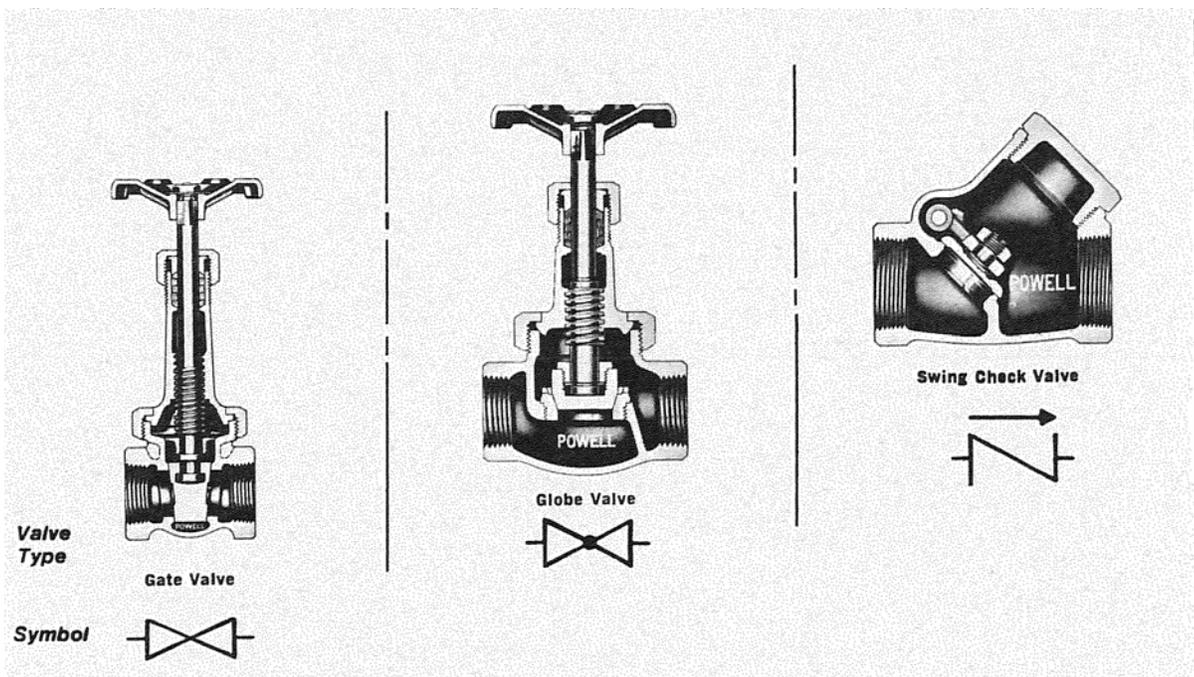


# POWELL VALVES

## HANDBOOK Of VALVE INFORMATION



**The Wm. Powell Company**

Dependable Valves Since 1846

2503 Spring Grove Avenue, Cincinnati, Ohio 45214-1771, U.S.A.

Phone 513-852-2000 • Fax No. 513-852-2997

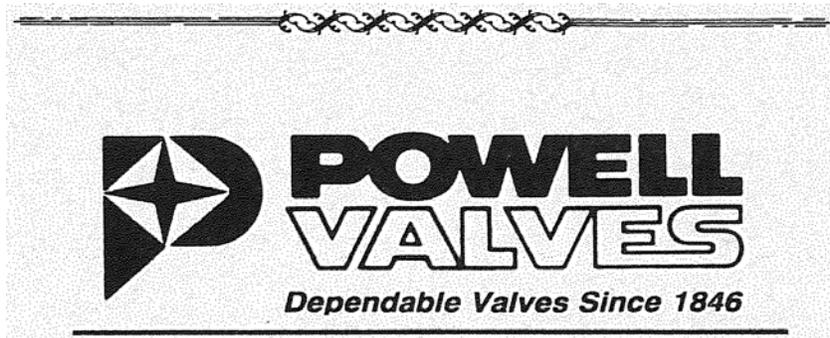
## **HANDBOOK OF VALVE INFORMATION**

Of all the great variety of mechanical and engineering equipment used in Industry today, none is more important than or as essential as the Valve. For whatever fluids – steam, water, oil, gas, air, acids, chemicals, etc. – are conveyed through pipes to set wheels and processes in motion, there must be valves to control their flow.

Therefore, to ensure the most satisfactory performance and longest valve life with the least amount of maintenance, it is vitally important to know –

- What type of valve to specify and install – whether a gate, globe, angle, check, ball, or butterfly valve, etc.
- Of what material it should be made to meet the specific requirements of the service in which it is to be used.
- What type of seat and disc is best to use.
- Of what material the disc should be made.
- Which bonnet construction will be most desirable – Integral, Screwed, Union, Bolted or Pressure Seal Design.
- Should it have a Rising Stem or Non-Rising Stem.
- Should it have an Inside Screw or Outside Screw and Yoke.
- Should it have Threaded, Flanged, Solder, Silver Braze, or Welding Ends.

That valve users may become better acquainted with these important factors concerning valve design, construction, application and care, and to help select the right valve as well as install and repair it, is the purpose of this booklet.



# MATERIALS of CONSTRUCTION

Powell Valves are available in Bronze, Iron, Cast Steel and Corrosion-Resisting Metals and Alloys.

Standards and specifications prescribe the rules and regulations for the construction of boilers and pressure vessels, including valves and safety appliances, specifications for materials, dimensional standards and requirements for piping systems. Powell Valves and Engineering Specialties, wherever applicable, conform to the requirements set forth in the publications (latest editions) of the following associations: API-American Petroleum Institute (Standards), ANSI-American National Standards Institute (Codes and Standards), ASME-American Society of Mechanical Engineers (Boiler Construction and Unfired Pressure Vessel Code), ASTM-American Society for Testing Materials (Material Specifications), MSS-Manufacturers' Standardization Society of the Valve and Fittings Industry (Standard Practices).

## BRONZES

Powell Bronze Valves are designed, manufactured and tested in accordance with MSS SP-80 Standard. End flanges are faced and drilled and in accordance with ASME B16.24.

## CAST IRON

Cast Iron Valves are in accordance with MSS SP-70 (Gate Valves), SP-85 (Globe and Angle Valves), and SP-71 (Check Valves). Pressure/Temperature limits are also given in these standards. End Flanges are faced and drilled in accordance with ASME B16.1. Face to Face dimensions of flanged end valves conform to ASME B16.10.

## LOW CARBON STEEL & LOW ALLOY STEEL

These valves are in accordance with ASME B16.34. The pressure and temperature limitations are per ASME B16.34 based on material and pressure class. End flanges are furnished faced and drilled and have dimensions equal to those given in ASME B16.5. Face to face dimensions of flanged end valves and end to end dimensions of weld end valves are in accordance with ASME B16.10.

## STAINLESS STEELS

Valves are made in CF3, CF8, CF3M or CF8M and conform to ASME B16.34 requirement. Pressure/Temperature ratings are per B16.34. Face to Face and End to End dimensions are per ASME B16.10. End Flanges are in accordance with ASME B16.5. Flat Face valves are available on special orders.

## SPECIAL ALLOYS and PURE METALS

In this classification are included Monel\*, Nickel, Hastelloy+ Alloys B and C, Alloy 20 and others. The pressure and temperature limitations of these metals are given in ASME B16.34, or are determined by the requirements and allowable stress limits given in the appropriate codes and standards.

## VALVE TRIM

Valve Trim is comprised of the following:

Gate-Globe-Angle Valves—Stem, Body or Seat Ring Seating Surfaces, Disc or Wedge Seating Surfaces, Backseat Bushing or a deposited weld for the Backseat. Swing Check Valves—Body or Seat Ring Seating Surface, Disc Seating Surface, Carrier Pin, Disc Nut, Disc Nut Pin and Pin Plug when furnished. Lift Check Valves—Body or Seat Ring Seating Surface, Disc Seating Surface and Disc Guide.

\*TM – International Nickel Co., Inc.

+ TM – Union Carbide Corporation.

## ABBREVIATIONS FOR COMMON VALVE TERMINOLOGY

W.O.G. ....	Water Oil Gas	T.D. ....	Teflon Disc
C.W.P. ....	Cold Working Pressure	F.F. ....	Flat Face
W.S.P. ....	Working Steam Pressure	R.F. ....	Raised Face
LPG ....	Liquefied Petroleum Gas	L.M.F. ....	Large Male and Female
T.E. ....	Threaded End	S.M.F. ....	Small Male and Female
F.E. ....	Flanged End	L.F. ....	Large Female
B.W.E. ....	Butt Welding End	S.F. ....	Small Female
S.W.E. ....	Socket Welding End	L.M. ....	Large Male
S. J. ....	Solder Joint	S.M. ....	Small Male
S.B. ....	Silver Braze	L.T.G. ....	Large Tongue Groove
S.I.B. ....	Screwed Bonnet	S.T.G. ....	Small Tongue Groove
U.B. ....	Union Bonnet	L.T. ....	Large Tongue
B.B. ....	Bolted Bonnet	S.T. ....	Small Tongue
O.S.Y. ....	Outside Screw and Yoke	L.G. ....	Large Groove
I.S.R.S. ....	Inside Screw and Yoke	S.G. ....	Small Groove
I.S.N.R.S. ....	Inside Screw Non-Rising Stem	R.T.J. ....	Ring Joint
N.R.S. ....	Non-Rising Stem	Int. S. ....	Integral Seat
R.S. ....	Rising Stem	Ren. S. ....	Renewable Seat
S.W. ....	Solid Wedge	I.P.S. ....	Iron Pipe Size
D.W. ....	Double Wedge	P.S.I. ....	Pounds per Square Inch
D.D. ....	Double Disc		

# VALVE SELECTION AND INSTALLATION HINTS

## FIRST CONSIDERATIONS

The first important consideration when specifying valves is to select the RIGHT Valve. Long life, satisfactory performance and low maintenance depend upon **Fitting the Valve to the Job**.

Whether or not a valve is suitable for a particular job is determined by its design and the materials of which it is made, both of which are discussed on following pages.

To be sure of selecting the right valve and of obtaining the best results, it is necessary to know the kind of media and the amount of flow to be handled, the pressure, temperature, nature of service, the physical conditions at points where valves are to be installed and the frequency of operation.

Proper safety procedures and precautions must be followed during valve installation, maintenance, and use as appropriate for the application and service conditions. The following minimum precautions shall be taken as appropriate.

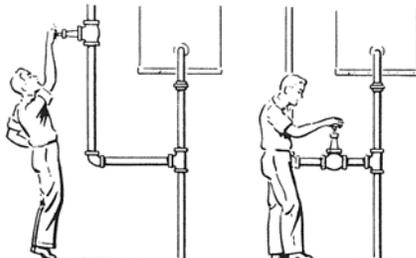
- Proper lock-out procedures.
- Proper removal of pressure from valve prior to servicing.
- Proper removal of all toxic media from work area or following proper procedures for handling such media.
- Use of any necessary protective clothing such as eye and ear protection.
- Excess force or heat shall not be used during maintenance or servicing operations.
- Most Powell Valves feature a machined backseat area on stem and bonnet (or backseat bushing) which may seal the packing area from the valve pressure. However, this cannot be guaranteed, and, therefore, Powell does not recommend replacing valve packing while under pressure
- All valves shall be operated within the appropriate pressure/temperature limits for the design and materials of construction.

## CARE OF VALVES BEFORE INSTALLATION

When valves are to be stored before installation, keep them dry wrapped and protected as shipped from the manufacturer. If they are unprotected and left exposed, sand or other gritty matter may get into the working parts and, if not thoroughly cleaned out, will cause trouble later on. Also, store valves so they cannot fall and where other heavy material cannot fall upon them. Great care should always be exercised in handling valves.

Before installation the inside of the valves should be blown out with compressed air or flushed with water to remove all dirt and grit. Piping should be cleaned out in the same manner, or it should be swabbed to remove dirt or metal chips left from threading operations or welding on the pipe.

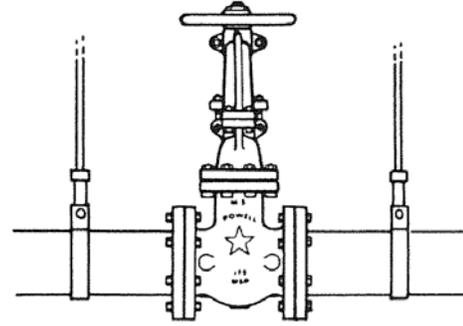
Paint, grease or joint sealing compound should be applied only to the pipe (male) threads – NOT on the threads in the valve body. This reduces the chances of the paint, grease or compound getting on the seat or other inner working parts of the valve to cause future trouble.



Locate valves so they can be easily reached.

## VALVE MATERIALS

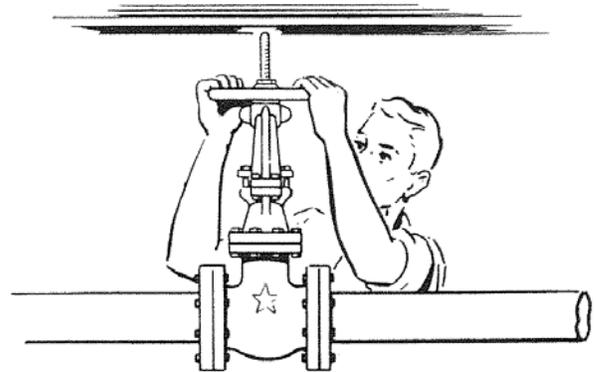
Choosing the right metal means good service. Bronze valves are suitable for steam pressure of 125 psi at 406 F., 150 psi at 406 F., 200 psi at 550 F., 300 psi at 550 F., and 350 psi at 550 F., for classes 125, 150, 200, 300, and 350, respectively. Iron valves are suitable for steam pressures at 125 psi and 250 psi at 450 F. for classes 125 and 250 respectively. For higher pressures and temperatures, Steel valves should be used. In processes where highly corrosive and erosive media are encountered, only valves made of pure metals and special alloys such as Powell Valves for Corrosion Resistance should be considered. If there is any doubt as to what materials to use consult our engineers.



It's good practice to support the line on each side of the valve.

Keep pipe strains off of the valves – don't let the valves carry the weight of the line, thermal strains, or other pipe loads. This may result in inefficient operation, jamming and early maintenance. It also makes it difficult to tighten the flanges properly. Piping should be suspended from hangers placed on each side of the valve to take up the weight. Large heavy valves should be independently suspended.

When installing rising stem valves, be sure to allow sufficient clearance to remove the stem and bonnet if necessary. Insufficient clearance prevents valves from being fully opened and results in excessive pressure drop, gate wedge erosion, chatter, wire drawing or seat wear.



