORAGE HEATER STEAM BLEED VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV 2-78

(ϕ - INDICATES CHANGE)

Ø TAG NUMBER:	THSBLV-1, THSBLV-2, THSBLV-3, THSBLV-4, TRSIS-1, TRSIS-2, TTSIS-1, TTSIS-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE (IN LINE)
CONNECTIONS:	1 INCH SOCKETWELD TO ASTM A106 GRADE B, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	STEAM AT 1550 PSIG MAXIMUM AND 675 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1500 LB
CAPACITY:	Cv = 1.4 MINIMUM
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. 3. HANDWHEEL MUST BE KEPT BELOW 125°F

4.7.59 Moisture Trap Separator Water Vent Valve

4.7.59.1

Identification Tag Number	Description
RTWVV-04 thru -21	Moisture Trap Separator Water Vent Valve

4.7.59.2 Description

Manufacturer	: Rockwell Edward, Pittsburgh, Penn.
Part Number	: 1/2 inch. Fig. 66128 (F22) T
Rocketdyne Specification No.	: SP42-015 (following)
Material	: Body: Chrome Moly
Weight	: 13 lb.

4.7.59.3 Prescribed Service

Steam

4.7.59.4 Vendor

Rockwell Edward

4.7.59.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.59.6 Periodic Service

None

4.7.59.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.59.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.59.9 Maintenance Instructions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.59.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-015
J. W. Lewellen JWL	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rockwell Rocketdyne Division**	DATE 11-29-79
E.G. Spencer 11-30-79	Canoga Park, California	SUPERSEDES SPEC. DATED:
F.G. Absalom 11-30-79	**SPECIFICATION**	REV. LTR.
		PAGE 1 of

TITLE

SEPARATOR WATER MANUAL VENT VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER: RTWVV-04 THRU RTWVV-21 (COMPONENTS SHALL BE TAG IDENTIFIED)

TYPE: GLOBE

CONNECTIONS: 1/2 INCH BUTT WELD TO ASTM A335 GRADE P22, SCHEDULE 80 PIPE

MATERIALS: COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS

ACTUATOR: HANDWHEEL

LINE FLUID: STEAM AT 1790 PSIA MAXIMUM AND 1050 F MAXIMUM

AMBIENT TEMPERATURE: 16 TO 113 F

ANSI RATING: 2500 LB

CAPACITY: Cv = 1.0 MINIMUM

LEAKAGE: INTERNAL - 10 CC/MINUTE MAXIMUM
EXTERNAL - NO VISIBLE LEAKAGE

PREPARATION FOR DELIVERY: THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

DESIGN FEATURES:

1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.
2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.60

4.7.60.1 Identification Tag Number — Description

Identification Tag Number	Description
RNMV	Nitrogen Main Valve

4.7.60.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 inch, Flg. 36120 RT
Rocketdyne Specification No.	:	SP42-053 (following)
Material	:	Body: Carbon Steel
Weight	:	15 lb.

4.7.60.3 Prescribed Service

GN_2

4.7.60.4 Vendor

Rockwell Edward

4.7.60.5 Special Cautions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.60.6 Periodic Service

None

4.7.60.7 Parts List

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.60.8 Special Tools

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.60.9 Maintenance Instructions

See Rockwell Edward manual V-370 (paragraph 4.7.4.11)

4.7.60.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-053
J. W. LEWELLEN	[illegible]	TYPE EQUIPMENT
APPROVAL	Rockwell International Corporation Rocketdyne Division Canoga Park California	DATE 9-16-80
E G Spencer 9/17/80		SUPERSEDES SPEC. DATED: 1-4-80
J. G. Olsen 9/17/80	SPECIFICATION	REV. LTR. A / PAGE 1 of

TITLE

MANUAL NITROGEN MAIN VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RNMV (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	1 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH LINE FLUID
ACTUATOR:	HANDWHEEL
LINE FLUID:	GASEOUS NITROGEN AT 1500 PSIG MAXIMUM AND 113 F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	1690 LB
CAPACITY:	Cv = 3 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

4.7.61 Downcomer Manifold Nitrogen Isolation Valve

4.7.61.1

Identification Tag Number	Description
RMNIS	Downcomer Manifold Nitrogen Isolation Valve

4.7.61.2 Description

Manufacturer	: Rockwell Edward, Pittsburgh, Penn.
Part Number	: 1 inch. Fig. 66128 (F22) T
Rocketdyne Specification No.	: SP42-016 (following)
Material	: Body: Chrome Moly
Weight	: 16 lb.

4.7.61.3 Prescribed Service

GN_2

4.7.61.4 Vendor

Rockwell Edward

4.7.61.5 Special Cautions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.61.6 Periodic Service

None

4.7.61.7 Parts List

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.61.8 Special Tools

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.61.9 Maintenance Instructions

See Rockwell Edward Manual V-370 (paragraph 4.7.4.11)

4.7.61.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-016
J. W. Lewellen	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rocketdyne Division**	DATE 7-11-80
7/14/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 5-6-80
7/15/80	**SPECIFICATION**	REV. LTR. C — PAGE 1 of 2

TITLE

MANUALLY OPERATED ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

Ø TAG NUMBER:	RMNIS (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
CONNECTIONS:	1 INCH BUTT WELD TO ASTM A335 GRADE P22, SCHEDULE 80 PIPE
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
Ø LINE FLUID:	GN_2
AMBIENT TEMPERATURE:	16 TO 113 F
ANSI RATING:	2500 LB
CAPACITY:	Cv = 8 MINIMUM
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 3 1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.62 Preheater Panel Nitrogen Isolation Valve

4.7.62.1 Identification

Tag Number	Description
RPNIS	Preheater Panel Nitrogen Isolation Valve

4.7.62.2 Description

Manufacturer	:	Rockwell Edward, Pittsburgh, Penn.
Part Number	:	1 inch, Fig. 36128 T
Rocketdyne Specification No.	:	SP42-119 (following)
Material	:	Body: Carbon Steel
Weight	:	15 lb.

4.7.62.3 Prescribed Service

GN_2

4.7.62.4 Vendor

Rockwell Edward

4.7.62.5 Special Cautions

4.7.62.6 Periodic Service

4.7.62.7 Parts List

4.7.62.8 Special Tools

4.7.62.9 Maintenance Instructions

4.7.62.10 Acceptance Tests

PREPARED BY	FSCM NO. 02602	NUMBER SP42-119
J. K. Cheng J.C.	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rockwell Division**	DATE 5-7-80
E G [signature] 5/12/80	Canoga Park, California	SUPERSEDES SPEC. DATED:
[signature] 5/13/80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

PREHEATER NITROGEN ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	RPNIS (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE
END CONNECTIONS:	1 INCH BUTT WELD
PIPE MATERIALS	ASTM A106 GRADE B, SCHEDULE 80
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	GASEOUS NITROGEN
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	2000 PSIG @ 600°F
AMBIENT TEMPERATURE:	16° TO 113°F
ANSI RATING:	1500 LB. CLASS
FLOW CAPACITY:	MINIMUM Cv = 8
LEAKAGE:	INTERNAL - ANSI CLASS IV (0.01% OF RATED CAPACITY) EXTERNAL - NO VISIBLE LEAKAGE
CLEANING & PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	• VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. • VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2-1/2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE. • HANDWHEEL MUST BE KEPT BELOW 125°F.

4.7.63 Gage Manifold Valves

4.7.63.1

Identification Tag Number	Description
GV	Gage Manifold Valves

4.7.63.2 Description

Manufacturer	:	Anderson, Greenwood & Co. Houston, Tex.
Part Number	:	PTMVCO
Rocketdyne Specification No.	:	SP42-054 (following)
Material	:	
Weight	:	2 lb.

4.7.63.3 Prescribed Service

Steam, water, oil

4.7.63.4 Vendor

Anderson, Greenwood

4.7.63.5 Special Cautions

None

4.7.63.6 Periodic Service

None

4.7.63.7 Parts List

See Anderson, Greenwood Report 2-0175-68-1 (following)

4.7.63.8 Special Tools

None

4.7.63.9 Maintenance Instructions

See Anderson & Greenwood Report 2-0175-68-1 (following)

4.7.63.10 Acceptance Tests

None

PREPARED BY		NUMBER
J. W. LEWELLEN	FSCM NO. 02602	SP42-054
APPROVALS	Rockwell International Corporation	TYPE
4/30/80	Rocketdyne Division	EQUIPMENT
4/30/80	Canoga Park, California	DATE 4-28-80
	SPECIFICATION	SUPERSEDES SPEC. DATED: 3-7-80
		REV. LTR. B / PAGE 1 of 2

TITLE

GAGE VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER:	GV (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	2-VALVE MANIFOLD
Ø CONNECTIONS:	1/2 INCH NPT FEMALE SUPPLY AND GAGE PORTS, BLEED PORT SIZE 1/2 INCH NPT
MATERIALS:	COMPATIBLE WITH LINE FLUID
ACTUATOR:	MANUAL
LINE FLUID:	WATER, GASEOUS NITROGEN OR OIL (EXXON CALORIA HT43) AT 2185 PSIG AND 200F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
Ø	
CAPACITY:	0.1 INCH DIAMETER (OR EQUIVALENT) MINIMUM FLOW PATH
LEAKAGE:	INTERNAL - 10 CC/MINUTE MAXIMUM EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURE:	A MANUALLY-OPERATED INTEGRAL BLEED VALVE TO DRAIN TRAPPED OUTLET PRESSURE SHALL BE PROVIDED.

ANDERSON, GREENWOOD & CO.

REPORT NUMBER

2-0175-68-1

OPERATION, MAINTENANCE & REPAIR OF VALVES AND MANIFOLDS

H5 Type Mini Valves - Micrometer Valves

MM1 & M9 Series Manifolds & Gauge Valves

V-600 Series Bleeder Valves

PTMVCO Manifolds

Prepared By: M L Schomer

M. L. Schomer

Date: 25 April 1972

FORM 128

1. INSTALLATION

1.1 Install valve in system with flow thru the valve as indicated by flow direction arrow stamped on the body of the valve. Pipe threaded ports should be connected using teflon tape or a suitable thread sealant. Valve seats and seals function satisfactorily with flow in reverse direction.

2. SYSTEM LIMITS

2.1. Teflon Packed - Metal Seat
Steel and Stainless Steel - 6000 PSI maximum - 400° F maximum.
Brass - 3000 PSI maximum - 400° F maximum.

2.2 O-Ring Seal - Metal Seat
Steel and Stainless Steel - 6000 PSI maximum - 200° F maximum.
Brass - 3000 PSI maximum - 200° F maximum.

2.3 Soft Seat - All Valves
3000 PSI maximum - 200° F maximum.

3. MAINTENANCE & REPAIR

3.1 Stem may be removed and relubricated in the event lubricant should wash out. If stem begins to squeek or feel rough when operated this is recommended. If stem threads are galled, the entire bonnet assembly should be replaced. O-ring sealed valve stems may be lubricated by applying oil externally.

3.2 Packing nut may be tightened in event a stem leak should develop on a teflon packed valve.

3.3 O-ring stem seals must be replaced if a leak develops.

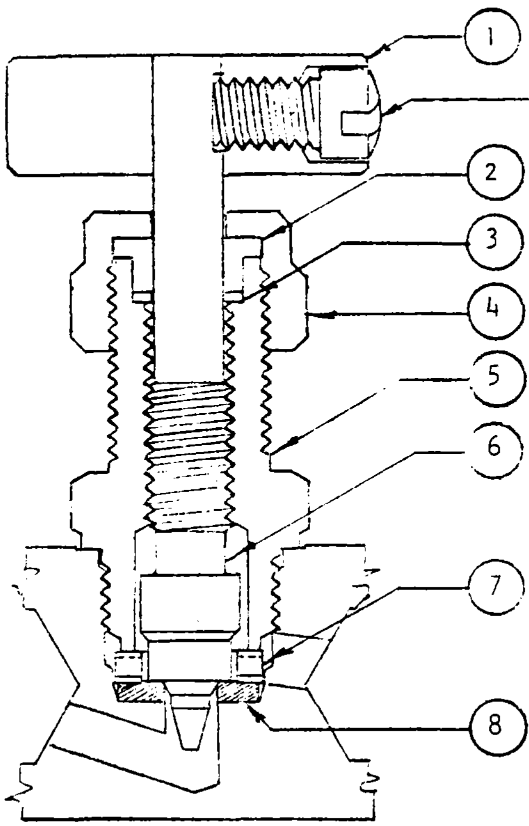
3.4 Soft seats are easily replaced by removing bonnet ass'y. or may be added to hard seat valves to salvage a valve that has become difficult to shut off tightly.

3.5 Refer to Page 2 & 3 for parts list and assembly torque values.

ANDERSON, GREENWOOD & CO.		TITLE: BONNET ASS'Y.	PG.
PREPARED	DATE		
CHECKED	DATE	NO. 2-2401 and 2-2340	2
APPROVED	DATE		

Report # 2-0175-68-1

PACKED BONNET ASSEMBLIES



ITEM	STAINLESS STEEL	CARBON STEEL	BRASS
1 Handle, Round	2-2320-3	2-2320-3	2-2320-3
1 Handle, "T"	2-2402-5	2-2402	2-2402
4 Packing Nut	2-2339-1	2-2339-2	2-2339
5 Bonnet	2-2337-1	2-2337-2	2-2337
6 Stem	2-2333-1	2-2333	2-2333
Bonnet Assemblies			
Round Handle	2-2340-1	2-2340-5	2-2340
"T" Handle	2-2401-8	2-2401-5	2-2401

1 Items 7 & 8 are not included in Hard Seat Valves.

2 Torque Stainless Steel & Carbon Steel 18-20 ft.lb. ~~Brass 10-12 ft. lb.~~

3 Lubricant recommended DESCO #600.

FORM-126

4.7.64 Differential Pressure Gage Valve

4.7.64.1 Identification

Tag Number	Description
DPGV	Differential Pressure Gage Valve

4.7.64.2 Description

Manufacturer: Anderson, Greenwood, Houston, Texas

Part Number: M6AVC-4

Rocketdyne Specification No.: SP42-056

Material: 4 lb.

Weight:

4.7.64.3 Prescribed Service

Water/Oil

4.7.64.4 Vendor

Anderson, Greenwood

4.7.64.5 Special Cautions

4.7.64.6 Periodic Service

4.7.64.7 Parts List

4.7.64.8 Special Tools

4.7.64.9 Maintenance Instruction

4.7.64.10 Acceptance Tests

PREPARED BY	FSCM NO. 02602	NUMBER SP42-056
J. W. LEWELLEN	**Rockwell International Corporation**	TYPE EQUIPMENT
APPROVALS	**Rockwell Rocketdyne Division**	DATE 4-28-80
E G Spencer 4/30/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 1-4-80
J. G. Avalon 4/30/80	**SPECIFICATION**	REV. LTR. A
		PAGE 1 of 2

TITLE

DIFFERENTIAL PRESSURE GAGE VALVE ASSEMBLY

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

TAG NUMBER: DPGV (COMPONENT SHALL BE TAG IDENTIFIED)

TYPE: INTEGRAL MANIFOLD, VALVE TYPES OPTIONAL

Ø CONNECTIONS: 1/2 INCH NPT FEMALE SUPPLY AND GAGE PORTS, BLEED PORT SIZE 1/4 INCH NPT

MATERIALS: COMPATIBLE WITH LINE FLUID

ACTUATOR(S): MANUAL

LINE FLUID: WATER OR OIL (EXXON CALORIA HT43) AT 2185 AND 200 F MAXIMUM

AMBIENT TEMPERATURE: 16 TO 113 F

CAPACITY: 0.1 INCH DIAMETER (OR EQUIVALENT) MINIMUM FLOW PATH

LEAKAGE: INTERNAL - 10 CC/MINUTE MAXIMUM
EXTERNAL - NO VISIBLE LEAKAGE

PREPARATION FOR DELIVERY: THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.

DESIGN FEATURE: DESIGN SHALL PROVIDE FOR EQUALIZATION OF DIFFERENTIAL PRESSURE AND SHALL INCORPORATE AN INTEGRAL BLEED VALVE FOR VENTING ISOLATED EQUALIZED PRESSURE.

4.7.65 Instrument Air Valves

4.7.65.1 Identification

Tag Number	Description
TIAADV-1 thru -11 TIAIS-1 thru -11	Instrument Air Valves

4.7.65.2 Description

Manufacturer : Hills-McCanna, Carpentersville, Ill.

Part Number : M502-BR-T-BR

Rocketdyne Specification No. : None

Material :

Weight :

4.7.65.3 Prescribed Service

Air

4.7.65.4 Vendor

Hills-McCanna

4.7.65.5 Special Cautions

None

4.7.65.6 Periodic Service

None

4.7.65.7 Parts List

None

4.7.65.8 Special Tools

None

4.7.65.9 Maintenance Instructions

See Hills-McCanna bulletin 1198B

4.7.65.10 Acceptance Tests

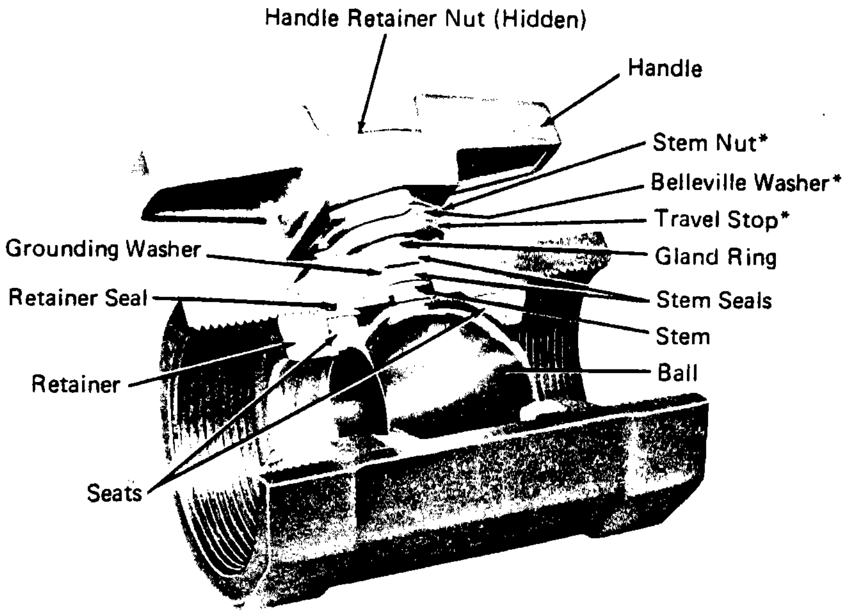
None

HILLS-McCANNA

McCanna 500 Ball Valves

Maintenance Instructions

For Valves with TFE, Reinforced TFE, or Buna Seats



*Parts used in 1-1/4-3" valves. 1/2", 3/4", 1" have pushnut only.

DISASSEMBLY

1. Remove valve from line and place in a vise. The valve end with the removable seat retainer should be up.

2. Unscrew the seat retainer, using a suitable wrench. A piece of flat stock ground to fit the slot is ideal for this purpose. Care must be taken so that the body threads are not damaged.

3. Remove retainer seal. Use caution in hooking out, so that ball is not scratched.

4. Place tee handle in closed position. This places the stem tang and ball slot so that the ball is free to roll out of the retainer end of the body.

5. Remove handle retainer nut and handle. Cut or snap the pushnut used in 1/2-inch through 1-inch sizes. Remove thin hex nut, Belleville washer and travel stop on all other sizes. Slide the gland ring off the stem. Push the stem into the body cavity and remove it through the end of the body.

6. Remove the stem seals and grounding washer. The top seal may be hooked out, but the inner seal should be pushed into the body cavity from the top.

7. After long use, the seats may be wedged very tightly in their retainers. Removal may require a combination of hooking and cutting. In any event, care must be taken so that the metal edges of the seat cavities are not damaged.

ASSEMBLY

Make sure that all parts are free of dust, grit, or other foreign material. The valve may be assembled and operated dry. However, a small amount of lubricant compatible with the line fluid will aid in assembly and allow the parts to more easily attain a "best fit" position. Such lubrication may be read into each step of the assembly. A high temperature silicone grease is used in factory assembly of standard valves.

1. Push one seat firmly into place in the retainer cavity machined in the body, with the flat side against the retainer and the spherical bevel facing the body cavity. Tamp down with fingers or a soft rod such as the eraser end of a lead pencil.

2. Place one stem seal on the stem. The seals have a slight bevel. Place the seal on the stem so that the raised outer edge faces up. When assembled, this raised outer edge will be at the bottom of the body counterbore.

3. Push the threaded end of the stem up through the stem hole and seat the stem seal into the counterbore machined into the body.

4. Press grounding washer into upper counterbore with the fingers up. Slide upper stem seal onto the stem so that the raised outer edge faces down into the counterbore. Slide the gland ring onto the stem and use it to tamp the upper seal into the counterbore.

5. a. 1/2-inch, 3/4-inch, 1-inch sizes. Install pushnut with the fingers up. It will be necessary to hold the stem up into the lower stem seal cavity while the pushnut is driven down. This may be done with a rod or wooden wedge inserted through the valve. Use care not to damage seat with wedge or rod. Drive the pushnut down evenly until all slack has been removed from the stem seals. A short length of tube or pipe slipped over the stem is an excellent tool for this operation. With the adjustable retainer end of the valve to the right, place the tee handle on the stem so that the Hills-McCanna lettering is readable right side up. Start the handle retainer nut on the stem but leave the handle slightly loose.

5. b. 1-1/4-inch through 3-inch sizes. Place the Belleville washer and travel stop on the stem. With the flats of the stem parallel with flow axis, it should be possible to rotate the stem 90° clockwise. If this is not possible, the stop has been inverted. With stop properly positioned, install stem nut. Tighten just past the point where all slack is taken up. Then back the nut off so that it is slightly loose. Place tee handle and handle nut on stem but do not tighten.

6. Turn the handle to the closed position. With the ball slot aligned with the stem tang, the ball may be dropped into position or lowered with tongs. Care must be taken to prevent nicking or scratching of the ball.

7. Install the retainer seal into the machined groove in the body. Some bending will be necessary, but use caution to prevent kinks or rolls. Be sure that the seal is seated firmly in the body groove.

8. Press the remaining seat into the retainer with flat side against retainer and tamp down so that it is fully seated. Place the handle in the valve open position (except for the 1/2-inch and 3/4-inch sizes, where the handle should be in the closed position), and screw the retainer into the body until light contact is made with the ball. Adjust the retainer to the proper seat compression as checked by handle torque. (See Table below.) All valves except 1/2-inch and 3/4-inch sizes should be in the open position when the adjustments are made, and the valve should be closed and reopened before each handle torque adjustment is made.

9. a. 1/2-inch, 3/4-inch, 1-inch sizes. Tighten handle retainer nut to the "stem nut tightness" shown in the table. Cycle the valve several times during tightening so that the stem seals will be properly seated at correct compression. Valve is ready for test or use.

9. b. 1-1/4-inch through 3-inch sizes. Tighten stem nut to the value shown in the table. Cycle the valve to seat stem seals during the adjustment. Install and tighten handle retainer nut. Valve is now ready for test or use.

Valve Size	Handle Torque (lb-in.) (with stem nut loose)			Stem Nut Tightness (lb-in.)
	TFE Seats	Reinf. TFE Seats	Buna N Seats	All Valves
1/2"	3-6	5-8	1-2	60
3/4"	5-9	8-12	2-3	60
1"	8-14	12-18	3-5	60
1-1/4"	13-21	18-26	6-8	120
1-1/2"	20-29	26-35	9-10	120
2"	28-38	35-45	12-14	120
3"	37-47	45-55	NA	120

Form No. 1198B
Printed in U.S.A.

HILLS-McCANNA COMPANY
400 MAPLE AVENUE, CARPENTERSVILLE, ILLINOIS 60110
HILLS-McCANNA CANADA, LTD., 2552 WHARTON GLEN, MISSISSAUGA, ONTARIO, CANADA
HILLS-McCANNA, LTD., TELFORD ROAD, BASINGSTOKE, HAMPSHIRE, ENGLAND

4.7.66 Ullage Nitrogen Isolation Valve

4.7.66.1

Identification Tag Number	Description
UNIS-4	Ullage Nitrogen Isolation Valve

4.7.66.2 Description

Manufacturer : Hills-McCanna, Carpentersville, Ill.

Part Number : S302-CS-T-CS

Rockedyne Specification No. : SP42-128 (following)

Material :

Weight : 3 lb.

4.7.66.3 Prescribed Service

GN_2

4.7.66.4 Vendor

Hills-McCanna

4.7.66.5 Special Cautions

See Hills-McCanna bulletin 1193B (following)

4.7.66.6 Periodic Service

See Hills-McCanna bulletin 1193B (following)

4.7.66.7 Parts List

None

4.7.66.8 Special Tools

None

4.7.66.9 Maintenance Instructions

See Hills-McCanna bulletin 1193B (following)

4.7.66.10 Acceptance Tests

None

PREPARED BY		NUMBER SP42-128
J. K. Cheng	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 12-12-80
E. C. Fun... 12/17/80		SUPERSEDES SPEC. DATED:
J. G. Absalom 12/18/80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

ULLAGE NITROGEN ISOLATION VALVE

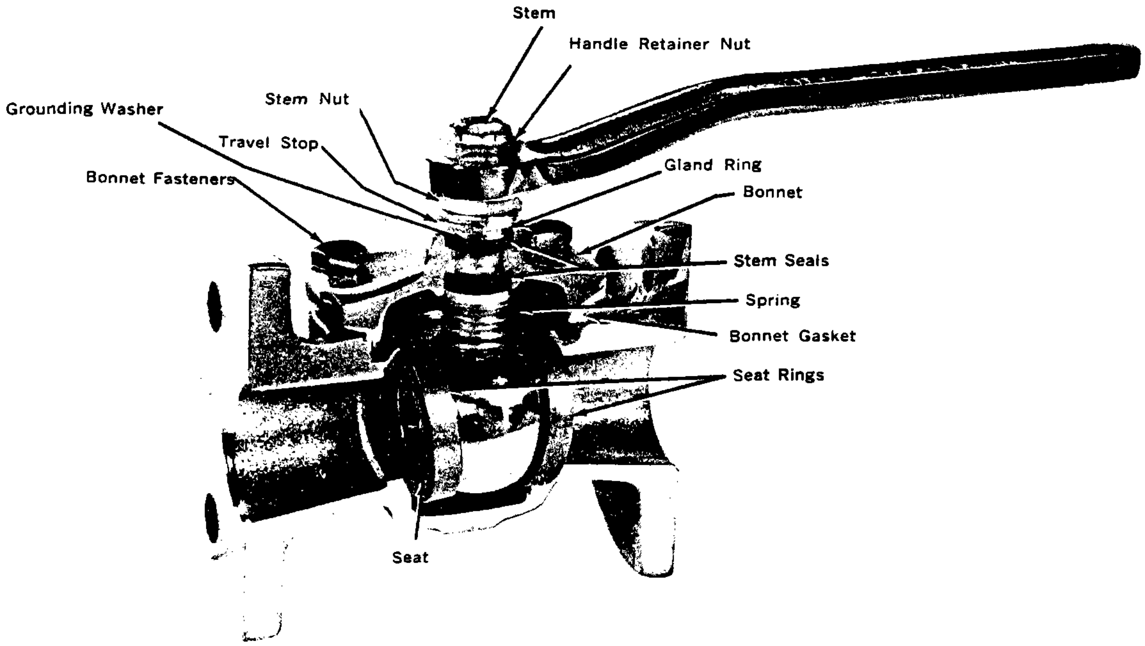
The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	UNIS-4 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	BALL (IN LINE)
CONNECTIONS:	1 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH LINE FLUID
ACTUATOR:	HANDWHEEL
LINE FLUID:	N_2 AND OIL (CALORIA HT43) AT 50 PSIG MAXIMUM AND 113°F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 113 F
CAPACITY:	Cv = FULL PORT
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHEMENT TO LINE.

HILLS-McCANNA

McCannaseal® Ball Valves

Installation and Maintenance Instructions



INSTALLATION

1. These valves may be installed in any position, using good pipe fitting practices.
2. To prevent distortion of seats when installing a weld end valve, the ball and seats should be removed before welding unless the heat influx into the valve body can be well controlled during the welding process.
3. If vălve has been furnished with means for body cavity pressure relief, Installation Bulletin #1186 should be carefully read before installation.
4. When valve is installed in hot service (400°F or better) check bonnet fasteners for relaxation and retighten after valve has been in service several days.

MAINTENANCE

1. Good operating procedure requires periodic inspection of the installed valve to insure proper function.
2. Stem leakage should be stopped immediately to prevent further damage. On 4″ and smaller size valves remove the handle retainer nut and handle. Turn stem nut clockwise to compress the stem seals. On 6″ thru 10″ valves the handle need not be removed except for convenience. Bend out the tabs of the lock washer and rotate the round retainer nut clockwise to compress seals. DO NOT OVERTIGHTEN—OPERATING TORQUE MAY BECOME EXCESSIVE. CAUTION: DO NOT BACK OFF ON STEM NUT WHEN VALVE IS UNDER PRESSURE. If stem leakage continues or operating torque becomes excessive, disassemble and replace stem seals.
3. Bonnet gasket leakage should be stopped immediately to prevent further damage. Tighten bonnet fasteners to the maximum torque shown in Table 2. If bonnet leakage continues, disassemble and replace gasket.
4. Valves which show high operating torque not resulting from stem seal overtightening or valves which show through leakage may have ball surfaces or seats damaged by foreign matter, excessive temperature, or excessive pressure. These valves should be disassembled for inspection and replacement of damaged parts.

NOTE: Maintenance Bulletin #1185 must also be followed if valve is equipped with metal seats or carbon-graphite seats with ball stop.

Maintenance Bulletin #1191A must also be followed if valve is equipped with self-relieving seats.

DISASSEMBLY

CAUTION: THERE MUST BE NO LINE PRESSURE ON THE VALVE AT THIS TIME.

1. Place handle in open position. Remove handle and loosen hex stem nut (or round retainer nut). Remove fasteners that hold bonnet to the body. Lift off bonnet assembly and spring. Remove stem nut (or retainer nut), travel stop, and gland ring. Slide stem out through the inner side of the bonnet.
2. Pry upper and lower stem seals and grounding washer out of counterbores, using care so that the bore surface is not scratched.
3. Insert a large screwdriver or similar tool into the oval slot of the ball and loosen up the ball by moving screwdriver and ball in a direction 90° to the pipe line until screwdriver rests against body. Pry ball and seats loose and upward by pushing the screwdriver handle down. Be careful not to mar gasket seal surface. CAUTION: THE BALL CANNOT BE TAKEN OUT OF THE BODY IF THE BALL IS IN THE CLOSED POSITION. IF THIS IS TRIED, THE BALL SURFACE WILL BE DAMAGED.

4. Clean and inspect the ball, seats, and flat seating surfaces of the body. If the seats are worn or scratched, push seats out of the metal seat rings and replace. Be sure the sealing surface on the back of the seat protrudes uniformly beyond the metal seat ring. Especially on seats having a separate inner metal ring, the seat must clear both the inner and outer metal rings. In rare cases of deep scratch marks on the ball surface, the ball also must be replaced.
5. If valve is equipped with seats made from non-resilient materials (i.e. carbon-graphite or metal) replacement seats must be lapped with the ball, preferably furnished as a lapped set from the factory.

ASSEMBLY

NOTE: This valve may be assembled dry where lubricants are not allowed in the system. However, assembly will be easier and initial operating torque will be lower if lubricants are used. Use lubricant compatible with the intended service.

1. Lightly grease stem and stem seals. Slide correct number of lower stem seals on stem. (See Table 1.) The raised outer edge of the seals should face into the lower counterbore. If split asbestos rings are used, the splits should be staggered for an effective seal. Insert stem and lower stem seals into bonnet from lower side.
2. Insert grounding washer into upper seal cavity with the fingers pointing out. Place new upper seal(s) on stem with the raised outer edge pointing in toward the counterbore. (See Table 1.) Tamp down with the gland ring.
3. Replace travel stop so that a clockwise movement of the handle would close the valve. If clockwise closure is not possible, remove the travel stop, invert, and replace. Add stem nut (or lock washer and retainer nut) and tighten seals. Attach handle. On 6″ thru 10″ valves, replace handle so that it is aligned with the milled index slot on the top of the stem.
4. Wipe ball and two seats clean of any foreign particles, especially make sure that the flat faces of the seats are clean, not scratched and not uneven. Clean scale or foreign particles from the two seating surfaces in the valve body. Apply a little grease to both sides of each seat and the ball.
5. Insert ball and 2 seats simultaneously into the body. The oval slot in the ball must be positioned approximately 90° to the pipe line. The slot has to face the bonnet opening.
6. The seats and ball are lined up to the pipe centerline by 4 lugs in the valve body. The play between seats and lugs should be equally distributed on both sides so that the ball is lined up to the centerline of the valve. The slot in the ball should be lined up centrally in the bonnet opening to facilitate the insertion of the stem. A large screwdriver is also ideal for this adjustment.
7. Put a new bonnet gasket in place on the bonnet. Set spring in place around the stem tang. The bonnet assembly and the spring are set on the valve body in such a fashion that the tang of the stem fits into the ball slot.
8. Press the bonnet down into the register fit of the body against the spring force. Use care so that the gasket is not cut or crushed. Grease the bonnet fastener threads and washer face. Install the nuts and tighten them evenly to torque values shown in Table 2. The seal occurs on the small step of the register fit and the bonnet flange face does not contact the body flange face. Do not overtorque to point where bolting is stretched or bonnet is bowed.
9. Open and close the valve several times to facilitate the seating of the ball. The valve is then ready for testing or usage.

Table 1—Number of Stem Seals

Valve Size	TFE or Reinforced TFE	Asbestos
½″-2″	Upper—1 Lower—2	1 2
3″-10″	Upper—3 Lower—3	2 2

NOTE: The slightly raised inner portion of the stem seals should be pointing away from the bonnet for both upper and lower stem seals. For asbestos stem seals, alternate splits around stem.

Table 2—Bonnet Fastener Torque Values in lb-ft.

Valve Size	150-300 Class	600 Class
½″-¾″	5	12
1″	5	20
1½″	8	20
2″	20	30
3″	40	60
4″	30	100
6″	65	160
8″	165	356
10″	165	500

NOTE: It may be necessary to retorque fasteners after first day of operation at full temperature and pressure.

WARNING
Hills-McCanna Ball Valves are designed and manufactured using good workmanship and materials, and they meet all applicable industry standards.
Hills-McCanna is anxious to avoid injuries and property damage which could result from misapplication of the product. Proper valve selection is imperative. Examples of the misapplication or misuse of a valve include use in a service in which the pressure/temperature rating is exceeded or in a chemical service incompatible with the valve materials; failure to use caution in operating valves in high temperature, high pressure, or highly hazardous services; failure to maintain valves as recommended.

Form No. 1193B
Printed in U.S.A.

HILLS-McCANNA COMPANY
400 MAPLE AVENUE, CARPENTERSVILLE, ILLINOIS 60110 • PHONE 312/426-4100
HILLS-McCANNA CANADA, LTD., 2450 DUNWIN DR., MISSISSAUGA, ONT., CANADA L5L 1J9
VALVE SYSTEMS INTERNATIONAL, LTD., TELFORD ROAD, CUMBERNAULD, SCOTLAND

4.7.67 Ullage Nitrogen Isolation Valve

4.7.67.1

Identification Tag Number	Description
UNIS-1	Ullage Nitrogen Isolation Valve
UNIS-5	Ullage Nitrogen Isolation Valve

4.7.67.2 Description

Manufacturer	:	Rockwell Edward
Part Number	:	1 inch, Fig. 848Y
Rocketdyne Specification No.	:	SP42-129 (following)
Material	:	
Weight	:	7.5 lb.

4.7.67.3 Prescribed Service

GN_2

4.7.67.4 Vendor

Rockwell, Edward

4.7.67.5 Special Cautions

See Rockwell, Edward service manual V-376 (paragraph 4.7.4.11)

4.7.67.6 Periodic Service

None

4.7.67.7 Parts List

None

4.7.67.8 Special Tools

See Rockwell, Edward service manual V-376 (paragraph 4.7.4.11)

4.7.67.9 Maintenance Instructions

See Rockwell, Edward service manual V-376 (paragraph 4.7.4.11)

4.7.67.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-129
J. K. Cheng	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rocketdyne Division**	DATE 12-12-80
E G Spencer 12/17/80	Canoga Park, California	SUPERSEDES SPEC. DATED:
J. G. Abalm 12/18/80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

ULLAGE NITROGEN ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	UNIS-1, UNIS-5 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE (IN LINE)
CONNECTIONS:	1 INCH SOCKETWELD TO ASTM A106 GRADE B
MATERIALS:	COMPATIBLE WITH LINE FLUID AND WELD CONNECTIONS
ACTUATOR:	HANDWHEEL
LINE FLUID:	N_2, ULLAGE GAS AND OIL (CALORIA HT43) AT 1.0 PSIG MAXIMUM AND 560°F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 150°F
ANSI RATING:	600 LB
CAPACITY:	Cv-= FULL PORT
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	1. THE VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE. 2. THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.7.68 Ullage Gas Isolation Valve

4.7.68.1 Identification

Tag Number	Description
UNIS-3	Ullage Gas Isolation Valve

4.7.68.2 Description

Manufacturer	:	Rockwell Edward
Part Number	:	1/2 inch. Fig. 848
Rocketdyne Specification No.	:	SP42-130 (following)
Material	:	
Weight	:	4 lb.

4.7.68.3 Prescribed Service

GN_2

4.7.68.4 Vendor

Rockwell, Edward

4.7.68.5 Special Cautions

See Rockwell Edward service manual V-376 (paragraph 4.7.4.11)

4.7.68.6 Periodic Service

None

4.7.68.7 Parts List

None

4.7.68.8 Special Tools

See Rockwell Edward service manual V-376 (paragraph 4.7.4.11)

4.7.68.9 Maintenance Instructions

See Rockwell Edward service manual V-376 (paragraph 4.7.4.11)

4.7.68.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-130
J. K. Cheng	Rockwell International Corporation Rocketdyne Division Canoga Park, California	TYPE Equipment
APPROVALS		DATE 12-12-80
E. Coferman 12/17/80		SUPERSEDES SPEC. DATED:
J. G. Absalom 12/18/80	**SPECIFICATION**	REV. LTR. / PAGE 1 of 2

TITLE

ULLAGE GAS ISOLATION VALVE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	UNIS-3 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	GLOBE (IN LINE)
CONNECTIONS:	1/2 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH LINE FLUID
ACTUATOR:	HANDWHEEL
LINE FLUID:	N_2, ULLAGE GAS AND OIL (CALORIA HT43) AT 1.0 PSIG MAXIMUM AND 560°F MAXIMUM
AMBIENT TEMPERATURE:	16 TO 150°F
ANSI RATING:	600 LB
CAPACITY:	Cv = FULL PORT
LEAKAGE:	INTERNAL - ANSI CLASS V EXTERNAL - NO VISIBLE LEAKAGE
PREPARATION FOR DELIVERY:	THE VALVE SHALL BE CONTAMINANT FREE (INCLUDING RUST AND MILL SCALE) AND SHALL BE PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION DURING SHIPMENT AND STORAGE.
DESIGN FEATURES:	THE VALVE SHALL BE DESIGNED TO PERMIT INSTALLATION OF 2 INCH THICK INSULATION AFTER ATTACHMENT TO LINE.

4.8 PRESSURE REGULATOR

Equipment Number	Description	Maintenance Section	Dwg. Number
PCV-31	Feedwater to Aux. Boiler/TSS Crossover Pressure Regulator	4.8.1	5163151
PCV-531	Service Air Hdr. Press. from Air Receiver Regulator	4.8.2	5163162
PCV-701	1st Heater Feedwater to Sample System	4.8.3	5163157
PCV-709	Condensate to Sample Cooler Regulator	4.8.4	5163157
PCV-7-1	Feedwater from Deaerator to Sampling System Regulator	4.8.5	5163157
PCV-721	Condensate from Sample Cooler Regulator	4.8.6	5163157
PCV-731	Condensate from Condenser to Sample System Regulator	4.8.7	5163157
PCV-814	Lube Oil Pressure Control Valve	4.8.8	
PCV-1409	BCS Shutter Air Regulator	4.8.9	5163162
PCV-2009	N_2 Pressure Regulator - 1	4.8.10	5163140
PCV-2013	N_2 Pressure Regulator - 2	4.8.11	5163140
PCV-3207	Heater Steam Warmup Press. Regulator - 1	4.8.12	5163144
PCV-3307	Heater Steam Warmup Press. Regulator - 2	4.8.12	5163144
PCV-4004	Ullage N_2 Pressure Regulator - 1	4.8.13	5163147
PCV-4006	Ullage N_2 Pressure Regulator - 2	4.8.14	5163147
PCV-4007	Ullage N_2 Pressure Regulator - 3	4.8.15	5163147

4.8.10 N_2 Pressure Regulator -1

4.8.10.1 Identification

Identification Tag Number	Description
PCV-2009	N_2 Pressure Regulator -1

4.8.10.2 Description

Manufacturer	:	Fisher Controls Co., Marshalltown, Iowa 50158
Part Number	:	630-8038
Rocketdyne Specification No.	:	SP42-009 (following)
Material	:	Body: Carbon Steel
Weight	:	25 lb.

4.8.10.3 Prescribed Service

GN_2 600 psig, 113°F

4.8.10.4 Vendor

Fisher Controls Co., Marshalltown, Iowa 50158

4.8.10.5 Special Cautions

See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.10.6 Periodic Service

None

4.8.10.7 Parts List

See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.10.8 Special Tools

None

4.8.10.9 Maintenance Instructions

See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.10.10 Acceptance Tests

None

PREPARED BY	FSCM NO. 02602	NUMBER SP42-009
G. J. Krall	**Rockwell International Corporation** **Rocketdyne Division** Canoga Park, California	TYPE Equipment
APPROVALS		DATE 3-6-80
E. G. Spencer 3/7/80	**SPECIFICATION**	SUPERSEDES SPEC. DATED: 11-29-79
J. G. Absalom 3/7/80		REV. LTR. A / PAGE 1 of 2

TITLE

NITROGEN REGULATOR, HIGH PRESSURE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

NUMBER	REVISION LETTER	PAGE
SP42-009	A	2

TAG NUMBER:	RNPR-1 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	PRESSURE REDUCING
CONNECTIONS:	1 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH CONNECTIONS AND LINE FLUID
LINE FLUID:	GN_2
Ø MAXIMUM INLET PRESSURE AND TEMPERATURE:	600 PSIG @ 113 F
REGULATED PRESSURE:	400 ± 40 PSIG, ADJUSTABLE 300 TO 425 PSIG
ANSI RATING:	900 LB CLASS
FLOW CAPCITY:	300 SCFM @ 600 PSIG INLET AND 400 PSIG OUTLET
AMBIENT TEMPERATURE:	16 TO 113 F
INTERNAL LEAKAGE:	10 CC/MIN
EXTERNAL LEAKAGE:	NONE VISIBLE
CLEANING AND PACKAGING:	SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

4.8.10.11 MANUFACTURERS INSTRUCTIONS:

Fisher Controls, Instruction Manual, 630 Series

Masoneilan, Micro Pak 29000 Series, Instruction No. 3051E

Masoneilan, Parts Supplement, Instruction No. 3051E PSI

Masoneilan, Series 2700 and 3700, Instruction No. 2033E

Instruction Manual

630 Series Regulators and Relief Valves

Form 1243, August 1979

WARNING

Fisher regulators and relief valves must be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Fisher instructions. Immediately call a qualified technician in case of trouble. Failure to correct the situation immediately may create a hazardous condition.

INTRODUCTION

Scope of Manual

This instruction manual provides operating, installation, maintenance, and parts information for the 630 Series regulators and relief valves.

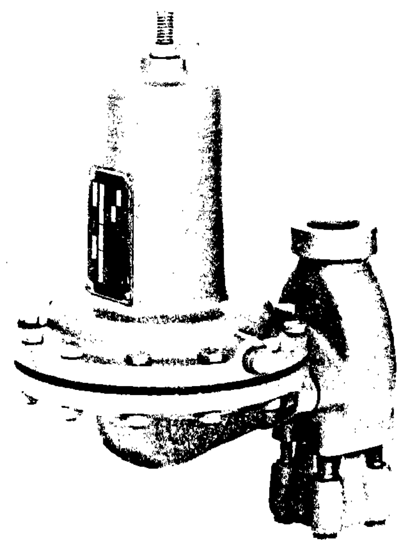


Figure 1. Spring-Loaded Type 630 Regulator

Description

The Fisher 630 Series consists of self-operated, Type 630 **Big Joe®** pressure regulators and Type 630R relief valves, available in either spring-loaded or pressure-loaded constructions. Pressure-loaded regulators use a Fisher Type 67, 67H, 1301F, or 1301G loading regulator. Pressure-loaded Type 630R relief valves use a Fisher Type 67 or 1301F loading regulator.

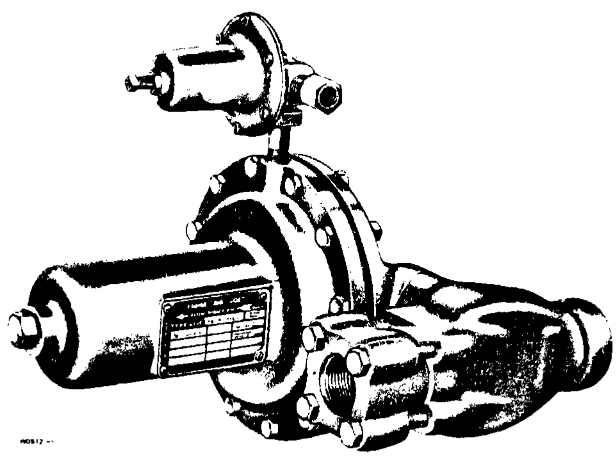


Figure 2. Pressure-Loaded Type 630R Relief Valve

Specifications

Table 1 lists the specifications for the 630 Series constructions.