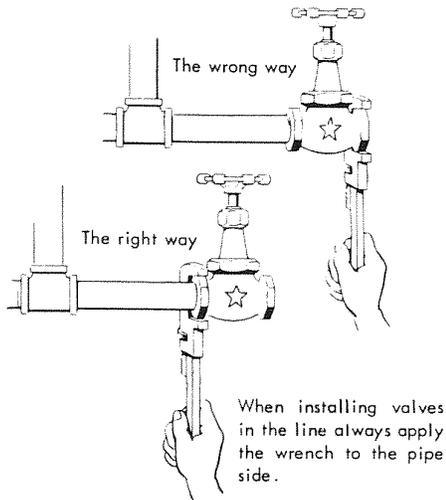
Plenty of clearance must be provided so rising stem valves can be fully opened.

Whenever possible, it is always better to install valves with the stem upright, but they can be mounted in the line with the stem at an angle. However, when installed with the stem in a downward position, the bonnet is under the line of flow forming a pocket to catch and hold any foreign matter that will eventually cut and ruin the stem or threads.

# VALVE SELECTION AND INSTALLATION HINTS (Cont.)

## PIPE THREADS

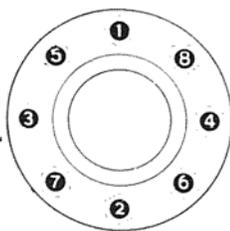
Avoid under size threads on the pipe. If the threaded section of the pipe is too small, the pipe, when screwed into the valve to make a tight connection, may strike the diaphragm and distort it so that the disc or wedge will not seat perfectly. Under size threads on the pipe also may make it impossible to get a tight joint. Safe practice is to cut threads to standard dimensions and standard tolerances. All pipe threads in the valve bodies are gauged to standard tolerances.



When installing threaded end valves always use the proper size wrenches with flat jaws (not pipe wrenches). By so doing there is less likelihood of the valve being distorted or damaged. Also the wrench should be used on the pipe side of the valve to minimize the chances of distorting the valve body. This is important where the valve is made of a malleable material, such as bronze. As a further precaution against distortion, see that the valve is closed tightly before it is installed.

## FLANGED END VALVES HOW TO TIGHTEN FLANGE BOLTS

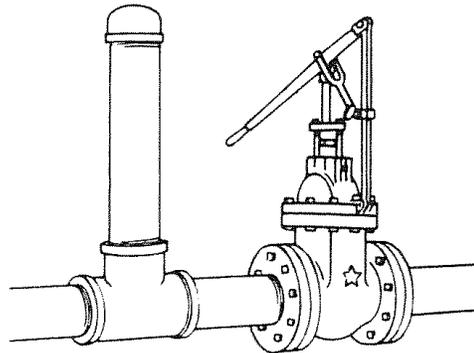
Rotate Flange so  
Holes straddle C/L



On flanged valves and fittings the flange bolts should be tightened by pulling down the nuts diametrically opposite each other and in the order as numbered (see illustration). All bolts should be pulled down gradually to a uniform tightness. Uniform stress across the entire cross section of the flange eliminates a leaky gasket.

(See ASME B16.1 and B16.5 for information on flange selection and limitations).

## HOW TO AVOID WATER HAMMER OR SHOCK



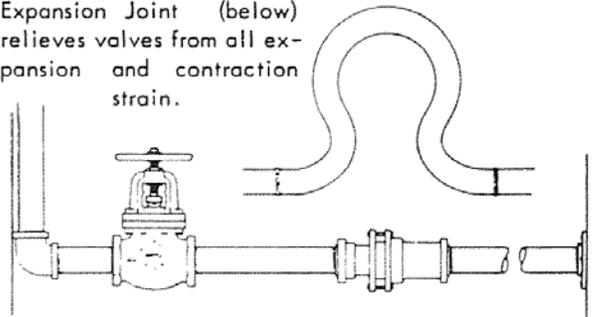
A capped standpipe installed in the line in front of the valve eliminates water hammer.

Where quick opening or closing valves are installed on liquid lines, severe water hammer or shock may result when the valve is opened or closed quickly. The resulting sudden back lash or surge of pressure causes excessive shock loading and vibration in the line. Usually a vertical capped standpipe, a few feet long and located not too far from the valve, will tend to absorb the surge.

## RELIEVING PIPE STRESSES

Long runs of rigidly supported piping carrying high temperature fluids should be joined with an expansion joint having sufficient traverse to more than take up the expansion of the length of pipe involved. This kind of installation protects valves and fittings.

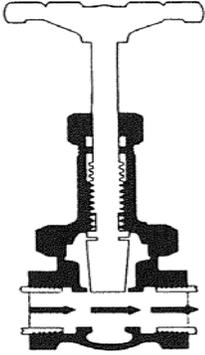
A "U" Expansion Bend or  
Expansion Joint (below)  
relieves valves from all ex-  
pansion and contraction  
strain.



Frequently, on large size high-pressure high-temperature stream lines or lines carrying hazardous media, a "U" Bend welded in the line serves the same purpose.

# BASIC TYPES of VALVES

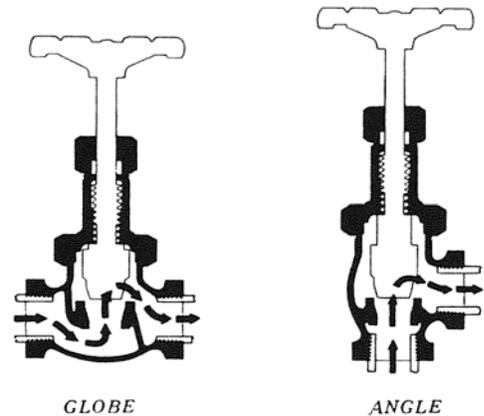
## GATE VALVES



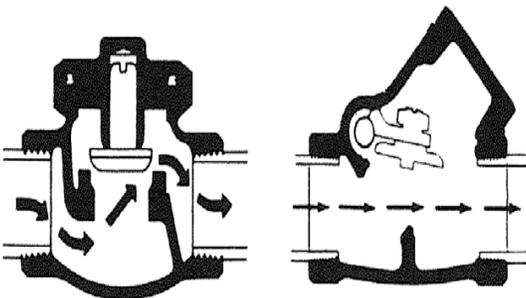
The gate valve is the type of valve most often used in industrial piping. The significant feature of the gate valve is less obstruction to flow, with less turbulence within the valve and very little pressure drop. When the valve is wide open, the wedge is lifted entirely out of the waterway, providing a straightway flow area through the valve. The gate valve should be specified with pressure drop is to be avoided. Also, gate valves should never be used for throttling purposes; only in the fully open or closed positions. If 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.

## GLOBE and ANGLE VALVES

The globe valve is used principally in throttling service to control the flow to any desired degree. Advantages of globe valves are efficient throttling, with minimum wire drawing or disc and seat erosion. As the valve seat is parallel to the line of flow, globe valves are not recommended where resistance to flow and pressure drop are unwanted, because the design of the valve body changes the direction of flow and causes turbulence, and pressure drop within the valve. The shorter disc travel and the fewer turns to open and close this valve save time and wear on the valve stem and bonnet. In most globe and angle valves, seat and disc can be repaired without removing the valve from the line. The angle valve, like the globe valve is used for throttling service. The flow on the inlet side of the valve is at right angle to the flow on the outlet side, making a 90° change in direction. Angle valves eliminate the use of elbows and extra fittings.



## LIFT and SWING CHECK VALVES



HORIZONTAL  
LIFT CHECK

SWING CHECK

The swing check, companion for the gate valve, works automatically. When the disc is wide open, a flow area with the least amount of obstruction is provided. Turbulence and pressure drop within the valve are very low. These valves may be installed in a horizontal line with flow under the disc, or vertical line with flow upward under the disc. When the flow reverses, the back pressure and weight of the disc closes the disc against the seat stopping all backflow.

The horizontal lift check, companion for the globe valve, works automatically. These valves are to be installed in a horizontal line only with flow under the disc.

The vertical lift check is also designed for working automatically. These valves are to be installed in a vertical line only with flow upward under the disc.

# BASIC TYPES of VALVES

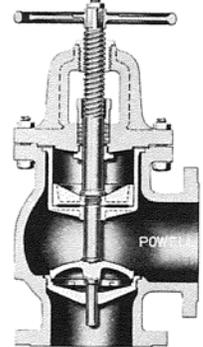
## NON-RETURN STOP and BOILER CHECK VALVES

Non-Return Stop and Boiler Check Valves are a safe-guard in steam power plants where more than one boiler is connected to the same header. They must be installed between the boiler and steam main or header and should be attached directly to or adjacent to the nozzle outlet of the boiler. This prevents back flow of steam from the main or header into the boiler, and also prevents steam entering or backing into a cold boiler. Pressure must be under the disc, with the valve stem in a vertical or upright position.

The valve will instantly close in case of tube rupture or other accident, cutting out the particular boiler to which it is attached when the pressure within that boiler drops below the pressure in the header. Likewise it opens when the boiler to which it is attached reaches the full pressure in the steam main. Proper selection of valve size is important for proper operation and to prevent excessive noise, vibration and wear.



GLOBE

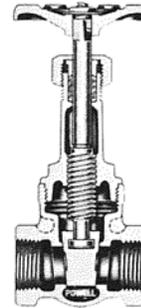


ANGLE

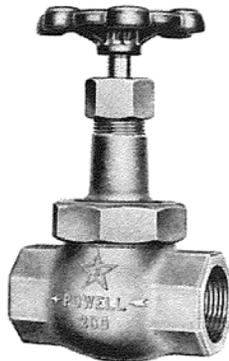
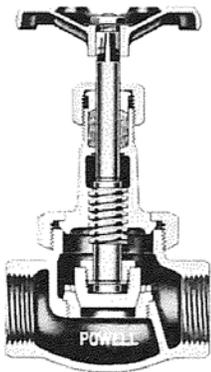
## VALVE BONNET DESIGNS

### THREADED BONNET

There are two types: (screw-in bonnet) where the outside of the base of the bonnet and the inside of the neck of the body are threaded; and the other (screwed-on bonnet) where the inside of the base of the bonnet and the outside of the neck of the body are threaded. The bonnet is attached to the body by screwing it into or onto the body neck. This is the simplest and therefore the most inexpensive type to make and is generally used in low pressure services. However, the operation of screwing the bonnet firmly to the body neck to make a tight seal tends to distort the neck or bonnet. It is therefore more difficult to make a tight seal again after the valve has been taken apart for reconditioning.



### UNION BONNET

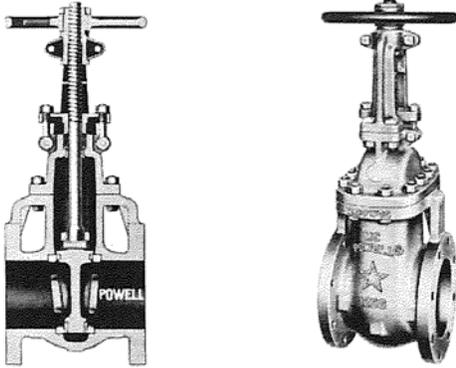


This design provides a quick, easy method of coupling and uncoupling the bonnet and valve body, and is therefore especially favored where the use of soft metal or composition discs requires periodic uncoupling of the bonnet to make replacements. The union bonnet provides a tight closure with a minimum of effort. The bonnet is provided with a bevel which engages against a corresponding bevel in the body neck. The heavy ring nut can be readily wrenched down to provide an absolutely tight seal. And, as all parts are in compression and firmly held in place, distortion is unlikely and the bonnet can be detached and tightly sealed in place again any number of times.

# VALVE BONNET DESIGNS (Cont.)

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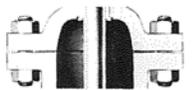
## BOLTED FLANGED BONNET • OUTSIDE SCREW RISING STEM



The bonnet and body neck flanges are bolted together. These valves are usually referred to as “O.S. & Y.” meaning Outside Screw Rising Stem and Yoke. The stem is threaded on the outside of the valve and does not come in contact with the media, thus eliminating possible erosion or corrosion of the stem threads. These parts may be easily lubricated to insure longer life.

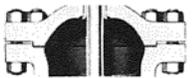
### Flat Faced Joint

This type of connection is generally used in low pressure service only



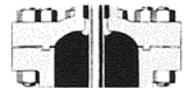
### Male and Female Joint

This type of connection is recommended for high pressure, high temperature installations. It also assures alignment of bonnet to body.



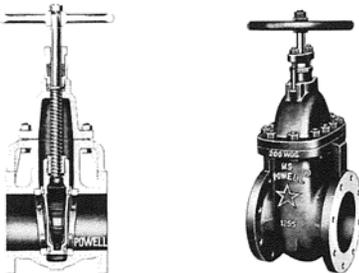
### Tongue and Grooved Joint

This type of connection is recommended for high pressure, high temperature installations. It also ensure alignment of bonnet to body and eliminates all possibility of the gasket blowing out



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## INSIDE SCREW NON-RISING STEM • BOLTED FLANGED BONNET

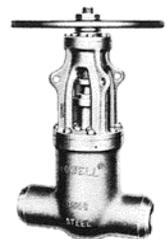
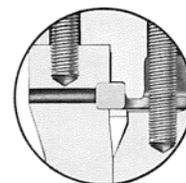


The bonnet and body neck flanges are bolted together. This type of stem design is generally used in gate valves. The stem rotates and threads into a disc holder that is threaded into the disc. The stem does not rise but merely turns with the handwheel. Non-rising stem valves are ideally suited where headroom is limited.

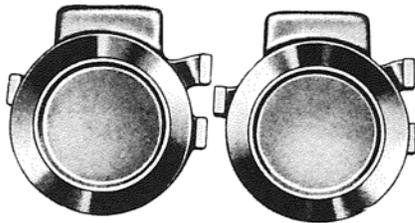
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## PRESSURE SEAL BONNET

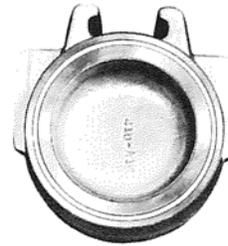
Powell Pressure Seal Valves are intended for high pressure, high temperature services. This design enables the valve to be easily assembled and disassembled. The segmental thrust rings absorb internal valve pressure. A hardened stainless steel protective ring prevents deformation of the top surface of the soft metallic gasket. The gasket may be removed without damaging the sealing surface of the body. The gasket seating surface in the body may be lapped, if required.



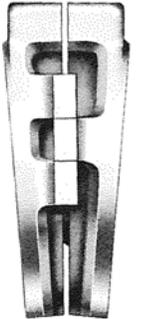
# WEDGES for GATE VALVES



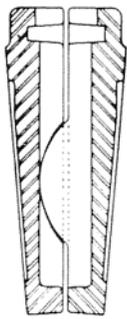
View showing seating faces of split wedge



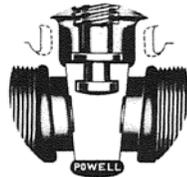
Gate Valve Wedge with Non-Metallic Insert



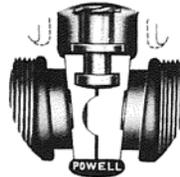
End view of split wedge



Sectional view of split wedge



View Showing Solid Wedge



View Showing Double Wedge



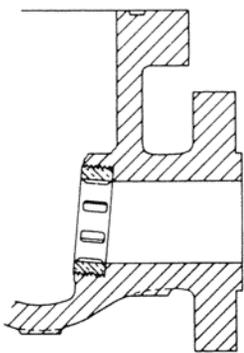
End view of flexible wedge

Solid Wedges are of one-piece construction solid web type. The seating surfaces are precision machined and carefully fitted in the valve so a full seating contact is made between the wedge and seats.

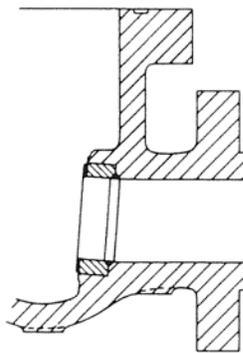
Split Wedges are of ball and socket design which are adjusting and self aligning to both seating surfaces. The split wedges are especially suited for air, gas and light oil service.

Flexible Wedges are of one-piece construction. The wedge, instead of being made completely solid with both seating surfaces rigid, is flexible. Heat expansion and contraction problems are minimized as the flexible wedge is able to compensate for this and remain easy to open. The wedge also has full seating surfaces on both the inlet and outlet seating surfaces.

## CAST STEEL GATE and GLOBE SEAT RINGS

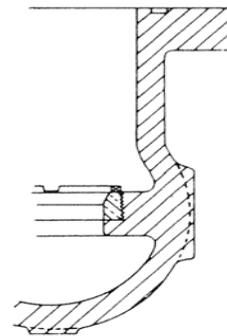


Sectional View Threaded-In Seat Ring in Gate Valve

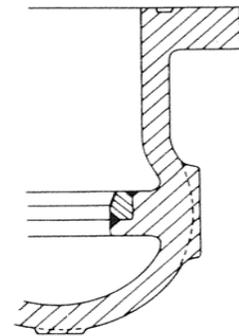


Sectional View Welded-In Seat Ring in Gate Valve

Steel gate valve seat rings are of heavy rectangular section. They seat directly against the main wall of the body casting. Seat rings are stellite faced machined to a close fit, fit in the valve body and seal welded ensuring a positive seal of the ring in the valve body.



Sectional View Threaded-In Seat Ring in Globe Valve



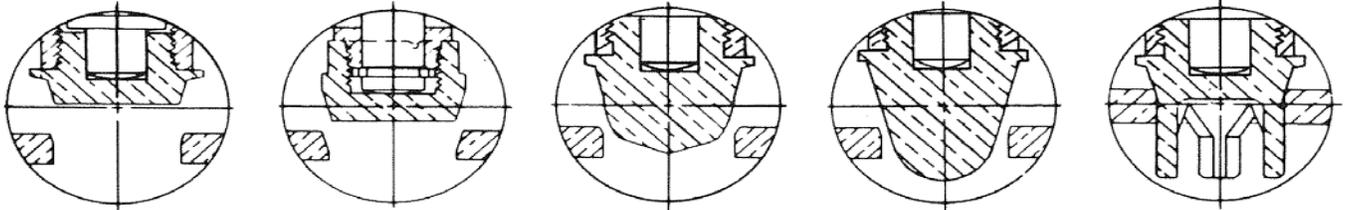
Sectional View Welded-In Seat Ring in Globe Valve

Steel globe valves are generally supplied with swivel discs. Seat rings are stellite faced, and are slip fit and seal welded or threaded and seal welded.

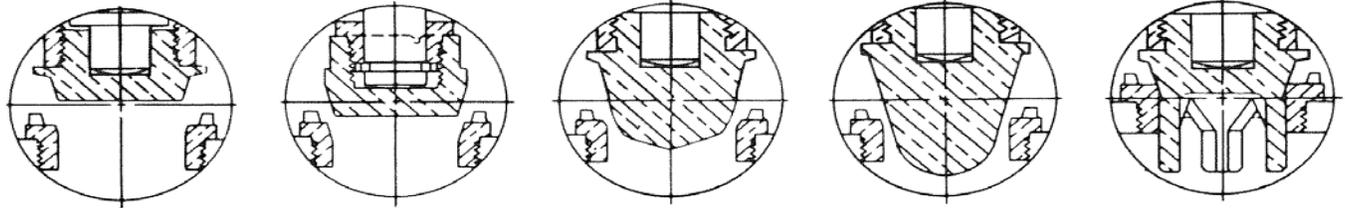
# GLOBE ANGLE "Y" DISCS and SEATS

Globe, Angle, and "Y" Valves are regularly supplied with integral seats and plug type discs.  
Valves with other type seats and discs are available on special order.

## INTEGRAL SEAT



## RENEWABLE SEAT



**PLUG**

For On-Off Service

**SEMI-CONE PLUG**

For fine non-characteristic flow regulation.

**EQUAL PERCENTAGE PLUG**

For equal percentage flow characteristic for pre-determined valve performance. Equal increments of valve lift give equal percentage increases in flow.

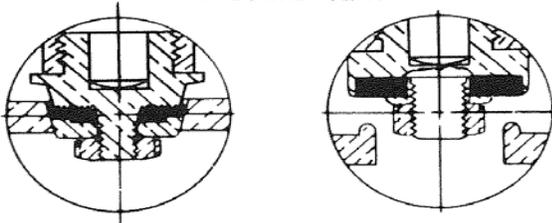
**LINEAR FLOW PLUG**

For linear flow characteristic regulation with high pressure drops.

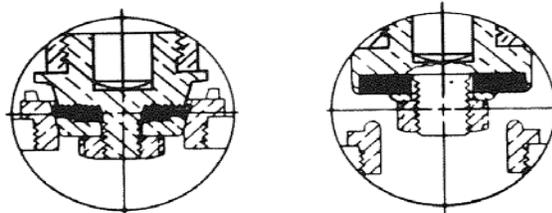
**"V" PORT PLUG**

For linear flow characteristic regulation with medium and low pressure drops.

## INTEGRAL SEAT



## RENEWABLE SEAT

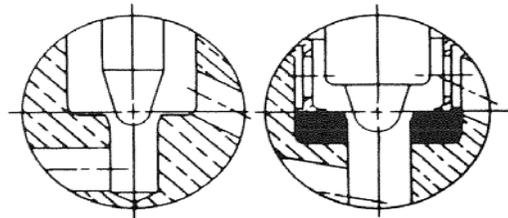


**HI-LO PLUG TYPE COMPOSITION DISC**

For tight shut-off with non-metallic plug disc insert (high & low pressures).

**LO-PRESSURE COMPOSITION DISC**

For on-off service and tight shut-off. Non-metallic disc. Low pressure service.



**NEEDLE PLUG (Instrumentation)**

High pressure drop and low flow metering. Reduced orifice.

**NEEDLE PLUG (Instrumentation)**

Non-metallic seat. High pressure drop and low flow metering. Reduced orifice.

NOTE: (1) Metal plugs & seats can be supplied with hard face seating surfaces.

(2) Non-metallic discs can be supplied in Teflon, Kel-F, Neoprene, etc.

(3) When ordering valves with Teflon discs, suffix T.D. must be added.

## CHECK VALVES:

Lift and Swing Check Valves can be furnished with integral or renewable seats and metal or composition discs.

# PIPE ENDS or CONNECTIONS of VALVES

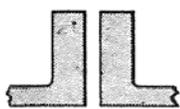
## THREADED ENDS



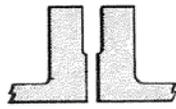
Threaded Ends, as the phrase suggests, are tapped with female threads into which the pipe is threaded (American Standard Pipe Threads ASME B1.20.1). Threaded End Valves are the least expensive, as less material and less finishing are required. Also, they can be more quickly and easily installed in the line. However, unless a number of extra fittings – such as unions, etc. – are used, it is difficult to remove them without dismantling a considerable portion of the piping.

## FLANGED ENDS

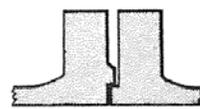
(SEE ASME B16.1 and B16.5 FOR FLANGE SELECTION and LIMITATION INFORMATION)



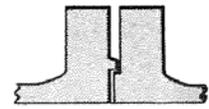
*PLAIN FACE*



*RAISED FACE*



*LARGE  
MALE AND FEMALE*



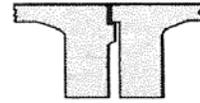
*SMALL  
MALE AND FEMALE*



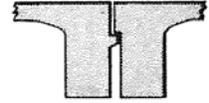
*LARGE  
TONGUE AND GROOVE*



*SMALL  
TONGUE AND GROOVE*



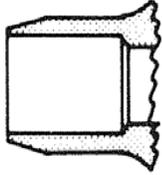
*RING JOINT*



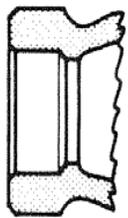
Flanged Ends make a stronger, tighter, and more leak-proof connection. Where heavy viscous media are to be controlled, as in Refineries, Process and Chemical Plants, etc., flanged end valves should be recommended. They are higher in initial cost, not only because of more metal but the flanges must be carefully and accurately machined. Also, the installation cost is greater, because companion flanges, to which the valve end flanges are bolted, as well as gaskets, bolts and nuts must be provided. All flat faces are commonly termed plain faces. Bronze and iron flat faces shall have a machined finish. Cast iron raised faces may be smooth finished or have a serrated finish which may be spiral or concentric in accordance with MSS SP-6. Steel flat faces and raised faces shall have a spiral or concentric serrated finish also in accordance with MSS SP-6. Steel male and female and tongue and grooved faces shall have a smooth finish. When ordering tongue and grooved facings, specify whether the facing should be tongue only, or grooved, etc. The steel ring joint faces shall have smooth finished grooves. If spiral wound gaskets are used on flange faces, the flanges should have a smooth finish.

# PIPE ENDS or CONNECTIONS of VALVES

## PROCEDURE FOR SOLDERING OR SILVER BRAZING (PIPE OR TUBING TO VALVES)



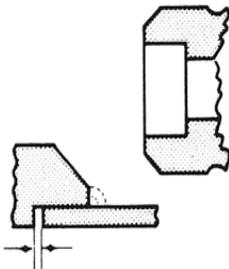
*Solder End*



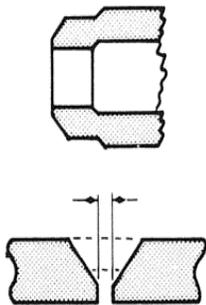
*Silver Brazing End*

1. Cut tube end square, making sure the diameter is not undersize or out of round. Remove all burrs.
2. Clean pipe or tubing end (at least to depth of socket) and inside of valve socket with steel wool, sand paper, sand cloth, etc. Clean with suitable solvent.
3. Apply solder flux or silver braze flux to the inside of the valve socket and the outside of the tubing end.
4. Insert pipe or tubing into the valve socket until it seats against the shoulder within the valve socket. Turn valve, piping or tubing once or twice to evenly distribute the flux.
5. Make certain valve is in partially open position before applying heat. If valve is provided with non-metallic disc, the disc should be removed before heat is applied. After removing the disc, the valve bonnet or bonnet ring should be replaced hand tight to prevent distortion to the threaded sections when heating the valve. The valve and pipe or tubing should be supported during the soldering or silver brazing process, and must not be strained while cooling.
6. Apply flame evenly around pipe or tubing adjacent to valve end until solder or brazing alloy suitable for the service flows upon contact. Apply solder or brazing alloy to the joint between the pipe or tubing and the end of the valve socket. When soldering tubing to valves apply flame toward bottom of valve socket until all solder is absorbed. When silver brazing, wave flame over the valve hexes to draw the metal alloy into the socket leaving a solid fillet of brazing alloy at the joint. Control the direction of the flame away from the valve body to avoid excessive heating which causes distortion and improper functioning of the valve.
7. Remove all excesses with cloth or brush.

## PROCEDURE FOR SOCKET OR BUTT WELDING (PIPE TO VALVES)



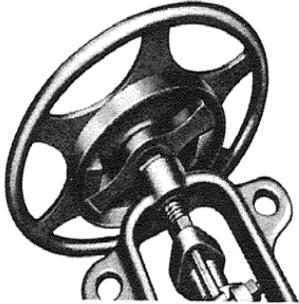
*Socket Welding End*



*Butt Welding End*

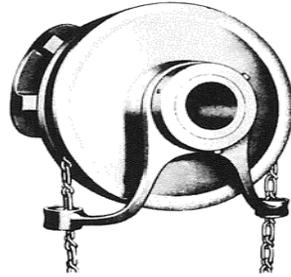
1. Machine pipe ends for butt welding joint. For socket welding, cut the pipe end square, making sure the diameter is not undersize or out of round. Remove all burrs.
2. Clean pipe end, valve joint, and inside of valve socket with a degreasing agent to remove oil, grease or other foreign material.
3. For butt welding, space as shown. Align by means of fixtures, and tack weld in place. For socket welding insert pipe into valve socket and space as shown by backing off pipe after it hits against the shoulder within the valve socket or by using a removable spacing collar. This procedure is very important. Tack weld in place.
4. Make certain valve is in partially open position before applying heat. Valve and Pipe should be supported during welding process and must not be strained while cooling.
5. It is recommended that welding be performed in accordance with Section IX of ASME Boiler and Pressure Vessel Code in addition to all other applicable codes.
6. Using the inert Gas-Arc or Metallic Arc method (for highest quality weld, inert Gas-Arc method is recommended), a butt or socket weld is normally completed in two or more passes. Make sure the first pass is clean and free from cracks before proceeding with the second pass. On butt welding the first pass should have complete joint penetration and be flush with the internal bore of the pipe. The second pass should blend smoothly with the base metal and be flush with the external diameter. Excessive Heat causes Distortion and Improper Functioning of the Valve.
7. Discoloration may be removed by wire brushing

# METHODS OF OPERATION



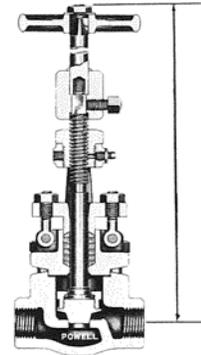
**Hammer Blow Handwheel**

Powell Cast Steel Globe, Angle and Non Return Valves can be equipped with Hammerblow Handwheel providing additional operating torque to facilitate operation of valves in services where the plain handwheel may be insufficient yet where gearing is not necessary. It is regularly supplied on certain large size valves.