Table 1. Specifications

AVAILABLE CONFIGURATIONS	See table 2	**MATERIAL TEMPERATURE CAPABILITIES**	**Standard:** −20 to 150°F (−29 to 66°C) **Optional:** −20 to 300°F (−29 to 149°C)
END CONNECTION SIZES AND STYLE	■ 1-inch or ■ 2-inch, screwed	**PORT DIAMETERS**	■ 1/8-inch (3.2 mm), ■ 3/16-inch (4.8 mm), ■ 1/4-inch (6.4 mm), ■ 3/8-inch (9.5 mm), or ■ 1/2-inch (12.7 mm)
MAXIMUM ALLOWABLE INLET PRESSURES	**Type 630 Regulators:** See table 3 **Type 630R Relief Valves:** See tables 6 and 7		
OUTLET PRESSURE RANGES	3 to 500 psig (0.2 to 34.5 bar) with intermediate values shown in tables 4 and 5	**COEFFICIENTS FOR RELIEF VALVE SIZING**	Wide Open C_g— 1/8-inch (3.2 mm) port: 13.5 3/16-inch (4.8 mm) port: 29.9 1/4-inch (6.4 mm) port: 53.5 3/8-inch (9.5 mm) port: 120 1/2-inch (12.7 mm) port: 215
MAXIMUM ALLOWABLE OUTLET PRESSURES	See tables 4, 5, and 7		
MAXIMUM ALLOWABLE PRESSURE DROPS	See table 3	**APPROXIMATE WEIGHTS**	**1-inch End Connection:** 25 lb (11.3 kg) **2-inch End Connection:** 30 lb (13.5 kg)

Table 2. Available Configurations

TYPE	LOADING	CONSTRUCTION	
		High Pressure	Low Pressure
PRESSURE REGULATORS			
630	Spring	X	X
630-101	Type 67 Regulator	X	X
630-106	Type 67H Regulator	X	X
630-102	Type 1301F Regulator	X	X
630-107	Type 1301G Regulator	X	X
RELIEF VALVES			
630R-101	Type 67 Regulator		X
630R-102	Type 1301F Regulator	X	
630R-103	Spring	X	
630R-104	Spring		X

INSTALLATION

WARNING

Personal injury or system damage may result if this unit is installed where service conditions could exceed the limits given in table 1. Installations should be protected from physical damage. Overpressuring any portion of this equipment may cause equipment damage, leak in the unit, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

System operation within the limits of table 1 does not eliminate the possibility of damage from external sources or from debris in the line. The unit should be inspected for damage regularly and after any overpressure condition.

Before installing, inspect the unit for any damage and any foreign material. The regulator or relief valve may be mounted in any position, however ensure that the flow direction corresponds with the direction of the arrow on the nameplate. Apply a good grade of pipe compound to the male threads of the pipeline.

Vents

WARNING

When the unit is installed in an enclosed area or indoors, escaping gas may accumulate and be an explosion hazard. Under these conditions the vent should be piped away from the unit to a freely ventilated outdoor location away from air intakes, windows, etc. Protect all vent openings against weather or the entrance of any foreign material that may plug the vent or affect operation of the regulator or relief valve. Inspect all vent openings periodically to be sure they are not plugged. If the vent is in an environment where freezing rain, ice, or snow could clog the vent, it is recommended that a weatherproof vent be used.

Spring-loaded constructions have a screened vent assembly (key 27, figures 5 and 7) installed in the 1/4-inch NPT spring case vent opening. If a remote vent is required, remove the vent assembly and install a remote vent line.

*Table 3. Maximum Inlet Pressures and Pressure Drops for Type 630 Regulators**

Description	1/8-inch (3.2 mm) and 3/16-inch (4.8 mm) Port Diameter	1/4-inch (6.4 mm) Port Diameter	3/8-inch (9.5 mm) Port Diameter	1/2-inch (12.7 mm) Port Diameter
Maximum Allowable Inlet Pressure, Psig (Bar)	1500 (103.5)†	1500 (103.5)†	1000 (69)†	750 (51.8)†
Maximum Allowable Pressure Drop‡ Psi (Bar, Differential)	1500 (103.5)	1000 (69)	500 (34.5)	250 (17.3)

*Does not apply to loading regulator of pressure-loaded Type 630 regulator.
† Inlet pressure must not exceed sum of the actual outlet pressure setting and the maximum allowable pressure drop. For example, with an outlet pressure setting of 200 psig (14 bar) and a 3/8-inch (9.5 mm) port diameter with a maximum allowable pressure drop of 500 psi (34.5 bar, differential), the maximum allowable inlet pressure is 700 psig (48.3 bar).
‡ Nitrile valve discs are normally furnished for pressure drops to 200 psi (14 bar, differential). For better erosion resistance, nylon valve discs are normally furnished for higher pressure drops.

Table 4. Spring-Loaded Type 630 Regulator Outlet Pressure Limits

Description	Low-Pressure Regulator				High-Pressure Regulator					
Outlet Pressure Range, Psig (Bar) and Spring Part Number	3 to 10 (0.2 to 0.7) 0W0192 27022	8 to 20 (0.5 to 1.4) 0W0191 27022	17 to 30 (1.2 to 2.0) 0W0190 27022	27 to 40 (1.9 to 2.8) 0Y0664 000A2	27 to 50 (1.9 to 3.5) 0W0192 27022	46 to 95 (3.2 to 6.6) 0W0190 27022	90 to 150 (6.2 to 10.3) 0W0190 27022	150 to 200 (10.3 to 13.8) 0Y0664 000A2	200 to 275 (13.8 to 18.9) 1J1469 27142	275 to 500 (18.9 to 34.5) 1K3709 27082
Maximum Allowable Operating Outlet Pressure, Psig (Bar)	10 (0.7)	20 (1.4)	30 (2.1)	40 (2.8)	50 (3.5)	95 (6.6)	150 (10.3)	200 (13.8)	275 (18.9)	500 (34.5)
Maximum Outlet Pressure Over Pressure Setting[1] Psig (Bar)	20 (1.4)		20[2] (1.4)	Limited by Maximum Emergency Outlet Pressure	200 (13.8)					200[3] (13.8)
Maximum Emergency Outlet (Casing) Pressure[4] Psig (Bar)	45 (3.1)				550 (38.0)					

1. Damage to internal parts of the regulator may occur if outlet pressure exceeds the actual pressure setting by amounts greater than those shown in this row.
2. For outlet pressure settings to 25 psig (1.7 bar) only. For pressure settings over 25 psig (1.7 bar), outlet pressure is limited by maximum emergency outlet pressure of 45 psig (3.1 bar).
3. For outlet pressure settings to 350 psig (24.1 bar) only. For pressure settings over 350 psig (24.1 bar), outlet pressure is limited by maximum emergency outlet pressure of 550 psig (38.0 bar).
4. Leakage or bursting of pressure containing parts may occur if outlet pressure exceeds these values.

Pressure-loaded constructions have a bleed orifice fitting (key 49, figure 9) installed in an extra outlet connection of the loading regulator. The function of this fitting is to bleed loading pressure during operation of the regulator or relief valve. If remote venting is required, remove the screen from the 1/4-inch NPT opening and install a remote vent line.

Overpressure Protection

As the case with most regulators, the Type 630 spring-loaded and pressure-loaded regulators have outlet pressure ratings that are lower than the inlet pressure ratings. Overpressure protection must be provided if the actual inlet pressure can exceed the outlet pressure rating. Overpressure protection is also required for the loading regulator and main regulator spring case of pressure-loaded regulators and relief valves.

Refer to the following tables to determine pressure ratings:

1. Spring-loaded Type 630 regulators.
   a. Inlet pressure and pressure drop—table 3.
   b. Outlet pressure—table 4.
2. Pressure-loaded Type 630 regulators.
   a. Main regulator inlet pressure and pressure drop—table 3.
   b. Loading pressure and outlet pressure—table 5.
3. Spring-loaded Type 630R relief valve pressure—table 6.
4. Pressure-loaded Type 630R relief valve pressures—table 7.

Table 5. Pressure-Loaded Type 630 Regulator Loading Pressure and Outlet Pressure Limits

LOADING REGULATOR TYPE	LOW-PRESSURE REGULATOR			HIGH-PRESSURE REGULATOR			
	Type 67	Type 67H	Type 1301F	Type 67	Type 67H	Type 1301F	Type 1301G
Maximum Inlet Pressure to Loading Regulator, Psig (Bar)	250 (17.3)	400 (27.6)	1500[1] (103.5)	250 (17.3)	400 (27.6)	1500[1] (103.5)	1500[1] (103.5)
Outlet Pressure Ranges[2], Psig (Bar)	5 to 60 (0.3 to 4.1)	5 to 60 (0.3 to 4.1)	10 to 60 (0.7 to 4.1)	50 to 100 (3.5 to 6.9)	50 to 100 (3.5 to 6.9)	50 to 225 (3.5 to 15.5)	200 to 500 13.8 to 34.5)
Maximum Operating Outlet Pressure[2], Psig (Bar)	60 (4.1)			100 (6.9)		225 (15.5)	500 (34.5)
Maximum Main Regulator Outlet Pressure Over Pressure Setting[3], Psig (Bar)	20[4] (1.4)			200 (13.8)		200 (13.8)	200[5] (13.8)
Maximum Emergency Outlet (Casing) Pressure of Loading Regulator[6], Psig (Bar)	66[7] (4.6)			110 (7.6)		250 (17.3)	550 (38.0)
Maximum Emergency Outlet (Casing) Pressure of Main Regulator[6], Psig (Bar)	66 (4.6)			550 (38.0)			

1. Limited to this value by maximum inlet pressure to Type 630 regulator.
2. Applies to both loading regulator and Type 630 main regulator.
3. Damage to internal parts of the regulator may occur if outlet pressure exceeds the actual pressure setting by amounts greater than those shown in this row. Loss of loading pressure to main regulator diaphragm will reduce outlet pressure setting in proportion to the loss in loading pressure.
4. For outlet pressure settings up to 46 psig (3.2 bar). For higher pressure settings, outlet pressure is limited by maximum emergency outlet pressure of 66 psig (4.6 bar).
5. For outlet pressure settings to 350 psig (24.2 bar). For higher pressure settings, outlet pressure is limited by maximum emergency outlet pressures of 550 psig (38.0 bar).
6. Leakage or bursting of pressure-containing parts may occur if outlet pressure exceeds these values.
7. Limited to this value by maximum emergency loading pressure of main regulator.

Table 6. Spring-Loaded Type 630R Relief Valve Pressure Limits

Description	Low-Pressure Relief Valve					High-Pressure Relief Valve			
Maximum Allowable Relief (Inlet) Pressure, Psig (Bar)	Relief Pressure Setting Plus Maximum Allowable Buildup of 25 psig (1.7 bar)					Relief Pressure Setting Plus Maximum Allowable Buildup of 250 psig (17 bar)			
Maximum Emergency Inlet (Casing) Pressure*, Psig (Bar)	75 (5.2)					550 (38.0)			
Relief (Inlet) Pressure Settings, Psig (Bar) and Spring Part Number	3 to 8 (0.2 to 0.5) 0W0192 27022	6 to 17 (0.4 to 1.1) 0W0191 27022	15 to 22 (1.0 to 1.5) 0W0190 27022	20 to 35 (1.4 to 2.4) 0Y0664 000A2	27 to 50 (1.9 to 3.5) 1J1469 27142	30 to 70 (2.0 to 4.8) 0W0191 27022	50 to 95 (3.5 to 6.5) 0W0190 27022	75 to 175 (5.2 to 12.1) 0Y0664 000A2	150 to 250 (10.4 to 17.3) 1J1469 27142

*Leakage or bursting of pressure-containing parts may occur if inlet pressure exceeds these values.

Table 7. Pressure-Loaded Type 630R Relief Valve Pressure Limits

LOADING REGULATOR TYPE	LOW-PRESSURE RELIEF VALVE	HIGH-PRESSURE RELIEF VALVE	
	Type 67	Type 67	Type 1301F
Maximum Allowable Inlet Pressure to Relief Valve	Relief Pressure Setting Plus Maximum Allowable Buildup of 25 psig (1.7 Bar)	Relief Pressure Setting Plus Maximum Allowable Buildup of 250 psig (17 Bar)	
Maximum Emergency Inlet (Casing) Pressure* of Relief Valve, Psig (Bar)	75 (5.2)	550 (38.0)	550 (38.0)
Maximum Allowable Inlet Pressure to Loading Regulator Psig (Bar)	75 (5.2)†	250 (17.3)	550 (38.0)†
Relief Pressure Settings, Psig (Bar)	10 to 20 (0.7 to 1.4) or 20 to 50 (1.4 to 3.5)	50 to 100 (3.5 to 6.9)	100 to 225 (6.9 to 15.5)
Maximum Emergency Outlet (Casing) Pressure* of Loading Regulator, Psig (Bar)	75 (5.2)‡	110 (7.6)	250 (17.3)

*Leakage or bursting of pressure-containing parts may occur if pressure exceeds these values.
† Limited to this value by maximum emergency inlet pressure of relief valve.
‡ Limited to this value by maximum emergency loading pressure of Type 630R.

WARNING

Overpressuring any portion of this equipment may cause damage to regulator parts, leaks in the regulator, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

To avoid overpressure, provide an appropriate overpressure protection device to ensure that none of the limits listed in tables 3 through 7 will be exceeded.

Regulator or relief valve operation below the limits specified in tables 3 through 7 does not preclude the possibility of damage from external sources or from debris in the gas line. Inspect the regulator for damage after any overpressure condition.

Loading Regulator Supply Pressure

Use a clean, dry gas as supply pressure for the loading regulator of pressure-loaded regulators or relief valves. Connect the supply to the 1/4-inch NPT inlet connection of the loading regulator. The supply pressure may be obtained from the upstream piping, but be certain adequate overpressure protection is provided for the loading regulator and for the spring case of the main regulator or relief valve.

STARTUP

Starting up the unit consists of turning on supply pressure to the loading regulator for pressure-loaded units, and for all units, opening the upstream block valve, introducing gas pressure, and checking (also adjusting, if necessary) the set pressure. Use gauges to monitor pressures during startup.

The range of allowable pressure settings is marked on the nameplate. If a pressure setting beyond the nameplate range is required, substitute an appropriate spring selected from table 9. Select a loading regulator spring from the appropriate loading regulator literature. Be sure to change the nameplate to indicate the new pressure range.

WARNING

To avoid the consequences of over-tightening the spring in spring-loaded regulators or relief valves, consult table 8 and replace the adjusting screw with one of the correct length when replacing the spring.

Some pressure ratings are dependent upon the actual outlet pressure settings being used. For example, with a Type 630 regulator, outlet pressure must not exceed the setting by more than 20 psig (1.4 bar) for low pressure constructions or 200 psig (14 bar) for high-pressure constructions, or damage to internal regulator parts may occur. However, with some higher pressure ranges, the setting plus 20 psig (1.4 bar) or 200 psig (14 bar) exceeds the maximum emergency outlet (casing) pressure. Before increasing the setting, refer to tables 3 through 7 (as appropriate). Review the pressure limits for the spring range being used, and be certain that the new pressure setting will not result in an overpressure condition. Always use a pressure gauge to monitor pressure when making adjustments.

Adjusting Spring-Loaded Regulators and Relief Valves

Loosen the locknut (key 2, figures 5 and 7) atop the spring case. While monitoring the pressure, rotate the adjusting screw (key 1, figures 5 and 7) clockwise to increase set pressure or counterclockwise to decrease it. When the unit is regulating or relieving pressure at the desired value, tighten the locknut.

Adjusting Pressure-Loaded Regulators and Relief Valves

Loosen the locknut on the loading regulator spring case. While monitoring gas pressure, rotate the loading regulator adjusting screw clockwise to increase set pressure or counterclockwise to decrease it. When the unit is regulating or relieving pressure at the desired value, tighten the locknut on the loading regulator.

SHUTDOWN

Slowly close the upstream block valve. For pressure-loaded constructions, shut off supply pressure to the loading regulator.

PRINCIPLE OF OPERATION

This section describes the operation of the Type 630 regulator and the Type 630R relief valve with spring loading. The pressure-loaded constructions operate the same way except that force on the top of the diaphragm is

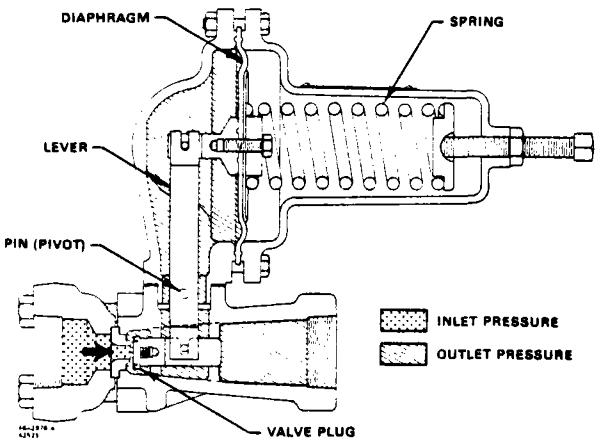


Figure 3. Type 630 Regulator Sectional View

pressure from a loading regulator, rather than a spring. Set pressure is changed with an adjusting screw on the loading regulator rather than on the main regulator or relief valve. The Type 630R relief valve uses a light spring for added stability.

Type 630 Regulators

Refer to figure 3. In the regulator construction, outlet pressure registers beneath the diaphragm. As long as the outlet pressure is less than the set pressure, spring force on the diaphragm causes the lever to hold the valve open. When the outlet pressure exceeds the set pressure, the diaphragm moves to compress the spring and the lever closes the valve until the outlet pressure returns to set pressure.

Type 630R Relief Valves

Refer to figure 4. In the relief valve construction, inlet pressure registers beneath the diaphragm. As long as the inlet pressure is less than the set pressure, spring force causes the lever to hold the valve closed. When the inlet pressure exceeds the set pressure, the diaphragm moves to compress the spring and the lever opens the valve allowing inlet pressure to bleed into the downstream line or to atmosphere until the inlet pressure returns to set pressure.

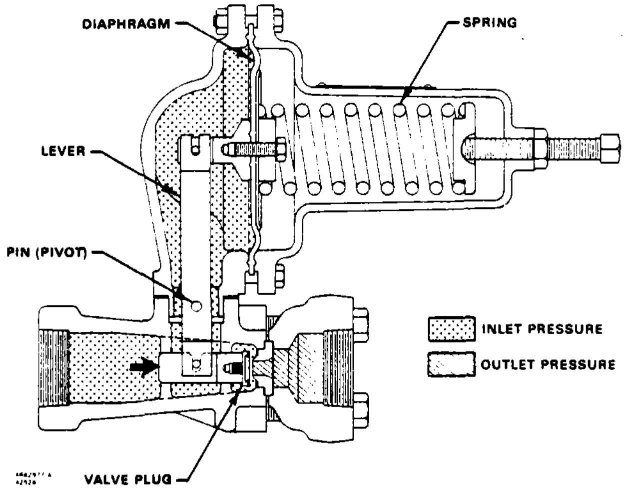


Figure 4. Type 630R Relief Valve Sectional View

MAINTENANCE

Parts are subject to normal wear and must be inspected and replaced as necessary. Frequency of inspection depends upon severity of service conditions.

WARNING

To avoid personal injury or equipment damage, isolate the regulator or relief valve from the pressure system and release all pressure before performing maintenance.

If the loading regulator of pressure-loaded constructions requires maintenance, disconnect the supply pressure line (and bleed orifice vent line if one is present) and unscrew the loading regulator from its mounting nipple. Refer to the separate 67 Series or Types 1301F and 1301G instruction manual for maintenance information.

Except where indicated, key numbers in the following procedures are shown in figure 5 for spring-loaded Type 630 regulator, in figure 6 for pressure-loaded Type 630 regulator, in figure 7 for spring-loaded Type 630R relief valve and in figure 8 for pressure-loaded Type 630R relief valve.

Replacing Seat Ring, Valve Disc, and Lever

Note

With some piping systems it may be possible to omit step 1 below by removing four cap screws (key 17) and spreading the body (key 23) and inlet adaptor (key 18) far enough apart to allow removal of the seat ring (key 20) and Type 630 valve disc (key 21, figures 5 and 6) or the seat ring (key 20) and the Type 630R valve seat O-ring (key 37, figures 7 and 8).

CAUTION

If step 1 is omitted and the body and inlet adaptor are separated, take care to avoid pinching fingers between the body and the inlet adaptor.

1. Disconnect piping from inlet adaptor (key 18). Remove four cap screws (key 17) and adaptor.

2. Remove seat ring (key 20) and gaskets (key 19).

3. To remove Type 630 valve disc (key 21, figures 5 and 6) or Type 630R valve seat O-ring (key 37, figures 7 and 8), first disconnect remote vent pipe (if one is used). For pressure-loaded constructions, disconnect loading-regulator supply line.

4. Unscrew the two cap screws that secure diaphragm adaptor (key 13) to body (key 23); remove diaphragm adaptor and attached spring case (key 3).

5. If it is necessary to replace the lever (key 14), drive out the pin (key 15) and slide the lever out of the diaphragm adaptor. When replacing the lever, make sure the slot engages the connector assembly (key 12) and replace the pin.

6. Remove valve carrier assembly (key 22) from body.

7. To replace seating surface:

a. **For Type 630,** use a 3/4-inch socket wrench to remove and re-install valve disc and holder assembly (key 21, figure 5 and 6).

b. **For Type 630R**, unscrew machine screw (key 36, figures 7 and 8) and remove O-ring washer and O-ring (keys 32 and 37, figures 7 and 8) from O-ring holder (key 21, figures 7 and 8). When reassembling, apply a good-quality gasket shellac to the machine screw thread.

8. Use new seat ring gaskets (key 19) and body gasket (key 16) when reassembling. Insert valve carrier assembly (key 22) into the body before re-installing the diaphragm adaptor.

Note

The spring case (key 3) must point away from the adaptor (key 18) on Type 630 regulators as shown in figures 5 and 6. On Type 630R relief valves, the spring case must face the same direction as the adaptor (key 18) as shown in figures 7 and 8.

9. Be certain the lever (key 14) engages the valve carrier.

10. Secure the diaphragm adaptor (key 13) to the body (key 23). Fit the adaptor (key 18) to the body (key 23) and install and tighten the four cap screws (key 17).

Replacing the Diaphragm

1. Relieve spring compression as follows:

a. For spring-loaded constructions, loosen locknut (key 2, figures 5 and 7). Turn the adjusting screw (key 1, figures 5 and 7) counterclockwise until spring compression is relieved.

b. For pressure-loaded Type 630R relief valves (and for pressure-loaded Type 630 regulators that have been furnished with a spring), turn cap screw (key 1, figure 8) counterclockwise until spring compression is relieved.

2. Disconnect remote vent line (if one is present).

3. For pressure-loaded constructions, disconnect the supply pressure line from the loading regulator (key 28, figure 9).

4. Remove spring case (key 3) by unscrewing cap screws and nuts (keys 9, 10, and 30).

5. Remove diaphragm (key 11) and attached parts from the lever (key 14).

6. Unscrew cap screw (key 6) from connector head assembly (key 12) and disassemble the diaphragm assembly.

7. Install new diaphragm. Note that low-pressure constructions use a diaphragm plate (key 8, figure 5) on the spring case side of the diaphragm. Low-pressure, pressure-loaded constructions use a diaphragm plate on each side of the diaphragm and a diaphragm plate gasket (key 38, figure 8) with each plate. Install new gaskets when replacing diaphragm.

8. When reassembling, be certain that the diaphragm connector is engaged in the lever.

9. To ensure proper slack in the diaphragm:

a. **For constructions using a spring,** tighten the spring case cap screws finger-tight only. Compress the spring slightly with the adjusting screw (or cap screw for pressure-loaded constructions); then complete the tightening of spring case cap screws and nuts.

b. **For constructions without a spring,** tighten spring case cap screws finger-tight only. Remove cap screw (key 1, figure 6). Insert a rod in the spring case and push on the diaphragm assembly to take up the slack; then complete the tightening of spring case cap screws. Re-install cap screw (key 1, figure 6) in spring case.

PARTS ORDERING

When corresponding with Fisher representative or the factory concerning this unit, state the type number and all other pertinent information on the nameplate. Specify the eleven character part number when ordering new parts from the following parts list.

PARTS LIST

Key	Description	Part Number
1	Adjusting Screw, steel	See table 8
2	Hex Nut, Cd pl steel (none req'd for pressure-loaded)	1A3524 24122
3	Spring Case	
	Low-pressure	
	Cast iron	3C7809 19042
	Steel	3N6981 22012
	High-pressure	
	Cast iron	3C7808 19042
	Steel	3N6983 22012
4	Upper Spring Seat, zinc	
	Type 630 pressure-loaded (none req'd)	
	Type 630 & 630R spring loaded & Type 630R pressure-loaded	
	Pressure range to 275 psig (19 bar)	0W0193 44022
	Pressure range over 275 psig (19 bar)	1K3711 44022
5	Spring, steel	See table 9
6	Cap Screw, pl steel	
	Types 630 & 630R low-pressure, pressure loaded	1B1363 24052
	All others	1R8176 99012
7	Lower Spring Seat	
	Low-pressure, steel	0W0203 24102
	High-pressure, zinc	
	Pressure range to 275 psig (19 bar)	0W0201 44022
	Pressure range over 275 psig (19 bar)	1K3710 44022
8	Diaphragm Plate, Cd pl steel	
	Low-pressure only	
	Spring-loaded (1 req'd)	0W0202 25072
	Pressure-loaded (2 req'd)	0W0202 25072
9	Cap Screw, Cd pl steel	
	Std (2 req'd)	1A3526 24052
	Wire seal	
	(1 req'd)	1A3526 24052
	(1 req'd)	1R4191 24052
10	Cap Screw, pl steel	
	Low-pressure (10 req'd)	1A3525 24052
	High-pressure (4 req'd)	1A3525 24052

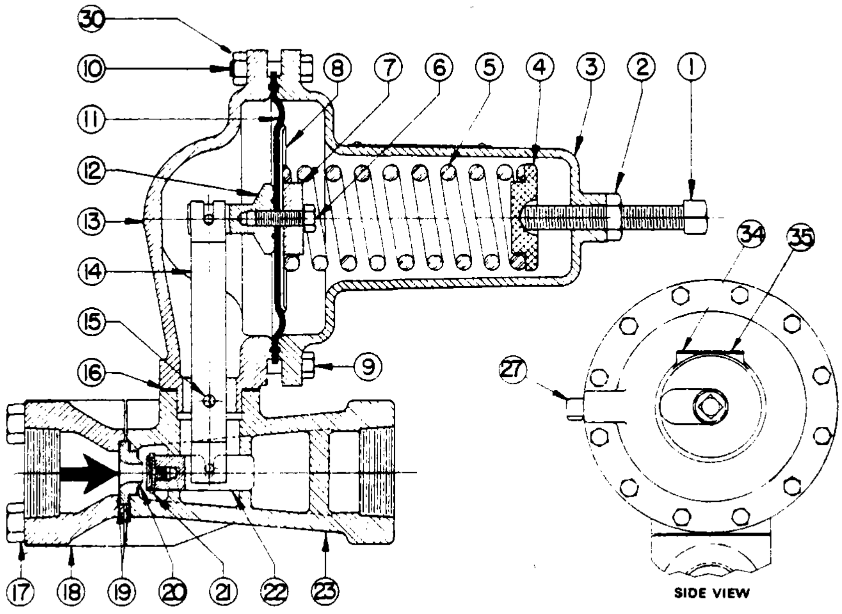


Figure 5. Spring-Loaded Type 630 Regulator—Low-Pressure Construction

Key	Description	Part Number
11*	Diaphragm, neoprene	
	Low-pressure	0W0200 02192
	High-pressure	0W0199 02192
12	Connector Head Ass'y	
	Pressure-loaded, low-pressure only	
	Aluminum trim	1C3000 X0012
	SST trim	1C3000 X0022
	All others	
	Aluminum trim	1P8465 000A2
	SST trim	1P8465 000B2
13	Diaphragm Adaptor	
	Low-pressure	
	Cast iron	0W0197 19012
	Steel	2N6985 22012
	High-pressure	
	Cast iron	0W0198 19012
	Steel	2N6987 22012
14	Lever Ass'y	
	Low-pressure	1B2891 000A2
	High-pressure	1B2890 000A2
15	Pin, SST	0W0188 35172
16	Gasket, asb/nitrile	0W0187 04022

Key	Description	Part Number
17	Cap Screw, steel (4 req'd)	
	1" body	1A9359 24052
	2" body	1A3535 24052
18	Inlet Adaptor, steel	
	1" NPT	1F4798 23022
	2" NPT	1F4799 23022
19	Inlet Body Gasket (2 req'd)	
	Copper, for brass trim	0W0184 15042
	Asbestos, for SST trim	0W0184 04022
20	Seat Ring	
	Type 630	
	Brass	
	1/8" (3.2 mm) port dia	0Z0400 14012
	3/16" (4.8 mm) port dia	1B2195 14012
	1/4" (6.4 mm) port dia	0W0183 14012
	3/8" (9.5 mm) port dia	0W0182 14012
	1/2" (12.7 mm) port dia	0W0181 14012

*Recommended spare part.

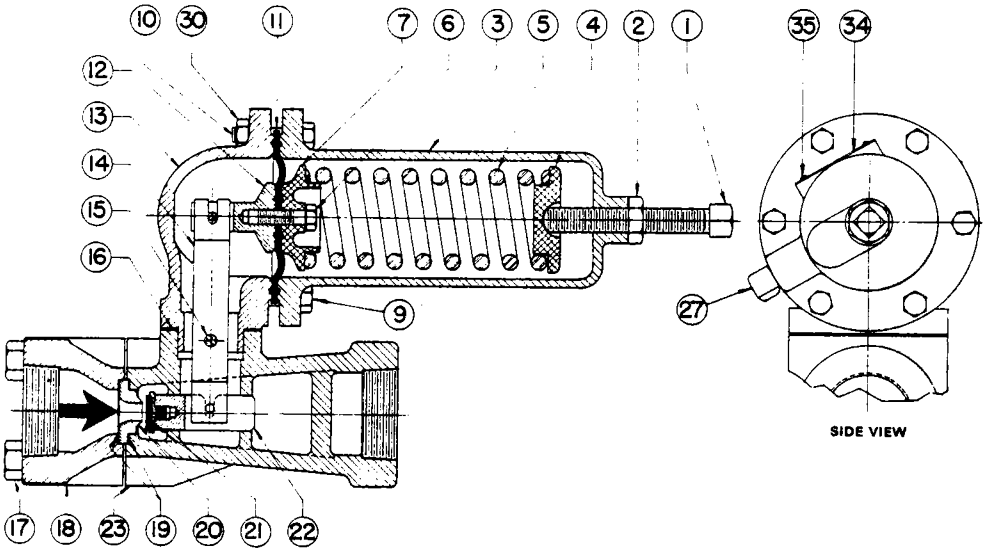


Figure 6. Spring-Loaded Type 630 Regulator—High-Pressure Construction

Key	Description	Part Number
20	Seat Ring (Continued)	
	SST	
	1/8" (3.2 mm) port dia	1K4166 35032
	3/16" (4.8 mm) port dia	1K4165 35032
	1/4" (6.4 mm) port dia	1K4164 35032
	3/8" (9.5 mm) port dia	1K4163 35032
	1/2" (12.7 mm) port dia	1K4162 35032
	Type 630R	
	Brass, 1/2" (12.7 mm) port dia	1B7350 14012
	SST, 1/2" (12.7 mm) port dia	1B7350 35032
21	Valve Disc Ass'y	
	Type 630 only	
	Brass/nitrile	1B4500 000A2
	SST/nitrile	1B4500 000B2
	Brass/polyurethane	1P7351 X0012
	SST/polyurethane	1P7351 000A2
	Brass/nylon	1C1860 000A2
	SST/nylon	1C1860 000B2
	Brass/TFE	1C1860 000C2
	SST/TFE	1C1860 000D2
21	O-Ring Holder	
	Type 630R	
	Brass	1D3360 14012
	SST	1D3360 35032
22	Valve Carrier	
	Brass	0W0186 14022
	SST	0W0186 35032
23	Body	
	1" NPT, cast iron	
	w/brass pitot tube	0W0209 000A2
	w/SST pitot tube	0W0209 X0012
	1" NPT, steel	
	w/brass pitot tube	2N6990 000A2
	w/SST pitot tube	2N6999 X0012
	2" NPT, cast iron	0W0215 19012
	2" NPT, steel	2N6991 22012
27	Vent Ass'y (none req'd for pressure-loaded)	Y602X1-A12
28	Loading Regulator (for pressure-loaded only)	
	Type 67, 67H, 1301F or 1301G	
30	Hex Nut, Cd pl steel	
	Low-pressure (10 req'd)	1A3527 24122
	High-pressure (4 req'd)	1A3527 24122
31	Cap Screw, pl steel (2 req'd) (not shown)	1A3418 24052
32	O-Ring Washer (For 630R only)	
	Brass	1D3359 14012
	SST	1D3359 35072
33	Plug, pl steel (not shown)	
	For 2" NPT bodies only	1D8293 28982
34	Nameplate, aluminum	
	Type 630	1F7496 11032
	Type 630R	21A5495 X012
35	Drive Screw, SST (4 req'd)	1A3682 28982
36	Machine Screw	
	Type 630R only	
	Brass	1A6826 18992
	SST	1D3364 35042
37*	O-Ring	
	Type 630R only	
	Nitrile	1D2888 06992
	TFE	1F5819 06522
38*	Gasket, asbestos (2 req'd)	
	For low-pressure, pressure-loaded only	1B1922 04022
39*	Gasket, copper	
	For pressure loaded only	0Y0089 15042
40*	Gasket, copper & asbestos	
	For pressure-loaded only	1E2759 99212

Note

Key nos. 47, 48 & 49 are for pressure loaded units only.

Key	Description	Part Number
47	Pipe Nipple, zinc pl galvanized steel	1B2188 26232
48	Street Elbow, malleable iron	
	High pressure units only	1A9132 21992
49	Bleed Orifice Ass'y	
	Low pressure	
	3-20 psig (0.2 to 1.4 bar) loading regulating range	1K8845 X0012
	20-100 psig (1.4 to 6.9 bar) loading regulator range	1K8844 X0012
	High pressure	1K8843 X0012

*Recommended spare part.

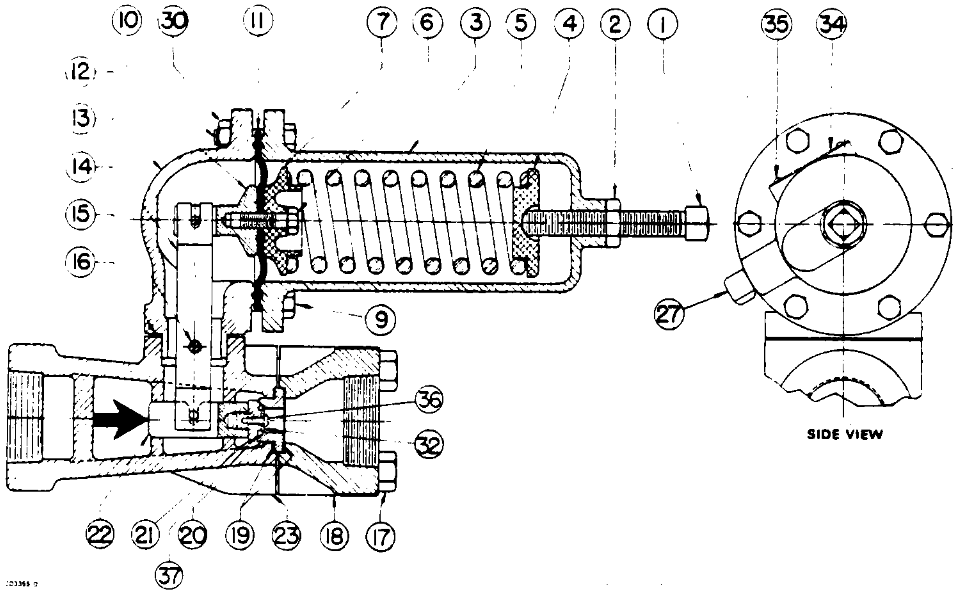


Figure 7. Spring-Loaded Type 630R Relief Valve—High-Pressure Construction

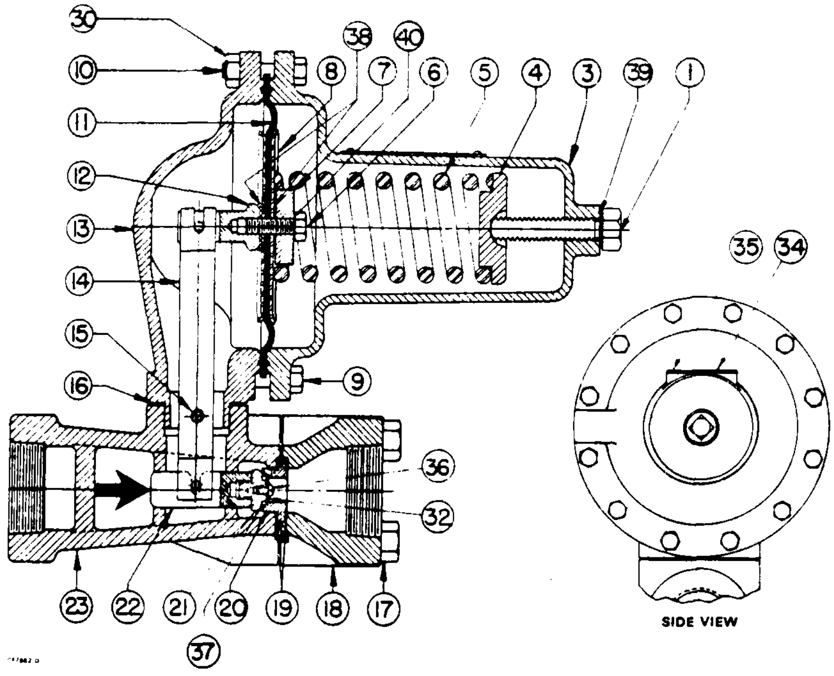


Figure 8. Pressure-Loaded Type 630R Relief Valve—Low-Pressure Construction

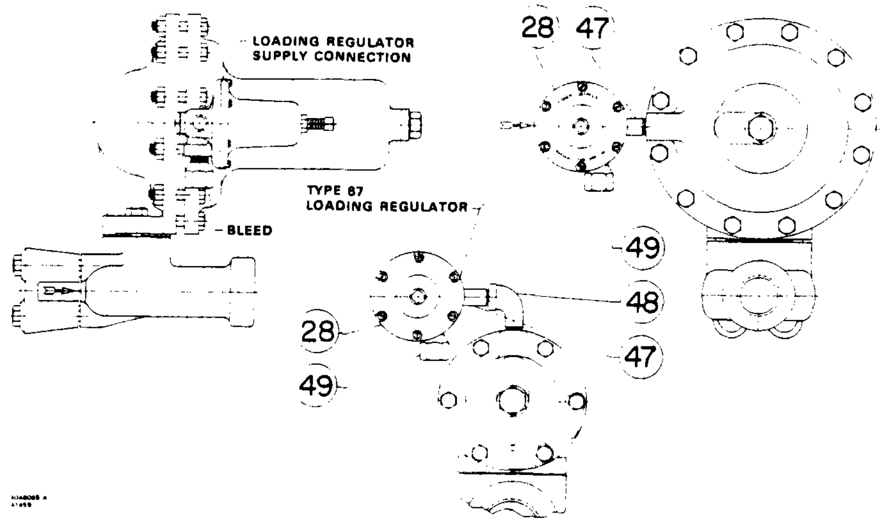


Figure 9. Exterior View of Pressure-Loaded Type 630 Regulator—Low-Pressure Construction

Table 8. Key 1, Adjusting Screw, Steel

TYPE	SPRING PART NUMBER	ADJUSTING SCREW PART NUMBER	ADJUSTING SCREW PART NUMBER (WIRE SEAL)	LENGTH OF THREADED PORTION	
				In.	mm
630	0W0192 27022	1A2791 28982	1R8299 28992	4	102
	0W0191 27022	1B2120 28982	1R8300 28992	3-1/2	89
	0W0190 27022	1A5005 28982	1R8085 28992	3	76
	0Y0664 000A2	1A5005 28982	1R8085 28992	3	76
	1J1469 27142	1A5005 28982	1R8085 28992	3	76
	1K3709 27082	1A5005 28982	1R8085 28992	3	76
	None†	1C1162 24092	. . .	7/8	22
630R	0W0192 27022	1A2791 28982	1R8299 28992	4	102
	0W0191 27022	1B2120 28982	1R8300 28992	3-1/2	89
	0W0190 27022	1A5005 28982	1R8085 28992	3	76
	0Y0664 000A2	1D3366 28982	1R8301 28992	3-1/4	83
	1J1469 27142	1D3366 28982	1R8301 28992	3-1/4	83
	0W0192 27022†	1D3590 24492	. . .	2-3/16	56

† Pressure-loaded construction.

Table 9. Key 5, Regulator Spring, Steel

Type		Outlet (or Relief) Pressure Setting, Psig (Bar)	Spring Part Number	Spring Color Code
Spring-Loaded Type 630	Low-Pressure	3 to 10 (0.2 to 0.7)	0W0192 27022	Red Stripe
		8 to 20 (0.8 to 1.4)	0W0191 27022	Olive Drab
		17 to 30 (1.2 to 2.0)	0W0190 27022	Zinc Plate
		27 to 40 (1.9 to 2.8)	0Y0664 000A2	Green Stripe
	High-Pressure	27 to 50 (1.9 to 3.5)	0W0192 27022	Red Stripe
		46 to 95 (3.2 to 6.6)	0W0191 27022	Olive Drab
		90 to 150 (6.2 to 10.3)	0W0190 27022	Zinc Plate
		150 to 200 (10.3 to 13.8)	0Y0664 000A2	Green Stripe
		200 to 275 (13.8 to 18.9)	1J1469 27142	Blue Stripe
		275 to 500 (18.9 to 34.5)	1K3709 27082	Yellow Stripe
Spring-Loaded Type 630R	Low-Pressure	3 to 8 (0.2 to 0.5)	0W0192 27022	Red Stripe
		6 to 17 (0.4 to 1.1)	0W0191 27022	Olive Stripe
		15 to 22 (1.0 to 1.5)	0W0190 27022	Zinc Plate
		20 to 35 (1.4 to 2.4)	0Y0664 000A2	Green Stripe
		27 to 50 (1.9 to 3.5)	1J1469 27142	Blue Stripe
	High-Pressure	30 to 70 (2.0 to 4.8)	0W0191 27022	Olive Drab
		50 to 95 (3.5 to 6.5)	0W0190 27022	Zinc Plate
		75 to 175 (5.2 to 12.1)	0Y0664 000A2	Green Stripe
		150 to 250 (10.4 to 17.3)	1J1469 27142	Blue Stripe
Pressure-Loaded Type 630R	Low-Pressure	10 to 20 or 20 to 50 (0.2 to 1.4) or (1.4 to 3.5)	0W0192 27022	Red Stripe
	High-Pressure	50 to 100 or 100 to 225 (3.5 to 6.9) or (6.9 to 15.5)	0W0192 27022	Red Stripe

Specifications are subject to change. Metric equivalents of English units are shown in parentheses and are in millimeters unless otherwise noted.

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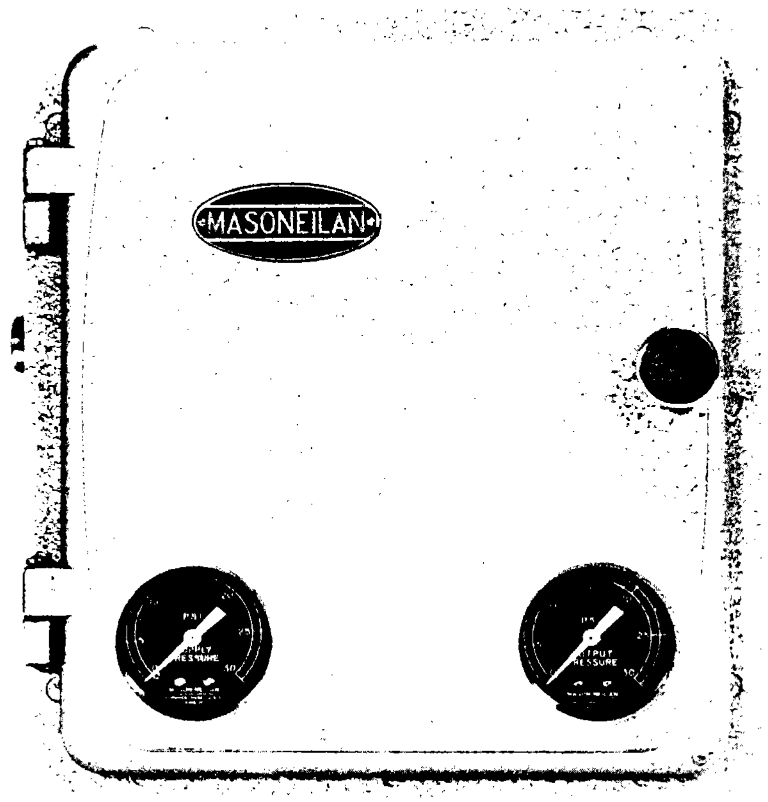
Masoneilan Series 2700 and 3700 Pressure and Temperature Controller Instructions



Masoneilan

installation

These instructions apply to all models of the 2700 and 3700 Series Pressure and Temperature Controllers. For a complete parts list, refer to Parts Supplement No. 2033E PSI.

General

When the controller is to be mounted on a No. 37 or No. 38 actuator, it is fastened to the pad (Fig. 1) on the spring barrel with two fillister head screws (5/16"-18 x ¾" long). The controller is mounted on Nos. 31 and 33 spring-diaphragm actuators (Fig. 2) with a bracket, two cap screws and 2 nuts. A universal type case permits surface or flush panel mounting. For surface mounting, drill two ⅜" dia. holes as shown in Fig. 3 and fasten controller to panel with two 5/16" cap screws and two nuts. For flush mounting, cut out panel as shown and secure the controller in place using the two brackets and cap screws provided.

Series 2700 Pressure Controllers

Connect the controlled pressure to the ¼" NPT controlled pressure connection located on the left side of the case. Install a shut-off valve in the controlled pressure piping.

On liquid and steam installations, slope the controlled pressure piping to vent air and vapors. When high points are unavoidable, make provisions for collecting and venting air and vapors at such points. Avoid making a pressure connection where rust or dirt may accumulate.

On air or gas installations, slope the controlled pressure piping to drain condensate. When low points are unavoidable, make provisions for collecting and draining possible accumulations of condensate.

Series 3700 Temperature Controllers

When installing temperature controllers, **DO NOT KINK, TWIST OR BEND** the flexible tubing in a radius of less than 3 inches, as it is part of a sealed filled system. **HANDLE WITH CARE.**

The bulb of the thermal system should be located where a representative temperature and unrestricted circulation are assured. The entire bulb or well should be immersed.

Bulbs ordinarily have an extension which may be bent to any desired angle up to 90 degrees, provided the radius of the bend is not less than 1 inch.

When installing Types 15 or 16 thermal systems, disconnect the well from the bulb by turning the jam nut. Do not turn the bulb. Screw the well in place and completely insulate the exposed portion. Insert the bulb in the well and tighten the jam nut, without turning the bulb. When inserting or removing the bulb, grasp the extension stem, not the flexible tubing.