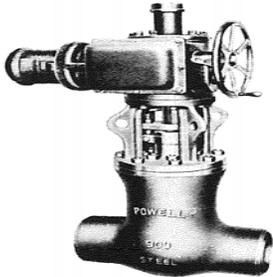
**Chainwheel Operated**

Sprocket rims with chain guides and chain permits easy operation of valves installed overhead. When chain wheels are used with valves that have a handwheel mounted on the stem, make sure that the stem is strong enough to withstand the extra weight and pull.



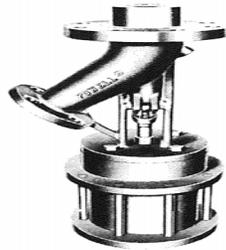
**Extension Stem**

Extension stems are used where valves are to be operated from a distance, with or without floor stands. Inquiries should specify the length of stem required. Extra long stems must be guided by supports. The above illustrated valve shows the dimension needed; center line of valve to top of handwheel nut.



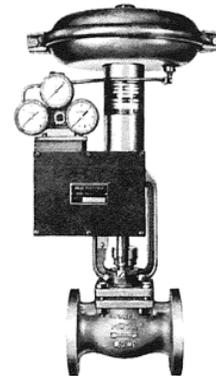
**Pressure Seal Gate Valve with Motor Actuator**

Motor Actuators give many advantages for remote control of valves. One of frequent use is on large size valves in high pressure power plants. Motor actuated valves are used where valves are inaccessible or where ease of operation, quick opening or closing, or remote control is desired. Motor Actuators are also used where the valve size or internal pressure of fluid make hand operation difficult. Motor units can be electric, air, or gas driven.



**Flush Bottom Tank Valve Air or Hydraulic Cylinder actuated, for operation by remote control.**

Cylinder operation is often desirable to speed the opening and closing of valves or when valves are in accessible places. Under normal conditions and with proper care cylinders will last as long as the valves. Valve cylinders are actuated by water, air or oil as the operating medium. Remote control is obtained by locating the operating valve in any convenient place within reasonable distance from the main valve.



**Flanged End Diaphragm actuated Globe Valve with position Indicators**

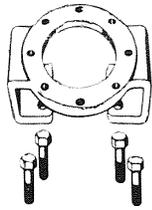
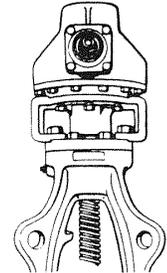
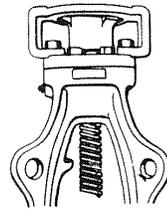
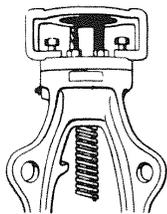
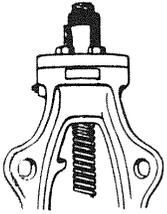
Powell diaphragm actuated valves are air operated. This equipment gives fast, safe, efficient operation of any valve. These air actuated valves are supplied for air operation.

# METHODS of OPERATION

## ADAPTO GEAR ACTUATORS

Powell Adapto Gear Actuators are the answer to providing ordinary gate, globe, angle, and non-return valves with gear operation. The actuators mount quickly and easily as installation does not require special drilling or tapping of the yoke in most cases.

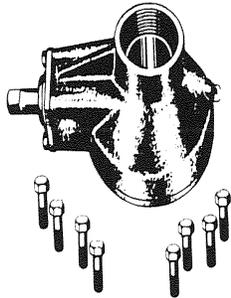
The gearing units are totally enclosed and lubricated for easy operation yet are light enough for one-man installation. Adapto Gear Actuators can be readily mounted on POWELL bronze, iron, steel, and corrosion resistant outside screw and yoke and non-rising stem valves. This series of illustrations show how easy it is to install a POWELL ADAPTO GEAR ACTUATOR on an Anti-Friction Bearing Yoke Gate Valve.



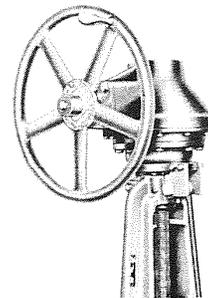
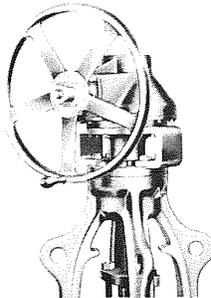
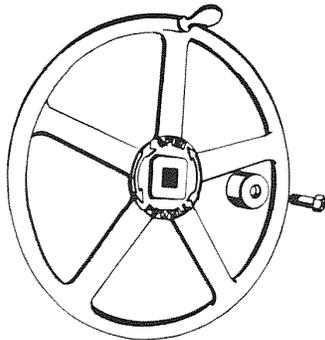
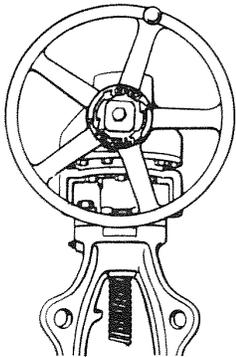
1. Remove the handwheel
2. Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
3. Install the drive sleeve and key on stem bushing
4. Mount gear actuator on adaptor and bolt together.
5. Conversion is completed.

On installed valves, adaptors are provided so that new stem bushings or yokes are not necessary. The arrangements shown describe the installation of the actuator.

On split yoke valves the conversion is the same except the adaptor is attached to the yoke by utilizing bolts connecting the split yoke.



In most cases, field conversion of POWELL VALVES can be completed without removing the valve from service. Only the handwheel and several bolts and nuts are removed. The actuator mounts quickly and easily as the adaptor does not require re-drilling or tapping of the yoke.



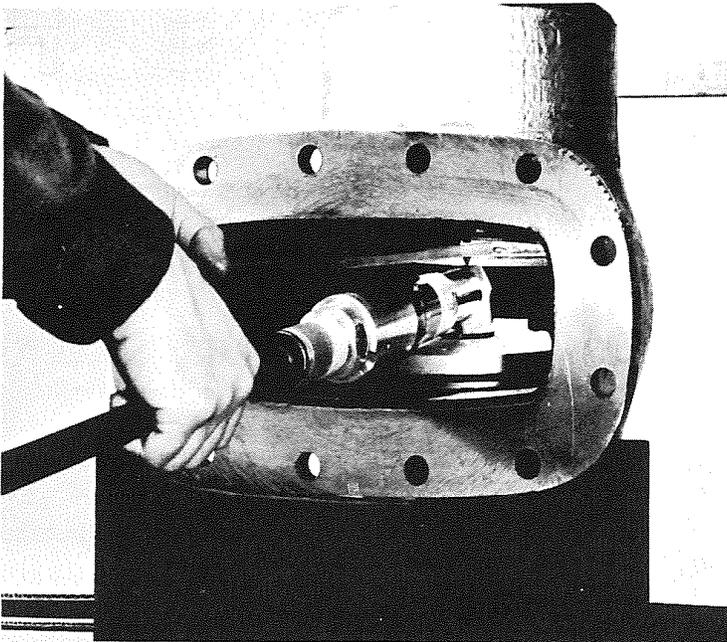
Adapto Gear Actuator for Outside Screw and Anti-Friction Bearing Yoke Valves

Adapto Gear Actuator for Outside Screw and Split Yoke Valves

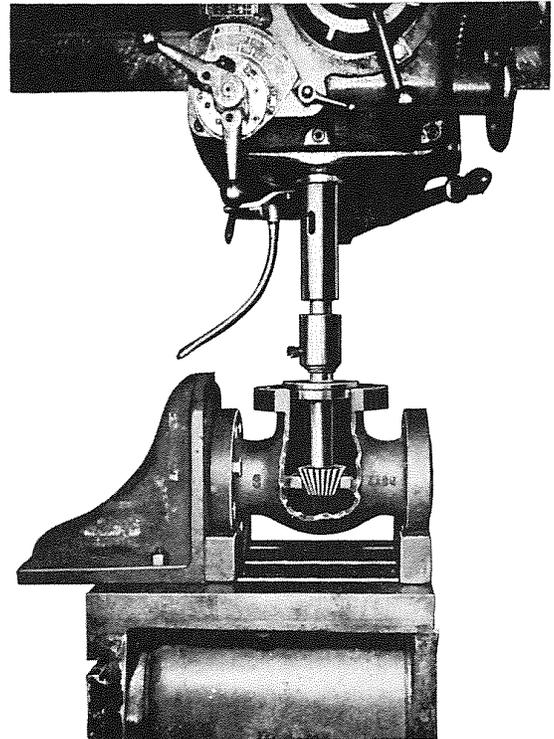
# OPERATION and MAINTENANCE of VALVES

1. A gate valve should be used in service where it can always be in a fully open or fully closed position. If the wedge 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 and premature wear.
2. WHEN RESEATING a gate valve, be sure and mark the wedge so it can be inserted in the valve body the same way it was removed, otherwise a tight closure may not be obtained. When a new wedge is installed, it must be fit to the body seats for proper sealing.
3. LUBRICATION of valves is especially important, and should be done on a strict schedule, at least annually. 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 stem threads should be kept clean and lubricated. Stem threads left dry and unprotected will become worn by grit and other abrasives, causing stem failure. Valves with rotating stem bushings are equipped with a lubricant fitting in the upper yoke for stem bushing lubrication. Stem Thread lubrication is performed by applying lubricant directly to the operating threads. For most applications, a general purpose lithium based EP0 or EP1 lubricant is recommended, however, the lubricant must be compatible with the environment in which it is used.
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 disc and 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 stem or packing damage can occur. If packing gland has compressed the packing to its limit, replace with new packing.
6. TO REGRIND renewable seat globe valves, remove the bonnet by unthreading the 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 the bonnet to the body. Thread union bonnet ring (Union Bonnet Design) 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. **CAUTION:** Before performing any maintenance or repairs to valves, caution must be exercised and all proper safety precautions must be followed as appropriate for the operation performed. This includes but is not limited to those procedures and precautions given on Page 4 under "First Consideration."

LAPPING SEAT FACES OF POWELL GATE VALVE

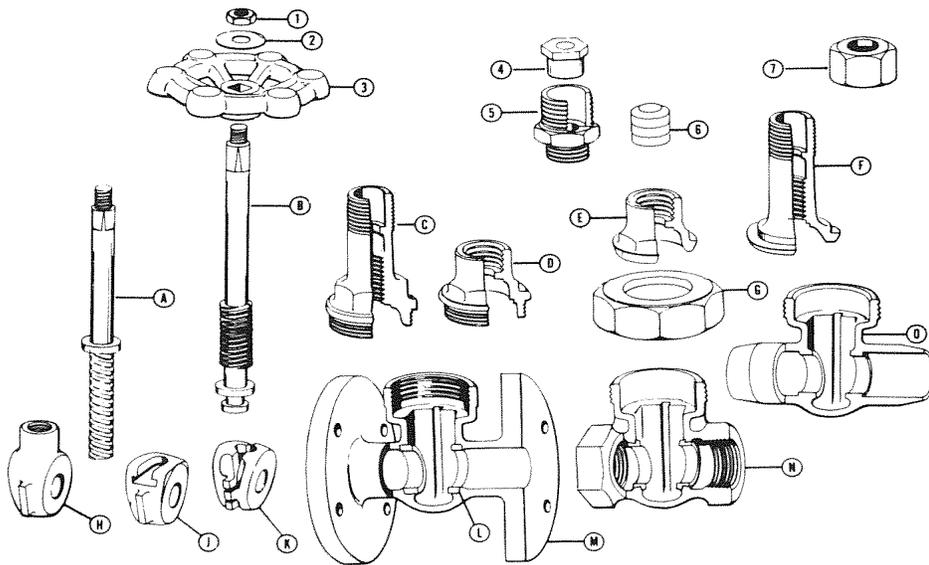


RESEATING A POWELL GLOBE VALVE



# THREADED and UNION BONNET RISING and NON-RISING STEM GATE VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

- 1. Handwheel Nut
- 2. Identification Plate
- 3. Handwheel
- 4. Packing Gland
- 5. Packing Box Spud  
(Non-Rising Stem Valves only)
- 6. Packing
- 7. Packing Nut
- A. Stem—Non Rising Stem Valves
- B. Stem—Rising Stem Valves
- C. Threaded-in Bonnet—Rising Stem Valves
- D. Threaded-in Bonnet—Non-Rising Stem Valves
- E. Union Bonnet—Non-Rising Stem Valves
- F. Union Bonnet—Rising Stem Valves
- G. Bonnet Ring
- H. Solid Wedge—Non-Rising Stem Valves
- J. Solid Wedge—Rising Stem Valves
- K. Double Wedge—Rising Stem Valves
- L. Seat Ring
- M. Body—Flanged Ends
- N. Body—Threaded Ends
- O. Body—Solder Joint End

### OPERATION:

These gate valves are manual operated. To close, turn the handwheel (part 3) in a clockwise direction; to open, turn the handwheel (part 3) in a counterclockwise direction.

### INSPECTION:

Periodical inspection and preventive maintenance is not required.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size and material; if applicable, metal when other than standard.

### PROCEDURES FOR REPAIR: (CAUTION: See note 7 on page 15)

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 would not show when the valve is completely open or closed. To adjust the packing, turn the packing nut (part 7) clockwise until leakage stops. If leakage continues, it is necessary to replace the packing as follows:
  - a. Remove handwheel nut (part 1), identification plate (part 2) and handwheel (part 3).
  - b. Remove packing nut (part 7) by turning counterclockwise until nut can be lifted off.
  - c. Slip the packing gland (part 4) off of the stem (part A or B).
  - d. Remove old packing (part 6).
  - e. Install the correct new packing (part 6)
  - f. Replace packing gland (part 4).
  - g. Replace packing nut (part 7) and pull down snug – no tight.
  - h. Replace handwheel (part 3), identification plate (part 2) and handwheel nut (part 1). Valve is ready to operate.
2. Seat Leakage – If valve seat leaks, it will be necessary to replace the wedge (part H, J, or K) as follows:
  - a. Remove bonnet ring (part G) by turning counterclockwise and lift out bonnet assembly. If valve has screwed-in bonnet, turn bonnet counterclockwise and remove complete assembly.
  - b. Run the stem (part A or B) down by turning in a clockwise direction.
  - c. Slip the wedge (part J or K) off of the stem (rising stem valves).