Air Piping

Provide a compressor capacity of about 1 cubic foot of free air per minute for each controller if maximum output pressure is 15 psi; 1.5 cubic feet of free air per minute if maximum output pressure is 30 psi. Maximum controller air consumption is approximately .3 SCFM.

Blow out all pipe tubing and fittings before connecting to controller. If thread compound is used, apply it only to male threads in moderate amount.

Supply air: Use ¼" brass pipe or ⅜" O.D. copper tubing for air supply to controllers. Copper tubing is preferable.

Connect the air supply to the ¼" NPT connection located on the left side of the case. Install a shut-off valve and filter-regulator (if controller is 3700 Series, also install supply pressure gauge) in this line. Adjust the regulator for the required reduced pressure, i.e., 20 or 35 psi. For continuous trouble-free operation, the air supplied to the filter-regulator must be clean and dry.

Output air: Use ¼" brass pipe or ⅜" O.D. copper tubing for the output air line. ¼" O.D. copper tubing may be used when the controller is valve mounted. Copper tubing will usually be found most satisfactory. Connect the output line to the tapped connection in the diaphragm case of the control valve. The output air piping must be free from leaks.

Overall controller action

The controller mechanism is set for the control action specified. The overall action can be checked by determining whether a rise in the controlled variable opens or closes the control valve.

Application	Control Valve	Controller
If a rise in controlled variable should	and the control valve action is	then the controller must be set for
close the valve	air-to-close	direct action
close the valve	air-to-open	reverse action
open the valve	air-to-close	reverse action
open the valve	air-to-open	direct action

To reverse the action of 2700 controllers, proceed as follows, refer to Figures 9 & 10:

1. Loosen the fittings at the pressure connection (23) and the pressure element (bourdon tube or bellows).
2. **Bourdon tube:** Remove the screws (16) holding the bourdon to the bourdon plate (28) and reverse the bourdon tube as illustrated on the instruction plate located inside the cover. *The pin at the tip of the bourdon tube must engage the lower edge of the overrange lever.* Swing the tubing and reassemble. To avoid bending the tubing, insert the pressure fitting into the bourdon tube before remounting the tube.
3. **Bellows:** Loosen nuts (20 & 27) and remove the bellows element from the controller. If the bellows will not slip by the overrange lever, loosen two screws (18) and pull out the proportional mechanism slightly. Reverse position of the bellows as outlined on the plate on the cover and reconnect tubing.
4. Reverse the set point index (77) and replace.

To reverse the action of 3700 controllers, refer to Fig. 11 and proceed as follows:

1. Remove the screws (16) holding the bourdon tube (21T) to the bourdon plate (28) and reverse the bourdon tube, as illustrated on the Instruction Plate located inside the cover.
2. *Rebend the capillary tubing of the thermal system, being careful to avoid kinking. The pin at the tip of the bourdon tube must engage the lower edge of the overrange lever A*
3. Reverse the set point index (77) and replace.

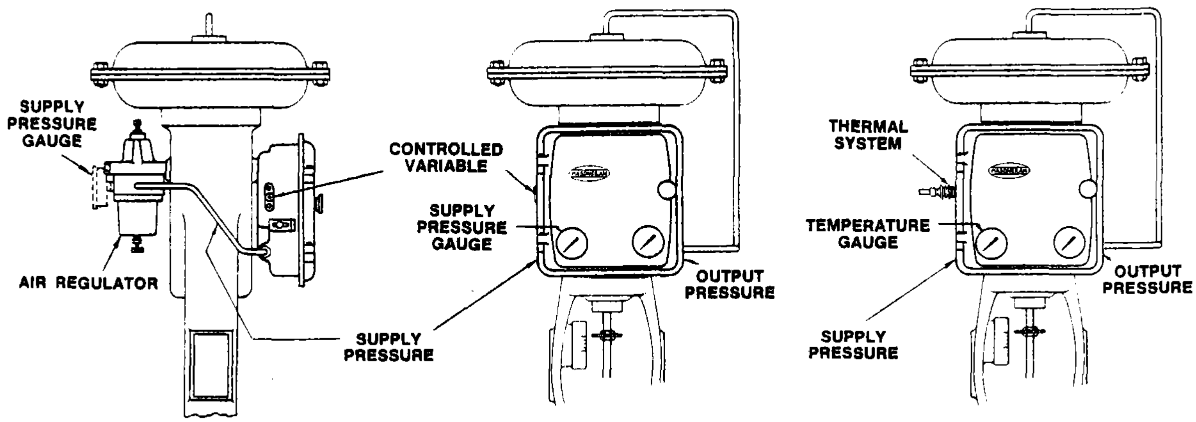


Figure 1
Valve Mounting — 37 and 38 Actuators

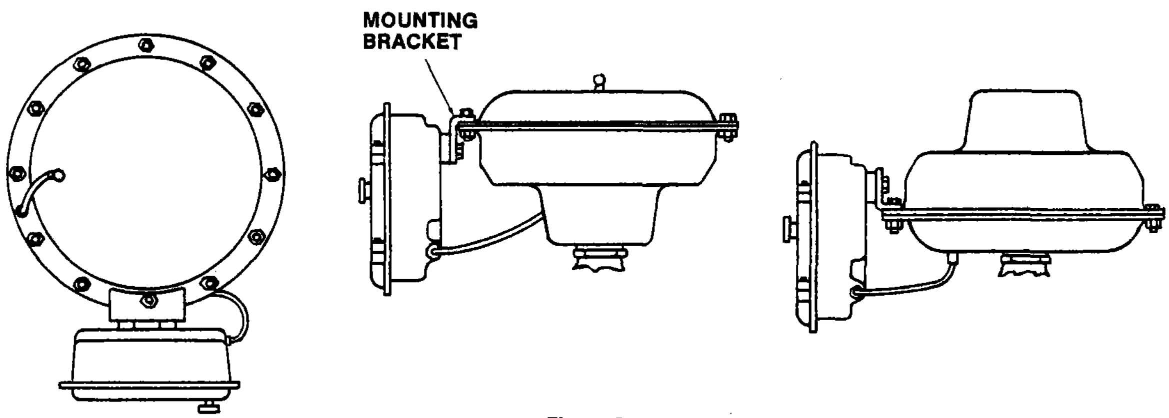


Figure 2
Valve Mounting — 31 and 33 Actuators

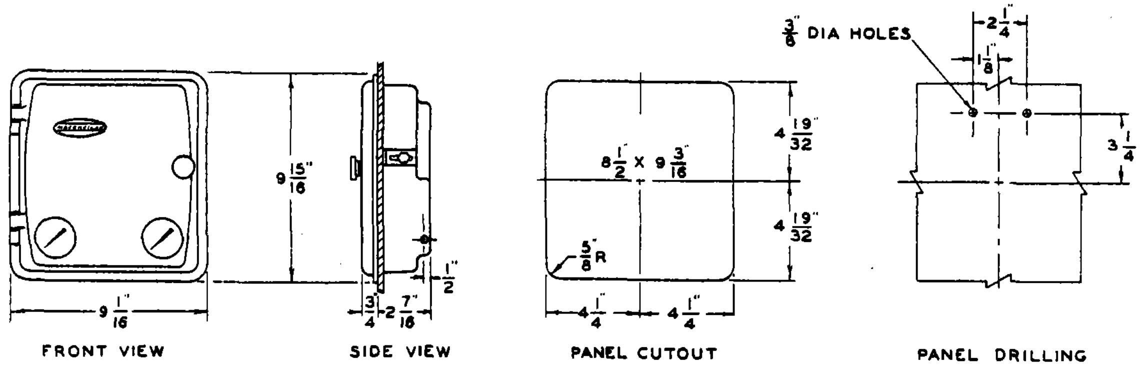


Figure 3
Flush and Surface Mounting on Panels

operation

Series 2700 Pressure and 3700 Temperature Controllers differ only in the respect that the latter controllers employ vapor pressure type thermal systems and an indicating dial thermometer replaces the supply pressure gauge and is an integral part of the thermal system. Bulb temperature is thus converted into a corresponding pressure and the operation of the controller is identical to that of the pressure controller.

Nozzle Block (Figures 4 & 12)

The nozzle block (12) contains a metering orifice which meters the air supply to the nozzle (8) and output system. When the nozzle is completely covered, the flow of air through the metering orifice builds the pressure in the output system to a maximum. When the nozzle is uncovered, the pressure in the output system falls to zero. Whenever the output pressure is in equilibrium with the controlled variable, a balance is established between the air passing through the metering orifice and that which escapes through the nozzle.

Booster Relay (Fig. 5)

Series 2700 and 3700 Controllers may be supplied with a 1:1 booster relay (17) as an integral part of the controller. The relay is attached, by two screws, to a mounting pad cast on the case.

In the event a booster relay is supplied for field mounting, a cover plate. channeled to connect the output air passage, must be removed. A smaller size nozzle is available, if desired, to reduce controller air consumption.

The supply air passes to the nozzle block and to the underside of the relay plug. Operation of the controller is then identical to that previously described except the nozzle block meters the air supply to the booster relay rather than the output system. Since the booster has a larger orifice than the nozzle block, the volume of output air delivered by the booster is greater than that which could be delivered through the nozzle block.

Proportional Mechanism (Fig. 4)
(Models 2705, 2706, 3705, 3706)

The proportional bellows (57) is fixed at one end and is directly connected to the output pressure from the nozzle block. The free end of the bellows is fastened to the proportional leaf spring (44). The flapper (B) rotates freely on the bearings mounted on the movable end of the proportional bellows. With the bourdon tube mounted for direct action as shown in Fig. 4, an increase in controlled variable causes the free end of the bourdon tube to rotate the flapper clockwise about the bearing. tending to lower the flapper to cover the nozzle and increase output pressure. The resultant increase in bellows pressure tends to raise the flapper bearing, causing the flapper to uncover the nozzle and decrease output pressure. In normal operation, the reaction of the proportional bellows to change in output pressure maintains the flapper in a position to throttle a steady output pressure.

Since the movement of the proportional bellows is proportional to movement of the free end of the bourdon tube and output pressure, then the output pressure must be exactly proportional to the movement of the free end of the bourdon tube.

Proportional-Reset Mechanism (Fig. 6)
(Models 2715, 2716, 3715, 3716)

The construction of this unit differs from the proportional unit in that a reset bellows (50) replaces the alignment spring and a resistance unit (11) and a capacity tank are included in the air circuit to the proportional and reset bellows.

When the controlled variable is at the set point under equilibrium conditions, the pressures in the reset and proportional bellows are equal. A departure from the set point causes the proportioning mechanism to act exactly as in a proportional controller, except that a differential is created between the pressures in the two bellows. If the process load stabilizes at a new value, the pressure in the two bellows gradually equalize by flow of air through the resistance unit and the required output pressure for a new valve plug position is obtained at the original set point. Reset rate (i.e. the number of times that the effect of proportional action with a given deviation is repeated per minute by the reset action) depends upon the particular process and is varied by changing the value of the resistance between the reset and proportional bellows.

Differential-Gap Mechanism (Figures 7 & 13)
(Models 2735, 2736, 3735, 3736)

This type controller is identical with the proportional type except that a three-way pilot (35), identical in appearance and mounting to the nozzle block is utilized. (Note: The proportional controller may be converted in the field by replacing the nozzle block with the three-way pilot. However, this would make a direct acting controller a reverse acting differential-gap controller and a reverse acting controller a direct acting differential-gap controller. No other parts are required except, if desired a differential-gap scale.)

When movement of the free end of the bourdon tube causes the flapper to rotate clockwise about the bearing, the flapper actuates the stem of the pilot to decrease output pressure. The resultant reaction of the proportional bellows causes the flapper to further actuate the stem of the pilot to reduce output pressure to zero. The controlled variable must then change a certain amount in the opposite direction to cause the three-way valve to increase output pressure.

The difference between the controlled variable at which the output is zero and at which it is maximum, is termed "differential-gap." The magnitude of the differential-gap is determined by the proportional band adjustment setting. The set point index establishes the midposition of the differential-gap.

Receiver Controller

Any of the foregoing 2700 Series Pressure Controllers may be used as receiver controllers when provided with a 3-15 psi bellows element. The controller input signal is then received from a transmitter or another controller and the operation of the receiver controller is identical to that described.

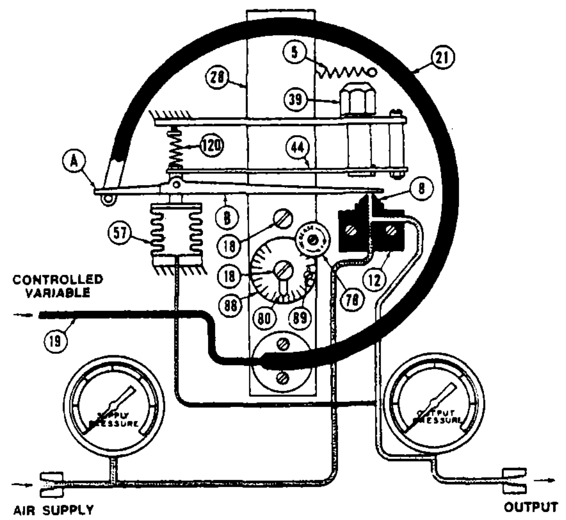


Figure 4 Proportional Controller

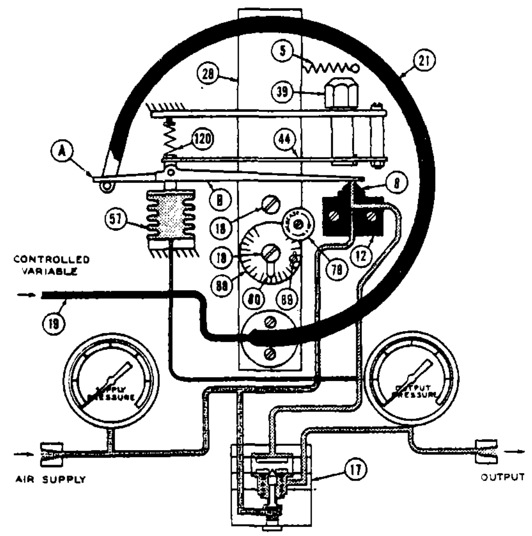


Figure 5 Proportional Controller with Booster Relay

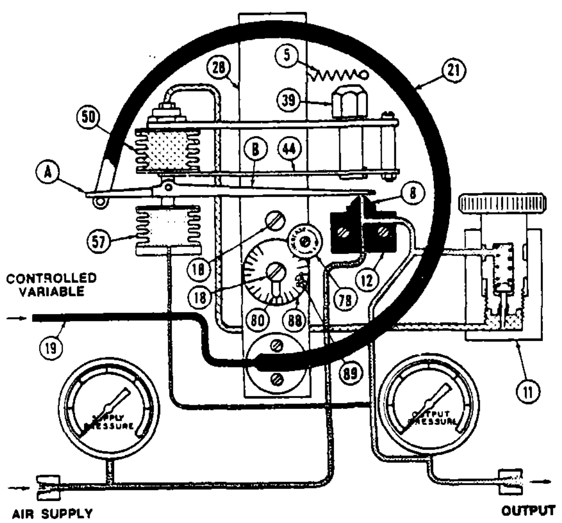


Figure 6 Proportional-Reset Controller

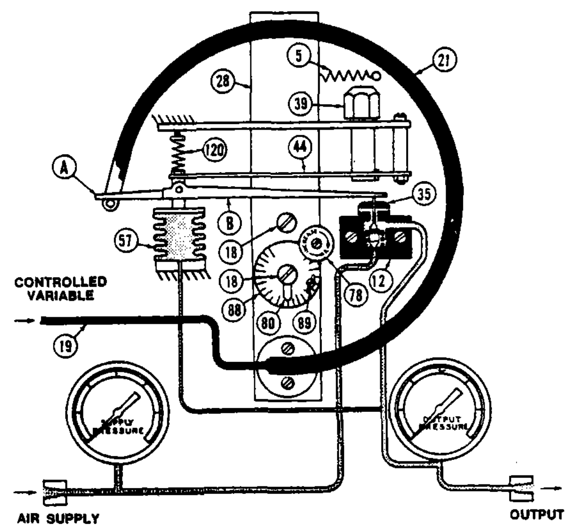


Figure 7 Differential-Gap Controller

Supply pressure **Output pressure** **Controlled pressure** **Reset pressure**

PARTS REFERENCE

Ref. No.	Part Name	Computer Abbrev.	Ref. No.	Part Name	Computer Abbrev.	Ref. No.	Part Name	Computer Abbrev.
5	Spring	SPRING	21	Pressure Element	ELEMENT	78	Knob (set print)	KNOB
8	Nozzle	NOZZLE	28	Bourdon Plate	BDN PLT	80	Bracket (pointer)	BRACKET
11	Reset Unit	RST UNT	35	Pilot (diff. gap)	PILOT	88	Dial	DIAL
12	Nozzle Block	NZL BLK	39	Knob (prop. band or diff. gap)	KNOB	89	Screw	SCREW
17	Relay	RELAY	44	Leaf Spring	LEAFSPR	120	Spring (alignment)	SPRING
18	Screw	SCREW	50	Reset Bellow S/A	RST BEL	* A	Overrange Lever	—
19	Element Connecting Tube S/A	ELM TBE	57	Bellows and Flapper S/A	BEL&FLP	* B	Flapper	—

* Part of Bellows and Flapper S/A (57)

adjustments

Proportional band

The function of the proportional band adjustment knob (39) is to vary the effective length of the proportional leaf spring. Its position determines the amount of movement of the bellows or bourdon tube required to produce a change in the output pressure from 3 to 15 psi and therefore determines the magnitude of the proportional band. Because of the general usage and convenience, the values indicated on the proportional band scale are in percent of the controlled variable range. For example, a 50% proportional band indicates a change in output pressure of 12 psi for a 50% change (of total range) in controlled variable. To make this adjustment, loosen the adjustment knob (39) until the clamp is free and slide the knob until the pointer indicates the desired value on the proportional band scale. Retighten proportional band adjustment knob.

Set point

Adjustment of the set point is accomplished by turning the set point adjustment knob (78) to rotate the bourdon tube or bellows about the plate post as a center, thus relocating the bourdon or bellows tip position. The direction for increasing or decreasing the set point is indicated on the set point knob index (77).

Reset rate (Figs. 9 & 14)

The reset rate knob (109) is provided with a reference scale to indicate the relative value of reset at a given proportional band setting. With the reset rate at a low value, which will not interfere with the proportional band adjustment, narrow the proportional band as much as the process will permit without cycling. Widen the band by approximately 50%. Turn reset rate knob clockwise slowly, increasing the reset rate until cycling occurs. Note the value of the reset rate when cycling occurs and set reset rate for approximately 75% of that value.

Differential gap

The width of the differential-gap is determined by the position of the differential gap pointer along the differential gap scale. The position of the set point index determines the position of the gap within the instrument range. To make this adjustment, loosen the differential gap adjustment knob (39) until the clamp is free. Slide the knob until the pointer indicates the desired value on the differential gap scale. Retighten differential gap adjustment knob. CAUTION: Supply pressure, i.e., 18 psi must be held constant in order to insure accuracy of trip point.

Alignment spring

The setting of the alignment spring (120) (Fig. 4) is a factory adjustment. The alignment spring is attached to the free end of the proportional leaf spring (44) and adjusted in compression to equal the force exerted by the proportional bellows (57) at 9 psi output pressure, so that the leaf spring is then flat at 9 psi output pressure.

This setting permits the adjustment of the proportional band with minimum change in output pressure (minimum upset to process) when the output pressure is at or near 9 psi. The value of 9 psi (midrange) has been selected since it approaches the normal operating pressure.

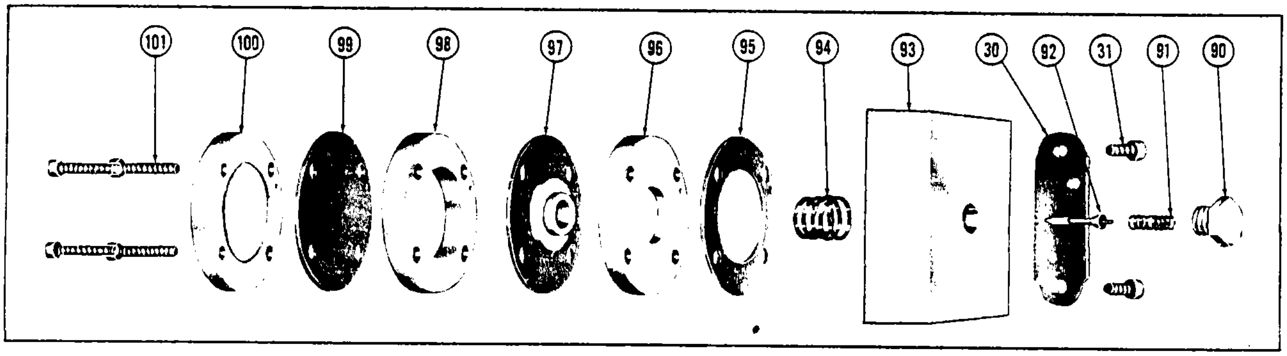
Calibration

The controller has been calibrated at the factory. However, if it becomes necessary to recalibrate the controller, proceed as follows:

1. Loosen proportional band knob (39) and slide knob until the pointer indicates a minimum proportional band. Retighten knob.
2. With the primary element subjected to the variable at 50% of the control range, turn dial (88) to midpoint by turning knob (78).
3. Loosen bourdon tube screws (16) or bellows frame screws (4) slightly and manually position bourdon tube or bellows frame until controller output pressure is approximately midpoint of output pressure range; i.e., 9 psi for 3-15 psi.
4. Retighten bourdon tube or bellows frame screws.
5. Turn set point adjustment knob (78) slightly until output pressure is exactly at the midpoint value.
6. Loosen screw on dial (88) and rotate dial until midpoint mark is aligned with pointer. Tighten screw.
7. Adjust set point and proportional band to desired values.

NOTE: Calibration procedure for controllers with reset is the same as that for proportional controllers except that 9 psi should be locked in the reset bellows.

Set reset rate index at 10 (open position) and adjust set point for 9 psi output. When 9 psi output remains constant for at least 30 seconds, set reset rate index at 0 (locking 9 psi in reset bellows) and follow proportional controller procedure.



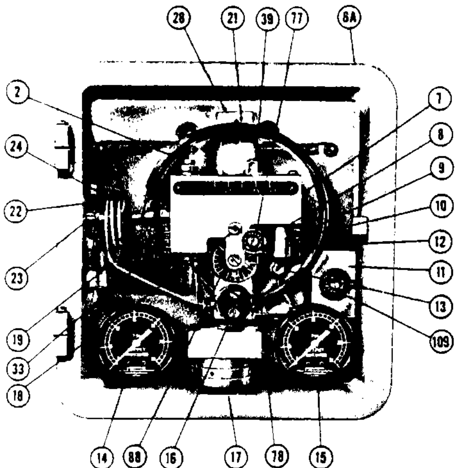


Figure 9
Model 2716 Proportional-Reset Controller with Booster Relay and Bourdon Element

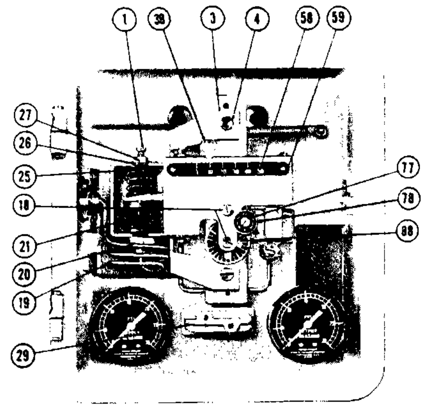


Figure 10
Model 2705 Proportional Controller with Bellows Element

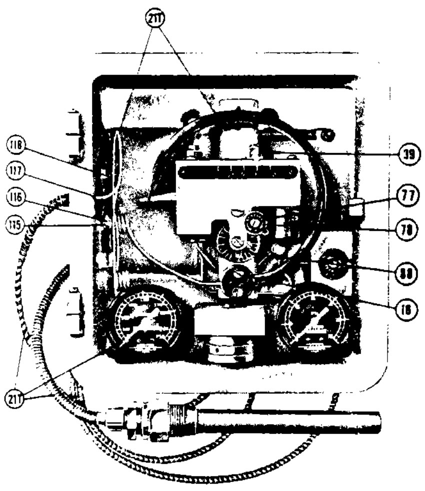


Figure 11
Model 3716 Proportional-Reset Controller with Booster Relay and Thermal Element

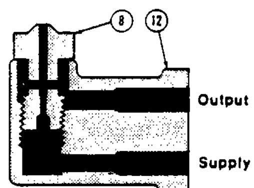


Figure 12
Nozzle Block Assembly for Proportional and Proportional-Reset Controllers

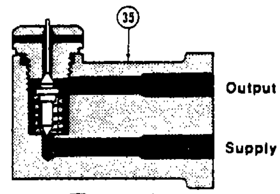


Figure 13
Nozzle Block Assembly for Differential-Gap Controllers

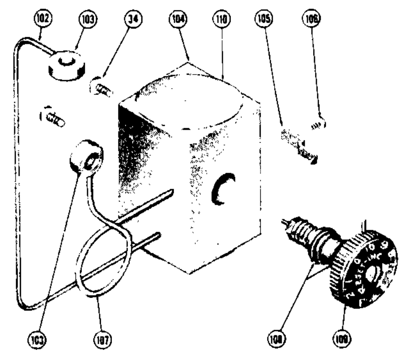


Figure 14 Reset Unit

PARTS REFERENCE

Ref. No.	Part Name	Computer Abbrev.
1	Machine Screw	MCN SCR
2	Screw	SCREW
3	Mounting Plate	MTG PLT
4	Screw	SCREW
6A	Case Sub-assembly	CASE SA
7	Proportional Mechanism S/A	PRP MCH
• 8	Nozzle	NOZZLE
• 9	Gasket (pilot)	GASKET
10	Screw (pilot)	SCREW
11	Reset Unit	RST UNT
12	Nozzle Block	NZL BLK
13	Screw	SCREW
14	Supply Gauge	SUP GGE
15	Output Gage	OUT GGE
16	Screw	SCREW
17	Relay	RELAY
18	Screw	SCREW
19	Element Connecting Tube S/A	ELM TBE
20	Nut	NUT
21	Pressure Element	ELEMENT

Ref. No.	Part Name	Computer Abbrev.
21T	Thermal System	
22	Closure Plate	CLS PLT
23	Process Connection	PR CONN
24	Machine Screw	MCN SCR
25	Spacer	SPACER
26	Washer	WASHER
27	Nut	NUT
28	Bourdon Plate	BDN PLT
29	Cover Plate	CVR PLT
30	Gasket	GASKET
31	Machine Screw	MCN SCR
33	Terminal	TERMINL
34	Machine Screw	MCN SCR
35	Pilot (diff. gap)	PILOT
39	Knob (prop. band or diff. gap)	KNOB
58	Scale Plate	SCL PLT
59	Drive Screw	DRV SCR
77	Set Point Index	SET INX
78	Knob (set point)	KNOB
88	Dial (set point)	DIAL
90	Spring Holding Screw	HLD SCR

Ref. No.	Part Name	Computer Abbrev.
91	Spring	SPRING
92	Pilot Plug	PIL PLG
93	Pilot Body	PIL BDY
94	Spring	SPRING
• 95	Gasket	GASKET
96	Spacer	SPACER
• 97	Diaphragm Block S/A	DPH BLK
98	Spacer Ring	SPC RNG
• 99	Diaphragm	DIAPHRM
100	Cap	CAP
101	Machine Screw	MCN SCR
102	Tubing	TUBING
103	Adapter	ADAPTER
104	Reset Housing	RST HSG
105	Pointer	POINTER
106	Screw	SCREW
107	Tubing	TUBING
•108	O-ring	O RING
109	Reset Unit S/A	RST UNT
115	Clamp	CLAMP
116	Nut	NUT

• Recommended spare part.

Booster relay (Fig. 8)

If disassembly of the booster relay is required, proceed as follows:

1. Unscrew (from the rear of the case) mounting screws which hold relay to the case. Break joint carefully to avoid damaging the relay gasket.
2. Remove screw (90) and remove relay spring (91) and plug (92) from relay body (93).
3. Unscrew four relay screws (101) holding relay cap (100), diaphragm (99), spacer ring (98), diaphragm block S/A (97), spacer (96) and gasket (95) to relay body. Diaphragm spring (94) will come free from body.
4. Clean parts with soft cloth. Use solvent if oil or grease is present. (Do not use solvent on diaphragm or gasket.) Blow out ports with clean air.
5. Assemble relay cap (100), diaphragm (99), spacer ring (98), diaphragm S/A (97), spacer (96), diaphragm spring (94) and gasket (95) on relay body. Align holes and insert screws (101).
6. Assemble plug (92), spring (91) and screw (90).
7. Position relay gasket (30) on case and fasten relay to case with the two mounting screws (31).

Proportional mechanism (Fig. 9)

To remove the proportional mechanism for inspection or replacement, loosen the index post screw (18) and the bellows tubing adapter screw (13) and lift out the proportional mechanism frame. Avoid disturbing the setting of the alignment spring.

Nozzle block (Fig. 12)

To clean the nozzle (8) which contains the metering restriction, remove the screws holding the nozzle block (12) to the case and unscrew the nozzle from the block. Wash the nozzle in carbon tetrachloride or benzine and then blow out with clean, dry air. When replacing the nozzle, be sure it is firmly seated in the nozzle block.

Pilot block (Fig. 13) (Differential-gap models)

To clean the pilot (35), remove the two screws holding the pilot to the case and unscrew the exhaust from it. Wash all parts in carbon tetrachloride or benzine and then blow out with clean, dry air. Clean plug with clean, soft cloth and reassemble.

Reset unit (Fig. 14)

On proportional-reset controllers, the resistance unit may require occasional cleaning.

1. With pointer (105) held so that it clears stop, turn reset knob counterclockwise and unscrew resistance unit (109) body to end of thread and remove.
2. Remove hex nut on bottom of resistance unit body. Spring, spring button and plug will come free from body.
3. Blow out ports and wipe parts with clean, lint-free cloth.
4. Reassemble spring, spring button and plug in resistance unit body.
5. Replace resistance unit body in reset frame.
6. Turn reset knob clockwise and screw resistance unit body into reset frame until plug contacts bottom. If unable to determine when contact occurs, remove resistance unit, press it down on a table top, depressing the plug, and slide it off the edge. The plug will snap back firmly into the seat. Replace in reset frame. When turning, a slight resistance will tell you when the plug stem contacts the bottom.
7. Hold reset knob from turning and loosen index post screw in center of knob.
8. Turn reset knob counterclockwise until reset knob stop contacts pointer. Turn dial to 0 and retighten screw in center of knob.

Trouble shooting

Difficulty in securing good controller performance may be caused by the process or by faulty installation. The following is a list of the sources of difficulties frequently overlooked:

a. Cycling of other controllers in the process.
b. Pulsations caused by pumps or steam traps.
c. Plugged or partially plugged controlled pressure connection.
d. Trapped, vapor or gas in controlled pressure connections, on liquid installations.
e. Condensate in controlled pressure connection, on gas or air installations.
f. Faulty air supply system.
g. Plugged nozzle orifice.
h. Sluggish thermal response due to improper bulb location or damaged tubing (3700).
i. Reset unit not set correctly.

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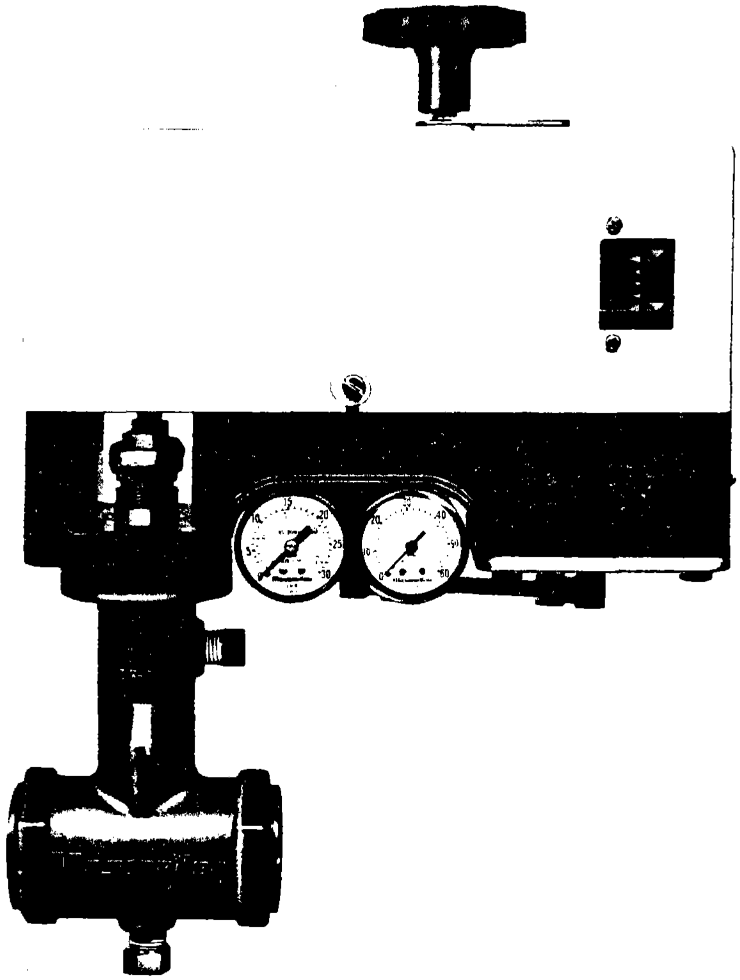
Facilities: Australia, Brazil, Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Singapore, Spain, United Kingdom, United States

Instruction No. 3051E

Masoneilan MicroPak 29000 Series Control Valve Instructions



Includes recommended spare part numbers

Instruction No. 3051E

4.8.10-25

Masoneilan

installation

These installation, operating and maintenance instructions apply to the Masoneilan MicroPak control valve and include part numbers for all recommended spare parts. Replacement parts should be ordered from the Parts Service Department at our Montebello, California plant. Always reference serial number and model number when ordering.

Warning: This equipment should not be installed, maintained or operated without reading, understanding and following these instructions. Failure to do so may result in personal injury or damage to the equipment.

Preliminary steps

1. Before installing the valve in the line, clean piping of all foreign material such as welding chips, scale, oil, grease or dirt.
2. Record serial plate data for future reference.
3. For inspection of the valve without interrupting the process, provide a hand operated stop valve on either side of the MicroPak with a hand-operated, throttling valve mounted in a bypass line.

Valve installation (Figs. 1, 2, 3 & 4)

Piping end connections The Micropak is rated at ANSI Class 1500 and has 1" NPT screwed ends. It may also be installed between machined raised face flanges of the following standards; ANSI Class 150, 300, 600, 900 and 1500 as well as DIN (ND) 10-250 metric.

Joint sealing—screwed connections Apply John Crane Plastic Lead No. 2 or Teflon tape to the pipe threads. Sealant used must be compatible with the process.

Joint sealing—flanged connections Suitable gasket materials are any good grade of asbestos fiber such as Durabla or equivalent, 1/16" thick. For extreme thermal or pressure cycling service long fiber asbestos gaskets such as Johns-Manville No. 76 are recommended. *Note: Do not use metal jacketed or spiral-wound gaskets.*

Thru-bolts For flange mounting use ASTM A193 GrB7 low alloy steel line bolting for temperatures from −20F to +650F. Use ASTM A193 GrB8 stainless steel bolting for corrosive or cryogenic service. Complete line bolting sets are available from Masoneilan.

Alignment (Fig. 1) First, push on the plastic bolt templates over the inlet and outlet ends with your flange rating arrow pointing up. The flow arrow cast on the body must be pointing in the direction of flow. Install bolting and tighten evenly in criss-cross fashion.

Insulation If required, insulate the valve as shown in Figure 3. Do not insulate higher than the shaded area.

Air Piping (Fig. 4)

If an on-off valve, pipe actuating air line to the ¼" NPT opening in the diaphragm cover (137). *If a throttling valve,* pipe supply and instrument signal lines to the appropriate connections in the positioner block (144). Use ¼" O.D. tubing or equivalent for air lines. *Note: Be sure that supply air pressure is 35 psi.*

Warning: Do not use air pressure greater than specified on serial plate.

Handwheel

Clockwise rotation will open the valve if air-to-open action, or close the valve if air-to-close action. Counterclockwise rotation returns the valve to fully automatic operation. Note: when turning handwheel counterclockwise, you will note a release of tension when the lever arm stop (122) is released from the lever. Continue to turn handwheel until a slight tension is felt and tighten handwheel lock (121).

Reversing valve action (Figs. 4, 5 and 15)

Warning: The valve actuator and positioner must be free of all pressure when reversing the action.

Hole A—Reverse Action (air-to-open)
Hole B—Direct Action (air-to-close)

1. Loosen cover screws (109), back off handwheel lock (121) and turn handwheel counterclockwise until cover floats free.
2. Remove retaining clips (112) from pins (105 & 124). Do not remove plug stem clevis pin or disturb spring clamp mechanism (115).
3. Place a ½" open end wrench under nut (125) and apply force to raise clevis (104) until pin (124) slips out.
4. Remove pin (105) from Hole "A" and insert in Hole "B" for air-to-close action, or from "B" to "A" for air-to-open action.
5. Reinstall pin (124). Install retaining clips (112) on pins (105 and 124). No recalibration should be required.
6. Reverse indicator plate (127) and align with indicator (126).
7. Reinstall cover, turning hand wheel clockwise to engage lever arm stop (122). Tighten cover screws (109).

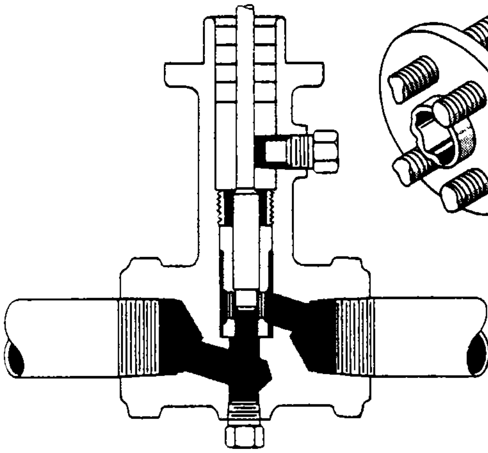


Fig. 1 MicroPak Installation
Screwed Connections

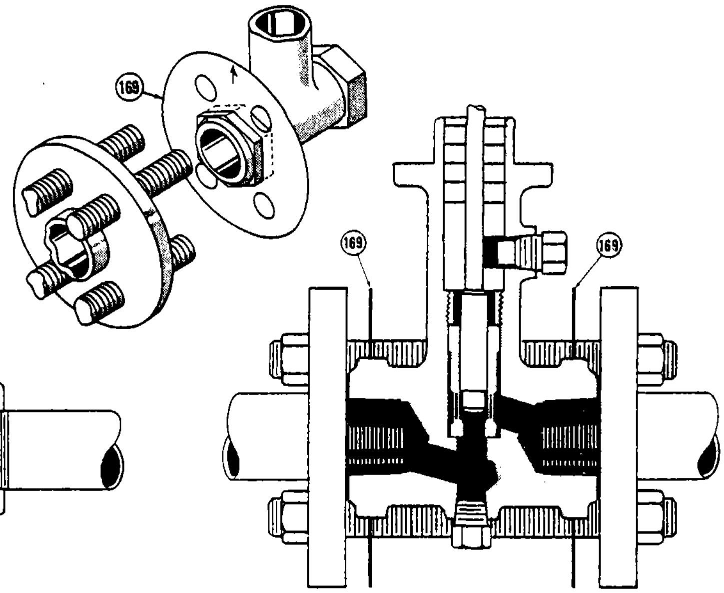


Fig. 2 MicroPak Installation
Flanged Connections

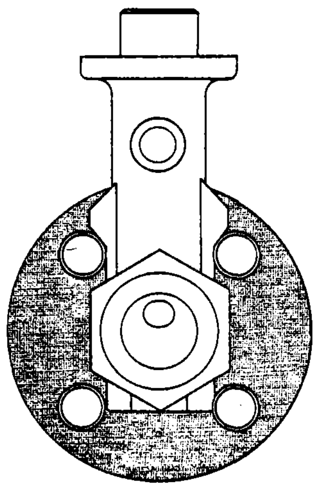


Fig. 3 Insulation for the
MicroPak Valve

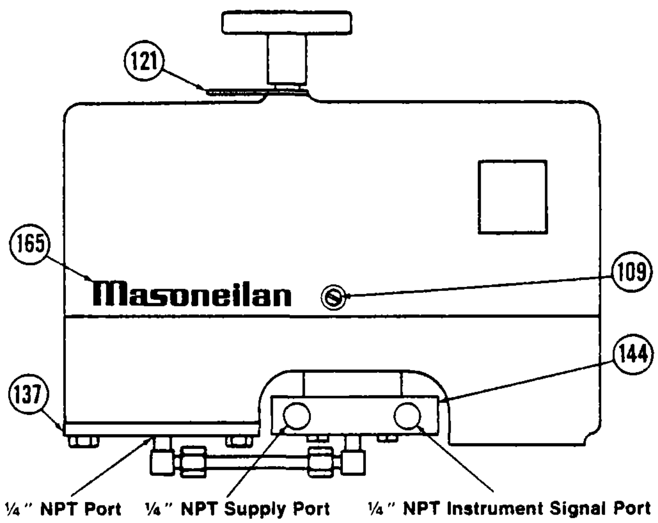


Fig. 4 MicroPak Air Connections

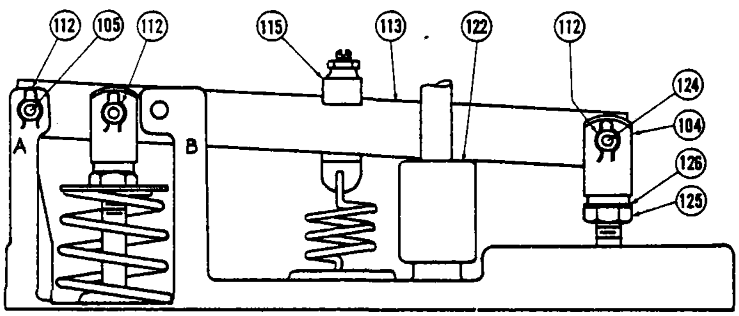


Fig. 5 Lever Assembly
(Shown in air-to-open configuration)

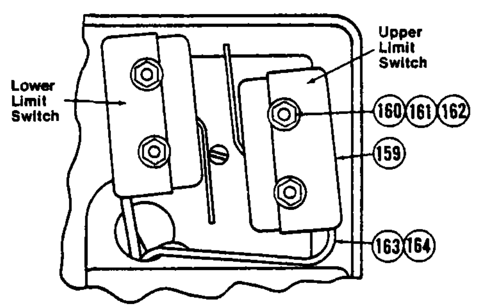


Fig. 6 Limit Switch Adjustment
Upper Limit Switch
Lower Limit Switch

Limit switches (Fig. 6)

Limit switches are wired and adjusted to customer order. The black wire attaches to either the normally open or normally closed terminal on the upper limit switch; the black and white striped wire attaches to its common terminal. The red wire is connected in like manner to the lower limit switch; the red and white wire to its common terminal. To adjust switches, loosen screws and nuts (160 & 162), stroke the valve to the desired position, adjust the position of the switch until it trips. Then tighten screws and nuts.

Note: If the process fluid or atmosphere around the valve is flammable, personal injury or equipment damage could result from an explosion caused by discharge of static electricity from valve components. To reduce the possibility of such injury, ground the valve shaft.

maintenance

Warning: Maintenance and/or disassembly should be performed with the valve, actuator and positioner free of all pressures.

Actuator diaphragm replacement (Figs. 7, 14, 15)

Unscrew tubing connection nut (138A). Remove four cap screws (139). Remove diaphragm cover (137) with tubing assembly intact. Remove diaphragm (136). Form new diaphragm (136) and insert over the piston as shown. Replace diaphragm cover (137) and tubing (140). Bolt diaphragm cover in place with four cap screws (139). Reconnect pressure connection (138). Check air connections for leaks.

Positioner maintenance (Figs. 8, 14 & 15)

1. Unscrew pressure connection nut (138A).
2. Unscrew cap screws (111) and remove manifold block (144), gasket (146), spring (158), pilot valve assembly (155-157), shims (145) and O-ring (153). *Caution: Handle shims carefully. They are delicate.*
3. Loosen locknut (117) and take-up screw (116) and unhook spring clamp (115) from lever arm (113).
4. Unscrew cap screws (141) and remove positioner block (147) from actuator bracket. Remove screws (148) to separate the positioner diaphragm assembly (152) from positioner block. Examine all parts for wear and replace if necessary.
5. Assemble positioner diaphragm assembly (152), with spring (154) if split range, to the block and tighten screws (148). Be sure that the small signal port O-ring is in its recess in the diaphragm assembly.
6. Assemble block assembly to actuator bracket. *Note: Orient the block (147) such that when the manifold block (144) is bolted on, the gauges will face in the right direction.*
7. Install O-ring (153), shims (145), pilot valve subassembly (155, 156, 157), gasket (146), spring (158) and manifold block (144). *Note: Gasketed ports in (146) must align with ports in block (147). Tighten cap screws (111) and positioner tubing nut (138).*

Adding packing (Figs. 9 & 14)

To add a ring of packing, depressurize the valve, back off packing flange nuts (8) all the way, lift the packing flange and follower and insert one ring of packing. Tighten nuts (8) finger tight plus one full turn.

Packing replacement (Figs. 10, 14 & 15)

The fastest and simplest way to replace packing is to remove the entire actuator without disturbing actuator parts or calibration. Remove all pressure from the valve and proceed as follows:

1. *Remove safety pin (11) from body.* Remove two packing flange nuts (8) and back off two mounting nuts (8A) as far as possible.
2. Be sure plug is off the seat. If a reverse acting valve (air-to-open, pin in hole A) turn handwheel clockwise until stroke indicator (126) is lined up with the first small mark on indicator plate (127).
3. With a block of wood and a mallet, if necessary, tap the actuator off the valve. Clean the packing box and plug stem and carefully place new rings of packing around the stem.
4. Reassemble the actuator-plug assembly to the valve being careful to: (a) align hole in spacer (5) with safety pin hole; (b) position the skive cut of each packing ring 120° from that of the adjacent ring; (c) replace two mounting nuts (8A) during reassembly; (d) use extra care in guiding each ring into the packing box. Replace safety pin (11). Return valve to fully automatic operation (see page 2 – Hand-wheel). Replace packing gland nuts (8).