- d. Remove wedge (part H) from stem by turning in clockwise direction (non-rising stem valves).
- e. Replace wedge (part H, J, or K).
- f. Remove seat ring (part L) if applicable. Remove wedge assembly. Use seat ring wrench and insert in the seat ring until lugs engage slots. Turn in counterclockwise direction to remove from body (part M, N, or O). Replace seat ring.

3. Damaged Stem (part A or B) – When stem threads become damaged so the valve is inoperable, replace stem as follows:
  - a. Remove handwheel nut (part 1), identification plate (part 2) and handwheel (part 3).
  - b. Remove bonnet (part C, D, E, or F) with a wrench by turning in a counterclockwise direction.
  - c. Remove this complete assembly from the valve body (part M, N, or O).

### RISING STEM VALVES

- d. Run the stem (part B) down by turning it in a clockwise direction
- e. Remove the wedge (part J or K) from the stem (part B) by following procedures outlined above in Number 2.
- f. Rotate the stem (part B) in a clockwise direction until the stem thread is completely out of the threaded portion of the stuffing box.
- g. Remove the stem (part B) by pulling it out of the stuffing box.
- h. Replace the stem (part B) by the reversing above procedure.

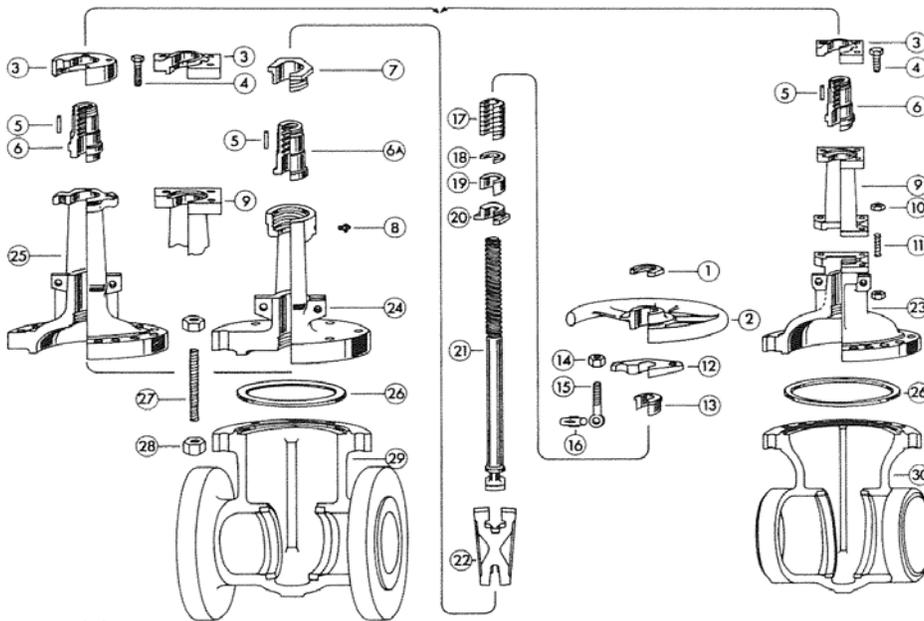
### NON-RISING STEM VALVES

- i. Secure flats of bonnet (part D or E) in vise. Remove packing nut (part 7) by turning in counterclockwise direction.
- j. Remove wedge (part H) from stem (part A) by turning in clockwise direction.
- k. Slip packing gland (part 4) off of the stem (part A).
- l. Remove packing (part 6).
- m. Remove packing box spud (part 5) by turning counterclockwise and slip off of stem (part A).
- n. Replace stem (part A) by reversing above procedure.

NOTE: Whenever a new stem is installed, it is necessary to replace the packing (part 6).

# BOLTED BONNET O.S. & Y. RISING STEM GATE VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1.	Handwheel Nut
2.	Handwheel
3.	Bearing Cap
4.	Cap Screw
5.	Handwheel Key
6.	Stem Bushing
7.	Stem Bushing Locknut
8.	Lubricant Fitting
9.	Yokearm – (10" – 12")
10.	Yokearm Nut
11.	Yokearm Stud
12.	Gland Flange
13.	Gland
14.	Eyebolt Nut
15.	Eyebolt
16.	Groove-Pin
17.	Packing
18.	Packing Washer
19.	Packing Spacer
20.	Lower Bonnet Bushing
21.	Stem
22.	Flexible Wedge
23.	Bonnet – (10" – 12")
24.	Bonnet – (2" – 4")
25.	Bonnet – (6" – 8")
26.	Gasket
27.	Body Stud
28.	Body Nut
29.	Body – Flanged
30.	Body - Weld

### OPERATION:

These gate valves are manually operated. To open, turn the handwheel (part 2) in a counterclockwise direction until valve is full open: To close, turn the handwheel (part 2) in a clockwise direction until wedge is snug against the seat.

### INSPECTION:

No periodical inspection or preventative maintenance is required, other than lubricating the stem (part 21) and stem bushing (part 6, 6A) per recommendations on page 15.

### 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.

### PROCEDURES FOR REPAIR: (CAUTION: See note 7 on page 15)

1. Stuffing Box Leakage... While operating valve, leakage around the stuffing box indicates the necessity to adjust or replace the packing. Suck leakage will not show when the valve is completely opened or closed.

I. To Adjust Packing... Turn eyebolt nuts (part 14) in a clockwise direction. Gland eyebolt nuts must be adjusted alternately with no more than ¼ turn on each until leakage stops. If leakage continues replace the packing.

II. To Replace Packing... Caution: Pressure must be completely removed before replacing the packing.

- Remove eyebolt nuts (part 14).
- Raise gland flange (part 12) and gland (part 13).
- Remove packing (part 17) with packing hooks.
- Install new packing, and reassemble by reversing above procedure.

2. Replace Stem Bushing... Caution: Pressure must be completely removed before replacing the stem bushing.

#### I. Yokearm Design

- Remove handwheel nut (part 1) by turning counterclockwise.
- Remove handwheel (part 2).
- Remove handwheel key (part 5).
- Remove bearing cap screws (part 4).
- Lift off bearing cap screws (part 4).
- Lift off bearing cap (part 3).
- Turn upper bushing (part 6) clockwise and remove from stem.
- Replace bushing (part 6) and reassemble by reversing above procedure.

#### II. One-piece Bonnet Design

- Remove handwheel nut (part 1) by turning counterclockwise.
- Remove handwheel (part 2).
- Remove handwheel key (part 5).
- With standard wrench turn bearing cap screws (part 4) or remove weld from bushing locknut (part 7) and turn in a counterclockwise direction.
- Remove bearing cap (part 31) or stem bushing locknut (part 7).
- Turn stem bushing (part 6 or 6A) clockwise and remove from stem.
- Replace stem bushing (part 6 or 6A) and reassemble by reversing above procedure.

3. Replaced Damaged Stem... Follow plant procedures for removing valve from service and removing pressure from valve.

- Slightly open valve (this takes pressure off seat face).
- Remove body to bonnet studs (part 27) and nuts (part 28).
- Gripping handwheel (part 2) lift upper structure until stem and wedge are entirely free of the valve body.
- Wedge can be removed from "T" head of stem with ease.
- Grip "T" head of stem (part 21) turn clockwise, stem will wind down and out of bonnet.
- Install new stem (part 21).
- Inspect wedge and seat ring for pitting and wear before sliding wedge on "T" head of stem and installing in the body. (Wedge should be installed in the body in the same position it was removed).
- Connect body and bonnet with studs (part 27) and nuts (part 28).

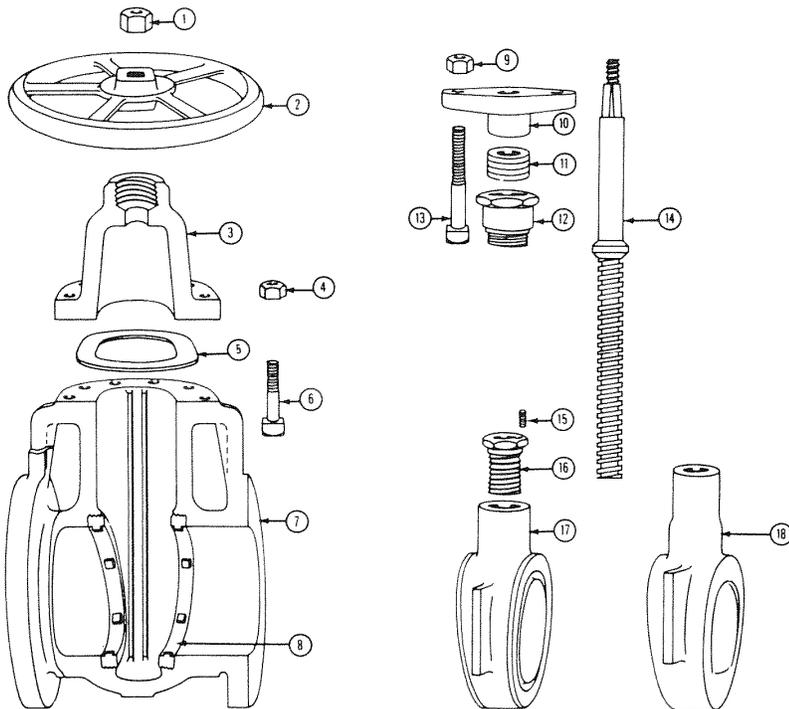
4. Replace Wedge... Follow plant procedures for removing valve from service and removing pressure from valve.

- Slightly open valve (this takes pressure off seat face).
- Remove body to bonnet studs and nuts (part 27 and 28).
- Gripping handwheel (part 2) lift entire bonnet structure until wedge is free of body.
- Slide wedge from "T" head of stem.
- Install new wedge (part 22), (lap the wedge faces).
- Connect body and bonnet with studs (part 27) and nuts (part 28).

NOTE: Whenever body and bonnet are separated, a new gasket (part 26) should be installed before reassembly. When stem (part 21) is removed, it is necessary to replace the packing (part 17).

# BOLTED BONNET INSIDE THREAD NON-RISING STEM GATE VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Handwheel Nut
2. Handwheel
3. Bonnet
4. Body Nuts
5. Gasket
6. Body Bolts
7. Body
8. Seat Ring
9. Gland Nuts
10. Packing Gland
11. Packing
12. Spud
13. Gland Bolts
14. Stem
15. Wedge Nut Set Screw
16. Wedge Nut
17. Wedge
18. Wedge

#### 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 preventive maintenance is not required.

#### 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 when other than standard.

#### PROCEDURE FOR REPAIRING: (CAUTION: See note 7 on page 15)

1. Stuffing Box Leakage... If leakage of the stuffing box occurs, tighten the gland nuts by turning 1/4 turn alternately until leakage stops. Replace packing, if leakage cannot be shut off by tightening gland nuts. The valve should not be under pressure when replacing packing. Replace packing as follows:

- a. Remove packing gland nuts
- b. Raise packing gland
- c. Remove Packing (part 11) 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
- g. Adjust as required when under pressure

Replacement of packing when a valve is back seated is hazardous and not recommended.

2. Seat Leakage – If valve seat leaks, it will be necessary to replace the wedge (parts 17 or 18) or the seat ring (part 8). Caution: Pressure must be completely removed before replacing wedge.

- a. Open valve.
- b. Remove body-to-bonnet nuts (part 4) and bolts (part 6). Complete assembly can now be lifted out of valve body (part 7).
- c. Run the stem (part 14) down by turning clockwise.
- d. Remove wedge (part 18) from stem (part 14) by turning in clockwise direction or remove wedge (part 17) by removing set screw (part 15) and wedge nut (part 16) by turning in counterclockwise direction.
- e. Replace wedge (part 17 or 18).
- f. Remove seat ring (part 8) if applicable. Use seat ring wrench and remove by turning counterclockwise. Install new seat ring. (Lap the seat face).
- g. Reassemble by reversing above procedures.

3. Damaged Stem – When stem threads become damaged so the valve is inoperable, replace the stem (part 14) as follows: Caution: All pressure must be completely removed before replacing the stem.

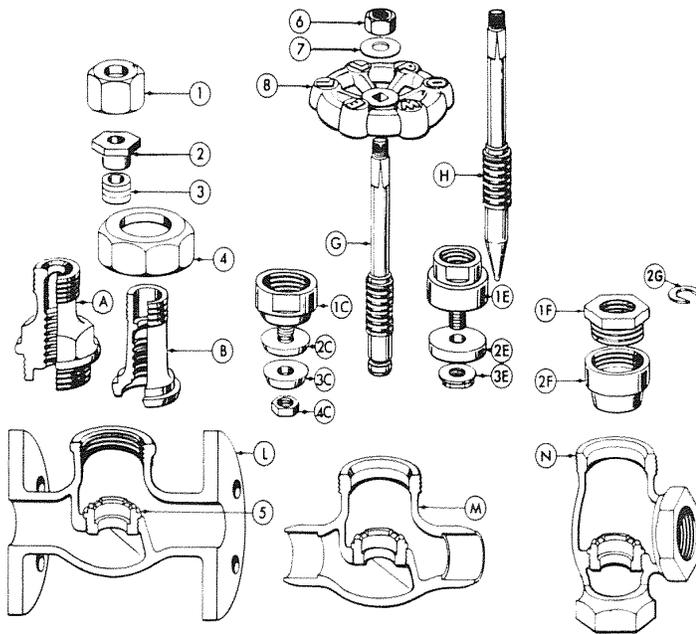
- a. Remove body-to-bonnet nuts (part 4) and bolts (part 6). Complete assembly can now be lifted out of valve body (part 7).
- b. Remove handwheel nut (part 1) and handwheel (part 2)
- c. Remove packing gland nuts (part 9), packing gland (part 10) and packing (part 11).
- d. Remove stuffing box spud (part 12) by turning counterclockwise and slip off of stem (part 14).
- e. Remove wedge (part 17 or 18).
- f. Install new stem (part 14) and reassemble by reversing above procedures.

NOTE: Whenever a new stem is installed, it is necessary to replace the packing (part 11).

When body and bonnet are separated, a new gasket (part 5) should be installed before reassembly.

# THREADED and UNION BONNET GLOBE and ANGLE VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Packing Nut
2. Packing Gland
3. Packing
4. Bonnet Ring
5. Seat Ring
6. Handwheel Nut
7. Identification Plate
8. Handwheel
- A. Threaded-in Bonnet
- B. Union Bonnet
- C. Hi-Lo Disc
  - 1C—Disc Holder
  - 2C—Non-Metallic Disc
  - 3C—Disc Plate
  - 4C—Disc Nut
- E. Composition Disc
  - 1E—Disc Holder
  - 2E—Non-Metallic Disc
  - 3E—Disc Locknut Washer
- F. Disc Locknut
  - 1F—Disc Nut
  - 2F—Disc
- G. Stem—Disc Locknut (Horseshoe Ring) Type
  - 2G—Horseshoe Ring
- L. Body—Globe-Flanged Ends
- M. Body—Globe-Solder Joint Ends
- N. Body—Angle-Threaded Ends

### OPERATION:

These globe valves are manually operated. To close, turn the handwheel (part 8) in a clockwise direction; to open, turn the handwheel (part 8) in a counterclockwise direction.

### INSPECTION:

Periodical inspection and preventative maintenance is not required.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size and material; if applicable metal when other than standard.

### PROCEDURE FOR REPAIRING: (CAUTION: See note 7 on page 15)

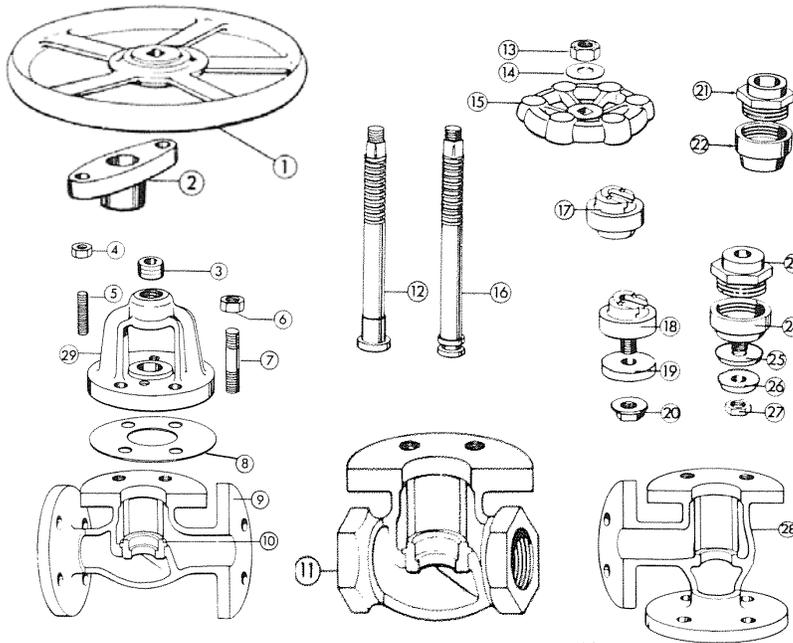
1. Stuffing Box Leakage—If there is leakage around the stuffing box when operating the valve, it is necessary to adjust or replace the packaging. Leakage would not show when the valve is completely opened or closed. To adjust the packing, turn the packing nut (part 1) clockwise until leakage stops. If leakage continues, it is necessary to replace the packing. This is accomplished by:
  - a. Remove handwheel nut (part 6), identification plate (part 7) and handwheel (part 8).
  - b. Remove packing nut (part 1) by turning counterclockwise until nut can be lifted off.
  - c. Slip the packing gland (part 2) off of the stem (part G or H).
  - d. Remove the old packing (part 3).
  - e. Install the correct new packing (part 3)
  - f. Return packing gland (part 2) (when applicable).
  - g. Return packing nut (part 1) and pull down snug—not tight
  - h. Replace handwheel (part 8), identification plate (part 7) and handwheel nut (part 6). Valve is ready to operate.
2. Seat Leakage—If valve seat leaks, it will be necessary to replace the disc (part 2F), or Hi-Lo disc assembly (part 1C, 2C, 3C, 4C), or composition disc (part 2E), or if needle valve, replace stem (part H) – and seat ring (part 5). If valve has integral seat, refinish seat in body with seating tool.
  - a. Remove bonnet ring (part 4) by turning clockwise and lift out bonnet assembly. If valve has screwed-in bonnet, turn bonnet counterclockwise and remove complete assembly.
  - b. Run the stem (part G or H) down by turning in a clockwise direction.

- c. Remove disc (parts C, E, F) from the stem. Disc Nut Type: remove the stem (part G) from the bonnet (part B). Secure disc (part 2F) in a vise by holding to square flats provided. Turn locknut (part 1F) counterclockwise with adjustable wrench until disengaged from disc (part 2F). Slide horse shoe ring (part 2G) from groove in stem (part G). Replace disc (part 2F).  
Hi-Lo Type: remove the stem (part G) from the bonnet (part B). Secure disc holder (part 1C) in a vise by holding to square flats provided. Remove disc nut (part 4C) with adjustable wrench by turning counterclockwise. Remove disc (part 3C) and disc plate (part 2C). Replace with new disc.  
Composition Type: remove the stem (part G) from the bonnet (part B). Secure disc holder (part 1E) in a vise by holding to square flats provided. Remove disc nut (part 3E) with adjustable wrench by turning counterclockwise. Remove disc (part 2E) and replace with new.
- d. Remove seat ring (part 5).  
Remove disc assembly. Use seat ring wrench and insert in the seat ring until lugs engage slots. Turn in counterclockwise direction to remove from body (parts L, M, N). Replace seat ring.
3. Damaged Stem (part G, H)—When stem threads become damaged so the valve is inoperable, replace the stem as follows:
  - a. Remove handwheel nut (part 6) and handwheel (part 8).
  - b. Remove the bonnet (parts A, B) with a wrench by turning in a counterclockwise direction.
  - c. Remove this complete assembly from the valve body (parts L, M, N).
  - d. Run the stem (parts G, H) down by turning in a clockwise direction.
  - e. Rotate stem (parts G, H) in clockwise direction until the stem thread is completely out of the threaded portion of the stuffing box.
  - f. Remove the stem (parts G, H) by pulling out the stuffing box.
  - g. Remove disc (parts C, E, F) from stem by following procedures outlined above (No.2)
  - h. Install new stem parts G, H) by reversing above procedure.

NOTE: Whenever a new stem is installed, it is necessary to replace the packing (part 3)

# BOLTED BONNET O.S. & Y. GLOBE and ANGLE VALVES

## -BRONZE DESIGN- OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Handwheel (Round)
2. Packing Gland
3. Packing
4. Gland Stud Nut
5. Gland Stud
6. Yoke Stud Nut
7. Yoke Stud
8. Gasket
9. Body—Globe—Flanged Ends
10. Seat Ring
11. Body—Globe—Threaded Ends
12. Stem—Disc Locknut Type
13. Handwheel Nut
14. Identification Plate
15. Handwheel
16. Stem—Slip-on Type
17. Disc—One-Piece—Slip-on
18. Composition Disc Holder
19. Composition Disc
20. Disc Nut
21. Disc Locknut
22. Disc
23. Disc Locknut—Hi-Lo Disc
24. Disc Holder
25. Non-Metallic Disc
26. Disc Plate
27. Disc Nut
28. Body—Angle—Flanged Ends
29. Yoke

### OPERATION:

These globe and angle valves are manual operated. To close, turn the handwheel (part 1 or 15) in a clockwise direction; to open, turn the handwheel (part 1 or 15) in a counterclockwise direction.

### INSPECTION:

Periodical inspection and preventative maintenance is not required other than stem (part 12 or 16) lubrication per recommendations on page 15.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size, and material, also type of disc material; if applicable, metal when other than standard.

### PROCEDURES FOR REPAIR: (CAUTION: See note 7 on page 15)

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 would not show when the valve is completely opened or closed. To adjust the packing, turn gland stud nuts (part 4) in clockwise direction. Gland nuts must be adjusted alternately with not more than 1/4" turn. If leakage continues, it is necessary to replace the packing.
  - a. Remove handwheel nut (part 13) identification plate (part 14) and handwheel (part 1 or 15).
  - b. Remove gland stud nuts (part 4) by turning in counterclockwise direction.
  - c. Remove upper valve assembly by removing stud nuts (part 6).
  - d. Turn stem (part 12 or 16) in clockwise direction until threads are clear. Pull stem and disc assembly straight down through yoke-bonnet.
  - e. Packing gland (part 2) will now lift out exposing the packing.
  - f. Packing (part 3) can now be lifted out.
  - g. Insert new packing and reassemble reversing above procedure. CAUTION: be careful not to damage new packing when feeding stem. Packing gland (part 2) must be inserted before threading stem.
2. Seat Leakage—If valve leaks, it will be necessary to replace the disc (part 17, 19, 22, or 25) or seat ring (part 10).
  - a. Remove upper valve assembly by removing bonnet stud nuts (part 6).
  - b. Remove disc (part 17, 19, 22, or 25) from stem (part 12, 16). Slip-on Type: the disc (part 17) will slip off of the stem (part 16).

Composition Type: disc holder (part 18) will slip off of the stem (part 16). Secure disc holder (part 18) and remove disc nut (part 20) with wrench by turning counterclockwise. Remove disc (part 19) from recess in bottom of disc holder (part 18). Replace with new and reassemble.

Disc Nut Type: remove the stem (part 12) from the bonnet as outlined in above (No. 1—Stuffing Box Leakage). Secure disc (part 22) in a vise by holding to square flats provided. Turn locknut (part 21) counterclockwise, with adjustable wrench, until disengaged from disc (part 22). Replace disc and reassemble.

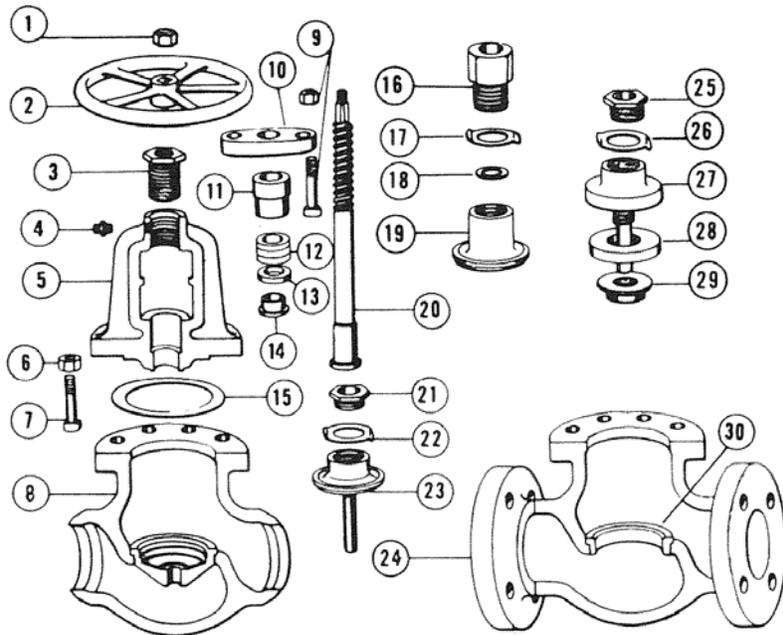
Hi-Lo Type: remove the stem (part 12) from the bonnet as outlined in above (No. 1—Stuffing Box Leakage). Secure disc holder (part 24) in vise on flats provided. Remove disc nut (part 27) with adjustable wrench by turning counterclockwise. Remove disc plate (part 26) and disc (part 25). Replace with new disc and reassemble.

- c. Remove seat ring (part 10). Remove disc assembly. Use a seat ring wrench and insert in the seat ring until lugs engage slots. Turn in counterclockwise direction to remove from body (part 9, 11, 28). Replace seat ring.
3. Damaged Stem (part 12, 16)—When stem threads become damaged so the valve is inoperable, replace the stem as follows:
  - a. Remove handwheel nut (part 13), identification plate (part 14) and handwheel (part 1 or 15).
  - b. Remove gland nuts (part 4) by turning in a counterclockwise direction.
  - c. Remove the upper bonnet assembly by removing the bonnet stud nuts (part 6).
  - d. Turn stem (part 12, 16) in clockwise direction until threads are clear. Pull stem (part 12, 16) and disc assembly straight down through yoke-bonnet.
  - e. Remove disc assembly as outlined above (No. 2—Seat Leakage).
  - f. Use new stem and reassemble by reversing above procedure.

NOTE: When a new stem or disc (when stem has to be removed) is installed, it is necessary to replace the packing (part 3). When body-to-bonnet joint is broken, it is necessary to install a new gasket (part 8).

# BOLTED BONNET O.S. & Y. GLOBE and ANGLE VALVES

## -IRON & STEEL DESIGN- OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Handwheel Nut
2. Handwheel
3. Upper Brushing
4. Lubricant Fitting
5. Bonnet
6. Body Nut
7. Body Bolt
8. Body—Globe—Butt Welding Ends
9. Packing Gland Bolt and Nut
10. Packing Gland (Two-piece)
11. Packing Gland (Two-piece)
12. Packing
13. Packing Washer
14. Back Seat Bushing
15. Gasket
16. Disc Nut-Plug Type Disc
17. Lockwasher-Plug Type disc
18. Thrust Washer-Plug Type Disc
19. Plug Type Disc
20. Stem
21. Disc Nut-Guided Disc
22. Lockwasher-Guided Disc
23. Guided Disc
24. Body—Globe—flanged Ends
25. Disc Locknut-Composition Disc
26. Lockwasher-Composition Disc
27. Disc Holder-Composition Disc
28. Composition Disc
29. Disc Nut-Composition Disc
30. Seat Ring

### OPERATION:

These globe and angle valves are manual operated. To close, turn the handwheel (part 2) in a clockwise direction: to open, turn the handwheel (part 2) in a counterclockwise direction.

### INSPECTION:

Periodical inspection and preventative maintenance is not required other than stem (part 20) lubrication per recommendations on page 15.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give figure number, size, and serial number, also disc material when a composition is used; if applicable, metal when other than standard.

### PROCEDURES FOR REPAIR: (CAUTION: See note 7 on page 15)

1. Stuffing Box Leakage... If leakage of the stuffing box occurs, tighten the gland nuts by turning 1/4 turn alternately until leakage stops. Replace packing, if leakage cannot be shut off by tightening gland nuts. The valve should not be under pressure when replacing packing. Replace packing as follows:
  - a. Remove packing gland nuts (part 9)
  - b. Raise packing gland (part 10) and rest on gland shelf
  - c. If two-piece gland, raise both glands (part 10 and 11) and remove packing (part 12) with packing hooks
  - d. Install new packing (part 12). Packing is cut and when installing make sure ends meet snugly
  - e. Replace packing gland or glands (part 10 or 11)
  - f. Tighten packing gland nuts (part 9) evenly on both sides-pull down snug-not tight
  - g. Adjust as required when under pressure
 Replacement of packing when a valve is back seated is hazardous and not recommended.
2. Seat Leakage—If valve seat leaks, it will be necessary to replace the disc (parts 19, 23, or 28) or seat ring (part 30). Pressure must be completely removed before removing disc.
  - a. Open valve.
  - b. Remove body-to-bonnet nuts (part 6) from bolts (part 7). Complete assembly can now be lifted out of valve body (part 8 or 24).
  - c. Run the stem (part 20) down by turning in a clockwise direction.
  - d. Remove disc (parts 19, 23, 28) from stem.
    - Guided Disc: remove disc (part 23) from disc nut (part 21) and lockwasher (part 22) by turning in counterclockwise direction. Replace with new disc

Plug Type Disc: remove disc (part 19) from disc nut (part 16) lockwasher (part 17) and thrust washer (part 18) by turning in counterclockwise direction. Replace disc.