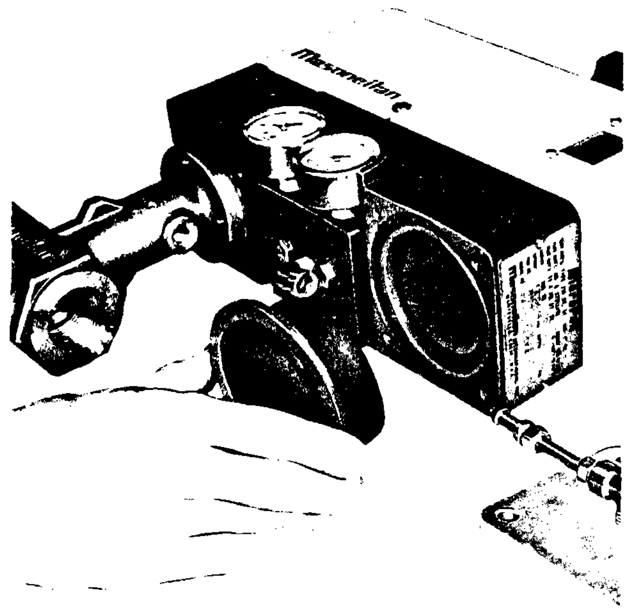


Fig. 7 Diaphragm Replacement

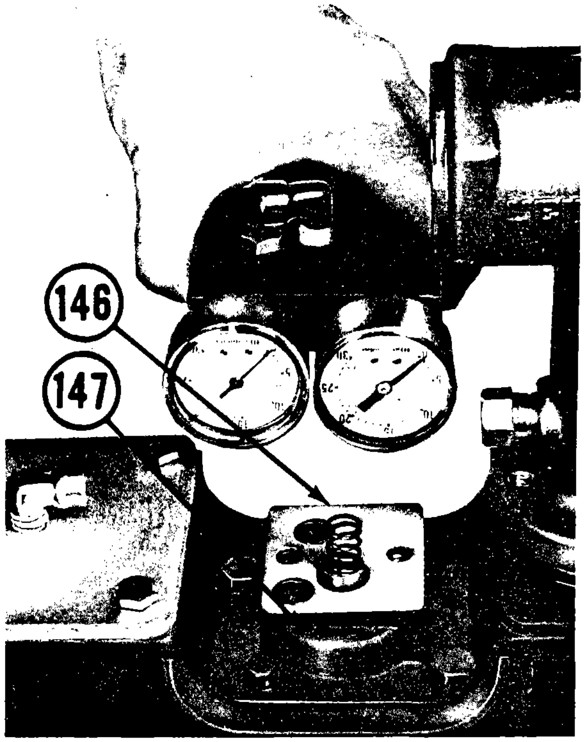


Fig. 8 Positioner Assembly

Note orientation of block (147) and gasket (146).

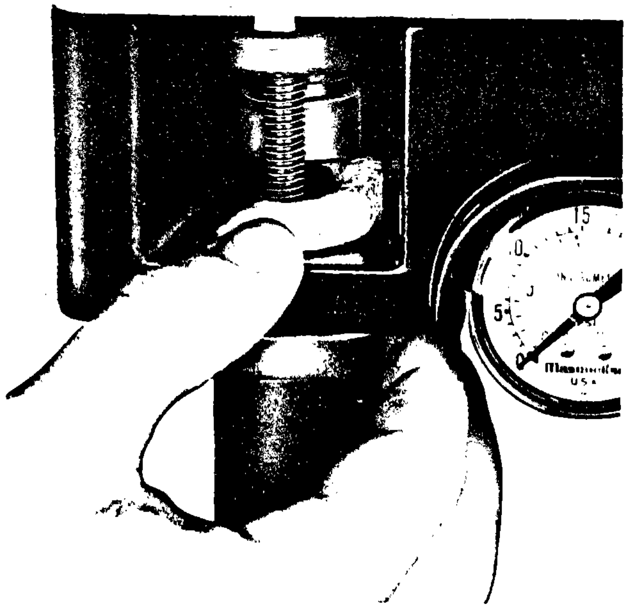


Fig. 9 Adding a Ring of Packing

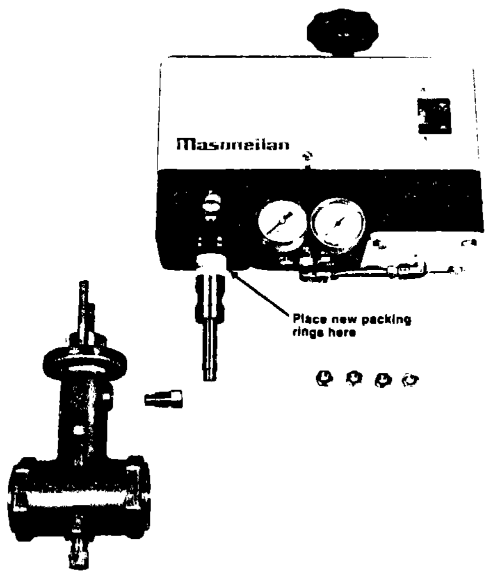


Fig. 10. Packing Replacement

maintenance

Trim removal (Figs. 11, 14 & 15)

1. Use the same procedure for plug removal as for packing replacement (see page 4).
2. Loosen cover screws (109), back off handwheel lock (121) and turn handwheel (120) counterclockwise until the cover floats free.
3. Remove all six retainer clips (112). Back off locknut (117) and take-up screw (116) and disconnect spring clamp (115) from the lever arm (113).
4. Place a ½" open end wrench under nut (125) and apply force to raise clevis (104) until pin (124) slips out. Remove pins (105) and lift lever arm (113) from actuator bracket (108).
5. Remove clevis (104), nuts (103), spring button (102), spring (106), grommet plate (101), packing parts and valve plug (12).
6. Using a 9/16" or 14 mm piece of hex stock and a wrench, unscrew seat ring retainer (4).
7. Remove pipe plug (1) from the valve body. Use a rod of suitable size, inserted through the pipe plug opening to remove the seat ring (3). Remove gasket (2) and thoroughly clean the gasket surface.

Trim reassembly (Figs. 11, 14 & 15)

1. Place gasket (2) on seat ring (3) and install both in the valve body. Orient seat ring with a port in line with the body outlet. Liberally lubricate the threads and bottom of retainer (4) with Molykote G.
2. With a 9/16" or 14 mm piece of hex stock, torque the retainer to 75 ft. lb. if a grafoil/stainless steel gasket or 40 ft. lb. if a glass filled Teflon gasket. (See figure 11.)
3. Replace plug (12) spacer (5) and packing (6) aligning the hole in the spacer with the safety pin hole in the valve body. Install safety pin (11) and plug (1) using Teflon tape on the thread.
4. Replace packing, positioning the skive cut of each packing ring 120° away from the cut of an adjacent ring. Install actuator bracket (108), packing box parts, grommet plate (101), spring (106), spring button (102), nut (103) and clevis (104).

Calibration (Figs. 12, 13, 14 & 15)

For convenience in calibration, the actuator must be built for reverse (air-to-open) action and converted to direct (air-to-close) action later if desired.

1. Tighten the packing. It is necessary that this be done before commencing calibration. Loosen locknut (103) and, preventing plug stem clevis (104) from rotating, turn plug stem with a screwdriver until clevis is positioned as shown in figure 12. Retighten locknut (103).
2. Replace lever arm stop (122). Install lever arm (113) with spring clamp hole up and insert pins (105) through hole A and plug stem clevis: *Note: coat pins lightly with a film of Molykote G lubricant.*
3. Apply 50 psi air to the valve inlet and press down on the lever to check valve leakage. Be sure that the lever does not contact the lever arm stop (122). If the valve does not shut off, remove clevis pin (105), loosen locknut (103) and screw plug stem down. One full turn will change plug position by .042". Retighten locknut (103).
4. Adjust piston rod clevis for 5/32" to 3/16" gap between holes to obtain the initial actuator spring load. (See figure 13.)
5. Reassemble force balance spring (114) and positioner spring clamp (115) to the positioner and lever arm. Pipe air supply and instrument signal lines to the positioner and set supply pressure to 35 psi. Apply sufficient output pressure to move the piston rod clevis up slightly. Connect clevis to lever arm with pin (124). *Note: Coat the pin with Molykote G lubricant before inserting.*
6. Remove output pressure and again check valve seat tightness with 50 psi air to the body inlet.
7. Apply minimum value of instrument signal range (3 psi for 3-15 signal). Turn take-up screw (116) until positioner output just begins to move the lever arm. Tighten locknut (117).
8. If the valve action is to be reverse (air-to-open), calibration is complete. Replace cover and adjust indicator plate (127).
9. If valve action is to be direct (air-to-close), apply sufficient output pressure to move the lever arm up slightly and remove pin (124). Remove air pressure from actuator. With the strain off pins (105), remove pin from hole A and install in hole B. Reapply air pressure and replace pin (124) and cover. To change valve action without using air pressure, refer to page 2.

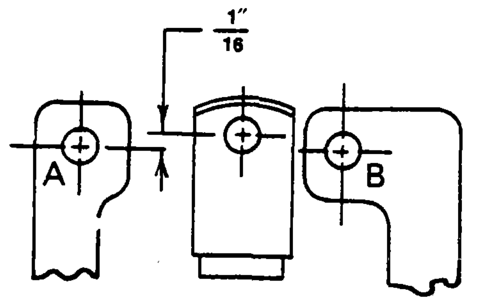


Fig. 12 Plug Stem Adjustment

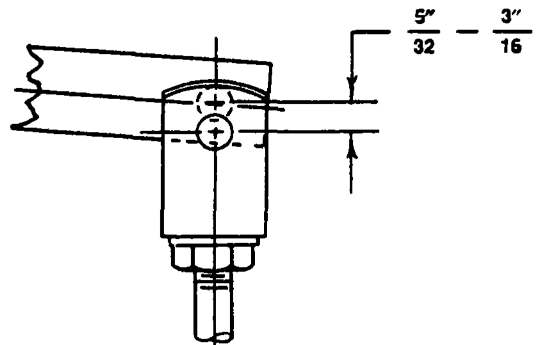


Fig. 13 Piston Rod Clevis Adjustment

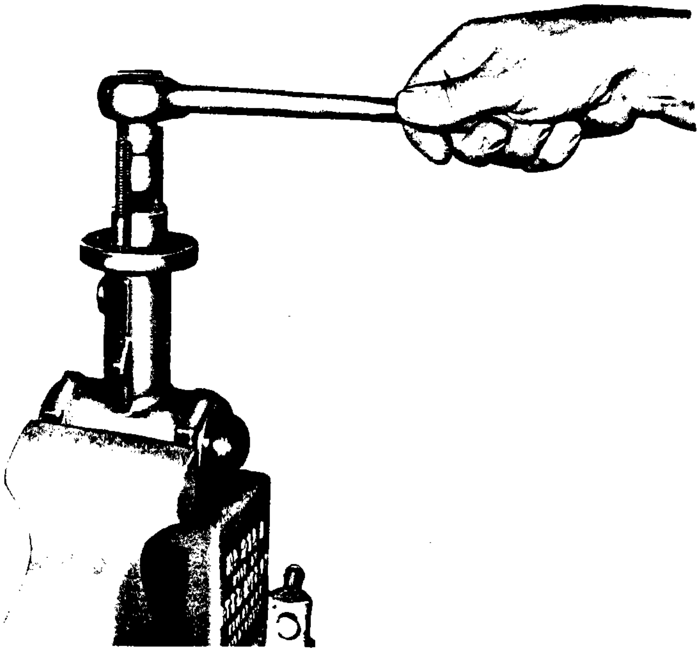


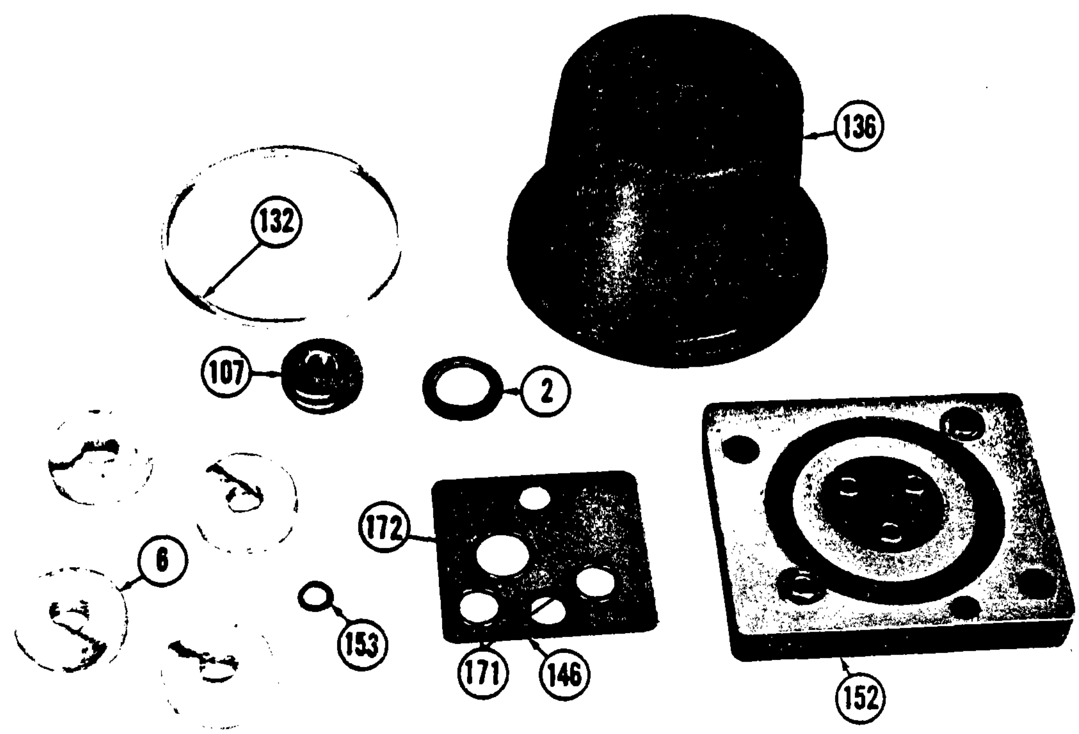
Fig. 11 Tightening the Seat Ring Retainer

PARTS REFERENCE

Ref. No.	Part Name	Ref. No.	Part Name	Ref. No.	Part Name
1	Pipe Plug	114	Force Balance Spring	141	Positioner Screw
• 2	Seat Ring Gasket	115	Spring Clamp	142	Output Gauge
3	Seat Ring	116	Take-up Screw	143	Instrument Gauge
4	Seat Ring Retainer	117	Locknut	144	Manifold Block
5	Packing Spacer	118	Handwheel Locknut	145	Shim
• 6	Packing	119	Handwheel Bushing	•146	Gasket
7	Packing Flange Stud	120	Handwheel	147	Positioner Block
8	Packing Flange Nut	121	Handwheel Lock	148	Screw
8A	Mounting Nuts	122	Lever Arm Stop	149	Screw
9	Packing Follower	123	Cover Plug	150	Lockwasher
10 '	Packing Flange	124	Pin	151	Spring Bracket
11	Safety Pin	125	Locknut	•152	Positioner Diaphragm S/A
12	Valve Plug and Stem S/A	126	Indicator	•153	O-Ring
13	Valve Body	127	Indicator Plate	'154	Spring
16	Stop	128	Piston Rod	†155	Sleeve
101	Grommet Plate	129	Indicator Plate Screw	†156	Spool
102	Spring Button	130	Speed Nut	†157	Spring
103	Nut	131	Piston	158	Spring
104	Clevis	•132	Piston Ring	159	Switch
105	Pivot Pin	133	Serial Plate Screw	160	Screw
106	Spring	134	Spring	161	Washer
107	Grommet	135	Serial Plate	162	Nut
108	Actuator Bracket	•136	Diaphragm	163	Wire
109	Cover Screw	137	Diaphragm Cover	164	Terminal
110	Cover	138	Pressure Connection	±165	Logo
111	Cap Screw	138A	Tubing Nut	168	Cover Washer
112	Retainer Clip	139	Cap Screw	±169	Thru-Bolt Template
113	Lever Arm	140	Tubing	±170	Signal Decal

•Recommended spare part.
†Supplied only as a complete sub-assembly. Includes sleeve (155), spool (156) and spring (157).
' Used only for split range.
±Not shown in figures.

recommended spare parts
stainless steel, monel, hastelloy c and alloy 20 valves



Ref. No.	Part Name		Part Number
2	Seat Ring Gasket	Type 316 St. St. Valves	009191-743-779
		Alloy Valves	009191-743-967
6	Packing (4 rings required)		005675-615-966
107	Grommet		971913-008-680
132	Piston Ring		029100-040-940
136	Diaphragm		029100-050-716
146	Pos. Gasket (incl. 3 "O" Ring)		349279-110-888
152	Positioner Diaphragm S/A	3-15 PSI range 3-9, 9-15 split range	349188-110-999
		6-30, 3-27 range	021100-212-999
153	O-Ring		971886-150-680
171	0-Ring (2)		971886-021-110
172	0-Ring		971886-102-120

Masoneilan Masoneilan International, Inc. ▪ Norwood, Massachusetts 02062, U.S.A.

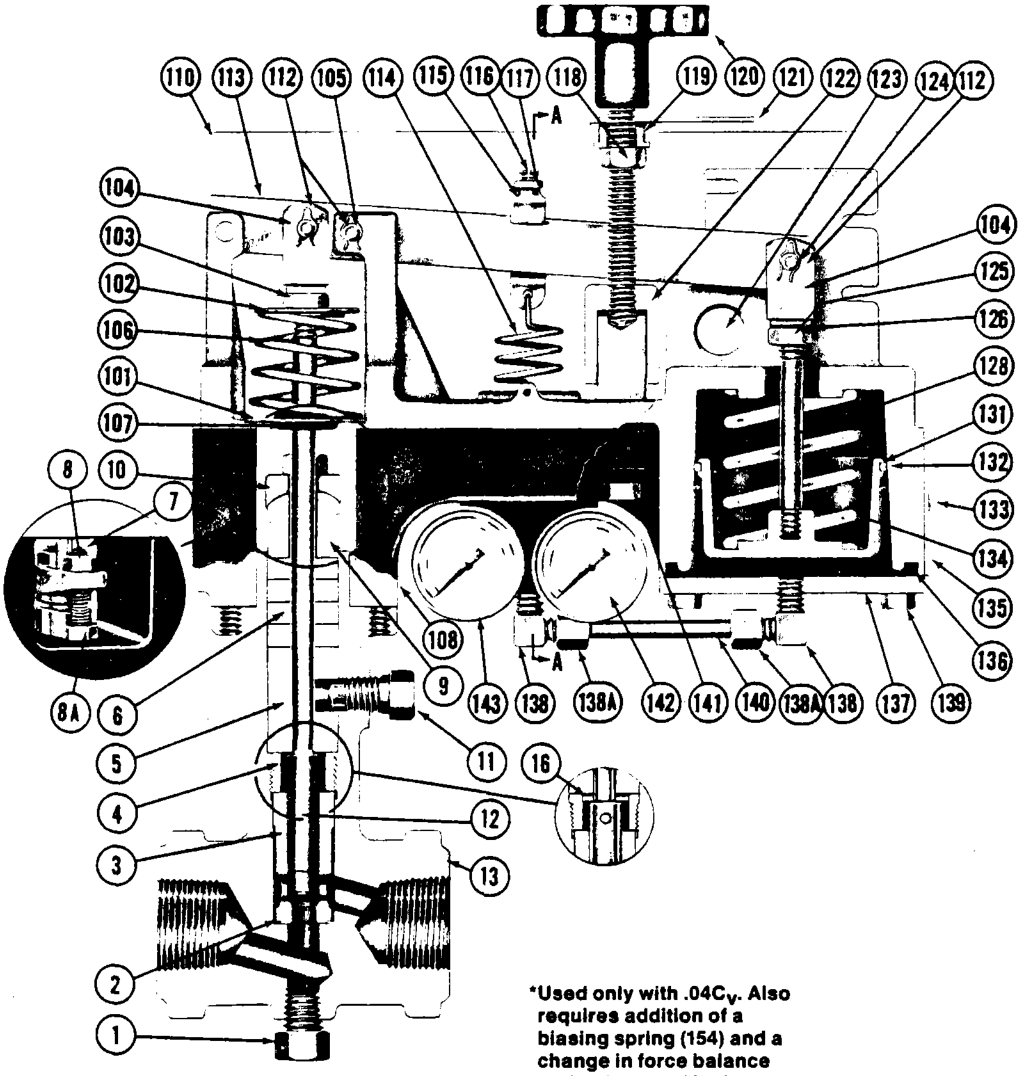
Corporate Offices, General Sales Office and Norwood Plant:
63 Nahatan Street, Norwood, Massachusetts 02062, U.S.A.
Telephone: (617) 762-4600; TWX: 710-336-0705; Telex: 92-4410;
Cable: MASONICA

Montebello Annin Plant:
1040 South Vail Ave., Montebello, Calif. 90640
Telephone: (213) 723-9351; Telex: 674-634;
Cable: ANNICO

Facilities: Australia, Brazil, Canada, France, Germany, Italy, Japan, Mexico, Netherlands, Singapore, Spain, United Kingdom, United States

78.7.3 Den

Printed in U.S.A.



*Used only with .04C_V. Also requires addition of a biasing spring (154) and a change in force balance spring (114) and indicator plate (127). See page 9.

Fig. 14

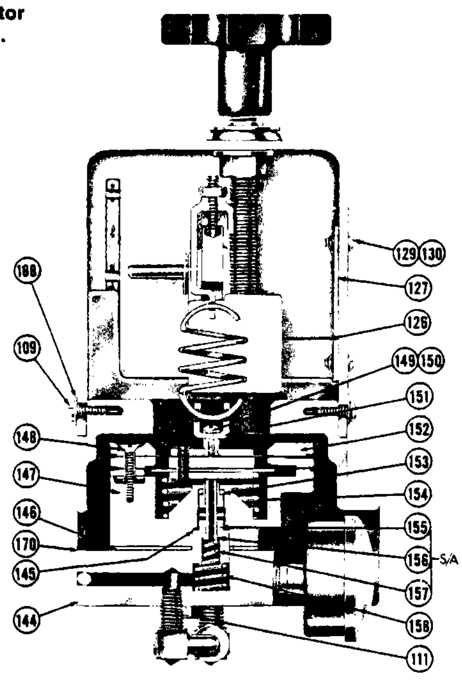
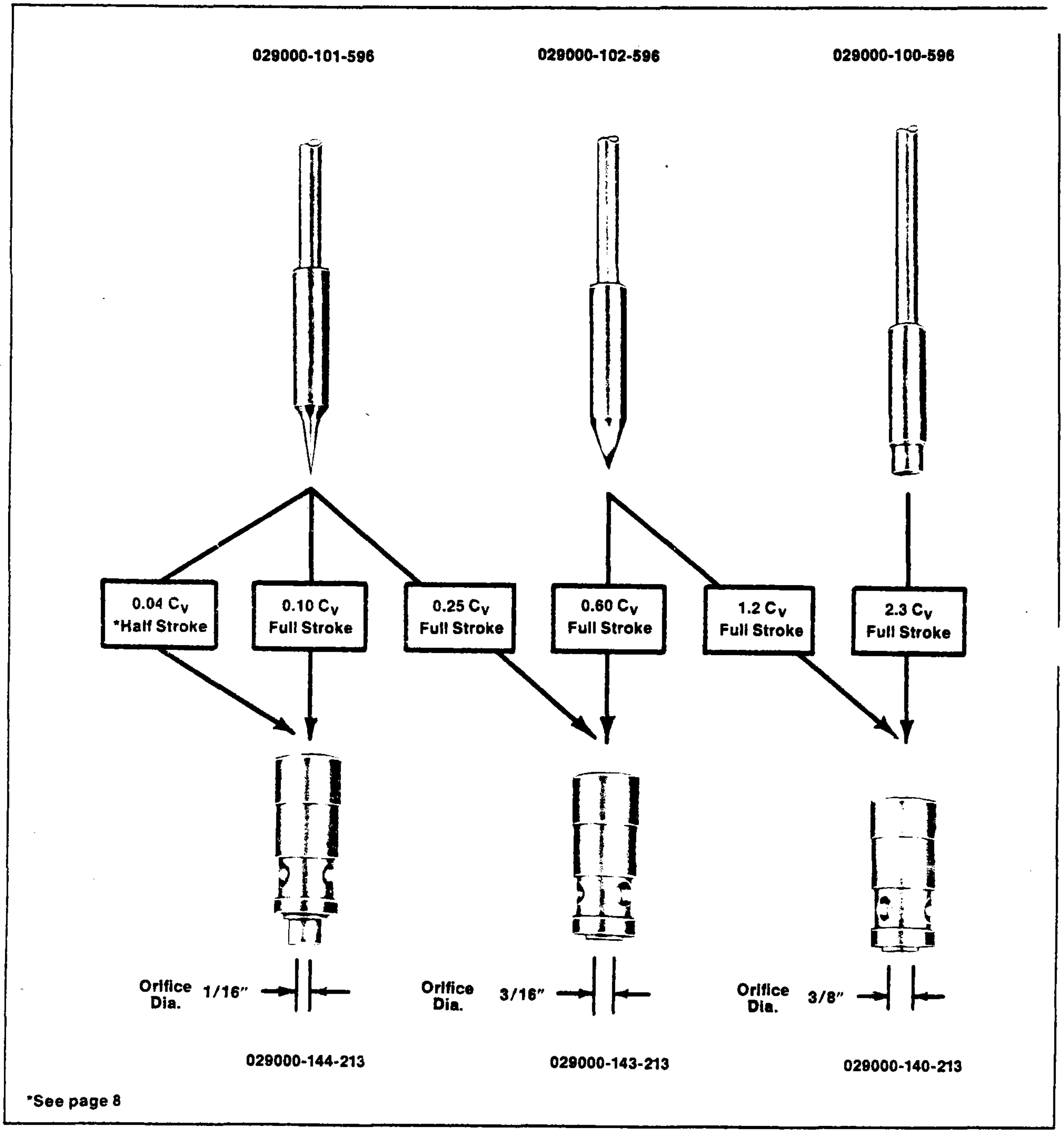


Fig. 15

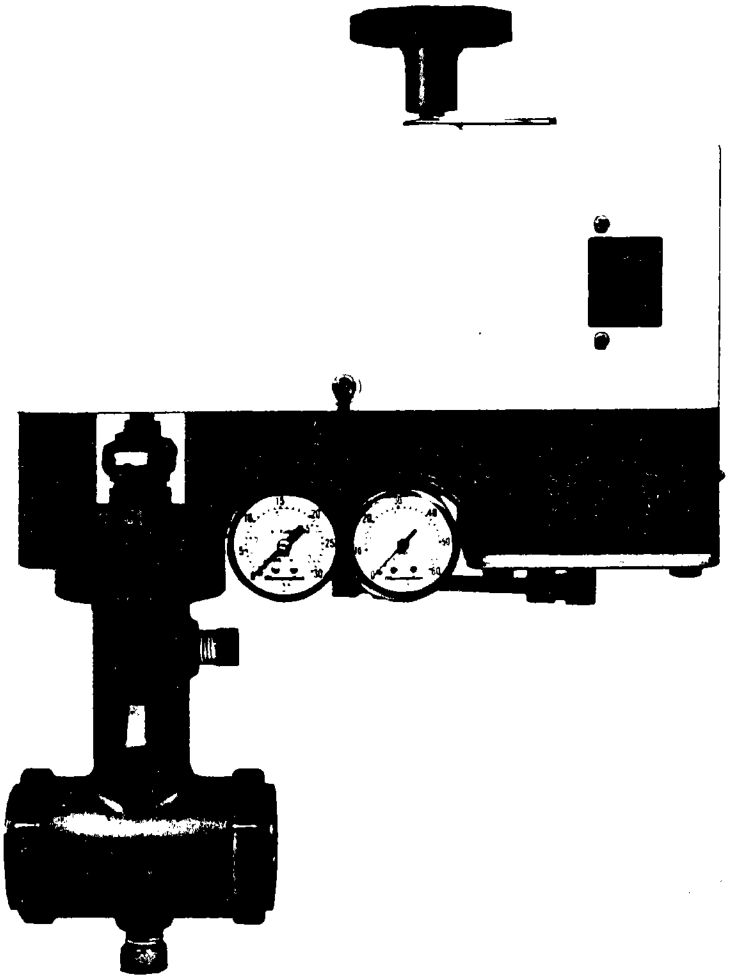


Three solid Stellite plugs and three Type 17-4 PH stainless steel seat rings are used in various combinations to produce the six standard C_V ratings shown. The part number is etched on each plug and seat ring. If wear and tear have obscured the number, the plug shape and seat ring orifice diameter will identify the parts.

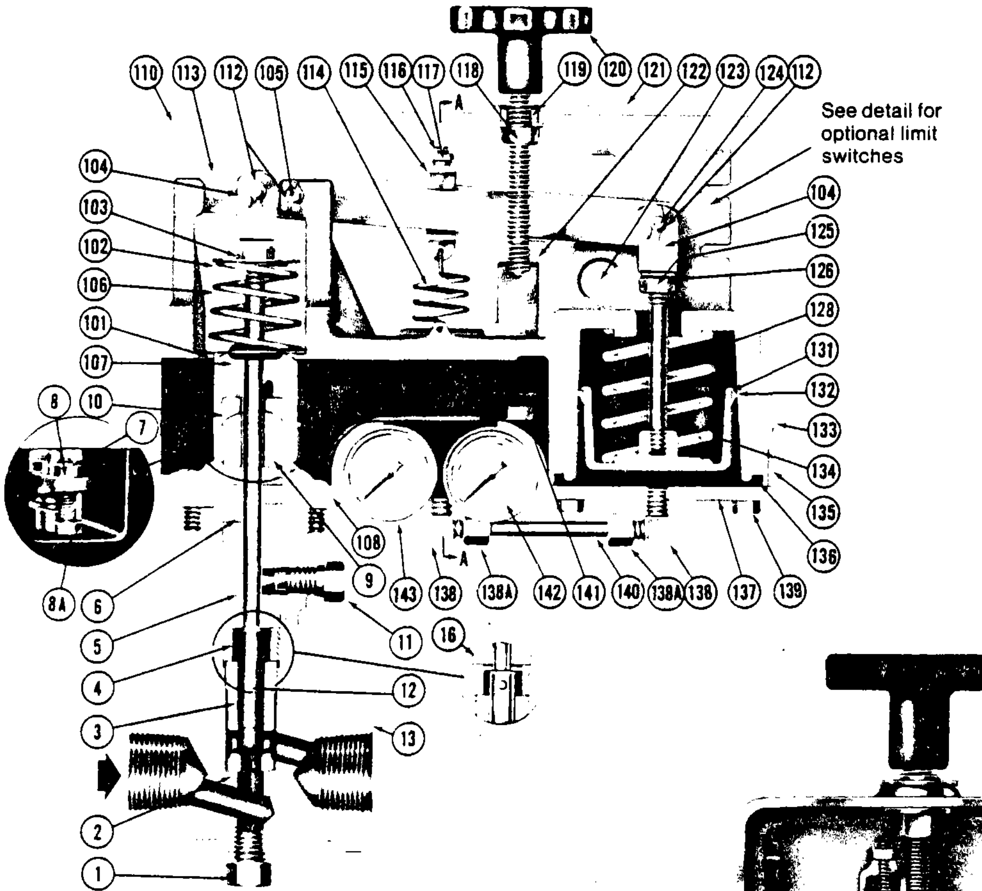
The 0.04 C_V rating is achieved by short stroking the plug used for 0.10 C_V. A different indicator plate (127) and force balance spring (114) are required, as well as a different positioner biasing spring (154). Stop (16) is used for 0.4 C_V only. Consult the Parts Service Department for required parts.

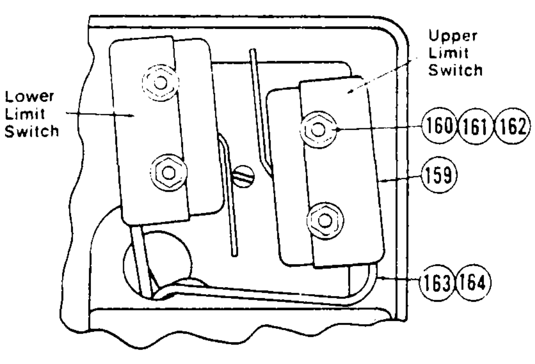
Calibration of a MicroPak valve with the 0.04 C_V rating exactly the same as that for other ratings. The positioner feedback spring limits the stroke.

Parts Supplement Instruction No. 3051E Masoneilan 29000 Series Control Valves

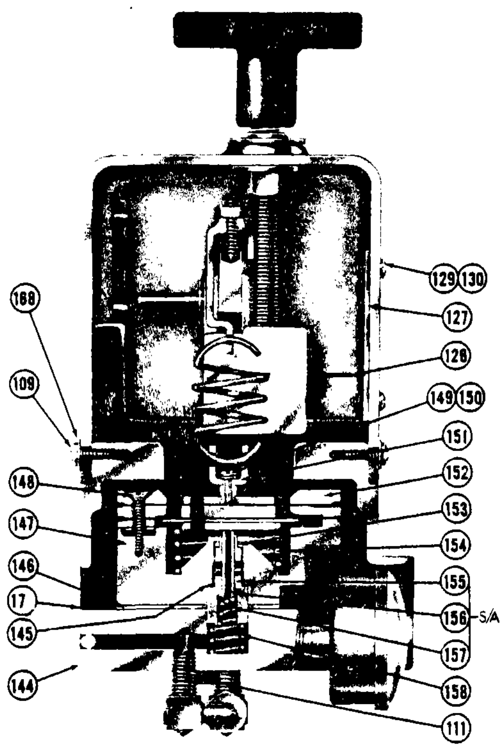


Representative Parts List For 29000 Series Control Valves

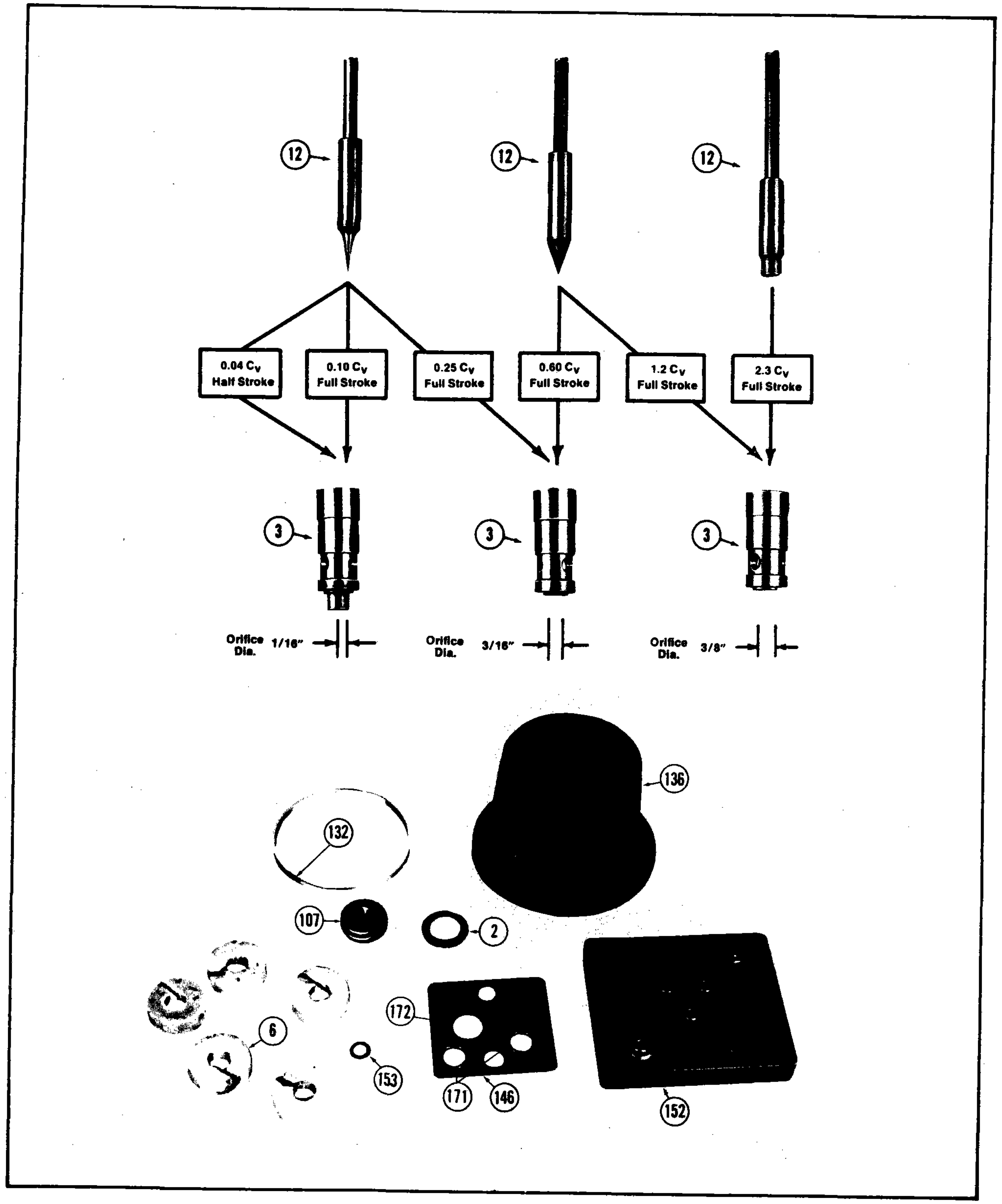




Detail
Limit Switches
(Optional)



Section A-A
(Larger Scale)



Line Bolting (optional)

Include serial number when ordering.

Ref. No.	Description	Material	Part Number: ANSI Class 150 ND 10-40	Qty.	ANSI Class 300-600 ND 64-160	Qty.	ANSI Class 900-1500	Qty.	ND-250	Qty.
166‡	Line Flange Stud	ASTM A193 GR B7	001247-548-066	4	001247-504-066	4	001247-377-066	4	001247-543-066	4
		ASTM A193 GR B8	001247-548-177	4	001247-504-177	4	001247-377-177	4	001247-543-177	4
167‡	Line Flange Nut	ASTM A194 GR 2H	971511-064-010	8	971511-066-010	8	971511-068-010	8	971511-067-010	8
		ASTM A193 GR B8	971511-064-158	8	971511-066-158	8	971511-068-158	8	971511-067-158	8

‡Not shown.

Limit Switch (optional)

Include serial number when ordering.

Ref. No.	Description	Remarks	Material	Part Number	Qty.
159	Switch	Standard	Various	971942-024-888	2
		Intrinsically Safe	Various	971942-023-888	2
160	Pan Head Screw		Stainless Steel	971287-017-250	4
161	Washer		Stainless Steel	971502-017-250	4
162	Nut		Stainless Steel	971511-006-250	4
163	Wire	White W/Black 24" Long	Plastic Coated Copper	974040-008-888	1
		White W/Red 24" Long	Plastic Coated Copper	974040-009-888	1
		Red 24" Long	Plastic Coated Copper	974040-002-888	1
		Black 24" Long	Plastic Coated Copper	974040-001-888	1
164	Terminal		Tinned Copper	974033-005-888	4
165	Stick On Logo		Plastic	983758-003-779	1

Valve Body

Include serial number when ordering.

Ref. No.	Description	Remarks	Qty.	Part Number: 316 Stainless Steel Construction	Alloy 20 Construction	Monel Construction	Hastelloy C Construction
1	Pipe Plug		1	005961-004-163	005961-004-230	005961-004-539	005961-004-572
2●	Seat Ring Gasket		1	009191-743-779	009191-758-967	009191-758-967	009191-758-967
3	Seat Ring	C_V=1.2 or 2.3	1	029000-140-213	029000-140-230	029000-140-733	029000-140-572
		C_V=.25 or .60	1	029000-143-213	029000-143-230	029000-143-733	029000-143-572
		C_V=.04 or .10	1	029000-144-213	029000-144-230	029000-144-733	029000-144-572
4	Seat Ring Retainer		1	029000-180-215	029000-180-230	029000-180-733	029000-180-572
5	Packing Spacer		1	029000-190-163	029000-190-230	029000-190-732	029000-190-572
6●	Packing	Crane No. 285	5	005675-615-966	005675-615-966	005675-615-966	005675-615-966
7	Packing Flange Stud		2	001247-552-177	001247-552-177	001247-552-177	001247-552-177
8(8A)	Packing Flange Stud Nut	8A as Mounting Nut	4	971511-011-158	971511-011-158	971511-011-158	971511-011-158
9	Packing Follower		1	029000-200-152	029000-200-230	029000-200-732	029000-200-572
10	Packing Flange		1	300239-000-003	300239-000-153	300239-000-153	300239-000-153
11	Safety Pin		1	435003-270-163	435003-270-230	435003-270-732	435003-270-572
12	Plug and Stem S/A	C_V=2.3	1	029000-100-596	029000-112-230	029000-109-733	029000-106-572
		C_V=.04, .10 or .25	1	029000-101-596	029000-113-230	029000-110-733	029000-107-572
		C_V=.60 or 1.2	1	029000-102-596	029000-114-230	029000-111-733	029000-108-572
13	Valve Body	ANSI Class 150 to 1500	1	029000-010-163	029000-010-230	–	029000-010-572
		ANSI Class 300 and 600	1	–	–	029000-011-732	–
		ANSI Class 900 and 1500	1	–	–	029000-012-732	–
16	Stop	Use Only with .04 C_V	1	029000-240-163	029000-240-230	029000-240-733	029000-240-572

● Recommended spare part.

Representative Parts List For 29000 Series Control Valves

Actuator

Include serial number when ordering.

Ref. No.	Description	Remarks	Material	Part Number	Qty.
101	Grommet Plate		Aust. St. St.	029100-110-250	1
102	Spring Button		Aust. St. St.	029100-120-250	1
103	Nut		Aust. St. St.	971512-012-250	1
104	Clevis		AISI 1010 to 1025	029100-070-002	2
105	Pivot Pin		17-4PH	029100-101-215	2
106	Spring		302 Aust. St. St.	000041-173-151	1
107●	Grommet		Buna-N	971913-008-680	1
108	Actuator Bracket		AA Mo. 38.0	029100-004-609	1
109	Cover Screw		Aust. St. St.	971349-007-250	2
110	Cover		Lexan	029100-010-707	1
111	Cap Screw		Aust. St. St.	971002-015-250	2
112	Retainer Clip		Aust. St. St.	051324-001-250	6
113	Lever Arm		Aust. St. St.	029100-080-250	1
114	Force Balance Spring	Full Stroke — 3-15, 6-30, 3-27 Ranges	ASTM A228	004171-115-048	1
		Full Stroke — 3-9, 9-15 Ranges	ASTM A228	004171-116-048	1
		Half Stroke — 3-15, 6-30, 3-27 Ranges	ASTM A228	004171-117-048	1
		Half Stroke — 3-9, 9-15 Ranges	ASTM A228	004171-115-048	1
115	Spring Clamp		Aust. St. St.	029100-020-250	1
116	Take-up Screw		Aust. St. St.	971442-012-250	1
117	Locknut		Aust. St. St.	971512-009-250	1
118	H/W Locknut		Gen. Aust. St. St. and Nylon	971543-002-888	1
119	H/W Bushing		Nylon	029100-150-690	1
120	Handwheel		Various	029100-130-888	1
121	Handwheel Lock		Aust. St. St.	029100-140-250	1
122	Lever Arm Stop		Wakefield AL 39C	029100-090-319	1
123	Cover Plug		Polystyrene	971589-013-701	1
124	Take Off Pin		17-4PH	029100-100-215	1
125	Locknut		Aust. St. St.	971514-002-250	1
126	Indicator		Aust. St. St.	029100-160-250	1
127	Indicator Plate	Full Stroke — All Ranges	Polystyrene	029100-170-701	1
		Half Stroke — .04C_v	Polystyrene	029100-173-701	1
128	Piston Rod		ASTM A193 GR B8	001247-550-177	1
129	Indicator Plate Screw		Aust. St. St.	971262-004-250	2
130	Speed Nut		Aust. St. St.	971549-001-250	2
131	Piston		AA Mo. 38.0	029100-034-609	1
132●	Piston Ring		Teflon	029100-040-940	1
133	Serial Plate Screw		Aust. St. St.	971335-002-250	2
134	Small Flow Rate Spring		ASTM A229 CL A1	000041-174-009	1
135	Serial Plate	316 St. St. Valves	304 Aust. St. St.	029100-172-153	1
		Other Materials	304 Aust. St. St.	029100-171-153	1
136●	Diaphragm		Buna-N with Dacron	029100-050-716	1
137	Diaphragm Cover		AA Mo. 38.0	029100-060-609	1
138	Elbow		Brass	311110-000-457	2
139	Cover Cap Screw		Aust. St. St.	971000-011-250	4
140	Tubing		Aust. St. St.	051427-008-250	1
141	Positioner Screw		ASTM A307	971002-015-110	2
142	Output Gauge		Various	435100-073-888	1
143	Instrument Gauge	3-15 psig	Various	435100-077-888	1
		6-30 psig	Various	004397-027-888	1
144	Manifold Block		ASTM A211 AL2024-T4	029100-180-621	1
145	Shim		Brass	317377-000-400	1
146●	Gasket	Includes "O" Rings 171 & 172	Various	349279-110-888	1
147	Block		Aluminum	349189-000-600	1
148	Flathead Screw		Aust. St. St.	971237-013-250	2
149	Binding Head Screw		Aust. St. St.	971283-003-250	1
150	Lockwasher		ASTM A307	971504-002-110	1
151	Spring Bracket		302 Aust. St. St.	021100-036-151	1
152●	Positioner Diaphragm S/A	Includes Split Range All Strokes — 3-15, 3-9, 9-15 Ranges	Various	349188-110-999	1
		All Strokes — 6-30, 3-27 Ranges	Various	021100-212-999	1
153●	O-Ring		Buna-N	971886-150-680	1
154*	Spring	All Strokes — 3-15, 6-30, 3-27 Ranges	ASTM A229	000041-175-130	1
		All Strokes — 3-9 Range	ASTM A229 CL A1	000041-172-009	1
		All Strokes — 9-15 Range	ASTM A229 CL A1	000041-171-009	1
155†	Sleeve		303 Aust. St. St.	021100-011-152	1
156†	Spool		17-4PH	021100-051-215	1
157†	Spring		302 Aust. St. St.	000040-168-151	1
158	Spring		ASTM A228	000040-169-048	1
168	Cover Washer		Nylon	971500-001-690	2
169‡	Thru-Bolt Template		Polystyrene	029000-210-701	2
170‡	Signal Decal		Various	348827-000-779	1
171●	"O" Ring	See Item 146	Buna-N	971886-021-680	2
172●	"O" Ring	See Item 146	Buna-N	971886-102-680	1

● Recommended spare part.
† Supplied only as a complete sub-assembly, includes 155, 156 and 157.
* Used only for split range.
‡ Not shown.

MASONEILAN 3051 E PSI

79.8.3 D/P

Material Identification Table

The following table is provided to simplify the identification of materials used in the construction of the valve. The last three digits of any given part number indicate the material used.

Material Code	Material	ASTM Designation
002	Carbon Steel	AISI 1010 to 1025
003	Carbon Steel	A668 CL B
009	Carbon Steel (Oil tempered)	A229 CL AI
010	Carbon Steel	A194 GR 2H
048	AISI 1075 to 1095 Carbon Steel	A228
066	Chrome Moly Alloy	A193 GR B7
110	Carbon Steel	A307
130	Carbon and Alloy Spring Steel	Varies
151	302 Austenitic Stainless Steel	A313-A167 TY302
152	303 Austenitic Stainless Steel	A582 TY303
153	304 Austenitic Stainless Steel	A351 GR CF8
158	304 Austenitic Stainless Steel	A194 GR 8
163	316 Austenitic Stainless Steel	A351 GR CF8M
177	304 Austenitic Stainless Steel	A193 GR B8 CL 1
213	17-4PH	A564 GR 630 ACI CB 7 Cu
215	17-4PH Casting	A564 GR 630 ACI CB 7 Cu
230	Alloy 20	A351 Gr Cn 7M B473
250	General Austenitic Stainless Steel	Varies
319	Iron Nickel Copper Alloy	Wakefield Alloy 39C
400	General Brass	Varies
457	C.A. No. 377 Forging Brass	B124 AL. 377
572	Hastelloy C	A494 GR Cu-12M-1
596	No. 6 Stellite on 316 St. St.	#6 Stellite on ASTM A276/A479 TY316
600	Aluminum	Varies
609	A A Mo. 380.0	B85 AL SC 84B
621	Alloy 2024-T4	B211
680	Nitrile (Buna N)	D1418 Class 1 N BR
690	Nylon	Varies
701	Plastic	Varies
707	Lexan	Varies
716	Buna-N with Dacron Fabric	None
732	Monel 400	B164 CL A
733	Monel K-500	SAE AMS-4676
779	316 Austenitic Stainless Steel with Grafoil	None
888	Various (consists of sub-assemblies)	Various
940	Teflon	D1457
966	Crane No. 285	None
967	Glass Filled Teflon	None
999	Various (consists of sub-assemblies)	Various

Masoneilan Masoneilan International, Inc. ▪ Norwood, Massachusetts 02062, U.S.A.

Corporate Offices, General Sales Office and Norwood Plant:
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Telephone: (617) 762-4600; TWX: 710-336-0705; Telex: 92-4410;
Cable: MASONICA

Montebello Annin Plant:
1040 South Vail Ave., Montebello, Calif. 90640
Telephone: (213) 723-9351; Telex: 674-634;
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Printed in U.S.A.

4.8.11 N_2 Pressure Regulator -2

4.8.11.1

Identification Tag Number	Description
PCV-2013	N_2 Pressure Regulator -2

4.8.11.2 Description

Manufacturer	:	Fisher Controls Co., Marshalltown, Iowa 50158
Part Number	:	630-8005
Rocketdyne Specification No.	:	SP42-010 (following)
Material	:	Body: Carbon Steel
Weight	:	25 lb.

4.8.11.3 Prescribed Service

GN_2 , 600 psig, 113°F

4.8.11.4 Vendor

Fisher Controls Co., Marshalltown, Iowa 50158

4.8.11.5 Special Cautions

See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.11.6 Periodic Service

None

4.8.11.7 Parts List

See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.11.8 Special Tools

None

4.8.11.9 Maintenance Instructions

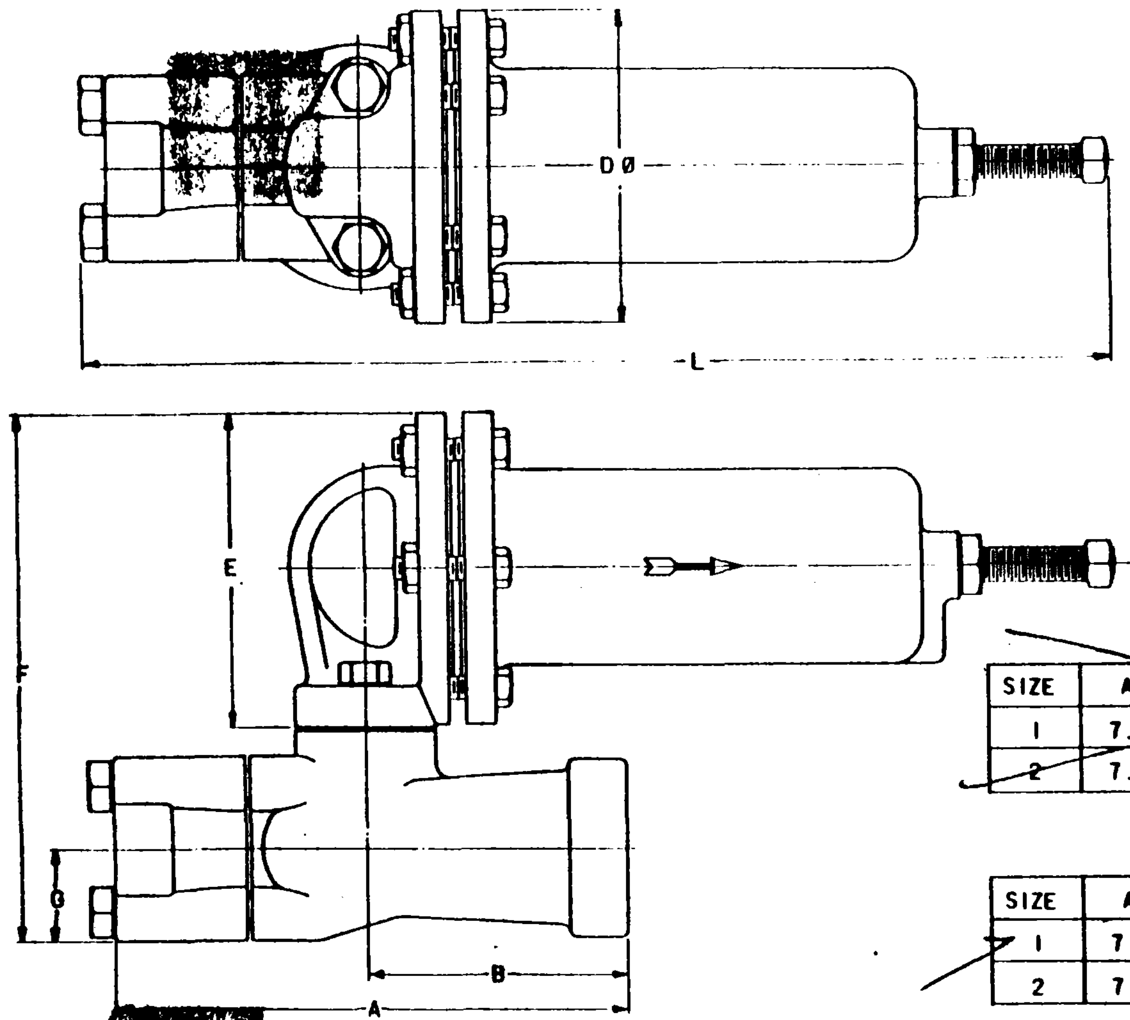
See Fisher instruction manual 630 series (paragraph 4.8.10.11)

4.8.11.10 Acceptance Tests

None

FEAT ES PICTORIALLY TYPICAL-ORIENTATION MAY DI ER

4.8.11-2



HIGH PRESSURE DIAPHRAGM ASSEMBLY

SIZE	A	B	DØ	E	F	G	L
1	7.38	3.69	4.62	4.69	7.81	1.38	15.88
2	7.88	3.94	4.62	4.69	8.44	2.00	16.38

LOW PRESSURE DIAPHRAGM ASSEMBLY

SIZE	A	B	DØ	E	F	G	L
1	7.38	3.69	7.12	7.19	10.31	1.38	15.38
2	7.88	3.94	7.12	7.19	10.94	2.00	15.88

CUSTOMER	P.O. NO.	JOB NO.	TAG NO.
Rocketdyne Division Rockwell Int'l Corp	R02 CAA454146		RNPR-2

REQN NO.	SERIAL NO.	OUR NO.	DIMENSIONS CERTIFIED CORRECT
	7802196	22-49537	DATE 7-2-80 BY Mendenhall

FISHER Controls
MARSHALLTOWN, IOWA

"BIG JOE" FIELD REGULATOR

TYPE 630

DWN R.M. 4-28-41
CHKD aef 4-28-41
APVD

SCALE-NONE

REVISIONS
B KSO 6-27-68
C GEK 5-16-79

DWG NO. X541

REV. C

PREPARED BY	FSCM NO. 02602	NUMBER SP42-010
G. J. KRALL	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rocketdyne Division**	DATE 3-6-80
E C Spencer 3/7/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 11-29-80
F G Absalom 3/7/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 2

TITLE

NITROGEN REGULATOR, LOW PRESSURE

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specficiations. Deviaions shall be approved in writing by Rocketdyne Engineering.

FORM R 131-H-1 REV. 2-78

(ϕ - INDICATES CHANGE)

NUMBER	REVISION LETTER	PAGE
SP42-010	A	2

TAG NUMBER:	RNPR-2 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	PRESSURE REDUCING
CONNECTIONS:	1 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH CONNECTIONS AND LINE FLUID
LINE FLUID:	GN_2
MAXIMUM INLET PRESSURE AND TEMPERATURE:	600 PSIG @ 113 F
Ø REGULATED PRESSURE:	10 ± 2 PSIG, ADJUSTABLE 8 TO 20 PSIG
FLOW CAPCAITY:	75 SCFM @ 400 PSIG INLET AND 10 PSIG OUTLET
ANSI RATING:	300 LB CLASS
AMBIENT TEMPERATURE:	16 TO 113 F
INTERNAL LEAKAGE:	10 CC/MIN
EXTERNAL LEAKAGE:	NONE VISIBLE
CLEANING AND PACKAGING:	SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.

4.8.12 Heater Steam Warmup Pressure Regulator

4.8.12.1 Identification Tag Number

Identification Tag Number	Description
PCV-3207	Heater Steam Warmup Pressure Regulator - 1
PCV-3307	Heater Steam Warmup Pressure Regulator - 2

4.8.12.2 Description

Manufacturer	:	Masoneilan International Inc., Montebello, Ca. 90640
Part Number	:	2911
Rocketdyne Specification No.	:	SP42-011 (following)
Material	:	Body: 304 Stainless Steel
Weight	:	28 lb.

4.8.12.3 Prescribed Service

Steam, 1550 psig, 675°F

4.8.12.4 Vendor

Masoneilan International Inc., Montebello, Ca. 90640

4.8.12.5 Special Cautions

None

4.8.12.6 Periodic Service

None

4.8.12.7 Parts List

See Masoneilan Instructions 2033E, 3051E, and 3051E PSI (paragraph 4.8.10.11)

4.8.12.8 Special Tools

None

4.8.12.9 Maintenance Instructions

See Masoneilan Instructions 2033E, 3051E, and 3051E PSI (paragraph 4.8.10.11)

4.8.12.10 Acceptance Tests

None

FOR: ROCKETDYNE DIV of ROCKWELL INTERNATIONAL CORP. OUR REFERENCE: AF242-1-1 & 1-2 BY: D. De Grido DATE: May 22, 1980

CUST. P.O.# R-02EAA454242 ITEM NO: 1 TAG NO: THSWPR-1 & THSWPR-2

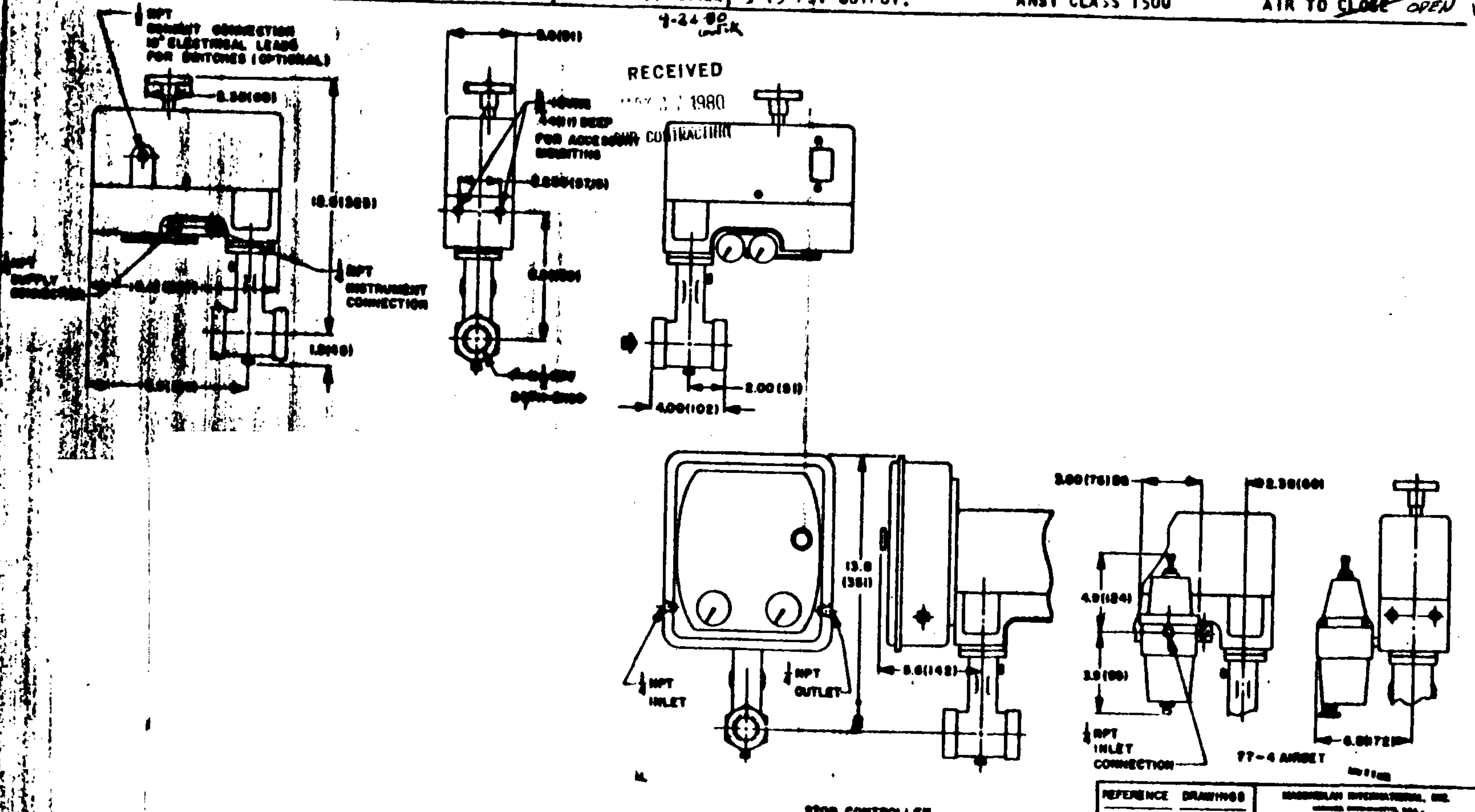
SIZE: 1" MODEL: 29111 MATERAL: ASTM A351-CF8M CONNECTIONS: SOCKETWELD

ACCESSORIES: 1. 2705, DIR ACTING, 316 S.S. BOURDON 0-1500 PSI RANGE ~~BRONZE BOURDON, 0-200 PSI RANGE~~, 3-15 PSI OUTPUT. ANSI CLASS 1500 AIR TO ~~CLOSE~~ OPEN per Telecon w/ Tom Bord 5/28/80

4-24-80

RECEIVED

1980



REFERENCE DRAWINGS	
MAGNETROL INTERNATIONAL, INC.	
29,000 SERIES MICROPAK	
C	029000-920

THIS PRINT FOR DIMENSIONAL PURPOSES ONLY.

THIS PRINT CERTIFIED CORRECT. SEE FACTORY ACKNOWLEDGEMENT FOR SPECIFICATIONS.

4.8.12-2

PREPARED BY	FSCM NO. 02602	NUMBER SP42-011
M. J. Ivary	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rocketdyne Division**	DATE 7-28-80
E G Spencer 7/29/80	Canoga Park, California	SUPERSEDES SPEC. DATED: 1-10-80
J. G. Absalom 7/29/80	**SPECIFICATION**	REV. LTR. A — PAGE 1 of 2

TITLE

BLANKET STEAM REGULATOR

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THSWPR-1, THSWPR-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	PRESSURE REDUCING
CONNECTIONS:	SOCKETWELD TO 1" SCH. 80 PIPE (ASTM A106 GRADE B)
MATERIALS:	COMPATIBLE WITH CONNECTIONS AND LINE FLUID
LINE FLUID:	STEAM
MAXIMUM ALLOWABLE WORKING PRESSURE AND TEMPERATURE:	1550 PSIG @ 675°F
REGULATED PRESSURE:	785 PSIG
ANSI RATING:	1500 LB. CLASS
FLOW CAPCITY:	281 LBS/HR @ 1450 PSIG, 650° INLET, 785 PSIG OUTLET
AMBIENT TEMPERATURE:	16° TO 113°F
INTERNAL LEAKAGE:	50 CC/MINUTE
EXTERNAL LEAKAGE:	NONE VISIBLE
CLEANING AND PACKAGING:	SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.
DESIGN FEATURE:	VALVE SHALL BE SERVICEABLE WITHOUT REMOVAL FROM THE LINE.

4.8.13 Ullage Nitrogen Pressure Regulator - 1

4.8.13.1

Identification Tag Number	Description
PCV-4004	Ullage Nitrogen Pressure Regulator - 1

4.8.13.2 Description

Manufacturer:	Fisher Controls, Marshalltown, Iowa
Part Number:	Y-600
Rocketdyne Specification No.:	SP42-125 (following)
Material:	
Weight:	30 lb.

4.8.13.3 Prescribed Service

GN_2

4.8.13.4 Vendor

Fisher Controls

4.8.13.5 Special Cautions

See Fisher Bulletin 71.3: Y-600

4.8.13.6 Periodic Service

None

4.8.13.7 Parts List

None

4.8.13.8 Special Tools

None

4.8.13.9 Maintenance Instructions

None

4.8.13.10 Acceptance Tests

None

FISHER Controls

Instruction Manual

Y600 Series Gas Service Regulators

Form 1389, November 1976

WARNING

Regulators should be installed, operated, and maintained in accordance with federal, state, and local codes, rules and regulations, and Fisher instructions.

If the regulator vents gas or a leak develops in the system, it indicates that service is required. Failure to take the regulator out of service immediately may create a hazardous condition.

Call a serviceman in case of trouble. Only a qualified person must install or service the regulator.

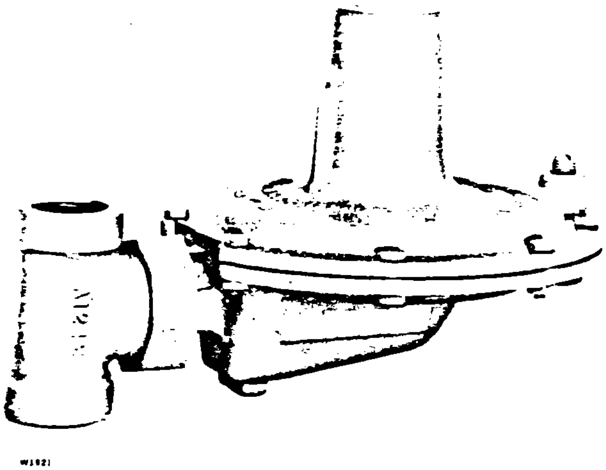


Figure 1. Type Y600-2 Gas Regulator

INTRODUCTION

Regulators of the Y600 Series may be applied as shutoff valves, pressure reducing valves, switching valves, relay or pressure loading valves, or monitoring regulators. Basic construction variations are described in the listing below and tabulated in table 1. A typical Type Y600-2 is shown in figure 1.

Type Y600-2—Spring-loaded regulator with cast iron body

Type Y600-3—Same as Type Y600-2 but with Type Y602-1 rainproof vent installed in lower casing

Type Y600-4—Same as Type Y600-2 but with internal relief valve and Type Y602-2 stabilizer vent installed in lower casing

Type Y600-5—Same as Type Y600-4 but with vent tap in upper casing and Type Y602-2 stabilizer vent for use at end of vent piping

Type Y600-6—Same as Type Y600-2 but with low-pressure safety shut-off valve

Type Y600-7—Same as Type Y600-6 but with Type Y602-1 rainproof vent installed in lower casing

Type Y600-8—Same as Type Y600-2 but with internal relief valve, low-pressure safety shut-off valve, and Type Y602-2 stabilizer vent installed in lower casing

Type Y600-9—Same as Type Y600-8 but with vent tap in upper casing and Type Y602-2 stabilizer vent for use at end of vent piping

Type Y600-10—A specially constructed unit with tight tolerances in and around the stem to provide a calibrated bleed around the stem to minimize hysteresis. It is operated by a downstream control line which must be adequately sized so that bleed around the stem will not cause improper pressure buildup under the diaphragm. Lower casing is tapped 1/2-inch NPT for control line connection.

Type Y600-11—Lower casing tapped 1/2-inch NPT for downstream control line, O-ring stem seal to prevent bleed or leakage around the stem, and vent tap in upper casing

Type Y600-12—Same as Type Y600-2 but with handwheel adjustment

Type Y600-13—Same as Type Y600-12 but with internal relief valve and Type Y602 stabilizer vent

Type Y600-14—Same as Type Y600-2 but with sealed handwheel adjusting screw for use when pressure-loading the spring case

Type Y600-15—Monitoring pilot used on a monitoring system; spring-loaded back disc allows quick bleed of the working pilot and main regulator

Table 1. Y600 Series

Construction Variations	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15
Standard with Pitot Tube	X	X	X	X	X	X	X	X			X	X	X	
Control Line Connection in Lower Casing, Special Neck									X					X
Y602-1 Vent (Lower Casing)		X				X								
Y602-2 Vent (Lower Casing)			X				X					X		
Y602-2 Vent (Upper Casing)				X				X						
Internal Relief			X	X			X	X				X		
Low Pressure Safety Shutoff					X	X	X	X						
O-Ring Stem Seal										X				
Handwheel											X	X	X	
Quick Bleed														X

INSTALLATION

Uncrate and inspect the regulator to see that the inside of the body is clean. Be sure the installation location is adequately protected from damage by vehicles and other external sources. The operating temperature range is −20°F to 150°F.

Blow out all pipelines to remove pipe scale and chips. Coat the male threads with a good grade pipe compound.

Install the unit using accepted piping practice. The regulator may be installed in any position as long as the flow through the body is in the direction indicated by the arrow cast on the body. If continuous operation is required during inspection or maintenance, install a three-valve bypass around the regulator.

WARNING

When a Y600 Series regulator with internal relief (Y600-4, -5, -8, -9) is used on hazardous gas applications, be sure the gas is vented to a safe location. Install a remote vent line to carry the gas to a well-ventilated area, if necessary. Failure to properly vent gas could cause personal injury due to noxious or explosive conditions created by the accumulation of the vented gas.

Be certain that the vent or pipe tap in the casing assembly is not positioned so that it can collect moisture which may drain into the casing assembly. The casing assembly may be rotated to any of four positions in order to obtain correct positioning. Follow the steps below to rotate the casing assembly. Key numbers refer to figures 5 and 6.

1. Loosen the union nut (key 19) and separate the body from the casing assembly. (The pitot tube assembly, key 76, if present, extends into the outlet of the body, so the casing assembly must be tipped toward the body outlet.)

2. Remove the four machine screws (key 77) and reposition the pitot tube so that it will extend into the body outlet and pipe the vent assembly (key 64, if present) so that it will be pointed downward when the unit is reassembled.

3. Reassemble the unit with the casing assembly in the desired position. Note that the groove pin must fit into one of four slots cut in the body threads. Make sure that the body gasket (key 16) and split ring (key 17) are in place and tighten the union nut.

Overpressure Protection

WARNING

Overpressuring any portion of this equipment may cause damage to regulator parts, leaks in the regulator, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas. Inspect the regulator for damage after any overpressure condition.

As is the case with most regulators, the Y600 Series regulators have an outlet pressure rating that is lower than the inlet pressure rating. Some type of overpressure protection is needed if the actual inlet pressure can exceed the maximum operating outlet pressure of the regulator or the inlet pressure ratings of other downstream equipment. Methods of overpressure protection include relief valves, series regulation, and monitoring regulation.

Table 2. Specifications

BODY SIZES	■ 3/4 inch ■ 3/4 inch x 1 inch ■ 1 inch ■ 1 inch x 1-1/4 inch ■ 1-1/4 inch		Disc Assembly—Brass and Nitrile O-Rings—Nitrile
BODY CONNECTIONS	■ 3/4-inch ■ 1-inch ■ 1-1/4-inch NPT	**MAXIMUM INLET PRESSURE**	150 PSIG
SPRING CASE CONNECTION	1/4-inch NPT	**OUTLET PRESSURE RANGE**	1 inch w.c. to 7 PSIG (spring loaded) 3 inches w.c. to 15 PSIG (pressure loaded)
LOWER CASING CONNECTION	■ 1/4-inch NPT ■ 1/2-inch NPT for Y600-10 and Y600-11	**MAXIMUM EMERGENCY OUTLET (CASING) PRESSURE**	20 PSI
CONSTRUCTION MATERIALS	Body—Cast Iron Diaphragm Casings—Cast Iron Diaphragm—Nitrile Valve Stem—Brass Seat Ring—Brass	**OPERATING TEMPERATURE RANGE**	−20°F to 150°F

The maximum inlet pressure for the Y600 Series is 150 psig. The maximum operating outlet pressure is 7 psig for spring loading and 15 psig for combination (spring and pressure) loading. Maximum emergency casing pressure is 20 psig.

Outlet pressures more than 2 psi over the set point of the regulator may damage internal parts such as the lever and diaphragm plate.

To Place into Operation

With all units except those with a low-pressure safety shut-off construction (Types Y600-6, -7, -8, and -9), the unit can be placed in operation by slowly introducing inlet pressure. The regulator will take control when downstream pressure is established. When placing a unit with a low-pressure safety shut-off valve into operation, lift the reset stem (key 36, figure 6) to open the regulator about half-way and hold it open until downstream pressure is established to operate the regulator. If the reset stem is lifted to its limit, flow will be shut off by the main control disc, preventing the build-up of downstream pressure necessary to operate the regulator.

Adjustments

The regulator has been adjusted at the factory to provide approximately the reduced pressure requested on the order. In spring-loaded units, the pressure setting may be adjusted to a value within the spring range shown in table 3. Note that units with a low-pressure safety shut-off valve (types Y600-6, -7, -8, and -9) have a higher range due to the valve spring (key 41). To adjust the pressure setting refer to figure 5 and follow the steps below.

1. Remove the closing cap (key 3).

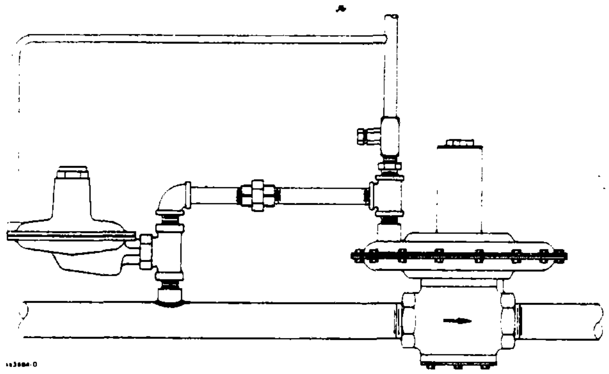


Figure 2. Typical Installation of a Type Y600 Used to Pressure Load a Type 66 Gas Regulator

2. Use a broad-bladed screwdriver or a 1-inch hex rod to turn the adjusting screw (key 2) either clockwise to increase outlet pressure or counterclockwise to decrease outlet pressure.

Types Y600-12, -13, and -14 with a handwheel (key 2A, figure 7) are adjusted by loosening the locknut (key 2E, if present) and turning the handwheel clockwise or counterclockwise.

Units with a safety shut-off valve will require the use of a hollow hex driver to fit over the reset stem (key 36, figure 6) or a screwdriver.

3. After making the adjustment and replacing the closing cap, the closing cap can be wired to the spring case assembly (key 23) to discourage tampering.

Table 3. Spring Data

Range of Single-Ported Soft-Seated Units*	Range of Safety Shut-Off Units*	Color Code	Main Spring Part Number	Relief Valve Opening Point Above Set Point†
1" to 3" w.c.‡	...	Pink	1B5584 27212	11" to 17" w.c.
1.3" to 4.6" w.c.‡	...	Orange	1B5585 27052	11" to 17" w.c.
3" to 8" w.c.‡	7" to 12" w.c.	Red	1B6538 27052	11" to 17" w.c.
3-1/2" to 6" w.c.‡	6" to 8" w.c.	Purple	1D8030 27052	11" to 17" w.c.
5-1/2" to 8" w.c.‡	7-1/2" to 10-1/2" w.c.	Brown	1B8387 27052	11" to 17" w.c.
5" to 15" w.c.‡	7-1/2" to 19" w.c.	Olive Drab	1B6539 27022	11" to 17" w.c.
11" to 28" w.c.‡	15" to 37" w.c.	Yellow	1B5370 27052	11" to 17" w.c.
1 to 2-1/2 psi	1.3 to 3 psi	Lt. Green	1B5371 27022	1/2 to 1-1/2 psi
2-1/4 to 4-1/2 psi	3 to 5 psi	Lt. Blue	1B5372 27022	1/2 to 1-1/2 psi
4-1/2 to 7 psi	5 to 7 psi	Black	1B5373 27052	1/2 to 2 psi

*With the regulator in the spring-case-down position, a light diaphrgam head will lower the pressure setting 0.6 in. w.c.; a heavy diaphragm head will lower the low pressure setting 1-1/4 in. w.c.

†The range shown indicates unit-to-unit variations. A given unit will relieve at a more consistent value.

‡The upper limit of this range will be about 3 in. w.c. less than shown for the Type Y600-15.

PRINCIPLE OF OPERATION

In all types of the Y600 Series, downstream pressure registers under the diaphragm. With some types, the registration is through a pitot tube (see figure 4) in the throat of the regulator; with other types, a downstream control line is connected to the lower casing. As the downstream pressure increases, the diaphragm lifts the lever, which moves the valve disc toward the seat ring to restrict flow. Some units have an internal relief valve, which is a spring-loaded assembly in the center of the diaphragm (see figure 6). If the downstream pressure increases after the main valve is closed (perhaps due to a nicked seat), the relief valve will open and vent gas into the upper casing where it will pass out the vent.

If the downstream pressure drops, the main spring forces the diaphragm down. This motion is transmitted through the lever, which pulls the valve disc open, allowing more gas to flow through the valve, the required gas is supplied to the downstream system and the reduced pressure is increased. If the downstream demand cannot be met and the regulator has a low pressure safety shut-off valve (see figure 6), the safety shut-off disc will stop flow completely by blocking the back side of the seat ring.

A Type Y600-15 regulator serves as a monitoring pilot and allows quick bleed of the working pilot and main regulator (see figure 3). When pressure under the diaphragm increases after the main disc is seated, the spring-loaded back disc opens and allows pressure from the working pilot and main regulator to bleed back through the throat of the monitoring regulator.

MAINTENANCE

Due to normal wear that may occur in regulators, parts such as the valve disc, seat ring, diaphragm, gaskets, and O-rings should be inspected and replaced as necessary. The possibility of damage from external sources, debris in the line, or overpressure conditions also exists. The regulator should be inspected periodically or after any unusual condition. The frequency of inspection and parts replacement depends upon the severity of service conditions or the requirements of state and federal laws.

Instructions are given below for disassembly and reassembly of the regulator. Key numbers are found in figures 5 and 6 unless otherwise noted.

WARNING

Before beginning maintenance procedures on the Y600 Series regulators, completely isolate the unit from system pressure. Release all pressure from the regulator. Failure to relieve pressure could result in personal injury due to an explosion of pressure-containing parts or sudden release of a compressed spring.

Disassembly

1. If the unit has a handwheel adjusting screw assembly (Type Y600-12, -13, and -14, figure 7), first loosen the hex nut (key 2E if present) and relieve the spring compression by turning the handwheel counterclockwise. On other units, remove the closing cap (key 3) and closing cap gasket (key 35). Turn the adjusting screw (key 2) with a 1-inch hex rod or broad-bladed screwdriver to relieve the spring compression. Units with a safety shut-off valve (figure 6) will require the use of a hollow hex driver to fit over the reset stem (key 36) or a screwdriver.

2. Remove the eight cap screws (key 21) and lift off the spring case assembly (key 23) and spring (key 1, figure 5). If the regulator has a relief valve, the relief valve spring and main regulator spring are connected to the diaphragm and diaphragm head assembly and can be removed when this unit is taken out of the lower casing.

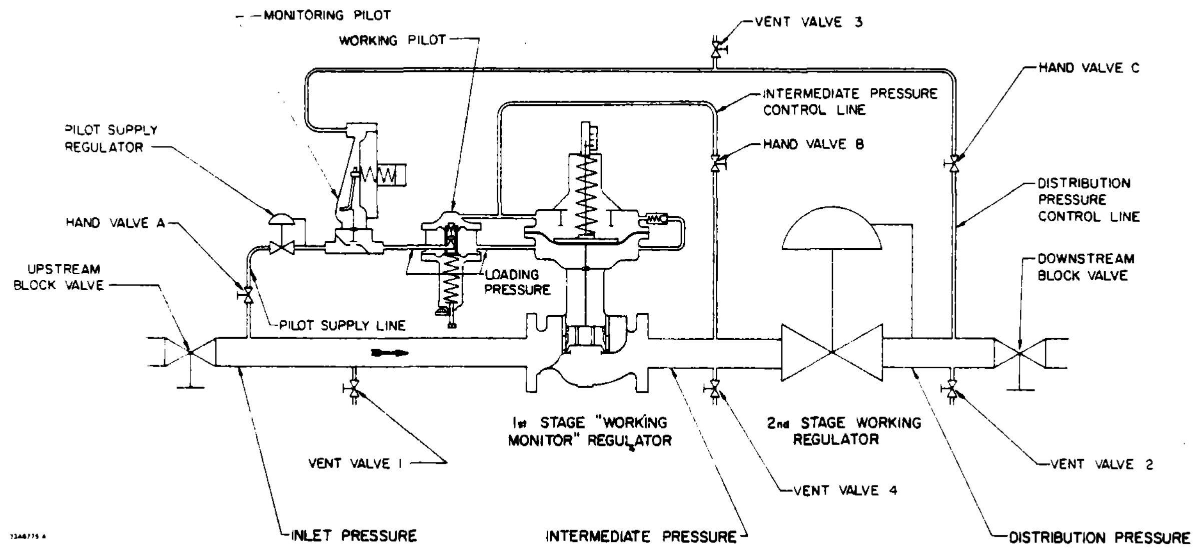


Figure 3. Monitoring System Installation—Type Y600-15 Regulator Used as the Monitoring Pilot

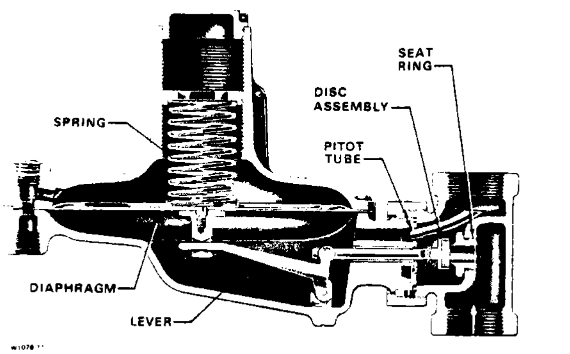


Figure 4. Interior View of Typical Y600 Series Regulator

3. Remove the diaphragm and head assembly (key 5) by tipping it so that the lever (key 9) will slip out of the pusher post (key 8, figure 5) or relief valve seat (key 33, figure 6).

4. The parts in the diaphragm and head assembly can be separated (and ordered separately) except those in Type Y600-4, -5, -8, and -9 regulators which have an internal relief valve. With internal relief construction (figure 6), the diaphragm is glued to the diaphragm head and must be ordered as an assembly (key 5, figure 6).

To disassemble the diaphragm assembly, unscrew either the cap screw (key 30, figure 5) in Types Y600-2, -3, -10, -11, -12, -14 and -15; the spring holder (key 30, not shown) in Types Y600-4, -5, and -13; or the reset stem (key 36, figure 6) in Types Y600-8 and -9.

5. To inspect the disc holder assembly (key 25) and seat ring (key 27), loosen the union nut (key 19), tip the lower casing (key 20) toward the outlet, and separate the lower casing from the body (key 28). Remove and inspect the body gasket (key 16).

Check the seat ring seating surface for nicks or chips which would cause leakage. The seat ring can be removed from the body by using a thin-wall socket.

Removing the cotter pin (key 14) permits removal of the disc holder assembly from the stem. Removing the cotter pin also permits removal of the bleed assembly (key 104), washer (key 105), spring (key 106), and O-ring (key 15) of the Type Y600-15 regulator.

6. Remove the shut-off disc holder assembly in the safety shut-off valve versions by unscrewing the body cap (key 38, figure 6) and pulling out the cotter pin (key 14, figure 6). The disc spacer (key 43, figure 6) is not part of the disc holder and may be removed from the disc holder for replacement if a new disc holder assembly is to be installed.

7. To check the O-ring (key 15, figure 8) in a Type Y600-11, remove the machine screws (key 11) from the lever so the valve stem (key 13) is not held captive by the lever. Slide the valve stem out of the lower casing and inspect the O-ring.

Reassembly

When reassembling the regulator, replace worn parts with new parts as necessary. Apply sealants and lubricants as indicated on the assembly drawings: "AS" = anti-seizing compound, "GK" = shellac sealer, "LS" = pipe thread sealant, "SP" = Staput* No. 14 (or an equivalent), "DC" = elastomer lubricant and sealant.

1. Put the stem O-ring of Type Y600-11 back onto the stem. Slide the stem into the lower casing and connect it to the lever. Replace the machine screws that hold the lever to the lower casing.

*Trademark of E.F. Houghton and Co.

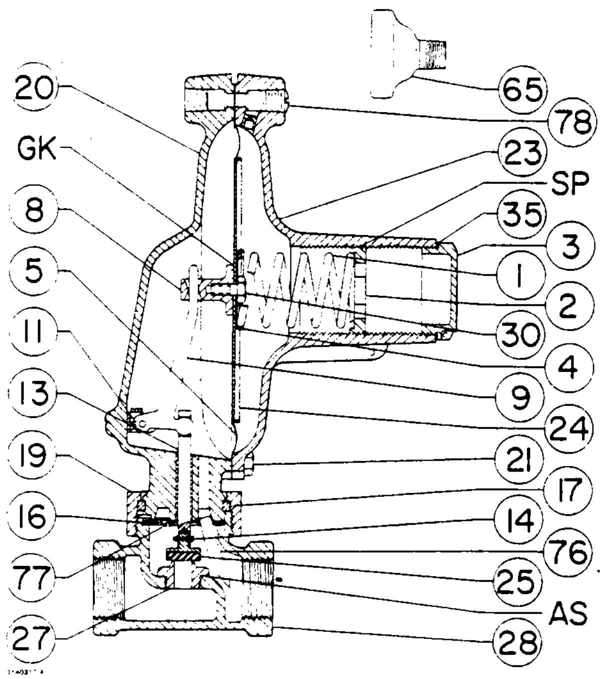


Figure 5. Type Y600-2 or -3 Regulator Assembly

2. Screw the seat ring back into the body.

3. On units with a low-pressure safety shut-off valve: Put the disc holder assembly and spacer onto the stem (key 40, figure 6). Replace the cotter pin (key 14, figure 6). Place the spring on the stem and slip the disc spacer through the seat ring. Screw on the body cap.

4. On a Type Y600-15 regulator, slide the bleed assembly, O-ring, washer, spring, and disc assembly onto the stem. Put the cotter pin through the disc assembly and the cut-away portion of the stem. On all other types, set the disc holder assembly on the stem and put in the cotter pin.

5. Place the body gasket and split ring on the body. Carefully set the lower casing on the body. Be sure the two halves of the split ring are properly positioned before tightening the union nut. Tighten the union nut.

6. Reassemble the diaphragm assembly if it has been taken apart. To return the diaphragm assembly to the lower casing, align the holes in the diaphragm with the cap screw holes in the lower casing and then slip the pusher post or relief valve seat onto the lever.

7. With the spring on the lower spring seat, put the upper spring case onto the lower spring case.

8. Screw in the cap screws finger-tight only. To assure proper slack in the diaphragm, turn the adjusting screw or handwheel clockwise to apply some spring force to the diaphragm. Finish tightening the cap screws.

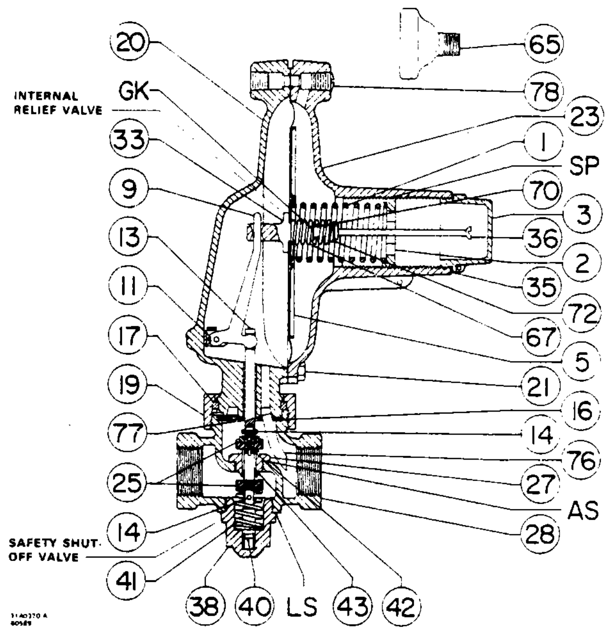


Figure 6. Type Y600-8 or -9 Regulator Assembly

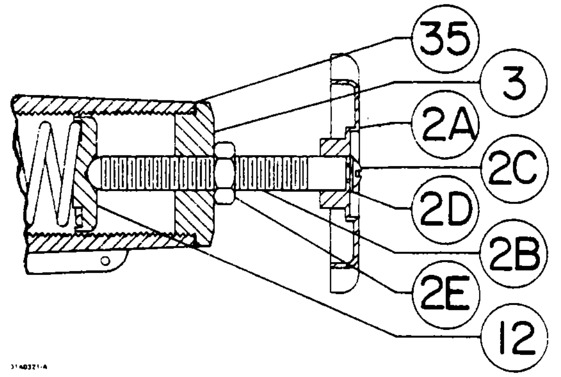


Figure 7. Types Y600-12, -13 or -14 Regulator Handwheel Assembly

9. Replace the closing cap gasket and closing cap if they have been removed.

10. Make adjustments as instructed in the "Adjustments" section. Refer to the "To Place into Operation" section to start up the regulator.

SERIAL NUMBER

Each regulator has the serial number, type number, spring range, and seat ring size stamped on its closing cap. Whenever corresponding with the Fisher sales representative, specify the serial number of the regulator. Be sure to state the complete eleven-character part number from the following parts list when ordering new parts.