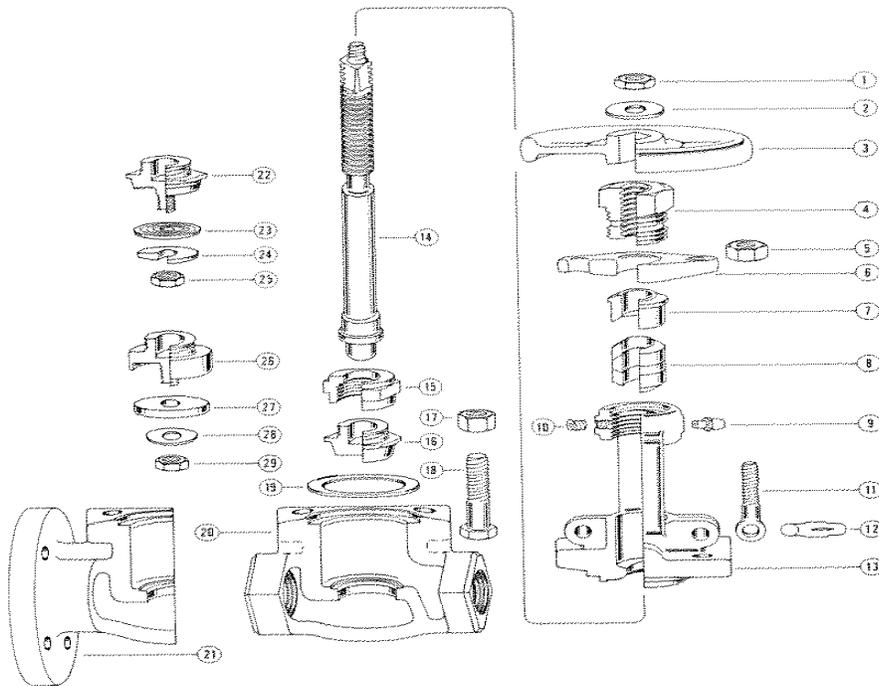
Composition Disc: remove disc assembly (parts 27, 28, 29) from disc nut (part 25) and lockwasher (part 26) by turning in a counterclockwise direction. Secure disc holder (part 27), remove disc nut (part 29) and disc (part 28). Replace disc (part 28) and reassemble.

- e. Remove seat ring (part 30). Use seat ring wrench and remove seat ring (part 30) by turning counterclockwise. Install new seat ring and reassemble.
3. Damaged Stem (part 20)—When stem threads become damaged so that valve is inoperable, replace the stem as follows:
  - a. Remove complete bonnet assembly by removing bonnet nuts (part 6) from bonnet bolts (part 7).
  - b. Remove handwheel nut (part 1) and handwheel (part 2).
  - c. Run the stem (part 20) down by turning in a clockwise direction.
  - d. Rotate stem (part 20) in a clockwise direction until the stem thread is completely out of the threaded portion of upper brushing (part 3).
  - e. Remove the stem (part 20) by pulling out of the stuffing box.
  - f. Remove disc (parts 19, 23, 28) from stem by following procedures outlined above. (No. 2).
  - g. Install new stem (part 20) and reassemble by reversing above procedure.
4. Replace Stem Bushing: Follow plant procedures for removing valve from service and removing pressure from valve.
  - a. Open valve approximately five (5) turns.
  - b. With wrench turn bushing (part 3) counterclockwise simultaneously with handwheel (part 2) until bushing is free of bonnet (part 5).
  - c. Remove handwheel nut (part 1) and handwheel (part 2).
  - d. Turn bushing (part 3) counterclockwise and remove from stem (part 20).
  - e. Replace bushing (part 3) and reassemble by reversing above procedure.

NOTE: Whenever a new stem is installed it is necessary to replace the packing (part 12). When body and bonnet are separated, a new gasket (part 15) should be installed before reassembly.

# BOLTED BONNET O.S. & Y. GLOBE VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Handwheel Nut
2. Identification Plate
3. Handwheel
4. Yoke Bushing
5. Gland Eyebolt Nut
6. Gland Flange
7. Gland Follower
8. Packing
9. Lubricant Fitting
10. Headless Set Screw
11. Gland Eyebolt
12. Gland Eyebolt Pin
13. Yoke
14. Stem
15. Disc Locknut
16. Disc
17. Yoke Bolt Nut
18. Yoke Bolt
19. Gasket
20. Body – Threaded Ends
21. Body – Flanged Ends
22. Disc Holder – Hi-Lo
23. Non-Metallic Disc – Hi-Lo
24. Disc Plate – Hi-Lo
25. Disc Nut – Hi-Lo
26. Disc Holder – Composition Disc
27. Composition Disc
28. Disc Plate – Composition Disc
29. Disc Nut – Composition Disc

### OPERATION:

These globe valves are manual operated. To close, turn handwheel (part 3) in a clockwise direction; to open, turn the handwheel (part 3) in a counterclockwise direction.

### INSPECTION:

Periodical inspection and preventative maintenance is not required other than stem (part 14) lubrication per recommendations on page 15.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give the figure number, size, serial number and material. Also give the disc material when a composition is used; if applicable, metal when other than standard.

### PROCEDURES FOR REPAIR: (CAUTION: See note 7 on page 15)

1. Stuffing Box Leakage—If there is leakage around the stuffing box, it is necessary to adjust or replace the packing. Leakage would not show when the valve is completely opened or closed. To adjust the packing, tighten the gland nuts (part 5) ¼ turn alternately until leakage stops. If leakage continues, it is necessary to replace the packing. Caution: The valve should not be under pressure when replacing the packing. For split packing only:
  - a. Remove packing gland nuts (part 5).
  - b. Raise gland flange (part 6) and gland follower (part 7), and remove packing (part 8) with packing hooks.
  - c. Install new packing (part 8). Packing is cut and when installing make sure ends meet snugly
  - d. Replace packing gland follower (part 7) and packing gland flange (part 6).
  - e. Tighten packing gland nuts (part 5 evenly on both sides – pull down snug – not tight.

NOTE: When solid packing is used follow step 3 below.

2. Seat Leakage – If the valve seat leaks, it will be necessary to replace the disc (part 16), or Hi-Lo disc assembly (part 22, 23, 24, 25), or composition disc (part 27). Pressure must be completely removed before removing disc. Refinish the seat in body with a seating tool.
  - a. Open valve.
  - b. Remove body-to-bonnet nuts (part 17) from bolts (part 18). Complete assembly can now be lifted out of the valve body (part 20 or 21).
  - c. Run the stem (part 14) down by turning in a clockwise direction.
  - d. Remove disc (part 16) or disc assemblies from the stem.
    - Disc Nut Type: remove the stem (part 14) from the bonnet (part 13). Secure disc locknut (part 15) by holding to square flats provided. Turn disc (part 16) counterclockwise with adjustable wrench until disengaged from the disc locknut. Replace disc.

Composition Type: remove the stem (part 14) from the bonnet (part 13). Secure disc holder (part 26) in jaws of vise on flats provided. Remove disc nut (part 29), with adjustable wrench, but turning counterclockwise.

Remove disc (part 27) from recess in bottom of disc holder and replace with new.

Hi-Lo Type: remove the stem (part 14) from the bonnet (part 13). Secure disc locknut (part 15) in jaws of vise on flats provided.

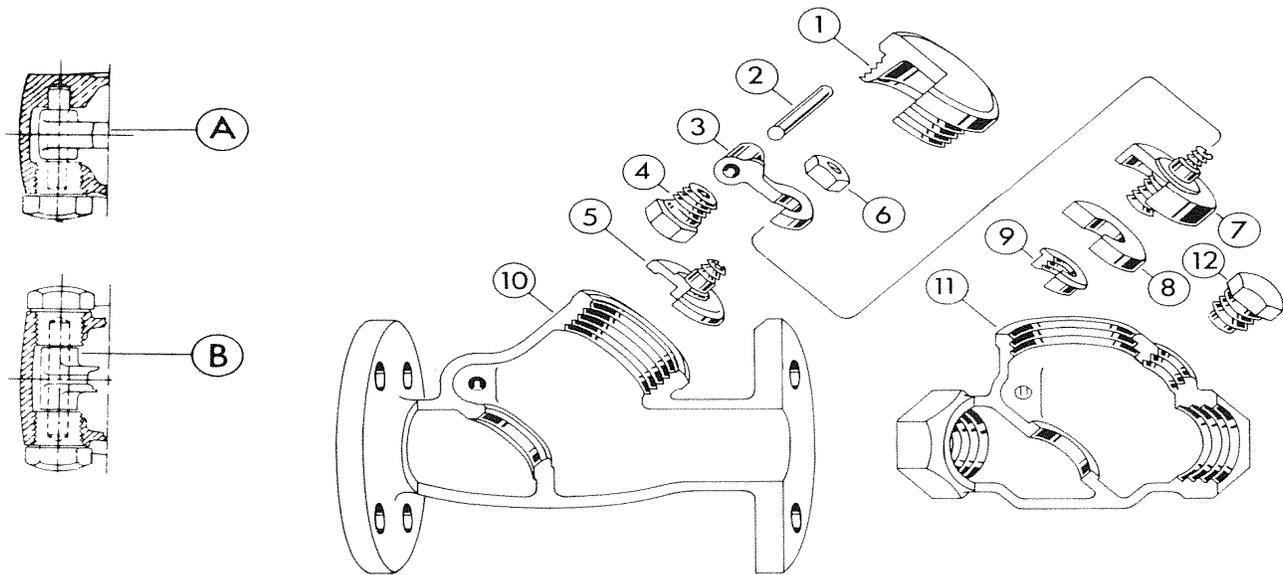
Remove disc assembly (part 22, 23, 24, 25) with adjustable wrench by turning counterclockwise. Replace disc assembly by securing disc holder (part 22) in disc locknut (part 15).

3. Damaged Stem (part 14) – When stem threads become damaged so the valve is inoperable, replace the stem as follows:
  - a. Remove complete bonnet assembly by removing bonnet nuts (part 17) from bonnet bolts (part 18).
  - b. Remove handwheel nut (part 1), identification plate (part 2), and handwheel (part 3).
  - c. Remove gland nut (part 5) and loosen packing gland (part 6) and gland follower (part 7).
  - d. Run the stem (part 14) down by turning in a clockwise direction.
  - e. Rotate stem (part 14) in a clockwise direction until the stem thread is completely out of the threaded portion of upper bushing (part 4).
  - f. Remove the stem (part 14) by pulling out of the stuffing box.
  - g. Replace packing; see step 1 above.
  - h. Remove disc (part 16 or disc assemblies) from stem by following procedure outlined above.
  - i. Install new stem (part 14) and reassemble by reversing above procedure.
4. Replace Stem Bushing: Follow plant procedures for removing valve from service and removing pressure from valve.
  - a. Open valve approximately five (5) turns.
  - b. With a standard wrench turn bushing (part 4) counterclockwise simultaneously with handwheel (part 3) until bushing is free of bonnet (part 13).
  - c. Remove handwheel nut (part 1), identification plate (part 2), and handwheel (part 3).
  - d. Turn bushing (part 4) counterclockwise and remove from stem (part 14).
  - e. Replace bushing (part 4) and reassemble by reversing above procedure.

NOTE: Whenever a new stem is installed, it is necessary to replace the packing (part 8). When body and bonnet are separated, a new gasket (part 19) should be installed before reassembly.

# THREADED CAP SWING CHECK VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

- |                |                                  |
|----------------|----------------------------------|
| 1. Cap         | 8. Composition Disc              |
| 2. Carrier Pin | 9. Disc Locknut-Composition Disc |
| 3. Carrier     | 10. Body-Flanged End             |
| 4. Side Plug   | 11. Body-Threaded End            |
| 5. Disc        | 12. Bumper Plug                  |
| 6. Disc Nut    | A. Detail-One Side Plug          |
| 7. Disc Holder | B. Detail-Two Side Plugs         |

### OPERATION:

Swing Check Valves must be installed with the pressure under the disc to function properly. These valves are completely automatic and their operation function depends on the fluid flow in the pipe.

### INSPECTION:

Periodical inspection and preventative maintenance is not required other than observing for proper functioning.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size, and material; if applicable, metal when other than standard.

**PROCEDURE FOR REPAIRING: (CAUTION: See note 7 on page 15)**

1. Seat Leakage—If valve seat leaks, it will be necessary to replace the disc (part 5 or 8).
  - a. Remove cap (part 1) by turning counterclockwise.
  - b. Remove side plug or plugs (part 4) and slide carrier pin (part 2) out through hole.
  - c. Remove complete disc assembly.

One-piece disc (part 5). Secure carrier (part 3) and remove disc nut (part 6) by turning counterclockwise. Replace disc (part 5) and reassemble by reversing this procedure.

Composition disc (part 8). Remove disc locknut (part 9) with wrench, holding disc holder (part 7) by screwdriver slot and rotating counterclockwise. Replace disc (part 8) and reassemble by reversing this procedure.