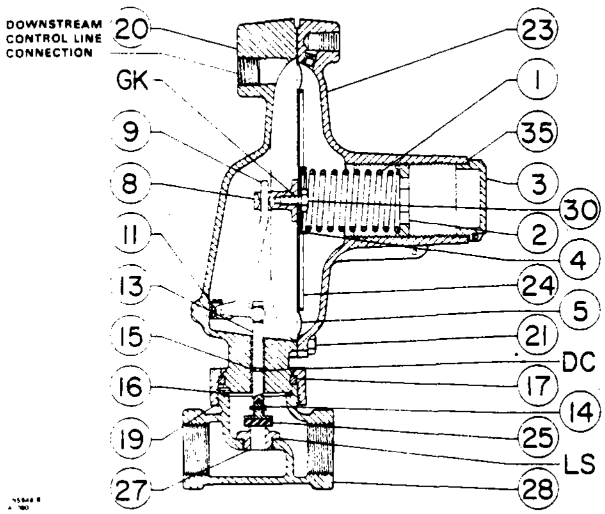


Figure 8. Type Y600-11 Regulator for External Control Line

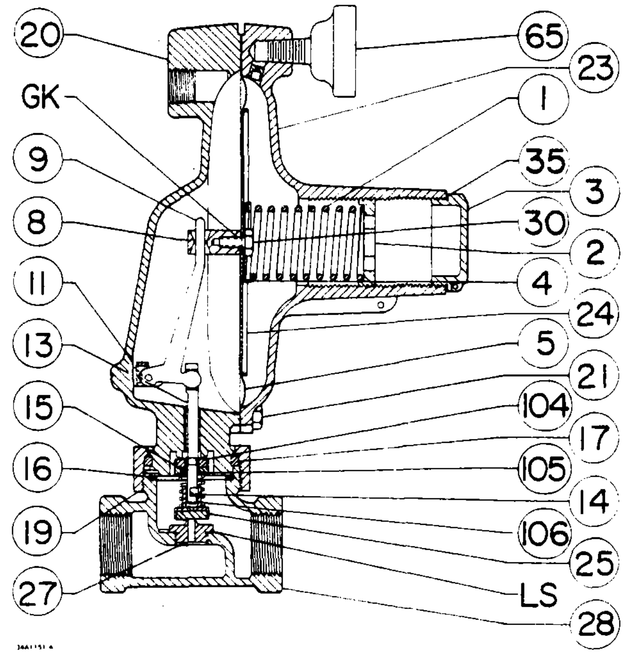


Figure 9. Type Y600-15 Pilot Assembly

PARTS LIST

Key	Description	Part Number
1	Spring, steel pl	
	Inches WC	
	1 to 3	1B5584 27212
	1.3 to 4.6	1B5585 27052
	3 to 12	1B6538 27052
	3.5 to 8	1D8030 27052
	5.5 to 10.5	1B8387 27052
	5 to 19	1B6539 27022
	11 to 37	1B5370 27052
	PSIG	
	1 to 3	1B5371 27022
	2.25 to 5	1B5372 27022
	4.5 to 7	1B5373 27052
2	Adjusting Screw, zinc	
	-2 thru -11, -15	1B5379 44012
2A	Handwheel, zinc	
	-12 & -13	1J4961 44012
	-14	1L2175 44992
2B	Handwheel Adjusting Screw, brass	
	-12 & -13	1J6128 14012
	14, SST, with spring:	
	11"-37" W.C.	1R4046 X0012
	1-3 PSIG	1R4047 X0012
	2.25-5 PSIG	1R4048 X0012
	4.5-7 PSIG	1R4049 X0012
2C	Machine Screw, steel pl	
	-12 & -13	1A8517 28982
	-14	1A3408 28992
2D	Lock Washer, steel	
	-12 & -13	1A3523 32992
	-14	1L4494 28982
2E	Hex Nut, steel Cd pl	
	-12 & -13	1L5078 24122
2F	O-ring, nitrile	
	-14 (not shown)	1D6875 06992
2G	Spring Seat Guide, SST	
	-14 (not shown)	1R4042 X0012
2H	Washer, nylon	
	-14 (not shown)	1R4043 X0012
2J	Groove Pin, SST	
	-14 (not shown)	1E2852 38982
3	Closing Cap	
	Aluminum	
	-2 thru -5, -10, -11,	
	& -15	1B5412 08012
	-6 thru -9	1B5416 44022
	Brass, -12 & -13	1A9261 14012
	SST, -14	1R4041 X0012
4	Lower Spring Seat, steel pl	
	-2, -3, -6, -7, -10, -11, -12,	
	-14 & -15	1B6363 25062
5*	Diaphragm, nitrile	
	-2, -3, -6, -7, -10, -11, -12, -14	
	& -15	1C9430 02072
5*	Diaphragm & Plate Assembly	
	Steel & nitrile	
	-4, -5, -8, -9 & -13	
	For springs	
	to 1.3 PSI	1B6425 X0012
	over 1.3 PSI	1B6424 X0012
8	Pusher Post, zinc	
	-2, -3, -6, -7, -10, -11, -12, -14	
	& -15	1A7966 44022
9	Lever Assembly	1B5375 000A2
11	Machine Screw, steel pl	
	(2 req'd)	1A3319 28982
12	Upper Spring Seat,	
	Steel, -12 & -13	1J6181 24092
	SST, -14	1R4044 X0012
13	Valve Stem	
	Brass	
	-11	1E3755 14012
	All others	1A8327 14012
	316 SST, -15	14A0634 X012
14	Cotter Pin	
	Brass, -6 thru -9 (2 req'd); All	
	others (1 req'd)	1A4040 18992
	Groove Pin, 303 SST	
	-15 (1 req'd)	1D7991 38992
15*	O-ring, nitrile	
	-11	1D2899 06992
	-15	1D1917 06992
16*	Body Gasket, asbestos	1A8325 04032
17	Split Ring, steel Cd pl	1A8326 48722
19	Union Nut	
	Malleable iron	1E4711 19062
20	Lower Casing Assembly, cast iron	
	-10	3D3533 X0012
	-11	3E3700 X0012
	-15	34A0637 X022
	All others	3D2909 000A2
21	Cap Screw, steel pl	
	(8 req'd)	1A3508 24052
22	Hex Nut, steel Cd pl	
	(8 req'd)	1E9853 24142
23	Spring Case Assembly	
	Cast iron	
	For springs to 1.3 PSI	
	-2, -3, -6, -7 & -12	1B6365 000A2
	-4, -5, -8, -9 & -13	1B6364 19042
	-10, -11, -15 & pressure	
	loaded -2 & -14	1B6365 X0072
	For 1 to 2.5 PSI springs	
	-2, -3, -6, -7 & -12	1U7561 X0012
	-4, -5, -8, -9 & -13	1U7561 X0112
	-10, -11 & -15	1U7561 X0062
	Pressure loaded	
	-2 & -14	12A2327 X012
	For 2.25 to 5 PSI spring	
	-2, -3, -6, -7 & -12	1U7562 X0012
	-4, -5, -8, -9 & -13	1U7562 X0112
	-10, -11 & -15	1U7562 X0062

* Recommended spare part.

Y600 Series

Key	Description	Part Number
23	Spring Case Assembly (Continued)	
	Pressure loaded	
	-2 & -14	12A2328 X012
	For 4.5 to 7 PSI spring	
	-2, -3, -6, -7 & -12	1U7563 X0012
	-4, -5, -8, -9 & -13	1U7563 X0112
	-10, -11 & -15	1U7563 X0062
	Pressure loaded	
	-2, -14	12A2329 X012
24	Diaphragm Plate, steel pl	
	-2, -3, -6, -7, -10, -11, -12, -14 & -15	
	For springs	
	to 1.3 PSI	004082 25062
	over 1.3 PSI	0Y0367 25062
25*	Disc Holder Assembly, brass & nitrile	
	-2 thru -5 & -10 thru -14	
	7/16" orifice & less	1A8328 000C2
	Over 7/16" orifice	1C4248 000C2
	-6 thru -9 (2 req'd)	1A8470 000A2
	-15	14A0632 X012
27	Seat Ring, brass	See following table
28	Body, cast iron	
	-2 thru -5 & -10 thru -15	
	3/4"	1D2911 19012
	3/4" x 1"	1D2914 19012
	1"	1D2912 19012
	1" x 1-1/4"	1D2915 19012
	1-1/4"	1D2913 19012
	-6 thru -9	
	3/4"	1D3124 19012
	3/4" x 1"	1D3127 19012
	1"	1D3125 19012
	1" x 1-1/4"	1D3128 19012
	1-1/4"	1D3126 19012
30	Cap Screw, steel pl	
	-2, -3, -10, -11	
	-12, -14 & -15	1A3090 24052
30	Spring Holder, brass	
	-4, -5 & -13	1C3231 14012
33	Relief Valve Seat, zinc	
	-4, -5, -8, -9 & -13	2B5419 44012
35*	Closing Cap Gasket	
	Neoprene	1P7533 06992
36	Reset Stem, steel Cd pl	
	-6 & -7	0V0773 24162
	-8 & -9	1D4809 24152
37	Hex Nut, steel Cd pl	
	-6 & -7	1A4997 24122
38	Body Cap, zinc & brass	
	-6 thru -9	1D2722 000A2
40	Valve Stem, brass	
	-6 thru -9	0K0770 14012
41	Valve Spring, SST	
	-6 thru -9	1A8661 37022
42	Machine Screw, steel pl	
	-6 thru -9	1A3461 28982
43	Disc Spacer, brass	
	-6 thru -9	1E1048 14012
49	Reset Lever, steel	
	-6 thru -9	0R0617 25092
65	Vent Assembly	
	-3, -7, -12 & -15	AB6341 000A2
	-4, -5, -8, -9 & -13	AB6340 000A2
67	Relief Valve Spring, steel pl	
	-4, -5, -8, -9 & -13	
	For springs	
	to 1.3 PSI	1C1734 27022
	over 1.3 PSI	1B5413 27022
70	Spacer, brass	
	-8 & -9	1C2886 14012
72	Retaining Washer, steel Cd pl	
	-8 & -9	1B6059 28982
76	Pitot Tube, zinc	
	-2 thru -9, -12, -13 & -14	2D8371 44012
77	Machine Screw, steel Cd pl (4 req'd)	
	-2 thru -9, -12, -13 & -14	1D8843 24502
78	Pipe Plug, steel Cd pl	
	All except -10 & -15	1B6366 24162
104	Bleed Assembly	
	303 SST/nitrile	
	-15 only	14A0636 X012
105	Washer, Carb St Pl	
	-15 only	14A0633 X012
106	Spring, 302 SST	
	-15 only	1U5506 37022

Key 27 Seat Ring, brass

Orifice Size (In.)	-2 thru -5 -10 thru -15	-6 thru -9
3/32	0R0441 14012	...
1/8	1A9367 14012	...
3/16	009912 14012	...
1/4	0B0420 14012	...
5/16	0B0421 14012	1B9569 14012
3/8	0B0422 14012	0L0831 14012
7/16	1A8346 14012	0L0832 14012
1/2	1A9288 14012	...
9/16	1C4252 14012	...

*Recommended spare part.

PREPARED BY	FSCM NO. 02602	NUMBER SP42-125
J. K. Chen	**Rockwell International Corporation**	TYPE Equipment
APPROVALS	**Rocketdyne Division**	DATE 1-22-81
E. C. Guenzer 1-26-81	Canoga Park, California	SUPERSEDES SPEC. DATED: 12-1-80
J. J. Obrzut 1/26/81	**SPECIFICATION**	REV. LTR. A
		PAGE 1 of 2

TITLE

ULLAGE NITROGEN PRESSURE REGULATOR

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	UNPR-3 (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	PRESSURE REDUCING
CONNECTIONS:	1 INCH NPT FEMALE
MATERIALS:	COMPATIBLE WITH CONNECTIONS AND LINE FLUID, AND OUTLET (SENSED) FLUID
LINE FLUID:	NITROGEN
OUTLET (SENSED)FLUID:	CALORIA VAPORS, HEPTANE, NITROGEN
MAXIMUM INLET PRESSURE AND TEMPERATURE:	150 PSIG @ 113 °F
REGULATED PRESSURE:	3.0 ± 0.5 INCH W.C. (ADJUSTABLE 2.0 to 6.0 INCH W.C.)
Ø FLOW CAPACITY:	10 SCFM @ 25 ± 5 PSIG INLET
AMBIENT TEMPERATURE:	16° TO 113°F
INTERNAL LEAKAGE:	50 CC/MINUTE
EXTERNAL LEAKAGE:	NONE VISIBLE IN BUBBLE TEST
CLEANING AND PACKAGING:	SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.
DESIGN FEATURE:	PASSAGES EXPOSE TO OUTLET (SENSED) FLUID MUST BE SELF-DRAINING SO THAT CONDENSING FLUID WILL NOT ACCUMULATE IN THE REGULATOR.

4.8.14 Ullage Nitrogen Pressure Regulator - 2

4.8.14.1

Identification Tag Number	Description
PCV-4006	Low Capacity Ullage GN_2 Pressure Regulator - 2

4.8.14.2 Description

Manufacturer:	Fisher Controls Co., Marshalltown, Iowa
Part Number:	Y-600-2
Rocketdyne Specification No.:	
Material:	Body: Carbon Steel
Weight:	10 lb.

4.8.14.3 Prescribed Service

GN_2

4.8.14.4 Vendor

Fisher Controls Co., Marshalltown, Iowa 50158

4.8.14.5 Special Cautions

See Fisher instruction manual Y-600 (paragraph 4.8.13-2).

4.8.14.6 Periodic Service

None

4.8.14.7 Parts List

See Fisher instruction manual Y-600 (paragraph 4.8.13-2).

4.8.14.8 Special Tools

None

4.8.14.9 Maintenance Instructions

See Fisher instruction manual Y-600 (paragraph 4.8.13-2).

4.8.14.10 Acceptance Tests

None

4.8.15 Ullage Nitrogen Pressure Regulator - 3

4.8.15.1

Identification Tag Number	Description
PCV-4007	High Capacity Ullage GN_2 Pressure Regulator - 3

4.8.15.2 Description

Manufacturer:	Fisher Controls Co., Marshalltown, Iowa 50158
Part Number:	730B-21
Rocketdyne Specification No.:	
Material:	Body: Carbon Steel
Weight:	25 lb.

4.8.15.3 Prescribed Service

GN_2

4.8.15.4 Vendor

Fisher Controls Co., Marshalltown, Iowa 50158

4.8.15.5 Special Cautions

See Fisher instruction manual (paragraph

4.8.15.6 Periodic Service

None

4.8.15.7 Parts List

See Fisher instruction manual (paragraph

4.8.15.8 Special Tools

None

4.8.15.9 Maintenance Instructions

See Fisher instruction manual (paragraph

4.8.15.10 Acceptance Tests

None

FISHER® Controls

Instruction Manual

730B and 730P Series Regulators

Form 605, August 1981

INTRODUCTION

Scope

This instruction manual provides instructions for the installation, maintenance, and parts ordering of the 730B and 730P Series service regulators.

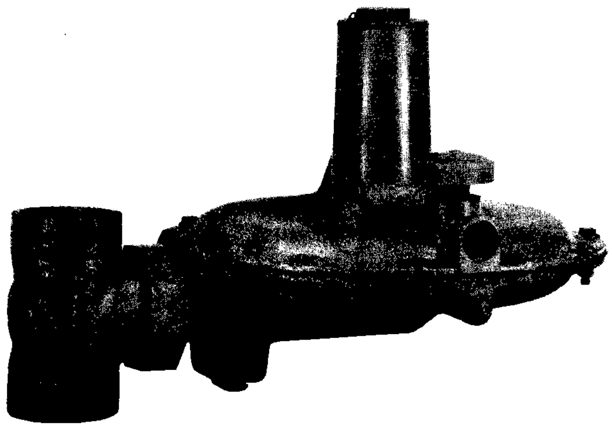


Figure 1. Type 730B-22 Regulator

Description

The 730B and 730P Series regulators are self-operated regulators that provide pressure reduction. In both the 730B and 730P Series regulators, the regulator body is connected to the lower casing by a union nut, the removal of which enables easy access to the internal parts of the regulator body. The 730B Series regulators (figure 1) sense downstream pressure through a pitot tube within the lower casing. The 730P Series regulators sense downstream pressure through an external control line piped to the lower casing assembly.

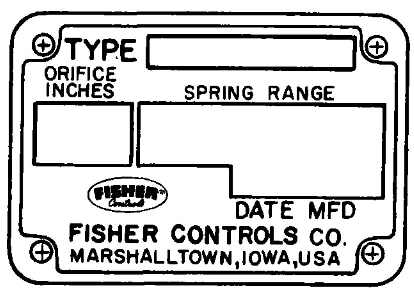


Figure 2. 730B and 730P Series Regulator Nameplate

Specifications

Table 1 lists specifications for the Type 730B and 730P Series regulators. A nameplate (figure 2) attached to the regulator upper casing lists specifications for that regulator.

Table 1. Specifications

AVAILABLE CONFIGURATIONS	730B and 730P Series regulators are described on page 1. See table 2 for additional differences between type-numbered regulator constructions.	**TEMPERATURE CAPABILITIES**	■ −20 to 150°F (−29 to 66°C) for nitrile elastomeric parts ■ 0 to 350°F (−18 to 177°C) for Viton† elastomeric parts
ALLOWABLE INLET PRESSURES*	**Maximum Recommended for Good Performance:** See table 3 **Emergency:** 165 psig (11.4 bar)	**PRESSURE SETTING ADJUSTMENT**	May be adjusted throughout each spring range by turning the adjusting screw
ALLOWABLE OUTLET PRESSURES*	**Maximum to Avoid Internal Part Damage:** 10 psig (0.69 bar) **Maximum Emergency (Casing):** 15 psig (1.0 bar) **Outlet Pressure Ranges:** See table 3	**PRESSURE REGISTRATION**	■ **730B:** Internal ■ **730P:** External control line
PORT DIAMETERS AND RELIEF SIZING COEFFICIENTS		**APPROXIMATE WEIGHT**	**1-1/2 In. Body:** 30 lb (13.6 kg) **2 In. Body:** 39 lb (17.7 kg)
		OPTIONS	■ Body tapped for pressure gauge ■ Pressure gauges (specify gauge and range from gauge bulletin) ■ TFE diaphragm protector
		ADDITIONAL SPECIFICATIONS	For body sizes and construction materials, see the Parts List section

Port Diameter, In. (mm)	1/4 (6.4)	3/8 (9.5)	1/2 (12.7)	3/4 (19.1)	1 (25.4)	1-3/16 (30.2)
Wide Open, C_g	53	110	190	415	700	910

*Pressure or temperature limitations in this manual and any applicable code limitations must not be exceeded.

† Trademark of DuPont Co., Inc.

Table 2. Available Configurations

Type Number	Description
730B-21	3/4 in. NPT vent in upper casing
730B-22	3/4 in. NPT vent in upper casing protected by a rainproof vent assembly
730B-23	Screened vent on side of upper casing
730B-26	Heavy duty construction in adjusting screw, closing cap, spring, and lower spring seat, rainproof vent assembly in top of spring case or screened vent on side of spring case
730B-31	3/4 in. NPT vent in upper casing, relief valve* connection in lower casing
730B-32	Rainproof vent on upper casing, relief valve connection in lower casing, rainproof vent assembly included for a relief valve*
730B-33	Screened vent in side of upper casing, relief valve connection in lower casing, rainproof vent assembly included for a relief valve*
730P-26	3/4 in. NPT vent in upper casing
730P-27	3/4 in. NPT vent in upper casing protected by a rainproof vent assembly
730P-28	Screened vent on side of upper casing

*For relief valve information, consult your Fisher sales office or sales representative.

INSTALLATION

WARNING

Overpressuring a regulator or associated equipment may cause personal injury or property damage due to bursting of pressure-containing parts or explosion of accumulated gas. To avoid overpressure, provide an appropriate pressure-relieving or pressure-limiting device to prevent the service conditions from exceeding the limits listed in table 1. A regulator should be inspected immediately for damage after any overpressure condition.

1. Use qualified personnel when installing, operating, and maintaining these regulators. Make sure that there is no damage to or foreign material in the regulator and that all tubing and piping are clean and unobstructed.

2. Apply pipe compound to the male pipeline threads, and install the regulator so that flow through it is in the direction indicated by the flow arrow cast in the regulator body. Downstream piping should be the same size as the regulator outlet for a distance of at least 4 feet (1.2 meters).

Table 3. Additional Specifications

OUTLET PRESSURE RANGES	SPRING		SEAT RING DIAMETER		MAXIMUM RECOMMENDED INLET PRESSURE	
	Part Number	Color	In.	mm	Psig	Bar
2.25 to 8 in. w.c. (5.5 to 20 mbar) or 9 to 20 in. w.c. (22.4 to 49.8 mbar) or 5.75 to 14 in. w.c. (14.3 to 37.9 mbar)	1A2001 27002 1B7666 27062 0B0197 000A2	Red Gray Iridite	1-3/16	30.2	5	0.3
			1	25.4	13	0.9
			3/4	19.1	25	1.7
			1/2	12.7	50	3.5
			3/8	9.5	100	6.9
			1/4	6.4	150	10.3
5.5 to 8.5 in. w.c. (13.7 to 21.2 mbar)	1C7254 27022	Brown	1 or 1-3/16	25.4 or 30.2	5	0.3
9 in. w.c. to 1.25 psig (22.4 to 86.2 mbar) or 0.75 to 2 psig (51.7 to 138 mbar) or 1 to 3.25 psig (69 to 207 mbar)	0B0194 27052 0B0196 000A2 0A0811 27202	Green Blue Orange	1-3/16	30.2	6	0.4
			1	25.4	14	1.0
			3/4	19.1	30	2.0
			1/2	12.7	50	3.5
			3/8	9.5	150	10.3
2 to 5.5 psig (138 to 379 mbar)	0Y0664 27022	Metallic with Green Stripe	1-3/16	30.2	15	1.0
			1	25.4	20	1.4
			3/4	19.1	35	2.4
			1/2	12.7	75	5.2
			3/8 or 1/4	9.5 or 6.4	100	6.9
4 to 10 psig (0.3 to 0.7 bar)	1H8024 000A2	Metallic (Cadmium-Plated)	1-3/16	30.2	20	1.4
			1	25.4	25	1.7
			3/4	19.1	40	2.8
			1/2	12.7	75	5.2
			3/8 or 1/4	9.5 or 6.4	100	6.9

3. To avoid bending the pitot tube, point the closing cap parallel to the regulator outlet. If the regulator is installed with the closing cap pointing down, the weight of internal parts will lower outlet pressure by either 1 inch w.c. (2.5 mbar) for regulators with a maximum outlet pressure setting equal to or less than 1.25 psig (86.2 mbar) or 2.5 inch w.c. (6.2 mbar) for regulators with a maximum outlet pressure setting greater than 1.25 psig (86.2 mbar).

4. If continuous operation of the system is required during inspection or maintenance, install a three-valve bypass around the regulator.

5. For a 730P Series regulator, connect the external control line to the 1/4-inch NPT female connection in the lower casing. Connect the other end of the control line to a straight run of pipe away from nipples, elbows, swages, or any area where abnormal gas velocities occur. See figure 5 for the location of the external control line connection.

WARNING

A regulator may vent some gas to the atmosphere. In flammable or hazardous gas service, vented gas may accumulate, causing personal injury or equipment damage due to fire or explosion. Vent a regulator in hazardous gas service to a remote, safe location.

6. To remotely vent the upper casing, remove the vent assembly (key 56, figure 3 or 5), if present, and install 3/4-inch NPT piping or tubing in the connection on top of the upper casing. The connection on the side of the upper casing is not tapped and cannot be used for remote vent piping or tubing. The piping or tubing should vent the upper case to a safe location, have as few bends as possible, and have a screened vent on its exhaust end that is weather resistant and always pointed in the downward direction.

7. If pressure adjustment is necessary, refer to the Startup section. In all cases, check the spring setting to make sure it is correct for the application.

STARTUP

With installation completed and downstream equipment adjusted, slowly open the upstream and downstream block valves, if used, while using gauges to monitor pressure.

Each regulator is factory-set for the pressure setting specified on the order. If no setting is specified, outlet pressure is factory-set at the midpoint of the regulator spring range.

The range of allowable pressure settings is marked on the nameplate. If a pressure setting beyond the nameplate range is required, install a spring with the desired range by following the procedures for changing the spring and diaphragm in the Maintenance section.

Always use a pressure gauge to monitor pressure when making adjustments.

To adjust the outlet pressure setting on all 730B and 730P Series regulators, turn the adjusting screw into the upper casing to increase the setting or out of the upper casing to decrease the setting. For the Type 730B-26 regulator, loosen the hex nut (key 93, figure 4), turn the adjusting screw (key 2, figure 4) to obtain the correct setting, and tighten the hex nut against the closing cap (key 3, figure 4). For all other 730B and 730P Series regulators, remove the closing cap and closing cap gasket (keys 3 and 35, figure 3 or 5), turn the adjusting screw (key 2, figure 3 or 5) to obtain the correct setting, install the gasket, and thread the closing cap onto the upper casing.

SHUTDOWN

First, close the upstream shutoff valve, and then, close the downstream shutoff valve. Next, open the vent valve between the regulator and the downstream shutoff valve, and open the vent valve between the regulator and the upstream shutoff valve. If vent valves are not installed, safely bleed off both inlet and outlet pressures, and check that the regulator contains no pressure.

MAINTENANCE

Regulator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and parts replacement depends on the severity of service conditions and the requirements of local, state, and federal rules and regulations.

WARNING

Avoid personal injury or property damage from sudden release of pressure or uncontrolled process fluid. Before starting disassembly:

- Isolate the regulator from the process,
- Release process pressure, and
- Vent the diaphragm loading pressure.

Key numbers refer to figures 3, 4, and 5 unless otherwise noted: figure 3 illustrates all 730B Series regulators except the Type 730B-26 regulator; figure 4 depicts the Type 730B-26 regulator; and figure 5 shows the Type 730P-26, -27, and -28 regulators.

Changing the Spring and Diaphragm

In addition to changing the spring and diaphragm, instructions are provided for changing parts located in the upper casing (key 23) and lower casing (key 20). Perform only the steps necessary to accomplish the required maintenance task, and then begin assembly at the appropriate step.

1. Remove the downstream external control line, if present.

2. Remove the closing cap and closing cap gasket (keys 3 and 35, figures 3 and 5), or loosen the hex nut (key 93, figure 4).

3. Turn the adjusting screw (key 2) counterclockwise out of the upper casing (key 23) to relieve spring compression.

4. Unscrew the cap screws and hex nuts (keys 21 and 22), and remove the upper casing (key 23).

5. Lift the spring (key 1) and upper spring seat (key 4, figure 4 or key 44, figures 3 and 5) off the diaphragm and plate assembly (key 5).

6. Unscrew the cap screw (key 30) to disassemble the lower spring seat (key 4), the diaphragm and head assembly (key 5), the lower diaphragm plate (key 6), and the lower diaphragm head gasket (key 7).

7. Inspect the pusher post (key 8) and lever (key 9). If bent or damaged, remove them by unscrewing the two machine screws (key 11).

8. Install the lever assembly (key 9), if removed, connect the valve stem (key 13) to the lever assembly, and secure the lever assembly with the machine screws (key 11).

9. During assembly, use lubricants or sealants on parts as indicated in figures 3, 4, or 5, and replace parts as required. Always use a new lower diaphragm head gasket (key 7).

Install the parts on the pusher post in the order listed below:

- Lower diaphragm head gasket (key 7),
- Lower diaphragm head (key 6),
- Diaphragm (key 5) pattern side up,
- Diaphragm plate (key 5), and
- Lower spring seat (key 4).

10. Insert and tighten the cap screw (key 30) to secure the parts to the pusher post (key 8).

11. Install the assembled parts in the lower casing (key 20). Make sure that the lever (key 9) fits in the pusher post (key 8) and that the holes in the diaphragm align with the holes in the lower casing.

12. Place the spring (key 1) on the lower spring seat (key 4), and then install the upper spring seat (key 4, figure 4 or key 44, figures 3 and 5).

13. Position the spring casing (key 23) on the diaphragm, and insert the cap screws and hex nuts (keys 21 and 22). Tighten them only finger tight.

14. Turn the adjusting screw (key 2) clockwise into the spring casing to ensure proper slack in the diaphragm, and then tighten the cap screws and hex nuts (keys 21 and 22).

15. Connect the downstream control line, if used, and refer to the Startup section before putting the regulator back in operation.

Changing the Disc and Seat Ring

Complete only the steps that provide information for the required maintenance. Sealants and lubricants required in assembly are listed in figures 3, 4, and 5.

1. Remove the downstream external control line connection, if used.

2. Loosen the union nut (key 19), and separate the lower casing (key 20) from the body (key 28). Remove the body gasket (key 16), but do not lose the snap ring (key 17).

3. If necessary, remove the seat ring (key 27).

4. If the disc holder assembly (key 25) must be removed or replaced, remove the cotter pin (key 14), and separate the disc holder assembly from the valve stem (key 13).

5. Insert the disc holder assembly in the valve stem (key 13), and secure with the cotter pin (key 14).

6. Thread the seat ring (key 27) tightly into the body (key 28).

7. Insert the body gasket (key 16) and snap ring (key 17), if removed, and fit the lower casing (key 20) into the body (key 28). Tighten the union nut (key 19) to fasten the parts together.

8. Connect the downstream control line, if used, and refer to the Startup section before returning the regulator to operation.

Changing Stem O-Ring

1. Complete steps 1 through 5 from the Changing the Spring and Diaphragm section.

2. Take the pusher post (key 8) and attached parts off the lever assembly (key 9).

3. Unscrew the machine screws (key 11), and remove the lever assembly (key 9).

4. Loosen the union nut (key 19), and separate the lower casing (key 20) from the body (key 28). Remove the body gasket (key 16), but do not lose the snap ring (key 17).

5. Pull the valve stem (key 13) and disc holder assembly (key 25) out of the lower casing (key 20).

6. Inspect and replace the O-ring (key 15), if necessary.

7. Slide the valve stem (key 13) and O-ring (key 15) into the stem bushing (key 12).

8. Install the body gasket (key 16) and snap ring (key 17), if removed, and fit the lower casing (key 20) into the body (key 28). Tighten the union nut (key 19) to fasten the parts together.

9. Install the lever assembly (key 9), connect the valve stem (key 13) to the level assembly, and secure the level assembly with the two machine screws (key 11).

10. Complete steps 11 through 15 of the Changing the Spring and Diaphragm section.

PARTS ORDERING

When corresponding with the Fisher sales office or sales representative about this regulator, include the type number and all other pertinent information stamped on the bottom cap and on the nameplate. Specify the complete 11-character part number from the following parts list when ordering replacement parts.

PARTS LIST

Key	Description	Part Number
1	Spring, steel	
	All except Type 730B-26	
	2-1/4 to 8 in. w.c. (5.6 to 19.9 mbar) red	1A2001 27022
	5-1/2 to 8-1/2 in. w.c. (13.6 to 12.1 mbar) brown	1C7254 27022
	5-3/4 to 14 in. w.c. (14.3 to 34.8 mbar) iridite	0B0197 000A2
	9 to 20 in. w.c. (22.4 to 49.8 mbar) gray	1B7666 27062
	9 in. w.c. to 1-1/4 psig (22.4 mbar to 0.9 bar) green	0B0194 27052
	3/4 to 2 psig (0.05 to 0.13 bar) blue	0B0196 27032
	1 to 3-1/4 psig (0.07 to 0.22 bar) orange	0A0811 27202
	Type 730B-26	
	2 to 5-1/2 psig (0.13 to 0.37 bar) green stripe	0Y0664 27022
	4 to 10 psig (0.27 to 0.7 bar) metallic	1H8024 000A2
2	Adjusting Screw	
	Type 730B-26, steel pl	1A5005 28982
	All other types, zinc	1A5896 44022
3	Closing Cap	
	Type 730B-26, brass	1H7987 14012
	All other types, zinc	1A5895 44022
4	Lower Spring Seat	
	Type 730B-26, brass (2 req'd)	1H7974 14012
	All other types, zinc	0X0147 44012
5*	Diaphragm & Plate Ass'y, steel/nitrile	
	For springs to 1.3 psig (89 mbar)	1N9721 X0012
	For springs over 1.3 psig (89 mbar)	1N9722 X0012
6	Lower Diaphragm Plate	
	Cd pl steel	0V0039 25072
	SST	0V0039 35032
7*	Lower Diaphragm Plate Gasket, asbestos	1A3487 04022
8	Pusher Post	
	Zinc	0Y0964 44012
	SST	0Y0964 35072
9	Lever Ass'y	
	Std & mild corrosive trim	1E3409 000A2
	SST trim	1E3409 000B2
11	Machine Screw (2 req'd)	
	Steel	1E1758 28982
	SST	1A8669 35032
12	Valve Stem Bushing, 730P Series only	
	Std trim, brass	1F5130 14012
	SST trim	1F5130 35032
13	Valve Stem	
	730B Series	
	Brass	0J0484 14012
	SST	0J0484 35032
	730P Series	
	Brass	1E7676 14012
	SST	1E7676 35032
14	Cotter Pin	
	Brass	1A4040 18992
	SST	1A8665 37022
15	O-Ring, nitrile 730P Series only	1E4727 06992
16*	Body Gasket, asbestos	1A3480 04032
17	Snap Ring, Cd pl steel	0Y0958 28982
19	Union Nut, malleable iron	0Z0176 19062
20	Lower Casing, cast iron	
	730B Series	
	Std trim	1C9472 000A2
	SST trim	1C9472 000B2
	730P Series	1E7678 19012
21	Cap Screw, steel (12 req'd)	1B5961 24052
22	Hex Nut, steel (12 req'd)	1A3093 24122
23	Spring Case, aluminum	
	Types 730B-21, -22, -31, -32	
	Types 730P-26, -27	
	For springs to 1.3 psig (89 mbar)	AE6180 X0012
	For springs over 1.3 psig (89 mbar)	AE6180 X0032
	Types 730B-23, -33	
	Types 730P-28	
	For springs to 1.3 psig (89 mbar)	AE6180 X0022
	For springs over 1.3 psig (89 mbar)	AE6180 X0042
	Type 730B-26	
	For up vent	AE6180 X0012
	For side vent	AE6180 X0022
25*	Disc Holder Assy	
	Std trim, brass/nitrile	
	1/2 in. (12.7 mm) port & smaller	1A8431 000A2
	3/4 in. (19.1 mm) port & larger	1C7831 X0012
	SST trim, SST/nitrile	
	1/2 in. (12.7 mm) port & smaller	1A8431 000B2
	3/4 in. (19.1 mm) port & larger	1C7831 X0072
26	Pipe Nipple, steel (not shown)	
	Types 730B-31, -32, -33	1C4882 26232
27	Seat Ring	
	Brass	
	1/4 in. (6.4 mm) port	0L0878 14012
	3/8 in. (9.5 mm) port	0H0825 14012
	1/2 in. (12.7 mm) port	0L0401 14012
	3/4 in. (19.1 mm) port	1A8323 14012
	1 in. (25.4 mm) port	1A8324 14012
	1-3/16 in. (30.2 mm) port	1C7834 14012
	SST	
	1/4 in. (6.4 mm) port	0L0878 35032
	3/8 in. (9.5 mm) port	0H0825 35072
	1/2 in. (12.7 mm) port	0L0401 35032
	3/4 in. (19.1 mm) port	1A8323 35072
	1 in. (25.4 mm) port	1A8324 35072
	1-3/16 in. (30.2 mm) port	1C7834 35072
28	Body	
	Cast iron	
	1-1/2 in. NPT	1B4036 19012
	2 in. NPT	1B4037 19012
	Steel	
	1-1/2 in. NPT	2L2445 22012
	2 in. NPT	2L2433 22012
29	Pipe Plug, steel Cd pl	
	Type 730B-21, -22, -23 & -26	1D7548 X0012
30	Cap Screw, steel	
	All 730B & 730P Series except Type 730B-26	
	For springs to 1.3 psig (89 mbar)	1C4732 24052
	For springs over 1.3 psig (89 mbar)	1A6678 24052
	Type 730B-26	1E4539 X0012
35*	Closing Cap Gasket	
	Neoprene	1N4462 06992
39	Street Elbow, malleable iron (not shown)	
	Type 730B-32	1A9132 21992
44	Upper Spring Seat, zinc	
	All except Type 730B-26	0Y0956 44012
46	Valve Disc Washer	
	3/4 in. (19.1 mm) port & over only	
	Aluminum	0X0146 09012
	SST	0X0146 35032

*Recommended spare part.

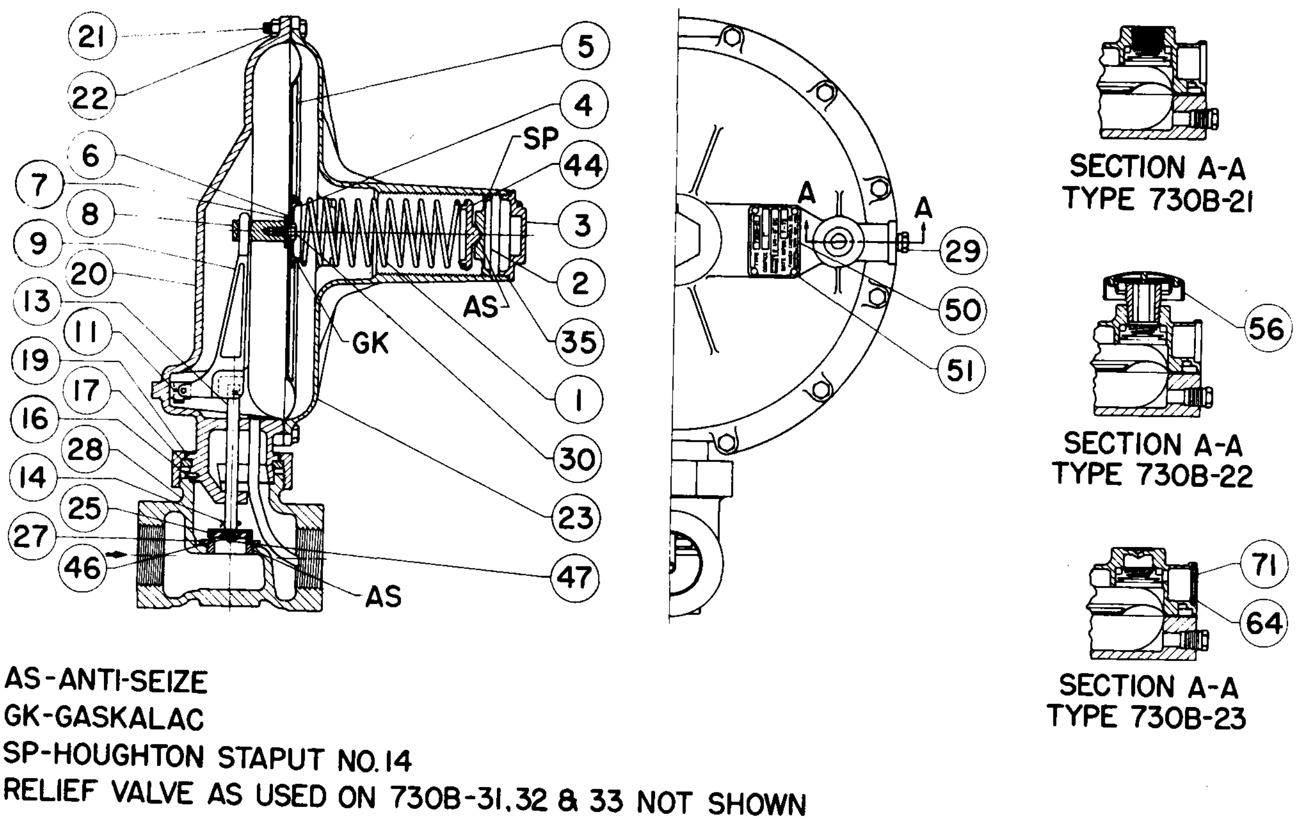


Figure 3. Type 730B-21, -22, -23, -31, -32, and -33 Regulators

Key	Description	Part Number
47	Machine Screw, 3/4 in. (19.1 mm) port & over only	
	Steel	1A3319 28982
	SST	1A8664 35042
48	Vent Ass'y, Type Y602-1 (not shown) Types 730B-32 & -33	EMY602X1-A1
50	Nameplate, aluminum	1E2401 11992
51	Drive Screw, steel (4 req'd)	1E5017 28982
56	Vent Assy Type Y602-10 Types 730B-22, -32, 730P-27 & Type 730B-26 w/ rainproof vent	EMY602X1-A10
64	Screen, SST Types 730B-23, -33, 730P-28 & Type 730B-26 w/ side vent	1B6335 38392
71	Snap Ring, SST Types 730B-23, -33, 730P-28 & Type 730B-26 w/ side vent	1B6336 38992
93	Hex Nut, cd pl steel Type 730B-26 only	1A3524 24122

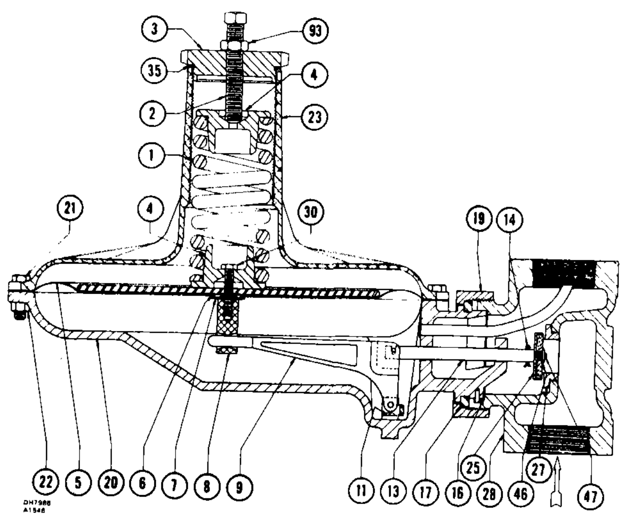


Figure 4. Type 730B-26 Regulator

*Recommended spare part.

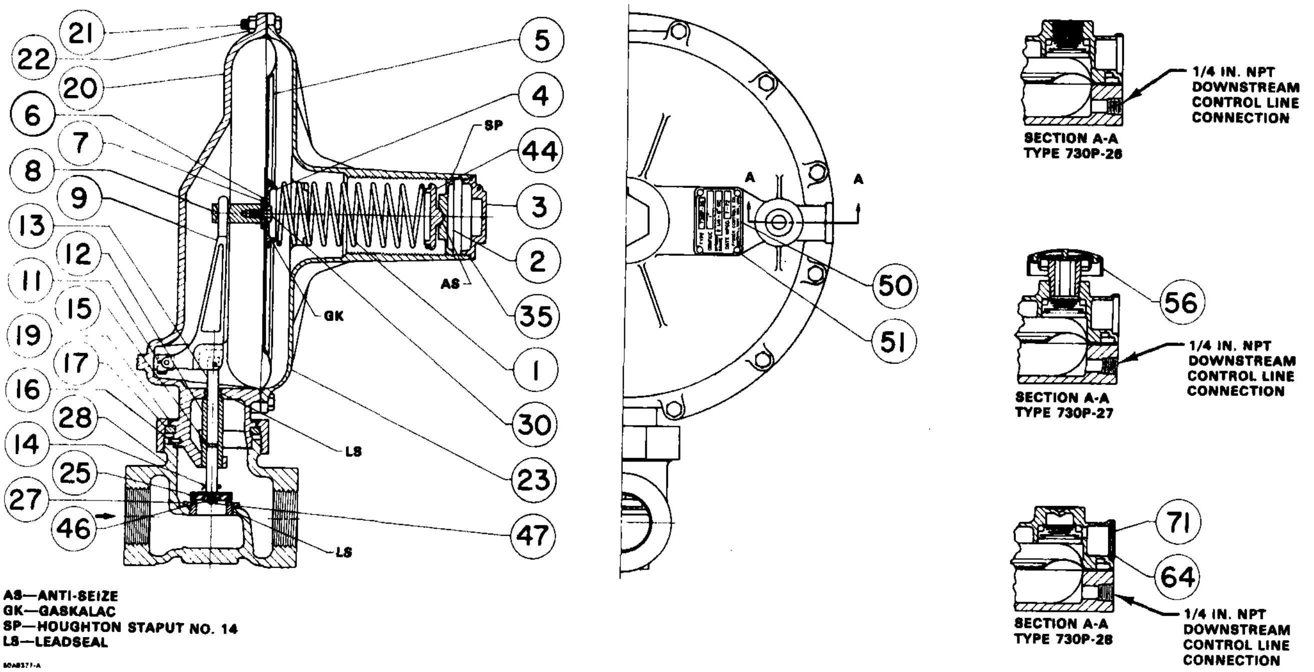


Figure 5. Type 730P-26 Regulator with Downstream Control Line Connection

4.9 RUPTURE DISCS

4.9 RUPTURE DISCS

Equipment Number	Description	Maintenance Section	Dwg. Number
(TPFRD-1)	Preheater Oil Rupture Disc	4.9.1	5163145
(TPFRD-2)	Preheater Oil Rupture Disc	4.9.1	5163145
(TSFRD-1)	Superheater Oil Rupture Disc	4.9.1	5163145
(TSFRD-2)	Superheater Oil Rupture Disc	4.9.1	5163145
(THFRD-1)	Condenser Oil Rupture Disc	4.9.2	5163142
(THFRD-2)	Condenser Oil Rupture Disc	4.9.2	5163142
(TFWRD)	Flash Tank Water Rupture Disc	4.9.3	5163143

4.9 Rupture Discs

4.9.1 4" Oil Rupture Discs

4.9.1.1 Identification

Identification	Description
Rocketdyne Designation	
TPFRD-1, -2	Preheater Oil Rupture Disc
TSFRD-1, -2	Superheater Oil Rupture Disc

4.9.1.2 Description

Manufacturer	:	Fike Metal Products, Blue Springs, Mo.
Part Number	:	ANSI 150 lb. GICS Flanges
Rocketdyne Specification No.	:	SP42-094 (Following)
Material	:	Inconel
Weight	:	

4.9.1.3 Prescribed Service

Oil

4.9.1.4 Vendor

Fike Metal Products, Blue Springs, Mo.

4.9.1.5 Special Cautions

See Fike literature, Form 101, (following)

4.9.1.6 Periodic Service

None

4.9.1.7 Parts List

None

4.9.1.8 Special Tools

None

4.9.1.9 Maintenance Instructions

None

4.9.1.10 Acceptance Tests

None

402-C. Assembly G Insert Type

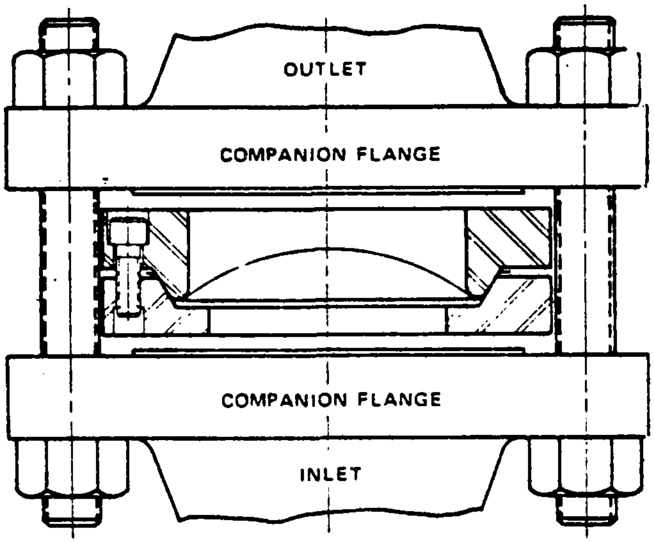


FIG. 37—Assembly "G" Insert Type

The assembly G insert type illustrated at left can be used to fit inside the existing ANSI (ASA) bolt circle. This reduces weight and provides maintenance economies because only half the studs need be entirely removed to install the unit. ANSI (ASA) specifications for the assembly G "insert type" are listed below in tabular form.

Flexible gaskets are not recommended for use between companion flanges and the assembly G insert type flange unless the minimum bolt load required to provide a leakproof seal between the disc and flange is compatible with the maximum non-flow compression characteristics of the gasket.

All assembly "G" insert type assemblies are furnished with a method of pre-assembly so the fragile rupture disc may be installed on the work bench, the unit re-assembled and installed into the line with minimum chance of damage to the rupture disc.

The crown of the Rupture Disc in insert "G" assemblies in 6" size and larger, may protrude out of the holddown (outlet) flange, making necessary non-rigid outlet piping and a method of raising outlet companion flange such as eye bolts or jackscrews for clearance. If a totally insertable assembly is required, (containing crown within assembly) such as with rigid piping consult factory before ordering.

TABLE 20
STANDARD INSERT "G"

PIPE SIZE	ANSI RATING (ASA)	MAX. RATING*	O.D.	OVERALL HEIGHT APPROX.	NO. OF PRE-ASSEMBLY SCREWS	PIPE SIZE	ANSI RATING (ASA)	MAX. RATING*	O.D.	OVERALL HEIGHT APPROX.	NO. OF PRE-ASSEMBLY SCREWS
1/2"	150	275	1-3/4	1-5/8	3	4"	150	275	6 3/4	1-5/8	3
1/2"	300	720	2	1-5/8	3	4"	300	720	7	1-5/8	3
1/2"	600	1440	2	1-5/8	3	4"	600	1440	7-1/2	1-5/8	3
1/2"	900	2160	2-3/8	1-5/8	3	4"	900	2160	8	1-5/8	3
1/2"	1500	3600	2-3/8	1-5/8	3	4"	1500	3600	8	2-1/8	3
3/4"	150	275	2-1/8	1-5/8	3	6"	150	275	8 5/8	2-1/8	3
3/4"	300	720	2-1/2	1-5/8	3	6"	300	720	9-3/4	2-1/8	3
3/4"	600	1440	2-1/2	1-5/8	3	6"	600	1440	10-3/8	2-1/8	3
3/4"	900	2160	2-5/8	1-5/8	3	6"	900	2160	11-1/4	3-1/2	4
3/4"	1500	3600	2-5/8	1-5/8	3	8"	150	275	10-7/8	2-1/8	3
1"	150	275	2-1/2	1-5/8	3	8"	300	720	12	2-1/8	3
1"	300	720	2-3/4	1-5/8	3	8"	600	1440	12-1/2	2-3/8	4
1"	600	1440	2-3/4	1-5/8	3	10"	150	275	13-1/4	2-1/8	4
1"	900	2160	3	1-5/8	3	10"	300	720	14-1/8	2-1/8	4
1"	1500	3600	3	1-5/8	3	12"	150	275	16	2-1/8	4
1-1/2"	150	275	3-1/4	1-5/8	3	12"	300	720	16 1/2	2-5/8	4
1-1/2"	300	720	3-5/8	1-5/8	3	14"	150	275	17-5/8	2-7/8	4
1-1/2"	600	1440	3-5/8	1-5/8	3	14"	300	720	19	3-7/16	4
1-1/2"	900	2160	3-3/4	1-5/8	3	16"	150	275	20-1/8	2-7/8	4
1-1/2"	1500	3600	3-3/4	1-5/8	3	16"	300	720	21-1/8	3-9/16	4
2"	150	275	4	1-5/8	**	18"	150	275	21-1/2	2-7/8	4
2"	300	720	4 1/4	1-5/8	3	18"	300	720	23-3/8	3-11/16	4
2"	600	1440	4-1/4	1-5/8	3	20"	150	275	23-3/4	3-1/4	4
2"	900	2160	5-1/2	1-5/8	3	20"	300	720	25-1/2	4-1/16	4
2"	1500	3600	5-1/2	1-5/8	3	24"	150	275	28-1/8	3-7/16	4
3"	150	275	5-1/4	1-5/8	3	24"	300	720	30-3/8	4 5/16	4
3"	300	720	5-3/4	1-5/8	3						
3"	600	1440	5-3/4	1-5/8	3						
3"	900	2160	6-1/2	1-5/8	3						
3"	1500	3600	6-3/4	2-1/8	3						

* From -20 to +100°F for carbon steel, 316, 321, and 347 stainless steel only.

**These units are supplied with side clips instead of pre-assembly screws.

PREPARED BY		NUMBER SP42-094
J. K. CHENG	FSCM NO. 02602	TYPE EQUIPMENT
APPROVALS	Rockwell International Corporation Rocketdyne Division Canoga Park, California	DATE 2-12-80
2/14/80		SUPERSEDES SPEC. DATED:
8-15-80	SPECIFICATION	REV. LTR. / PAGE 1 of 2

TITLE

HEAT TRANSFER FLUID RUPTURE DISC

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TPFRD-1 AND -2, TSFRD-1 AND -2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	INSERT TYPE RUPTURE DISC FLANGE ASSEMBLY
END CONNECTIONS:	DISC CARTRIDGE TO BE MOUNTED BETWEEEN 4 INCH, 150 LB, RF FLANGES
DISC CARTRIDGE (ASSY.) MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	OIL (CALORIA HT 43, DENSITY = 52.0 $\frac{\text{LB}}{\text{CU FT}}$ @ 125°F)
RUPTURE PRESSURE AND TEMPERATURE:	121 PSIG±5% OVER A TEMPERATURE RANGE OF 25°F TO 125°F (SECONDARY RELIEF DEVICE)
DISC DIAMETER:	4 INCH
AMBIENT TEMPERATURE:	16° TO 113°F
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.
CODE CONFORMANCE:	PER ASME BOILER AND PRESSURE VESSEL CODE SECTION VIII
DESIGN FEATURES:	• DISC CARTRIDGE TO BE INSTALLED WITH FLEXITALLIC GASKETS. • 3 SPARE DISCS ARE TO BE PROVIDED WITH EACH CARTRIDGE.

4.9 Rupture Discs

4.9.2 6" Rupture Discs

4.9.2.1 Identification | Description

Identification	Description
Rocketdyne Designation	
THFRD-1, -2	Condenser Oil Rupture Disc

4.9.1.2 Description

Manufacturer	: Fike Metal Products, Blue Springs, Mo.
Part Number	: ANSI 150 lb. GICS Flanges
Rocketdyne Specification No.	: SP42-095 (Following)
Material	: Inconel
Weight	:

4.9.1.3 Prescribed Service

Oil

4.9.1.4 Vendor

Fike Metal Products, Blue Springs, Mo.

4.9.1.5 Special Cautions

See Fike literature, Form 101, (following)

4.9.1.6 Periodic Service

None

4.9.1.7 Parts List

None

4.9.1.8 Special Tools

None

4.9.1.9 Maintenance Instructions

None

4.9.1.10 Acceptance Tests

None

402-C. Assembly G Insert Type

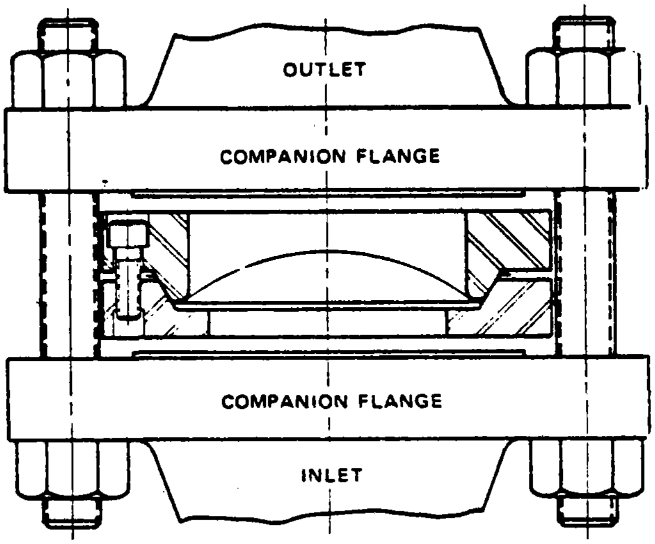


FIG. 37—Assembly "G" Insert Type

The assembly G insert type illustrated at left can be used to fit inside the existing ANSI (ASA) bolt circle. This reduces weight and provides maintenance economies because only half the studs need be entirely removed to install the unit. ANSI (ASA) specifications for the assembly G "insert type" are listed below in tabular form.

Flexible gaskets are not recommended for use between companion flanges and the assembly G insert type flange unless the minimum bolt load required to provide a leakproof seal between the disc and flange is compatible with the maximum non-flow compression characteristics of the gasket.

All assembly "G" insert type assemblies are furnished with a method of pre-assembly so the fragile rupture disc may be installed on the work bench, the unit re-assembled and installed into the line with minimum chance of damage to the rupture disc.

The crown of the Rupture Disc in insert "G" assemblies in 6" size and larger, may protrude out of the holddown (outlet) flange, making necessary non-rigid outlet piping and a method of raising outlet companion flange such as eye bolts or jackscrews for clearance. If a totally insertable assembly is required, (containing crown within assembly) such as with rigid piping consult factory before ordering.

TABLE 20
STANDARD INSERT "G"

PIPE SIZE	ANSI RATING (ASA)	MAX. RATING*	O.D.	OVERALL HEIGHT APPROX.	NO. OF PRE-ASSEMBLY SCREWS
1/2"	150	275	1-3/4	1-5/8	3
1/2"	300	720	2	1-5/8	3
1/2"	600	1440	2	1-5/8	3
1/2"	900	2160	2-3/8	1-5/8	3
1/2"	1500	3600	2-3/8	1-5/8	3
3/4"	150	275	2-1/8	1-5/8	3
3/4"	300	720	2-1/2	1-5/8	3
3/4"	600	1440	2-1/2	1-5/8	3
3/4"	900	2160	2-5/8	1-5/8	3
3/4"	1500	3600	2-5/8	1-5/8	3
1"	150	275	2-1/2	1-5/8	3
1"	300	720	2-3/4	1-5/8	3
1"	600	1440	2-3/4	1-5/8	3
1"	900	2160	3	1-5/8	3
1"	1500	3600	3	1-5/8	3
1-1/2"	150	275	3-1/4	1-5/8	3
1-1/2"	300	720	3-5/8	1-5/8	3
1-1/2"	600	1440	3-5/8	1-5/8	3
1-1/2"	900	2160	3-3/4	1-5/8	3
1-1/2"	1500	3600	3-3/4	1-5/8	3
2"	150	275	4	1-5/8	**
2"	300	720	4-1/4	1-5/8	3
2"	600	1440	4-1/4	1-5/8	3
2"	900	2160	5-1/2	1-5/8	3
2"	1500	3600	5-1/2	1-5/8	3
3"	150	275	5-1/4	1-5/8	3
3"	300	720	5-3/4	1-5/8	3
3"	600	1440	5-3/4	1-5/8	3
3"	900	2160	6-1/2	1-5/8	3
3"	1500	3600	6-3/4	2-1/8	3

PIPE SIZE	ANSI RATING (ASA)	MAX. RATING*	O.D.	OVERALL HEIGHT APPROX.	NO. OF PRE-ASSEMBLY SCREWS
4"	150	275	6-3/4	1-5/8	3
4"	300	720	7	1-5/8	3
4"	600	1440	7-1/2	1-5/8	3
4"	900	2160	8	1-5/8	3
4"	1500	3600	8	2-1/8	3
6"	150	275	8-5/8	2-1/8	3
6"	300	720	9-3/4	2-1/8	3
6"	600	1440	10-3/8	2-1/8	3
6"	900	2160	11-1/4	3-1/2	4
8"	150	275	10-7/8	2-1/8	3
8"	300	720	12	2-1/8	3
8"	600	1440	12-1/2	2-3/8	4
10"	150	275	13-1/4	2-1/8	4
10"	300	720	14-1/8	2-1/8	4
12"	150	275	16	2-1/8	4
12"	300	720	16-1/2	2-5/8	4
14"	150	275	17-5/8	2-7/8	4
14"	300	720	19	3-7/16	4
16"	150	275	20-1/8	2-7/8	4
16"	300	720	21-1/8	3-9/16	4
18"	150	275	21-1/2	2-7/8	4
18"	300	720	23-3/8	3-11/16	4
20"	150	275	23-3/4	3-1/4	4
20"	300	720	25-1/2	4-1/16	4
24"	150	275	28-1/8	3-7/16	4
24"	300	720	30-3/8	4-5/16	4

* From -20 to +100°F for carbon steel, 316, 321, and 347 stainless steel only.

**These units are supplied with side clips instead of pre-assembly screws.

PREPARED BY	FSCM NO. 02602	NUMBER SP42-095
J. K. CHENG J.C.	Rockwell International Corporation	TYPE EQUIPMENT
APPROVALS	Rocketdyne Division	DATE 2-12-80
E G Spencer 2/14/80	Canoga Park, California	SUPERSEDES SPEC. DATED:
J M. [illegible] 2-11-80	SPECIFICATION	REV. LTR.
		PAGE 1 of 2

TITLE

THERMAL STORAGE HEATER FLUID RUPTURE DISC

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	THFRD-1, THFRD-2 (COMPONENTS SHALL BE TAG IDENTIFIED)
TYPE:	INSERT TYPE RUPTURE DISC FLANGE ASSEMBLY
END CONNECTIONS:	DISC CARTRIDGE TO BE MOUNTED BETWEEN 6 INCH, 150 LB, RF FLANGES
DISC CARTRIDGE (ASSY.) MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	150LB CLASS
LINE FLUID:	OIL (CALORIA HT 43, DENSITY = 52.0 $\frac{LB}{CU\ FT}$ @ 125^{O}F)
RUPTURE PRESSURE AND TEMPERATURE:	121 PSIG ± 5% OVER A TEMPERATURE RANGE OF 25^{O}F TO 125^{O}F (SECONDARY RELIEF DEVICE)
DISC DIAMETER:	6 INCH
AMBIENT TEMPERATURE:	16^{O} TO 113^{O}F
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.
CODE CONFORMANCE:	PER ASME BOILER AND PRESSURE VESSEL CODE SECTION VIII
DESIGN FEATURES:	• DISC CARTRIDGE TO BE INSTALLED WITH FLEXITALLIC GASKETS. • 3 SPARE DISCS ARE TO BE PROVIDED WITH EACH CARTRIDGE.

4.9 Rupture Disc

4.9.3 2" Thermal Storage Flash Tank Water Rupture Disc

4.9.3.1 Identification — Description

Rocketdyne Designation

Identification	Description
TFWRD	Thermal Storage Flash Tank Water Rupture Disc

4.9.3.2 Description

Manufacturer	:	Fike Metal Products, Blue Springs, Mo.
Part Number	:	ANSI 150 lb. 2" G insert type
Rocketdyne Specification No.	:	SP42-124 (Following)
Material	:	
Weight	:	5 lb.

4.9.3.4 Prescribed Service

Water

4.9.3.4 Vendor

Fike Metal Products, Blue Springs, Mo.

4.9.3.5 Special Cautions

See Fike literature, Form 101, (following)

4.9.3.6 Periodic Service

None

4.9.3.7 Parts List

None

4.9.3.8 Special Tools

None

4.9.3.9 Maintenance Instructions

None

4.9.3.10 Acceptance Tests

None

402-C. Assembly G Insert Type

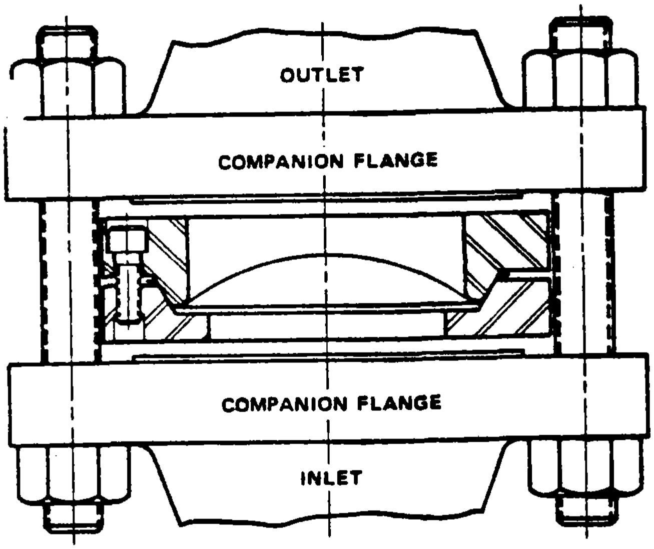


FIG. 37—Assembly "G" Insert Type

The assembly G insert type illustrated at left can be used to fit inside the existing ANSI (ASA) bolt circle. This reduces weight and provides maintenance economies because only half the studs need be entirely removed to install the unit. ANSI (ASA) specifications for the assembly G "insert type" are listed below in tabular form.

Flexible gaskets are not recommended for use between companion flanges and the assembly G insert type flange unless the minimum bolt load required to provide a leakproof seal between the disc and flange is compatible with the maximum non-flow compression characteristics of the gasket. See Table 16.

All assembly "G" insert type assemblies are furnished with a method of pre-assembly so the fragile rupture disc may be installed on the work bench, the unit re-assembled and installed into the line with minimum chance of damage to the rupture disc.

The crown of the Rupture Disc in insert "G" assemblies in 6" size and larger, may protrude out of the holddown (outlet) flange, making necessary non-rigid outlet piping and a method of raising outlet companion flange such as eye bolts or jackscrews (see 411-A) for clearance. If a totally insertable assembly is required, (containing crown within assembly) such as with rigid piping consult factory before ordering.

TABLE 20
STANDARD INSERT "G"

PIPE SIZE	ANSI RATING (ASA)	MAX. RATING*	O.D.	OVERALL HEIGHT APPROX.	NO. OF PRE-ASSEMBLY SCREWS
1/2"	150	275	1-3/4	1-5/8	3
1/2"	300	720	2	1-5/8	3
1/2"	600	1440	2	1-5/8	3
1/2"	900	2160	2-3/8	1-5/8	3
1/2"	1500	3600	2-3/8	1-5/8	3
3/4"	150	275	2-1/8	1-5/8	3
3/4"	300	720	2-1/2	1-5/8	3
3/4"	600	1440	2-1/2	1-5/8	3
3/4"	900	2160	2-5/8	1-5/8	3
3/4"	1500	3600	2-5/8	1-5/8	3
1"	150	275	2-1/2	1-5/8	3
1"	300	720	2-3/4	1-5/8	3
1"	600	1440	2-3/4	1-5/8	3
1"	900	2160	3	1-5/8	3
1"	1500	3600	3	1-5/8	3
1-1/2"	150	275	3-1/4	1-5/8	3
1-1/2"	300	720	3-5/8	1-5/8	3
1-1/2"	600	1440	3-5/8	1-5/8	3
1-1/2"	900	2160	3-3/4	1-5/8	3
1-1/2"	1500	3600	3-3/4	1-5/8	3
2"	150	275	4	1-5/8	**
2"	300	720	4-1/4	1-5/8	3
2"	600	1440	4-1/4	1-5/8	3
2"	900	2160	5-1/2	1-5/8	3
2"	1500	3600	5-1/2	1-5/8	3
3"	150	275	5-1/4	1-5/8	3
3"	300	720	5-3/4	1-5/8	3
3"	600	1440	5-3/4	1-5/8	3
3"	900	2160	6-1/2	1-5/8	3
3"	1500	3600	6-3/4	2-1/8	3
4"	150	275	6-3/4	1-5/8	3
4"	300	720	7	1-5/8	3
4"	600	1440	7-1/2	1-5/8	3
4"	900	2160	8	1-5/8	3
4"	1500	3600	8	2-1/8	3
6"	150	275	8-5/8	2-1/8	3
6"	300	720	9-3/4	2-1/8	3
6"	600	1440	10-3/8	2-1/8	3
6"	900	2160	11-1/4	3-1/2	4
8"	150	275	10-7/8	2-1/8	3
8"	300	720	12	2-1/8	3
8"	600	1440	12-1/2	2-3/8	4
10"	150	275	13-1/4	2-1/8	4
10"	300	720	14-1/8	2-1/8	4
12"	150	275	16	2-1/8	4
12"	300	720	16-1/2	2-5/8	4
14"	150	275	17-5/8	2-7/8	4
14"	300	720	19	3-7/16	4
16"	150	275	20-1/8	2-7/8	4
16"	300	720	21-1/8	3-9/16	4
18"	150	275	21-1/2	2-7/8	4
18"	300	720	23-3/8	3-11/16	4
20"	150	275	23-3/4	3-1/4	4
20"	300	720	25-1/2	4-1/16	4
24"	150	275	28-1/8	3-7/16	4
24"	300	720	30-3/8	4-5/16	4

* From −20 to +100°F for carbon steel, 316, 321, and 347 stainless steel only. For 304 stainless steel and higher temperatures, see Table 18

**These units are supplied with side clips instead of pre-assembly screws.

PREPARED BY	FSCM NO. 02602	NUMBER SP42-124
J. K. CHENG J.C.	Rockwell International Corporation	TYPE EQUIPMENT
APPROVALS	Rocketdyne Division	DATE 9-17-80
E G Spencer 9/25/80	Canoga Park California	SUPERSEDES SPEC. DATE:
G. G. Absalom 9/25/80	SPECIFICATION	REV. LTR.
		PAGE 1 of 2

TITLE

THERMAL STORAGE FLASH TANK WATER RUPTURE DISC

The intent of this specification is to identify mandatory requirements for one or more elements of a 10 MWe Solar Pilot Plant. This specification supersedes prior specifications. Deviations shall be approved in writing by Rocketdyne Engineering.

TAG NUMBER:	TFWRD (COMPONENT SHALL BE TAG IDENTIFIED)
TYPE:	INSERT TYPE RUPTURE DISC FLANGE ASSEMBLY
END CONNECTIONS:	DISC CARTRIDGE TO BE MOUNTED BETWEEN 2 INCH, 150 LB, RF FLANGES
DISC CARTRIDGE (ASSY.) MATERIALS:	COMPATIBLE WITH LINE FLUID AND CONNECTIONS
ANSI RATING:	150 LB CLASS
LINE FLUID:	WATER
RUPTURE PRESSURE AND TEMPERATURE:	173 PSIG @ 350°F (SECONDARY RELIEF DEVICE)
DISC DIAMETER:	2 INCH
AMBIENT TEMPERATURE:	16° TO 113° F
CLEANING AND PACKAGING:	VALVE SHALL BE FREE OF ALL CONTAMINANTS (INCLUDING RUST AND MILL SCALE), AND PACKAGED WITH COVERED PORTS TO PREVENT CONTAMINATION OR DAMAGE DURING SHIPMENT OR STORAGE.
CODE CONFORMANCE:	PER ASME BOILER AND PRESSURE VESSEL CODE SECTION VIII
DESIGN FEATURES;	3 SPARE DISCS ARE TO BE PROVIDED WITH EACH CARTRIDGE.

Installation and Maintenance Instructions for

FIKE Rupture Disc Assemblies

Assemble rupture disc flanges to existing piping or companion flanges, using good pipe fitting practice. Flow arrows on flanges must point downstream.

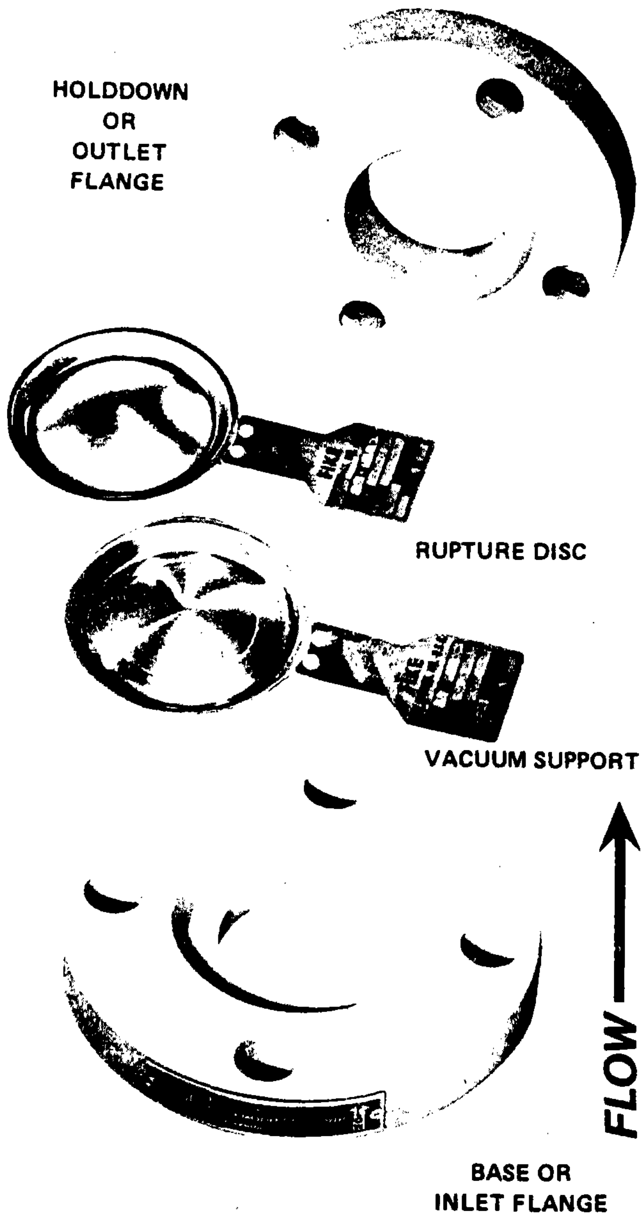


ILLUSTRATION OF
THE BOLTED TYPE FLANGE ASSEMBLY

WARNING: Do not locate rupture disc assembly where people are exposed to the disc itself or the area above the rupture disc.

This precaution applies to a rupture disc assembly having a free outlet even though it has a baffle to absorb thrust.

Vent toxic or inflammable fumes and liquids to a safe place.

Brace piping to absorb shock when disc breaks.

To install a new rupture disc or to replace an old rupture disc, check the following steps:

1. FLANGE PREPARATION:

For bolted type flanges, remove bolting and part flanges. (For union type flanges and screw type flanges, unscrew the holddown nut and disassemble.) Do not damage seating surfaces. Remove old or ruptured disc. Clean seating surfaces of flanges. If seating surfaces of flanges will not wipe clean, use solvent, steel wool or fine emery cloth. Grit and dirt on seating surfaces may damage rupture disc and cause premature failure.

2. RUPTURE DISC PREPARATION:

CAUTION: Handle rupture disc with extreme care. Do not bend, poke or in any way distort the rupture disc.

Clean the new rupture disc if foreign material is present. It is very important that the entire surface of the rupture disc be perfectly clean. Even finger prints on the disc that may come in contact with material in the system may, in some cases, cause premature corrosion of the disc due to the combination of certain acids inherent in the fingerprint and the material contained in the system.

3. INSTALLING A RUPTURE DISC:

If the rupture disc is to be used with a vacuum support, the serial number of the vacuum support must correspond to the serial number of the rupture disc.

CAUTION: The vacuum support must be placed under the rupture disc, Not On Top Of Rupture Disc.

Rupture disc and vacuum support (if used) must be placed between the rupture disc flanges so that the crown of the disc is downstream, i.e. the crown of the rupture disc must go into the outlet (holddown flange).

We do not recommend installing a rupture disc whose pressure-temperature rating is greater than the flange pressure-temperature rating.

4. ASSEMBLE:

After positioning the rupture disc, lower the holddown flange (or the ring for screw type flanges) onto the rupture disc. For bolted type flanges replace studs and nuts. Clean threads on studs and nuts if excessive foreign material is present. Wire brushing is usually sufficient. (For union type flanges and screw type flanges replace the holddown nut.) In clamping the rupture disc between the flanges, it is important that an even pressure is brought to bear on the disc, keeping the facing surfaces of the base (inlet) and holddown (outlet) flanges as near parallel as possible during the assembly operation. It is not necessary to use an excessive amount of pressure to clamp the disc securely between the flanges since the 30° angular seating gives a decided advantage in clamping pressure.

WARNING: Excessive tightening may damage surfaces of flanges and can easily "cut through" thin, soft rupture discs.

PREVENTIVE MAINTENANCE:

Under normal operating conditions the rupture disc should be replaced yearly or at rupture. Severe operating conditions may require that the disc be replaced more often. Instructions and precautions contained herein should be carefully followed.

Fike METAL PRODUCTS CORP. 704 South 10th Street, Blue Springs, Missouri 64015 • 816-229-3405

Recommended Torque Values for Fike 30° Seat and Poly S-D Rupture Discs in Insert or Full Bolting Type Flanges.

TABLE 16

	NOMINAL PIPE SIZE															
	1/2"	3/4"	1"	1-1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Max. Load L.L.	6000	9000	15000	18000	40000	55000	108000	125000	210000	247000	265000	280000	305000	390000	475000	560000
Max. Load H.L.	11000	28000	38000	50000	105000	145000	220000	300000								
150 (ASA) ANSI																
Reqd. Load	2189	6497	8746	11482	34818	46700	46066	58702	137227	172641	197660	227877	258915	246676	271829	322136
Max. Press.	275	275	275	275	275	275	275	275	275	275	275	275	275	275	275	275
Min. Torque	4.5	13.5	18.2	24	90	122	60	91	214	209	240	317	270	290	255	335
Max. Torque	12.5	19	31	38	104	143	141	195	328	300	322	398	318	457	445	583
Type Lip	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL
300 (ASA) ANSI																
Reqd. Load	2189	6497	8746	11482	34818	46700	46066	58702	137227	172641	197660	227877	258915	246676	362065	486865
Max. Press.	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720	720
Min. Torque	4.5	13.5	23	36	45	73	72	91	167	209	240	317	270	266	314	507
Max. Torque	12.5	23	39	56	52	86	169	130	255	257	311	262	318	339	412	583
Type Lip	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL	LL
600 (ASA) ANSI																
Reqd. Load	2240	6497	8746	12459	34818	53396	68390	99609	192071							
Max. Press.	1440	1440	1440	1440	1200	11440	1440	1440	1440							
Min. Torque	4.7	13.5	23	39	45	83	125	138	300							
Max. Torque	12.5	23	39	56	52	86	197	174	328							
Type Lip	LL	LL	LL	LL	LL	LL	LL	LL	LL							
600 (ASA) ANSI																
Reqd. Load					47997											
Max. Press.					1440											
Min. Torque					63											
Max. Torque					137											
Type Lip					HL											
900 (ASA) ANSI																
Reqd. Load	7570	19486	17462	33343	71992	79985	149308	288137								
Max. Press.	2160	2160	2160	2160	2160	2160	2160	2160								
Min. Torque	24	60	63	139	131	146	350	450								
Max. Torque	34	75	138	167	191	264	515	469								
Type Lip	HL	HL	HL	HL	HL	HL	HL	HL								
1500 (ASA) ANSI																
Reqd. Load	10515	27065	24239	46293	99998	111241	188318									
Max. Press.	3000	3000	3000	3000	3000	3000	3000									
Min. Torque	33	84	88	192	182	261	490									
Max. Torque	34	88	138	208	191	264	515									
Type Lip	HL	HL	HL	HL	HL	HL	HL									

L.L. = Light Lip H.L. = Heavy Lip

All Torque Values shown are in foot pounds. All pressure and load requirements are in PSIG and 72°F.

All torque values based on new free running studs coated with light oil. Stud material ASTM A193-B7, nuts ASTM A194-2H. Flanges of carbon steel ASTM A105 or A181 and stainless steel flanges of similar tensile material.

It is suggested, after initial start up and system is brought to working pressure and temperature, studs be retorqued to values shown due to material relaxing.

Care must be taken during installation that flange faces are brought down at an equal rate and that flange faces are parallel.

Rupture disc and flange seating surfaces must be clean and free of any rust and foreign matter.

1. The torque values shown in Table 16 apply to standard prebulged, "HO" and "HOV" (with metal seal), "CPV", "CPV-C" and standard prebulged with vacuum support construction, calculated for the following disc materials:
   - Stainless Steel
   - Inconel
   - Monel
   - Nickel
   - Aluminum
   - Hastelloy
2. For copper, silver, gold, lead lined discs and other ductile materials, minimum and maximum values are to be reduced by 50%.
3. For "HO", "HOV", "PL-HO", "PL-HOV" discs with plastic seals, it is recommended that 50% of the minimum torque values shown on Table 16 be used for the minimums and the minimums be used as maximum torque values and the seats of the base flange and disc be coated with silicon grease where possible.
4. For teflon, vinyl or epon coated discs (on process side), minimum torque value should be half way between minimum and maximum values given and the maximum torque value remain as shown. Teflon, vinyl and epon are slick substances, therefore more torque is required to hold disc and keep from slipping.

It should be understood that the values shown on Table 16 are based on optimum conditions. Many various things can affect torque and seat of disc in flanges. For example, rusty studs and/or nuts can increase torque required by as much as 3 times, any scratch or gouge in the seating area of either the disc or base flange will result in leakage, also not bringing flange faces down parallel at an equal rate. It should be understood that maximum values should not be used except as a last resort, in any case, never exceed maximum value as this will cause permanent deformation to rupture disc flanges, possibly affecting burst pressure and seal of disc in flanges.

4.10 TRAPS

4.10 TRAPS

Equipment Number	Description	Maintenance Section	Dwg. Number
T-AS-1-1		4.10.1	5163144
T-AS-1-2		4.10.2	5163144
T-MS-3-1		4.10.3	5163143
T-MS-4-2		4.10.4	5163143
T-MS-4-3		4.10.5	5163144
T-MS-4-4		4.10.6	5163144
T-MS-9-5		4.10.7	5163149
T-MS-10-6		4.10.8	5163149
T-ST-5-1		4.10.9	5163146
T-ST-5-2		4.10.10	5163146
T-ST-6-3		4.10.11	5163149
T-VT-6-3		4.10.12	5163149
T-VT-4-2		4.10.13	5163143

4.10 Steam Traps

4.10.1 Auxiliary Steam Trap

4.10.1.1 Identification

Tag Number	Description
T-AS-1-1	Auxiliary Steam Trap

4.10.1.2 Description

Manufacturer:	Yarway Corporation Blue Bell, Penn. 19422
Part Number:	1" 740 AH
Specification No:	DOE Dwg No. 40P70012I, CP 9
Material:	
Weight:	

4.10.1.3 Prescribed Service

Aux. Steam

4.10.1.4 Vendor

Yarway

4.10.1.5 Special Cautions

See Yarway Manual (following)

4.10.1.6 Periodic Service

See Yarway Manual (following)

4.10.1.7 Part Lists

See Yarway Manual (following)

4.10.1.8 Special Tools

None

4.10.1.9 Maintenance Instructions

See Yarway Manual (following)

4.10.1.10 Acceptance Test

None

4.10.2 Auxiliary Steam Trap

4.10.2.1 Identification

Identification	Description
T-AS-1-2	Auxiliary Steam Trap

4.10.2.2 Description

Manufacturer:	Yarway Corporation Blue Bell, Penn. 19422
Part Number:	1" 740 AH
Specification:	DOE Dwg No. 40P70012I, CP 9
Materials:	
Weight:	

4.10.2.3 Prescribed Service

Aux. Steam

4.10.2.4 Vendor

Yarway

4.10.2.5 Special Cautions

See Yarway Manual (following)

4.10.2.6 Periodic Service

See Yarway Manual (following)

4.10.2.7 Part List

See Yarway Manual (following)

4.10.2.8 Special Tools

None

4.10.2.9 Maintenance Instructions

See Yarway Manual (following)

4.10.2.10 Acceptance Test

None

4.10.3 Main Steam Trap

4.10.3.1 Identification — Description

Identification	Description
T-MS-3-1	Main Steam Trap

4.10.3.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" C-500 BSWR Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.3.3 Prescribed Service

Main Steam

4.10.3.4 Vendor

Yarway

4.10.3.5 Special Cautions

See Yarway Manual (following)

4.10.3.6 Periodic Service

See Yarway Manual (following)

4.10.3.7 Part List

See Yarway Manual (following)

4.10.3.8 Special Tools

None

4.10.3.9 Maintenance Instructions

See Yarway Manual (following)

4.10.3.10 Acceptance Test

None

4.10.4 Main Steam Trap

4.10.4.1 Identification — Description

Identification	Description
T-MS-4-2	Main Steam Trap

4.10.4.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" 515 ASWR

Specification: DOE Dwg. No. 40P70012I, CP 9

Materials:

Weight:

4.10.4.3 Prescribed Service

Main Steam

4.10.4.4 Vendor

Yarway

4.10.4.5 Special Cautions

See Yarway Manual (following)

4.10.4.6 Periodic Service

See Yarway Manual (following)

4.10.4.7 Part List

See Yarway Manual (following)

4.10.4.8 Special Tools

None

4.10.4.9 Maintenance Instructions

See Yarway Manual (following)

4.10.4.10 Acceptance Test

None

4.10.5 Main Steam Trap

4.10.5.1 Identification — Description

Identification	Description
T-MS-4-3	Main Steam Trap

4.10.5.2 Description

Manufacturer:	Yarway Corporation Blue Bell, Penn. 19422
Part Number:	1" 515 ASWR
Specification:	DOE Dwg No. 40P70012I, CP 9
Materials:	
Weight:	

4.10.5.3 Prescribed Service

Main Steam

4.10.5.4 Vendor

Yarway

4.10.5.5 Special Cautions

See Yarway Manual (following)

4.10.5.6 Periodic Service

See Yarway Manual (following)

4.10.5.7 Part List

See Yarway Manual (following)

4.10.5.8 Special Tools

None

4.10.5.9 Maintenance Instructions

See Yarway Manual (following)

4.10.5.10 Acceptance Test

None

4.10.6 Main Steam Trap

4.10.6.1 Identification

Identification	Description
T-MS-4-4	Main Steam Trap

4.10.6.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn 19422

Part Number: 1" 515 ASWR Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.6.3 Prescribed Service

Main Steam

4.10.6.4 Vendor

Yarway

4.10.6.5 Special Cautions

See Yarway Manual (following)

4.10.6.6 Periodic Service

See Yarway Manual (following)

4.10.6.7 Part List

See Yarway Manual (following)

4.10.6.8 Special Tools

None

4.10.6.9 Maintenance Instructions

See Yarway Manual (following)

4.10.6.10 Acceptance Test

None

4.10.7 Main Steam Trap

4.10.7.1 Identification — Description

Identification	Description
T-MS-9-5	Main Steam Trap

4.10.7.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" 740 AH Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.7.3 Prescribed Service

Main Steam

4.10.7.4 Vendor

Yarway

4.10.7.5 Special Cautions

See Yarway Manual (following)

4.10.7.6 Periodic Service

See Yarway Manual (following)

4.10.7.7 Part List

See Yarway Manual (following)

4.10.7.8 Special Tools

None

4.10.7.9 Maintenance Instructions

See Yarway Manual (following)

4.10.7.10 Acceptance Test

None

4.10.8 Main Steam Trap

4.10.8.1 Identification — Description

Identification	Description
T-MS-10-6	Main Steam Trap

4.10.8.2 Description

Manufacturer:	Yarway Corporation Blue Bell, Penn. 19422
Part Number:	1" C 500 ASWR Trap
Specification:	DOE Dwg No. 40P70012I, CP 9
Materials:	
Weight:	

4.10.8.3 Prescribed Service

Main Steam

4.10.8.4 Vendor

Yarway

4.10.8.5 Special Cautions

See Yarway Manual (following)

4.10.8.6 Periodic Service

See Yarway Manual (following)

4.10.8.7 Part List

See Yarway Manual (following)

4.10.8.8 Special Tools

None

4.10.8.9 Maintenance Instructions

See Yarway Manual (following)

4.10.8.10 Acceptance Test

None

4.10.9 Steam Trap

4.10.9.1 Identification — Description

Identification	Description
T-ST-5-1	Steam Trap

4.10.9.2 Description

Manufacturer:	Yarway Corporation Blue Bell, Penn. 19422
Part Number:	1" 740 AH Trap
Specification:	DOE Dwg No. 40P70012I, CP 9
Materials:	
Weight:	

4.10.9.3 Prescribed Service

Steam

4.10.9.4 Vendor

Yarway

4.10.9.5 Special Cautions

See Yarway Manual (following)

4.10.9.6 Periodic Service

See Yarway Manual (following)

4.10.9.7 Part List

See Yarway Manual (following)

4.10.9.8 Special Tools

None

4.10.9.9 Maintenance Instructions

See Yarway Manual (following)

4.10.9.10 Acceptance Test

None

4.10.10 Steam Trap

4.10.10.1 Identification — Description

Identification	Description
T-ST-5-2	Steam Trap

4.10.10.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" 740 AH Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.10.3 Prescribed Service

Steam

4.10.10.4 Vendor

Yarway

4.10.10.5 Special Cautions

See Yarway Manual (following)

4.10.10.6 Periodic Service

See Yarway Manual (following)

4.10.10.7 Part List

See Yarway Manual (following)

4.10.10.8 Special Tools

None

4.10.10.9 Maintenance Instructions

See Yarway Manual (following)

4.10.10.10 Acceptance Test

None

4.10.11 Steam Trap

4.10.11.1 Identification / Description

Identification	Description
T-ST-6-3	Steam Trap

4.10.11.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" 740 AH Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.11.3 Prescribed Service

Steam

4.10.11.4 Vendor

Yarway

4.10.11.5 Special Cautions

See Yarway Manual (following)

4.10.11.6 Periodic Service

See Yarway Manual (following)

4.10.11.7 Part List

See Yarway Manual (following)

4.10.11.8 Special Tools

None

4.10.11.9 Maintenance Instructions

See Yarway Manual (following)

4.10.11.10 Acceptance Test

None

4.10.12 Vent Trap

4.10.12.1 Identification — Description

Identification	Description
T-VT-6-3	Vent Trap

4.10.12.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn. 19422

Part Number: 1" 460 ASWR Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.12.3 Prescribed Service

Steam

4.10.12.4 Vendor

Yarway Corporation

4.10.12.5 Special Cautions

See Yarway Manual (following)

4.10.12.6 Periodic Service

See Yarway Manual (following)

4.10.12.7 Part List

See Yarway Manual (following)

4.10.12.8 Special Tools

None

4.10.12.9 Maintenance Instructions

See Yarway Manual (following)

4.10.12.10 Acceptance Test

None

4.10.13 Vent Trap

4.10.13.1 Identification — Description

Identification	Description
T-VT-4-2	Vent Trap

4.10.13.2 Description

Manufacturer: Yarway Corporation
Blue Bell, Penn 19422

Part Number: 1" 740 AH Trap

Specification: DOE Dwg No. 40P70012I, CP 9

Materials:

Weight:

4.10.13.3 Prescribed Service

Steam

4.10.13.4 Vendor

Yarway

4.10.13.5 Special Cautions

See Yarway Manual (following)

4.10.13.6 Periodic Service

See Yarway Manual (following)

4.10.13.7 Part List

See Yarway Manual (following)

4.10.13.8 Special Tools

None

4.10.13.9 Maintenance Instructions

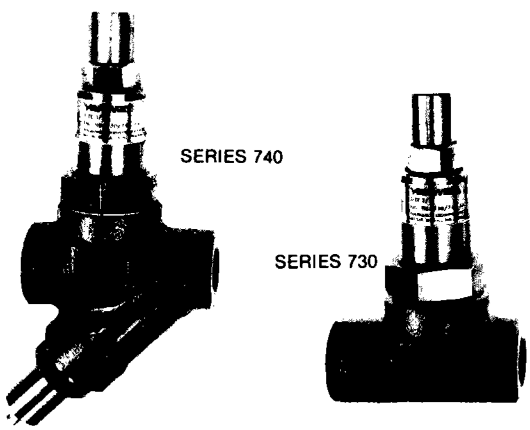
See Yarway Manual (following)

4.10.13.10 Acceptance Test

None

yarway®

installation, operation, and maintenance instructions for series 730 and 740 steam traps (also series 60, 120, 290)



RATINGS

Series 730L/740L 20-300 psi @ 450F threaded or socket welding ends.
Series 730H/740H 300-600 psi @ 750F threaded or socket welding ends.

PRESSURE SHELL: ANSI Class 600

Operating Range—Series 730L/740L: Set to operate without adjustment from 20 psi to 300 psi, against back pressures at trap outlet up to 40% of trap inlet pressure. Series 730H/740H: from 300 to 600 psi and back pressures up to 25%. For operation of either series on back pressures higher than specified above, consult Yarway before selecting or installing trap. See below for special adjustment for low pressure or high back pressure operation.

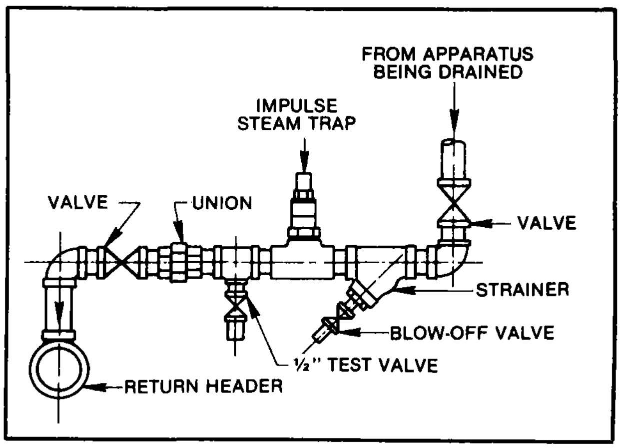
Special Adjustment of 730L/740L and 730H/740H for: Operation 10 to 50 psig; or back pressures up to 55% of inlet pressure. First cool trap. Remove cap nut, turn threaded stem and lock nut counterclockwise. Use pliers to remove split washer. Then turn stem and lock nut clockwise until lock nut (without washer) seats tightly, without jamming on top of bonnet. Lubricate thread. Replace gasket and cap nut. Trap is ready for operation.

INSTALLATION

Before installing trap—blow out piping thoroughly to remove loose scale and dirt. Use pipe dope sparingly. Piping, valves and fittings should be at least equal to or one size larger than trap connection.

Location—Below equipment being drained, in horizontal line. Where freezing is encountered—install trap on side or in vertical line, discharging downward.

Valves—Gate or ball valves for inlet and outlet stop valves, test valve, and strainer blow-off. See drawing. By-pass valves not required or recommended.



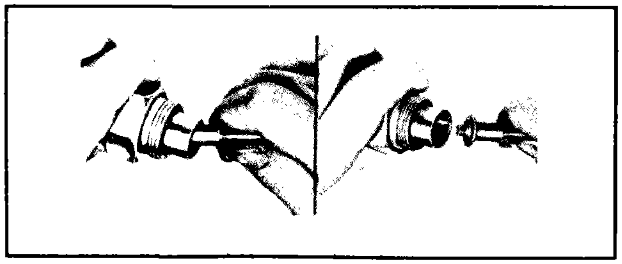
Strainer—Series 740 has integral strainer and blow-off valve. For Series 730, install Yarway Series 901 (iron) or 921 (steel) fine screen strainer ahead of trap. Install blow-off valve on strainer cap.

Discharge Line—If discharging to atmosphere use length of piping to conduct discharge to safe location, reduce noise and flash vapor. If discharge is to closed return system, install a test tee and valve at trap outlet for checking trap operation.

MAINTENANCE

If trap does not open—Make certain all steam valves are open. Control orifice may be clogged with scale or dirt. Disassemble and clean as described below.

If trap does not shut off—Check for excessive return line pressure. Trap may be cleared under full steam pressure by removing cap nut and turning threaded stem of cylinder up and down several times with a screwdriver—without changing setting of lock nut. This should dislodge dirt. If this is not successful, remove bonnet and clean working parts as described.



To clean trap—Caution—Trap should not be disassembled hot. Holding body with wrench remove only the trap bonnet. This removes all working parts. Remove seat adapter from bonnet. To remove seat adapter from bonnet, pull adapter firmly rotating it counter-clockwise. Do not try to pry assembly apart—this will damage sealing surfaces. After the seat adapter is removed from the bonnet, remove cap nut, lock pin and lock nut. Then thread the cylinder down to expose the valve piece long enough to grasp. Hold bonnet and cylinder firmly, roll valve edgewise as shown above. Replace same way. Clean valve, interior of control cylinder with a rag. If not adequate, soak all the parts in rust solvent. Do not use crocus cloth or similar material to clean parts. If valves or seats are worn from service, install a new repair kit. If dirt *or* foreign material builds up in control orifice, it should be cleaned with a fine wire and the polished orifice throat cleaned of any deposits. Care should be taken not to damage orifice walls during this cleaning.

Reassembling trap—Clean and inspect the sealing surfaces of trap and seat adapter. Bonnet and seat adapter will not seal if surfaces are dirty or damaged. Lubricate threads*.

Install the seat adapter carefully into the bonnet, being careful that valve enters opening in valve seat. Apply small amount of thread lubricant* to bonnet threads and cap nut. Apply torque directly to bonnet. Make certain the bonnet gasket is in place; a bonnet gasket is not required for series 60, 120, or 290 traps. See table for tightening torques.

RECOMMENDED TORQUE VALUES

Trap Size	Part	lb-ft	kg-meter
½"	Trap Bonnet	115-130	15, 9-18
	Strainer Bonnet	95-110	13, 1-15.2
	Seat (A internals)	16-18	2.18-2.47
¾"	Trap Bonnet	115-130	15, 9-18
	Strainer Bonnet	115-130	15, 9-18
	Seat (B internals)	24-26	3.28-3.57
1	Trap Bonnet	115-130	15, 9-18
	Strainer Bonnet	115-130	15, 9-18
	Seat (C & E internals)	29-31	4.03-4.32
½, ¾, 1	Lock Nut	7.9-8.3	1, 10-1, 15
	Cap Nut	25-30	3, 5-4, 2

To clean strainer

Series 740—Using wrench, operate blow-down valve while trap is under steam pressure. This will often restore trap operation. If not successful, close valve ahead of trap (and downstream if closed system), remove strainer bonnet and clean screen.

Series 730—Y-strainer ahead of trap may be blown down. Clean by opening blow-down valve attached to screen cap. If not successful, close valve ahead of strainer, remove cap and clean screen.

To clean screens—At least once a year remove strainer screen. Clean by blowing out with air or washing with rust solvent. If screen is damaged install a replacement screen. A new gasket should be used.

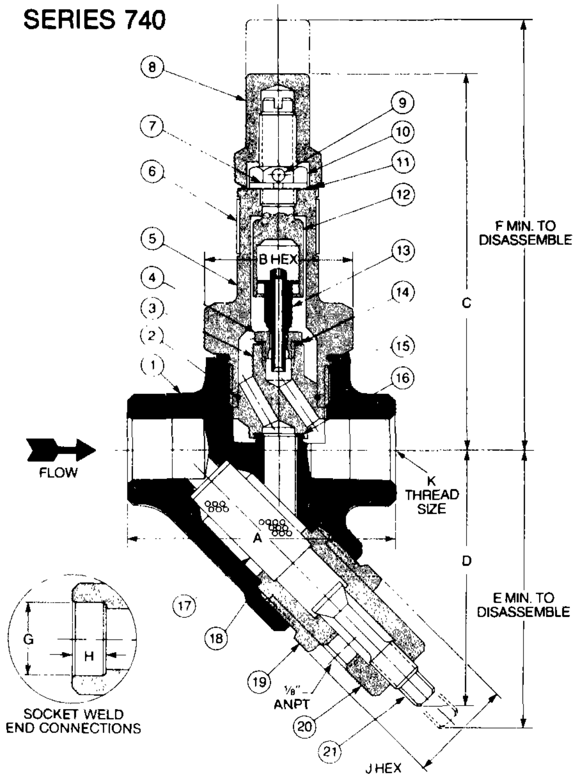
PART NUMBER FOR SCREENS OF VARIOUS YARWAY TRAPS

Trap Series No. and Type	Screen	Trap Size	Part No. of Screen
720 Disc 740 Piston 760 Thermo-static	Perforated .038" dia. holes; 304 stainless steel	3/8" and 1/2"	952411-01
		3/4" and 1"	952411-02
745 Orifice 780 Diaphragm	50 x 60 mesh; 304 stainless steel, Dutch Weave; .010" perforation.	1/2"	956854-01
		3/4"	956854-02

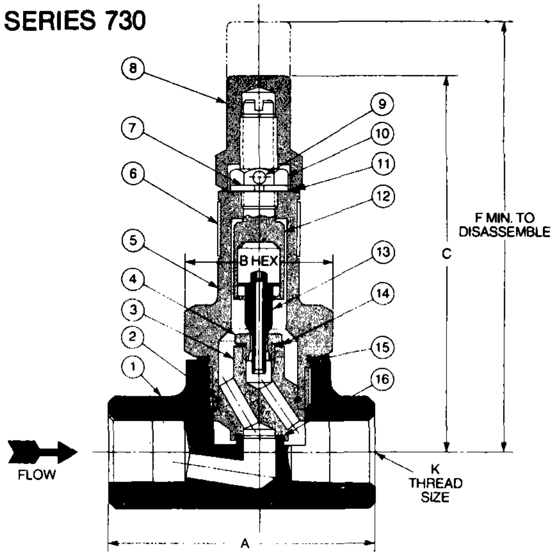
Reassembling strainer—Clean and inspect the gasketing surfaces of the body and strainer lock nut. Gasket will not seal if gasket surfaces are damaged. Install screen in blow-down body. Replace strainer gasket. Apply small amount of thread lubricant to threads. Thread lock nut into body. Refer to tightening torques table.

**Molykote "G" or Molydee (paste or spray)*

SERIES 740



SERIES 730



PARTS/MATERIALS

ITEM	PART	MATERIAL	ITEM	PART	MATERIAL
1	BODY	ASME SA-182 Gr. F11	12	CONTROL CYLINDER	STAINLESS STEEL
2	RETAINING RING	17/7 PH STAINLESS STEEL	13	VALVE	STAINLESS STEEL
3	SEAT ADAPTER	STAINLESS STEEL HT	14	SEAT GASKET	MONEL
4	VALVE SEAT	STAINLESS STEEL TYPE 414 HT	15	BONNET GASKET	MONEL CLAD ASBESTOS
5	BONNET	ASTM A-582 TYPE 416	16	ADAPTER GASKET	MONEL
6	NAME PLATE	STAINLESS STEEL	17	SCREEN	STAINLESS STEEL
7	SPLIT WASHER	BRASS	18	CAP GASKET (STRAINER)	MONEL
8	CAP NUT	STAINLESS STEEL, SERIES 400	19	LOCK NUT (STRAINER)	ASME SA-193 Gr. B7
9	LOCK PIN	BRASS	20	BLOW DOWN BODY	ASTM A-582 TYPE 416
10	LOCK NUT	STAINLESS STEEL	21	VALVE (STRAINER)	ASTM A-276 TYPE 420 HT
11	CAP GASKET	MONEL			

DENOTES REPAIR PARTS AVAILABLE AS FACTORY ASSEMBLED KIT ONLY.

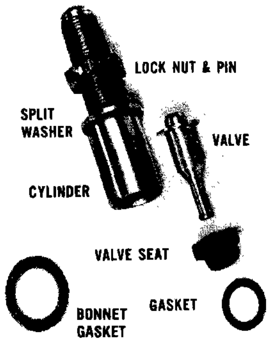
DIMENSIONS/WEIGHTS

TRAP SIZE, IN. (DN)	DIMENSIONS, IN. (mm)										APPROX. WT. lb. (kg)	
	A	B	C	D	E	F	G	H	J	K	730	740
$\frac{1}{2}$ (15)	$3\frac{5}{32}$ (80)	$1\frac{1}{2}$ (38)	$4\frac{7}{16}$ (113)	$3\frac{1}{16}$ (78)	$3\frac{11}{16}$ (94)	$5\frac{13}{16}$ (148)	.860 (21.8)	$\frac{3}{8}$ (9.5)	$1\frac{1}{16}$ (27)	$\frac{1}{2}$ ANPT	$2\frac{1}{4}$ (1.1)	$2\frac{3}{4}$ (1.3)
$\frac{3}{4}$ (20)	$3\frac{35}{64}$ (90)	$1\frac{1}{2}$ (38)	5 (127)	$3\frac{3}{8}$ (86)	4 (102)	$6\frac{3}{8}$ (162)	1.070 (27.2)	$\frac{1}{2}$ (12.7)	$1\frac{3}{16}$ (30)	$\frac{3}{4}$ ANPT	$2\frac{3}{4}$ (1.3)	$3\frac{1}{2}$ (1.6)
1 (25)	$3\frac{15}{16}$ (100)	$1\frac{1}{2}$ (38)	$5\frac{1}{8}$ (130)	$3\frac{19}{32}$ (91)	$4\frac{3}{32}$ (104)	$6\frac{1}{2}$ (165)	1.335 (33.9)	$\frac{1}{2}$ (12.7)	$1\frac{3}{16}$ (30)	1 ANPT	3 (1.4)	4 (1.8)

REPAIR KIT*

Installing New Parts

Caution:
Repair Kit consists of a set of matched parts, tested together. For proper trap operation, do not use any of the old parts.



1. *Install cylinder-valve assembly**

Unscrew cap nut and bonnet and *discard old inside parts: lock nut, pin, split washer, cylinder and valve.* Screw new cylinder (with valve inside) into bonnet. Install new washer and run lock nut (beveled corners must be on top) down on cylinder stem until pinholes line up, then insert pin. *Turn stem down until lock-nut and washer seat (but do not jam) on top face of bonnet. This is correct position for cylinder in bonnet. Torque the lock nut and cap nut to the valves shown in the torque table.* For operating pressures from 10 to 50 psi (Series 730L740L) and from 10 to 50 psi (Series 730H/740H) install lock nut without split washer.

2. *Install new seat**

To avoid possibility of stripping seat thread remove old valve seat from the seat adapter as follows: Put penetrating oil around seat. Hold seat adapter firmly in a vise and remove seat with hex socket wrench. Clean seat gasket surface. Install new seat and seat gasket using a small amount of thread lubricant. *Caution:* Do not damage the seating surfaces of seat adapter. Clean gasketing surface on seat adapter before reassembling seat adapter with new seat. See torque table for torque values.

3. *Reassemble bonnet**

Clean gasketing surfaces between body and bonnet, cap nut and bonnet before assembling these parts. Lubricate bonnet, cap nut and control cylinder threads before reassembly. Place bonnet gasket gapped face upward. See table for tightening torques.

SERIES 60, 120, 290 IMPULSE STEAM TRAPS

Series 730 and 740 supersede Series 60, 120, 290 traps, however Repair Kits for Series 730 and 740 traps can be used in Series 60, 120, 290 traps. See interchange for traps and Repair Kits table below.

Old Series Trap	Equiv. New Series 730/740 Trap	All Use Repair Kit
½" 60	½" 730AL or ½" 740AL	730AL/740AL
½" 60B	½" 730BL or ½" 740BL	730BL/740BL
¾" 60	¾" 730CL or ¾" 740CL	730CL/740CL
1" 60	1" 730EL or 1" 740EL	730EL/740EL
½" 120	½" 730AH or ½" 740AH	730AH/740AH
½" 120B	½" 730BH or ½" 740BH	730BH/740BH
¾" 120	¾" 730CH or ¾" 740CH	730CH/740CH
1" 120	1" 730EH or 1" 740EH	730EH/740EH
½" 290	½" 730AHSW or ½" 740AHSW	Same as
½" 290B	½" 730BHSW or ½" 740BHSW	Equivalent
¾" 290	¾" 730CHSW or ¾" 740CHSW	Series 120
1" 290	1" 730EHSW or 1" 740EHSW	Above

Note: Series 740 traps provide integral strainer and blow-off valve not previously available in Series 60, 120, 290. For installation, service of Series 60, 120, 290 traps, follow instructions in this pamphlet as given for equivalent Series 730 and 740 traps.

**For Series 60, 120 and 290 traps, use the appropriate 730/740 repair kit. Seat and seat gasket mount directly in trap body; bonnet gasket (pt 15) for 730/740 is not required for Series 60, 120 or 290 traps.*

YARWAY

Yarway Corporation, Blue Bell, Pennsylvania 19422

Yarway Canada Ltd., Guelph, Ontario
Yarway Europa B.V., Roosendaal; The Netherlands • Yarway Ltd., Salisbury, England, U.K.
Societe Industrielle des Charmilles, Villemomble, France
Yarway, Duesseldorf, West Germany • Yarway do Brasil LTDA, Sao Paulo, Brazil • Gadelius Yarway K.K., Kobe, Japan

5M 1/81 PN 306209 Rev. A-48B1

Printed in U.S.A.

YARWAY

how to install and service series C250, C260 and C500 integral strainer steam traps

INSTALLATION

Range and Back Pressure Limits

Press./Temp. Rating	Size—SW End Connection	Series	Trap Internals Size
600 psi 975F (40 bars, 524C)	1", 1¼", 1½" (25, 32, 40 mm)	C250	E or G
1500 psi 975F (100 bars, 524C)	1", 1½", 2" (25, 40, 50 mm)	C260	E
2500 psi 1050F (180 bars, 565C)	½", ¾", 1" (15, 20, 25 mm)	C500	A or B

Maximum allowable back pressure is 25% of inlet pressure.

Position—Locate steam trap below outlet from equipment (gravity flow). If the trap must be above the drain, provide a "U" or lift fitting at the bottom of the raiser before the trap (water seal). The trap may be installed in a horizontal or vertical line so long as the trap is positioned to discharge horizontal or downward.

Piping—Blow the system out before installing the trap. *Pipe size to and from trap should be at least equal to trap size or one size larger.* Discharge line for short runs can be equal to trap size; should be larger for long runs. Avoid excessive back pressure.

Valves—Use gate type for isolating, globe type for strainer blow down, or for test (see Fig. No. 1) by-passes are not recommended, except for critical installations. If discharge is to overhead return, install a swing check valve in the discharge line.

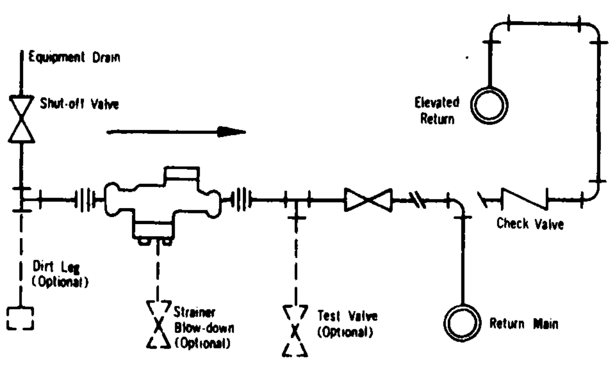


Fig. 1 Typical Installation

MAINTENANCE

Check trap and blow down strainer frequently during first month of operation. Thereafter system conditions will dictate frequency of blowdown (or cleaning of screen if there is no blow down valve) during normal operation.

Frequent Checks for proper trap operation can be quickly made by one of the following methods:

1. *Observe the discharge* from the trap through the test valve. Close the downstream stop valve before opening the test valve. If trap is functioning properly, periodic discharge of condensate should be visible from test valve. *Note:* that at all times a minute discharge of condensate and flash steam is visible at the trap discharge.
2. *Hold screwdriver* or metal rod against the base of the trap bonnet. Listen for characteristic, slow clicking sound of valve piece as it opens and closes. *Note:* Low condensate loads are handled through valve piece control orifice, without opening and closing of the valve piece.
3. Using a surface pyrometer, *check temperatures* up and downstream of the trap; measure on cleaned surface of pipe.
   - A. The trap is operating normally if the inlet and outlet measured temperatures are within 5 to 10% below saturation temperature corresponding to pressures up and downstream.
   - B. If measured inlet and discharge temperature are high and near one-another, then live steam is blowing through the trap.
   - C. If measured upstream temperature is considerably lower than the saturation temperature corresponding to inlet steam pressure, then trap is continuously closed.
4. If the *trap remains open,* not shutting off (blowing through)—cause may be scale, dirt or oxide deposits in the trap. Disassemble and clean trap.
5. If the *trap remains closed* and/or provides inadequate drainage—cause may be worn or damaged trap internals or clogged strainer.

DISASSEMBLY—*Steam Trap*

1. Remove hexagon nuts (6), take off bonnet (2) and bonnet gasket (11). Carefully lift out internals shown in blown up section above.
2. Unthread seat (7) from adapter (6).
3. Tilt the valve (8) out of the control cylinder (5).

ITEM	NAME OF PART	MATERIAL
1	BODY	CR.MO.STL. A217-WC9
2	BONNET, TRAP	CR.MO.STL.
3	BONNET, STRAINER	CR.MO STL
4	LOCK NUT	STAINLESS STEEL
5	CONTROL CYLINDER	STAINLESS STEEL
6	CONTROL CYLINDER ADAPTER	STAINLESS STEEL
7	SEAT	STAINLESS STEEL
8	VALVE PIECE	STAINLESS STEEL
9	PIN, LOCK	MONEL
10	SCREEN	STAINLESS STEEL
11	GASKET SPIRAL WOUND	ST.STL. & ASBESTOS
12	GASKET SPIRAL WOUND	ST.STL. & ASBESTOS
13	GASKET SPIRAL WOUND	ST STL. & ASBESTOS
14	STUD TRAP BONNET	STEEL
15	NUT, HEX, TRAP BONNET	STEEL
16	STUD STRAINER BONNET	STEEL
17	NUT, HEX STRAINER BONNET	STEEL

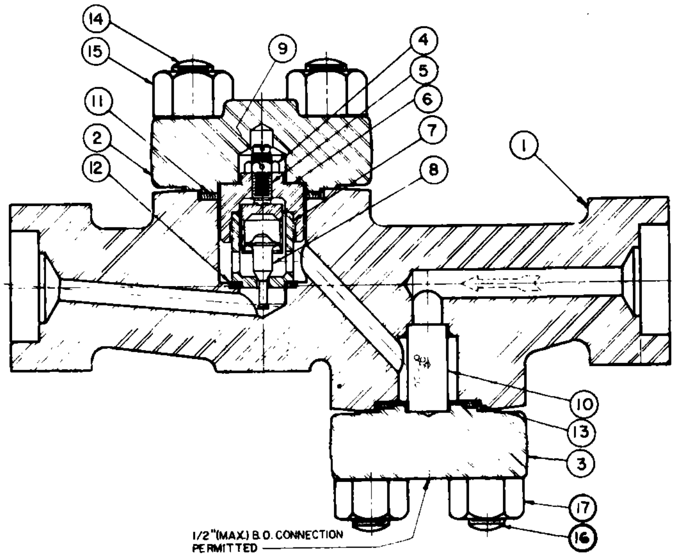


Fig. 2 Sectional View and Parts List

4. Inspect and clean all parts with a cloth and a non-corrosive solvent. Heavy deposits may be cleaned from valve piece orifice with a piece of fine wire. Be careful not to damage valve piece orifice, disc edge or control cylinder bore. Under no circumstances should crocus cloth or tools be used to clean surfaces.

5. Inspect control cylinder bore, valve piece and seat for wear. Warn parts cause inefficient and improper operation and therefore should be replaced with a factory-set repair capsule.

   A. *REPAIR CAPSULE* consists of the following parts: control cylinder (5), lock nut (4), control cylinder adapter (6), seat (7), valve piece (8) and lock pin (9). (See bottom of page for ordering instructions.) Repair capsules are furnished as an assembled unit with matched parts not individually interchangeable.

Note: Seat gaskets (12) and bonnet gaskets (11 & 13) are not furnished with the repair capsule and are available from Yarway as separate items. (Gaskets 11 & 13 are identical)

DISASSEMBLY—*Strainer*

1. Remove hexagon nuts (15), take off strainer bonnet (3), screen (10), and bonnet gasket (13).
2. Clean screen with compressed air, or steam, or by washing in solvent. Replace screen if damaged.

REASSEMBLY

Before reassembly, clean both trap and strainer studs (14) and lubricate with high temperature lubricant such as "Molykote".

Clean body recess and all gasketing surfaces for seat and bonnet gaskets.

REASSEMBLY—*Steam Trap*

1. Place seat gasket (12) into body.
2. If repair capsule is being installed, simply place preassembled unit on seat gasket.
3. If internals were taken apart and cleaned:
   A. Carefully slide valve piece into control cylinder.
   B. Thread seat into adapter, making sure that valve piece drops through seat orifice.
4. Make sure in both cases that seat is positioned properly on seat gasket.
5. Place bonnet gasket on body sealing surface. Mount bonnet on studs and handtighten bonnet hexagon nuts.
6. Torque diagonally opposite bonnet nuts to torque values shown in table below.

TORQUE VALUES lb-ft (kg-m)

Series No.	Trap Bonnet	Strainer Bonnet
C250	50-55 (74-82)	50-55 (74-82)
C260	200-210 (296-310)	130-140 (193-207)
C500	200-210 (296-310)	70-80 (104-118)

REASSEMBLY—*Strainer*

1. Press screen into recess on strainer bonnet.
2. Place new gasket (13) on bonnet gasketing surface.
3. Carefully raise bonnet over studs. Be sure that screen properly enters body recess and gasket lines up concentric with body gasket recess.
4. Hand tighten hexagon nuts on studs and torque diagonally opposite nuts to values shown.

INSTRUCTIONS on how to order replacement or spare parts:

EXAMPLE:

Quantity—Repair capsule for size, series number* Yarway QCT integral strainer steam trap.
*Be sure to indicate letter size of trap internals, shown on nameplate as the 5th digit of the series number.

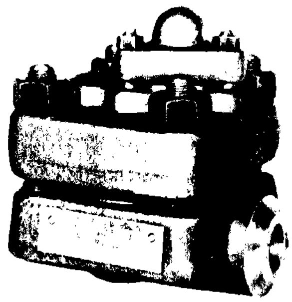
Quantity—Bonnet gasket, or seat gasket for size, series, Yarway QCT integral strainer steam trap.

YARWAY
Yarway Corporation, Blue Bell, Pennsylvania 19422 • Yarway Canada Ltd., Guelph, Ontario
Yarway Ltd., Salisbury, England • Yarway Europa B.V., Roosendaal, The Netherlands
Part No. 042-305056 1M 9-76 CD

Printed in U.S.A.

YARWAY

How to install and service series 515/516 integral strainer impulse® steam traps to 1500 psig



THE YARWAY SERIES 515 INTEGRAL STRAINER TRAP

RATINGS

OPERATING PRESSURE RANGES
BACK PRESSURE LIMITS

Piston Valve Traps rated to 1500 psig (incl.) are factory set to operate from 150 psig to maximum rated pressure. Maximum allowable back pressure at trap outlet equals 25% of pressure at trap inlet, based on absolute pressures.

SERIES NUMBERS

To determine the size, series number, and pressure-temperature rating refer to the nameplate on the trap body.

SUFFIX LETTER IDENTIFICATION

SW	Socket weld ends
A, B	Internal part size
R	Commercial (flanges per ASA Standard)
E	Navy (flanges per MIL-T-960E)

SIZE END CONN.	FIGURE NUMBER	INTERNAL PARTS PISTON	AVAILABLE END CONNECTIONS	RATING
½", ¾", 1"	515	A or B	SW	1500 psi—975°F
	516		SW	1500 psi—850°F

NOTE: Series 515 socket weld end traps are chrome moly steel construction. Series 516 socket weld end traps are constructed from carbon steel.

INSTALLATION

PIPING to and from the trap should be equal to trap size or one size larger. Discharge line for short runs equal to trap size; larger for long runs. Avoid configurations that would cause excessive back pressure.

LOCATE TRAP below outlet from equipment (gravity flow). If trap must be above the drain provide a "U" or lift fitting at the bottom of the riser before the trap (water seal). The trap may be installed in a horizontal or vertical line or at any angle so long as the discharge is downward or horizontal.

VALVES—Use gate type for isolating, globe type for strainer blowdown, or for test (see Figure No. 1). By-passes not recommended except for critical installations. If discharge is to a multi-station or overhead return, put a swing check valve in discharge line to prevent backflooding on shutdown. Select a check valve suitable for the application.

BLOW THE SYSTEM OUT before installing the trap. Frequent strainer blowdown or cleaning is recommended on a new system. Conditions will dictate frequency of blowdown in normal operation.

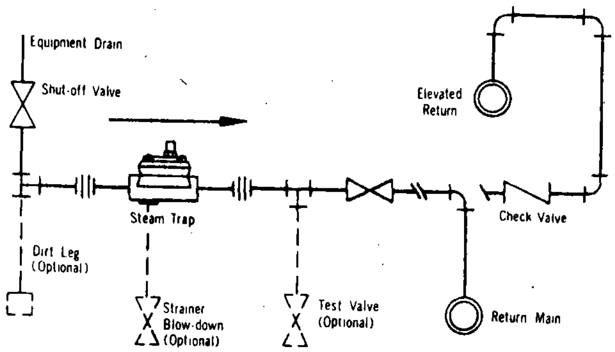


FIGURE NO. 1 **NORMAL INSTALLATION — CLOSED RETURN INSTALLATION — OVERHEAD RETURN**

MAINTENANCE

(1) For best trap operation and maximum service life, strainer screen should be cleaned frequently. This can best be done by using a blowdown valve connected to blow-off connection.

(2) Periodically remove the bonnet and clean and inspect the screen. This should be done at least once a year, and more frequently if the trap is not fitted with a strainer blowdown valve.

(3) When cleaning the strainer it is recommended that the trap be inspected and working parts cleaned if necessary. In the event of condensate drainage problems, check before opening the trap whether the trouble is due to a clogged line, valve broken or in wrong position, or dirty strainer requiring blowdown.

(4) More frequent checks for proper trap operation can be quickly made by one of the following methods:

A. Observe the discharge from the trap through the test connection—first closing the downstream stop valve.

B. Hold screwdriver or metal rod against base of cap. Listen for characteristic clicking sound of valve as it opens and closes.

C. Check temperature of the cleaned pipe surface up and downstream of trap. Use a touch pyrometer or temperature sensitive crayon.

If trap is remaining open continuously or not operating at all:
—strainer screen may be damaged or dirty
—parts may be worn from service
—dirt and scale may be lodged in internals

Disassemble and inspect the trap.

DISASSEMBLY

1. Remove bonnet and unscrew seat.
2. Inspect and clean all parts. If satisfactory, reassemble trap. It is recommended that new gaskets be used.

IF INTERNALS REQUIRE REPLACING

1. Remove cap nuts, cap, and using wrench and screwdriver simultaneously, loosen control cylinder.
2. Pull lock pin, remove locknut, and unscrew control cylinder.
3. Install new internals, and gaskets. Reassemble trap.

1—Body
2—Bonnet
3—Cap
* 4—Valve
* 5—Control cyl.
* 6—Seat
* 7—Lock nut
* 8—Lock pin
9—Seat gasket
*10—Cap gasket
11—Bonnet gasket
12—Screen
13—Bonnet stud
14—Bonnet nut
15—Cap stud
16—Cap nut
*—Repair kit parts

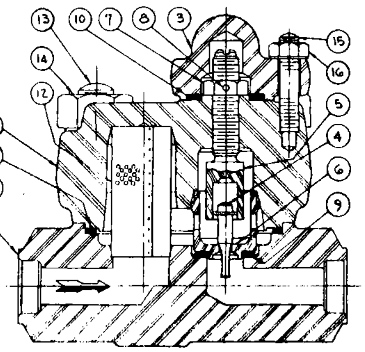


FIGURE NO. 2—PISTON VALVE TYPE

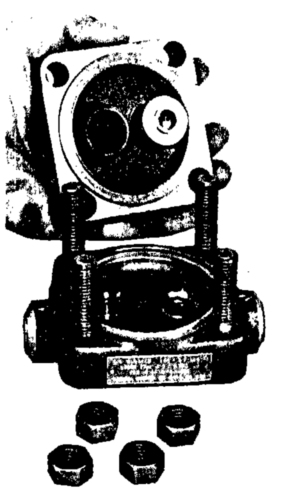


FIGURE NO. 3 — Trap disassembled exposing strainer and "cage" arrangement of all trap working parts mounted in the bonnet.

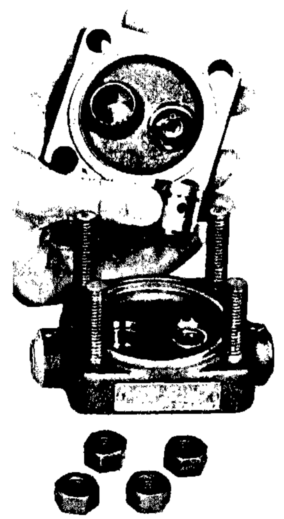


FIGURE NO. 4 — Seat removed to show valve and control cylinder.

SERVICING

After disassembly clean internal parts with a cloth and a non-corrosive solvent. Heavy deposits may be cleaned from orifice in top of piston valve with a piece of fine wire or toothpick.

***BE CAREFUL** not to damage valve orifice, disc edge, or control cylinder bore. Under no circumstances should crocus cloth or tools be used to clean any surfaces of trap parts.*

Inspect control cylinder bore, valve and seat for wear. Worn parts cause inefficient or improper operation. They should be replaced with a factory-set repair kit.

CAUTION: The valve, seat and control cylinder of the repair kit are matched parts. They are not individually interchangeable with similar parts from other repair kits. Do not re-use any of the old parts when installing a new repair kit.

Clean the strainer screen with air or steam blast or wash in solvent.

SPARE PARTS

To cover a one year service period, it is recommended that spare parts be stocked as follows:

A. One (1) repair kit for every four (4) integral strainer traps installed of same internals. (Minimum number of kits 1)

B. One (1) spare set of gaskets (one each bonnet gasket and seat gasket) for each trap installed.

C. One (1) strainer screen for each trap installed.

GASKETS	DIMENSIONS	Y.W. PART NUMBERS
9–Seat Gasket	1" O.D. x ⅝" I.D. x .125"	938635-03
†10–Cap Gasket	1¼" O.D. x ⅞" I.D. x .125"	938635-04
11–Bonnet Gasket	3¼" O.D. x 2⅞" I.D. x .125"	938635-05

†Repair Kit Part

REASSEMBLY

INSTALLING REPAIR KIT

1. Clean sealing surfaces and all internal parts.
2. Clean studs and lubricate with high temperature lubricant.
3. Remove lock pin and nut from control cylinder stem.
4. Screw control cylinder into bonnet.
5. Insert valve in seat, holding valve in position, screw seat into bonnet—be sure valve enters control cylinder and that seat contacts the bottom of the counterbore in the bonnet.
6. Replace locknut (bevels up), and lockpin.
7. Screw cylinder down; tighten locknut *lightly*.
8. Push screen into body recess and with new bonnet and seat gaskets in place lower bonnet over studs.
9. Run bonnet nuts on studs and tighten alternately; tighten cap nuts alternately.*
10. Replace cap gasket cap and nuts.

* Recommended tightening torques for the bonnet and cap are 70 ft.-lbs. and 25 ft.-lbs. respectively. The bonnet and cap are to be tightened down to make metal-to-metal contact so as to provide proper load on the spiral wound gaskets.

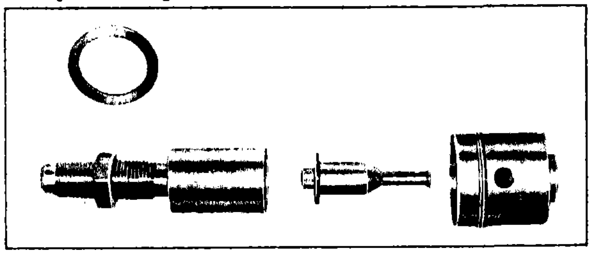


FIG. NO. 5 — REPAIR KIT — PISTON VALVE INTERNALS

YARWAY

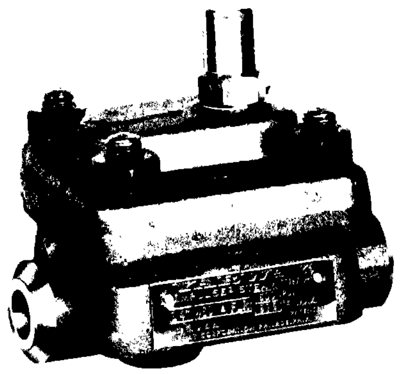
Yarway Corporation, Blue Bell, Pennsylvania 19422 • Yarway Canada Ltd., Guelph, Ontario
Yarway Ltd., Salisbury, England • Yarway Europa B.V., Roosendaal, The Netherlands

Part No. 042-302684 (2M-579)

Printed in U.S.A.

yarway

how to install and service series 400 integral strainer impulse® steam traps to 600 psig



SERIES 400
INTEGRAL STRAINER TRAP
(End illustrated)

RATINGS

OPERATING PRESSURE RANGES
BACK PRESSURE LIMITS

Piston Valve Traps rated to 400 psig (incl.) are factory set to operate from 20 psig to maximum rated pressure. Maximum allowable back pressure at trap outlet equals 40% of pressure at trap inlet.

Piston Valve Traps rated to 600 psig (incl.) are factory set to operate from 40 psig to 600 psig. Maximum allowable back pressure at trap outlet equals 25% of pressure at trap inlet.

Note: The traps operate over the specified ranges without adjustment. Piston Valve Traps may be adjusted to operate between 10 psig and the minimums stated above by removing the split washer (see disassembly section). Back pressures higher than the percentages stated above will cause the traps to blow open. Where normal system back pressures are high, removal of the split washer will also permit operation against back pressures up to 55% of pressure at trap inlet.

Disc Valve Traps rated to 600 psig (incl.) operate from 4 psig to maximum rated pressure. Maximum allowable back pressure at trap outlet is 60% of pressure at trap inlet.

SERIES NUMBERS

To determine the size, series number, and pressure-temperature rating refer to the nameplate on the trap body.

SUFFIX LETTER IDENTIFICATION

SW	Socket weld ends
FL	Flanged ends (special option only)
A, B, C,	Internal part size
E	Navy (flanges per MIL-T-960*E*)
D	Navy (flanges per MIL-T-960*D*)

SIZE END CONN.	FIGURE NUMBER	INTERNAL PARTS PISTON DISC	AVAILABLE END CONNECTIONS	RATING
½″	440 441 460 461	A or B	SW, FL SW SW, FL SW	400 psi—975 F 400 psi—850 F 600 psi—975 F 600 psi—850 F
¾″	440 441 460 461	A, B, C	SW, FL SW SW, FL SW	400 psi—975 F 400 psi—850 F 600 psi—975 F 600 psi—850 F
1″	440 441 460 461	A, B, C	SW, FL SW SW, FL SW	400 psi—975 F 400 psi—850 F 600 psi—975 F 600 psi—850 F

Notes:

(1) 400# socket weld and thread end traps are furnished for 300 psi and 150 psi ratings.

(2) All flanged end traps are of chrome moly steel construction. Socket weld end traps in the Series 440 or 460 are chrome moly steel construction. Series 441 and 461 socket weld end traps are constructed from carbon steel.

INSTALLATION

PIPING to and from the trap should be equal to trap size or one size larger. Discharge line for short runs equal to trap size; larger for long runs. Avoid configurations that would cause excessive back pressure.

LOCATE TRAP below outlet from equipment (gravity flow). If trap must be above the drain provide a "U" or lift fitting at the bottom of the riser before the trap (water seal). The trap may be installed in a horizontal or vertical line or at any angle so long as the discharge is downward or horizontal.

VALVES—Use gate type for isolating, globe type for strainer blowdown, or for test (see Figure No. 1). By-passes not recommended except for critical installations. If discharge is to a multi-station or overhead return, put a swing check valve in discharge line to prevent backflooding on shutdown.

BLOW THE SYSTEM OUT before installing the trap. Frequent strainer blowdown or cleaning is recommended on a new system. Conditions will dictate frequency of blowdown in normal operation.

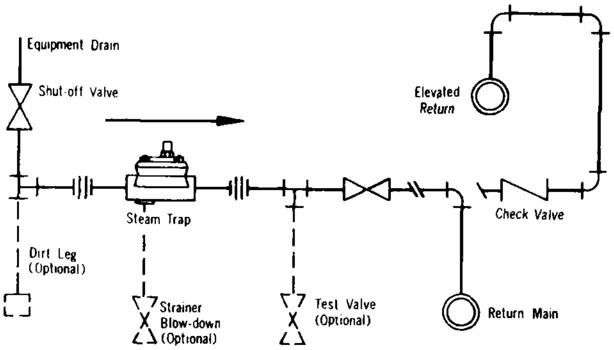


FIGURE NO. 1 **NORMAL INSTALLATION — CLOSED RETURN INSTALLATION — OVERHEAD RETURN**

MAINTENANCE

(1) For best trap operation and maximum service life, strainer screen should be cleaned frequently. This can best be done by using a blowdown valve connected to blow-off connection.

(2) Periodically remove the bonnet and clean and inspect the screen. This should be done at least once a year, and more frequently if the trap is not fitted with a strainer blowdown valve.

(3) When cleaning the strainer it is recommended that the trap be inspected and working parts cleaned if necessary. In the event of condensate drainage problems, check before opening the trap whether the trouble is due to a clogged line, valve broken or in wrong position, or dirty strainer requiring blowdown.

(4) More frequent checks for proper trap operation can be quickly made by one of the following methods:

A. Observe the discharge from the trap through the test connection—first closing the downstream stop valve.

B. Hold screwdriver or metal rod against base of cap. Listen for characteristic clicking sound of valve as it opens and closes.

C. Check temperature of the cleaned pipe surface up and downstream of trap. Use a touch pyrometer or temperature sensitive crayon.

If trap is remaining open continuously or not operating at all:

—strainer screen may be damaged or dirty

—parts may be worn from service

—dirt and scale may be lodged in internals

Disassemble and inspect the trap.

DISASSEMBLY

PISTON VALVE TYPE

(1) Remove bonnet and unscrew seat.

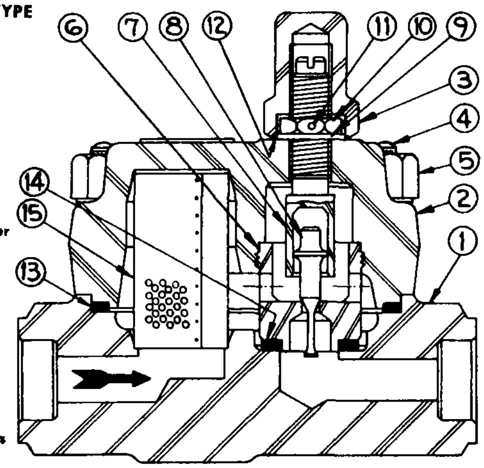
(2) The valve is larger in diameter than the open end of the cylinder. To remove the valve from the cylinder, push valve into back of cylinder, squeeze open end of cylinder lightly with pliers—then tilt the valve out of the cylinder.

(3) Inspect and clean all parts. If satisfactory, reassemble trap. If internals require replacing, remove cap nut and lock pin. Then using wrench and screwdriver simultaneously loosen control cylinder and locknut. Remove split washer and unscrew control cylinder. See page 4 for repair kit installation and assembly.

Note: To reset trap for low pressure operation, omit split washer when reassembling. Tighten locknut lightly against bonnet.

FIGURE NO. 2
PISTON VALVE TYPE

1—Body
2—Bonnet
3—Cap nut
4—Stud (4)
5—Nut (4)
* 6—Seat
* 7—Control Cylinder
* 8—Valve
* 9—Split washer
*10—Locknut
*11—Lock pin
*12—Cap gasket
13—Bonnet Gasket
*14—Seat Gasket
15—Screen



*—Repair kit parts

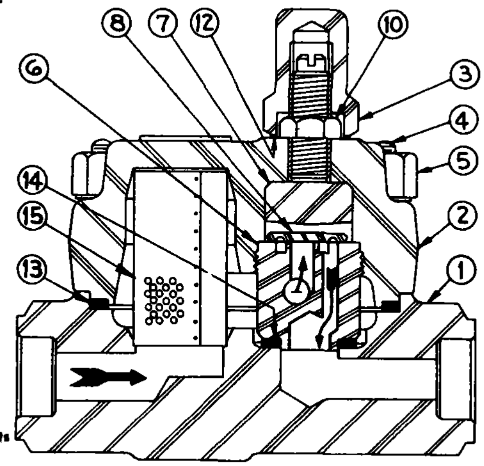
DISC VALVE TYPE

(1) Remove bonnet and unscrew seat.

(2) Inspect and clean all parts. If satisfactory, reassemble trap. If internals require replacing, remove cap nut. Then using wrench and screwdriver simultaneously loosen adapter and locknut and unscrew adapter. See page 4 for repair kit installation and assembly.

FIGURE NO. 3
DISC VALVE TYPE

1—Body
2—Bonnet
3—Cap nut
4—Stud (4)
5—Nut (4)
* 6—Seat
7—Adapter
* 8—Disc
10—Locknut
*12—Cap gasket
13—Bonnet gasket
14—Seat gasket
15—Screen



*—Repair Kit Parts

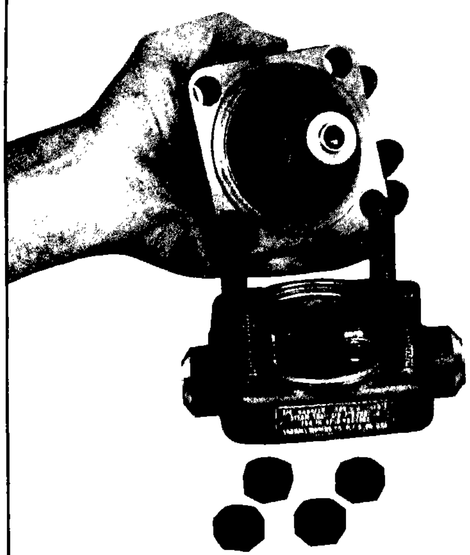
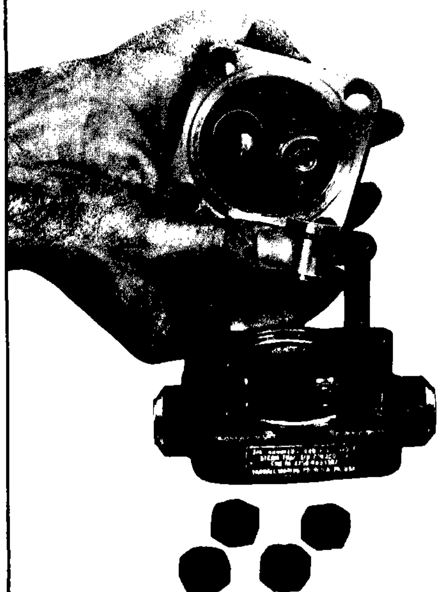


FIGURE NO. 4

Trap disassembled exposing strainer and "cage" arrangement of all trap working parts mounted in the bonnet

FIGURE NO. 5

Seat removed to show valve and control cylinder



SERVICING

After disassembly clean internal parts with a cloth and a non-corrosive solvent. Heavy deposits may be cleaned from orifice in top of piston valve with a piece of fine wire or toothpick.

> ***BE CAREFUL not to damage valve orifice, disc edge, or control cylinder bore (piston valve trap). Under no circumstances should crocus cloth or tools be used to clean any surfaces of trap parts.***

Inspect control cylinder bore, valve and seat for wear (disc and seat in disc type trap). Worn parts cause inefficient or improper operation. They should be replaced with a factory-set repair kit. Repair kit does not include bonnet and seat gasket. These should be ordered separately.

> ***CAUTION: The valve, seat and control cylinder of the repair kit are matched parts. They are not individually interchangeable with similar parts from other repair kits. Do not re-use any of the old parts when installing a new repair kit. Always use new gaskets.***

Clean the strainer screen with air or steam blast or wash in solvent.

SPARE PARTS, SPECIAL TOOLS

SPARE PARTS

To cover a one year service period, it is recommended that spare parts be stocked as follows:

A. One (1) repair kit for every four (4) integral strainer traps installed of same internals. (Minimum number of kits—1)

B. One (1) spare set of gaskets (one bonnet gasket and one seat gasket) for each trap installed.

C. One (1) strainer screen for each trap installed.

SPECIAL TOOLS

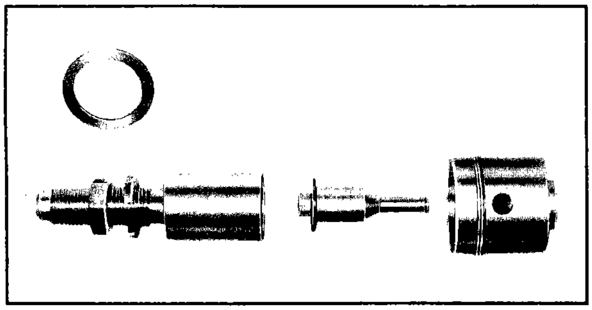
For the disc valve type trap, the use of a spanner wrench (J. H. Williams #0-471A) is recommended for seat removal and tightening.

REPAIR KIT

INSTALLING REPAIR KIT—REASSEMBLY

PISTON VALVE TYPE

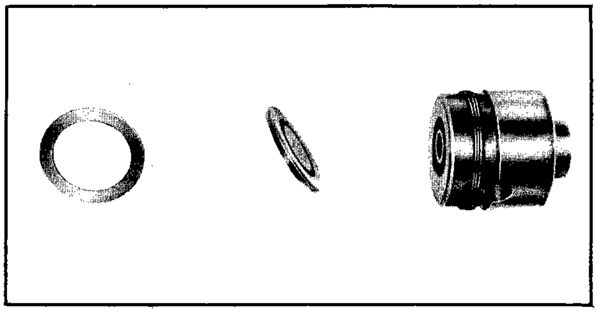
1. Clean sealing surfaces and all internal parts.
2. Clean studs and nuts and lubricate (stud and nut face) with high temperature lubricant.
3. Remove lock pin and nut from control cylinder stem.
4. Screw control cylinder into bonnet.
5. With valve in cylinder, screw seat into bonnet—be sure valve enters seat orifice and that seat contacts the bottom of the counterbore in the bonnet.
6. Replace split washer, locknut (bevels up), and lockpin.
7. Screw cylinder down; tighten locknut *lightly*.
8. Push screen into body recess and with body and seat gaskets in place lower bonnet over studs.
9. Run bonnet nuts on studs, lubricate studs and nut faces with a high temperature lubricant such as Molykote "G" or Moly Dee, and tighten alternately.*
10. Replace cap nut and gasket, tighten cap nut.



DISC VALVE TYPE

1. Clean sealing surfaces and all internal parts.
2. Clean studs and nuts and lubricate (stud and nut face) with high temperature lubricant.
3. Screw adapter into bonnet; tighten firmly and lock with locknut.
4. Place disc in chamber (groove facing seat); screw seat into bonnet and tighten firmly.
5. Push screen into body recess and with bonnet and seat gaskets in place lower bonnet over studs.
6. Run bonnet nuts on studs and tighten alternately.*
7. Replace cap nut and gasket, tighten cap nut.

*Recommended maximum tightening torque for the bonnet is 50 ft./lb. The bonnet is to be tightened down to make metal to metal contact so as to provide proper load on the spiral wound gaskets.



YARWAY

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