# BOLTED CAP SWING CHECK VALVES

## OPERATIONAL and REPAIR PROCEDURE

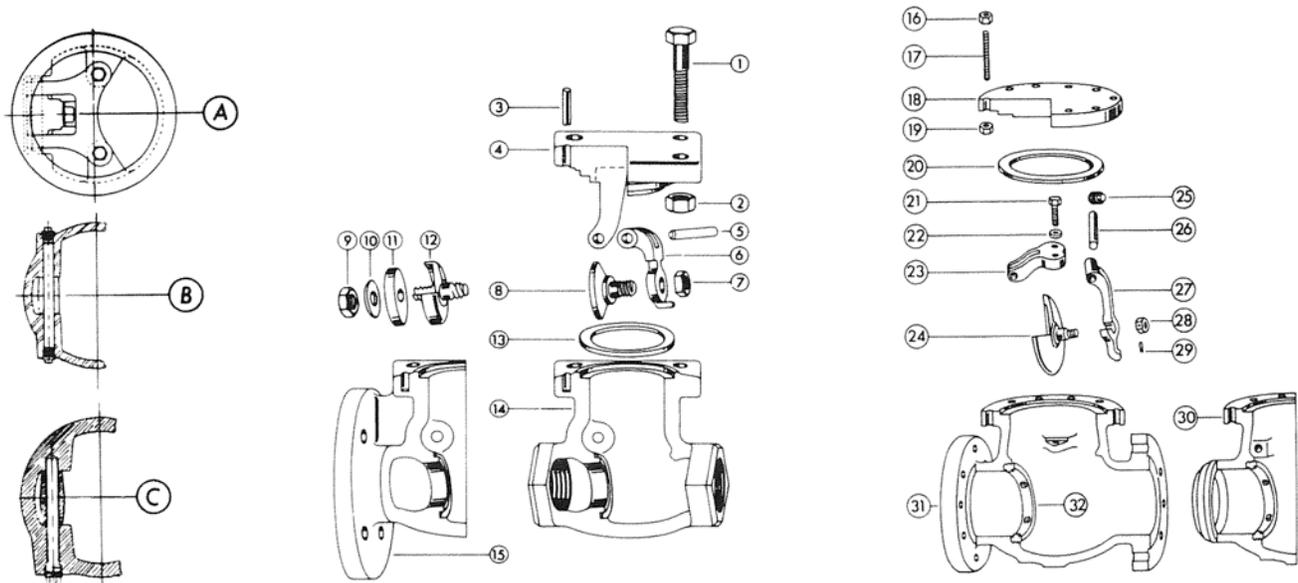


Fig. I

Fig. II

### PARTS IDENTIFICATION

- |   |   |  |
|---|---|--|
| <ul style="list-style-type: none"> <li>1. Cap Bolt</li> <li>2. Cap Bolt Nut</li> <li>3. Locating Pin</li> <li>4. Cap</li> <li>5. Carrier Pin</li> <li>6. Carrier</li> <li>7. Disc Locknut</li> <li>8. Disc</li> <li>9. Disc Nut</li> <li>10. Disc Plate</li> <li>11. Composition Disc</li> <li>12. Disc Holder</li> </ul> | <ul style="list-style-type: none"> <li>13. Gasket</li> <li>14. Body – Threaded Ends</li> <li>15. Body – Flanged End</li> <li>16. Body Nut</li> <li>17. Body Stud</li> <li>18. Cap</li> <li>19. Body Nut</li> <li>20. Gasket</li> <li>21. Cap Screw</li> <li>22. Lockwasher</li> <li>23. Disc Holder Hanger</li> <li>24. Disc</li> </ul> | <ul style="list-style-type: none"> <li>25. Pipe Plug</li> <li>26. Disc Holder Pin</li> <li>27. Disc Holder</li> <li>28. Disc Nut</li> <li>29. Disc Nut Pin</li> <li>30. Body – Welding End</li> <li>31. Body – Flanged Ends</li> <li>32. Seat Ring</li> </ul> <p>A. Detail – Hanger Type Disc<br/>         B. Detail – Pin Type – Two Side Plugs<br/>         C. Detail – Pin Type – One Side Plug</p> |
|---|---|--|

**OPERATION:**

Swing Check Valves must be installed with the pressure under the disc to function properly

**INSPECTION:**

Periodical inspection or preventative maintenance is not required other than observing for proper functioning.

**REPAIR PARTS:**

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size and material; if applicable, metal when other than standard.

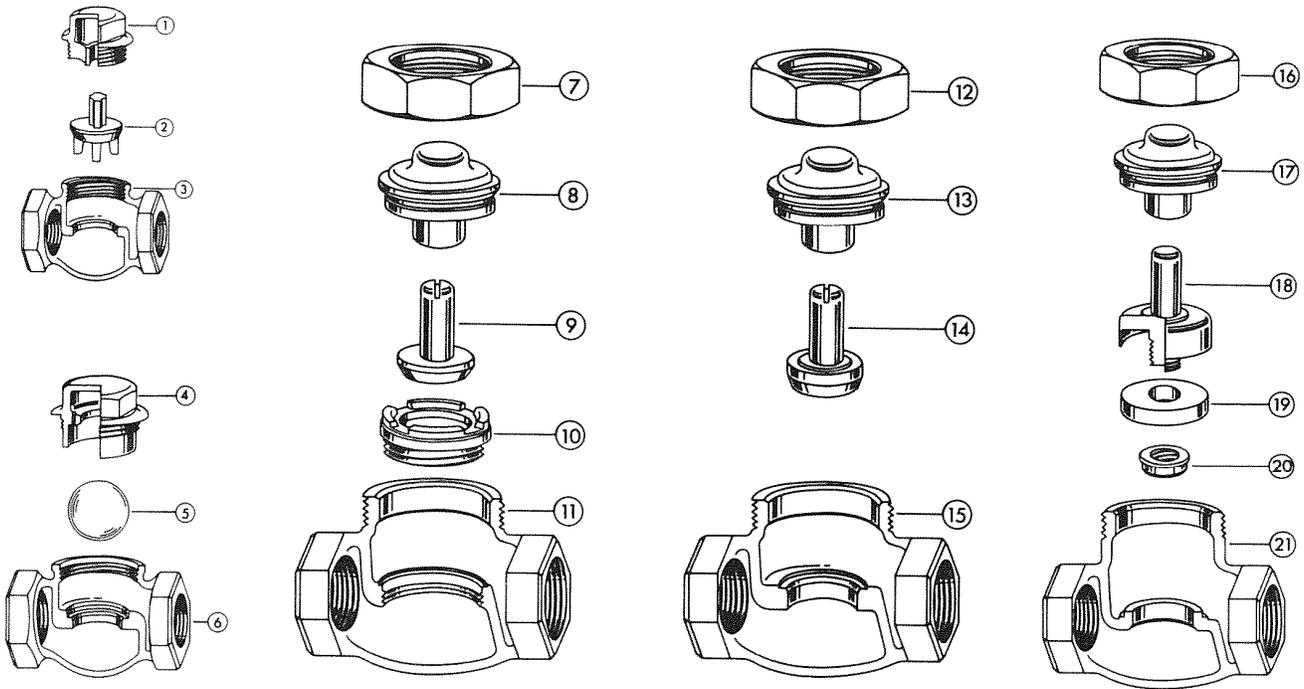
**PROCEDURE FOR REPAIRING (CAUTION: See note 7 on page 15)**

1. Seat Leakage – If valve seat leaks, it will be necessary to replace the disc or seat ring.
  - a. Remove the cap (part 4 or 18) by removing the nuts (part 2 or 16) from either the body studs (part 17) or body bolts (part 1). Use a wrench and turn in a counterclockwise direction.
  - b. For pin type valves, remove side plug (part 25) and slide disc holder pin (part 26) out through hole for side plug.
  - c. Assembly of disc (part 24), disc holder (part 27), disc nut (part 28) and disc nut pin (part 29) can now be lifted out of the body through the top.
    - d. Remove disc nut pin (part 29), then disc nut (part 28) with a wrench by turning counterclockwise.
    - e. Replace disc (part 24) and reassemble by reversing above procedure.
    - f. On hanger type valves (Fig. II), the entire disc assembly is attached to ears within the body. Remove cap screws (part 21) and lockwashers (part 22) and lift out entire assembly. Follow same procedures as given in c, d, and e.
    - g. On valve cap suspended disc valves (Fig. I), the entire disc assembly is attached to the valve cap. Remove cap bolts nuts (part 2) and lift out entire assembly. Remove disc locknut (part 7 or 9) by turning counterclockwise. Replace disc (part 8 or 11) and reassemble by reversing above procedure. When reassembling valve be sure the locating pin (part 3) is in proper alignment between the valve cap (part 4) and the valve body (part 14 or 15).
    - h. Remove seat ring (part 32) if necessary. Remove disc assembly. Use seat ring wrench and insert in the seat ring until lugs engage slots. Turn in counterclockwise direction to remove from body (part 31). Replace seat ring and reassemble valve.

NOTE: When cap and body are separated, new gasket should be installed when reassembling.

# UNION and THREADED CAP HORIZONTAL LIFT CHECK VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

- |                       |                        |                           |
|-----------------------|------------------------|---------------------------|
| 1. Cap                | 8. Disc Guide          | 15. Body-Threaded Ends    |
| 2. Disc               | 9. Disc                | 16. Ring Nut              |
| 3. Body-Threaded Ends | 10. Seat Ring          | 17. Disc Guide            |
| 4. Cap                | 11. Body-Threaded Ends | 18. Disc Holder           |
| 5. Ball               | 12. Ring Nut           | 19. Disc-Composition Disc |
| 6. Body-Threaded Ends | 13. Disc Guide         | 20. Disc Nut              |
| 7. Ring Nut           | 14. Disc               | 21. Body-Threaded Ends    |

**OPERATION:**

These valves must be installed with the pressure under the disc to function properly. These horizontal lift check valves are completely automatic and their operation depends on the fluid flow in the pipe.

**INSPECTION:**

Periodical inspection or preventative maintenance is not required other than observing for proper functioning.

**REPAIR PARTS:**

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size and material; if applicable, metal other than standard.

**PROCEDURE FOR REPAIRING: (CAUTION: See note 7 on page 15)**

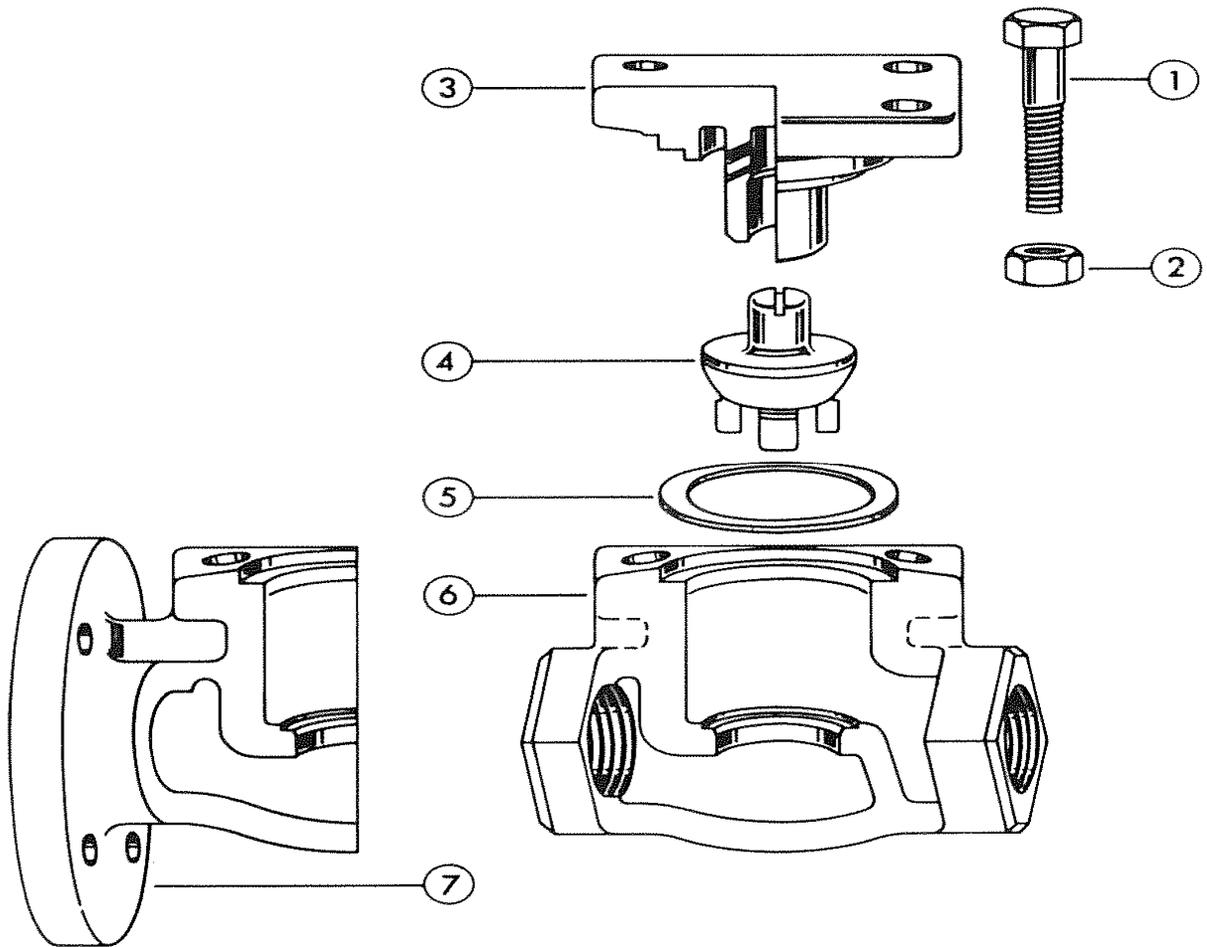
1. Seat Leakage—if valve seat leaks, it will be necessary to replace the disc (part 2, 9, or 14) or disc assembly

(part 18, 19, or 20); if ball check, refinish seat in body with seating tool; if valve has seat ring, see instruction “c”

- a. Remove cap (part 1 or 4) or ring nut (part 7, 12, or 16) by turning counterclockwise.
- b. Remove complete assembly.  
 One-piece disc (part 2, 9, or 14): Slip disc out of disc guide (part 8 or 13) and replace with new disc.  
 Composition disc (part 19): Secure disc holder (part 18) in vise and remove disc nut (part 20) by turning counterclockwise. Remove disc (part 19). Replace with new disc.  
 Ball disc (part 5): Replace with new.
- c. Remove seat ring (part 10): Remove disc. Use seat wrench and insert in the seat ring until lugs engage slots. Turn in counterclockwise direction to remove from body. Replace with new seat ring.

# BOLTED CAP HORIZONTAL LIFT CHECK VALVES

## OPERATIONAL and REPAIR PROCEDURE



### PARTS IDENTIFICATION

1. Cap Bolt
2. Cap Bolt Nut
3. Cap - Bolted
4. Disc

5. Gasket
6. Body - Threaded Ends
7. Body - Flanged Ends

### OPERATION:

These valves must be installed with the pressure under the disc to function properly. These horizontal lift check valves are completely automatic and their operation depends on the fluid flow in the pipe.

### INSPECTION:

Periodical inspection or preventative maintenance is not required other than observing for proper functioning.

### REPAIR PARTS:

All parts are shown on this page. When ordering repair parts, be sure to give valve figure number, size and material; if applicable, metal when other than standard.

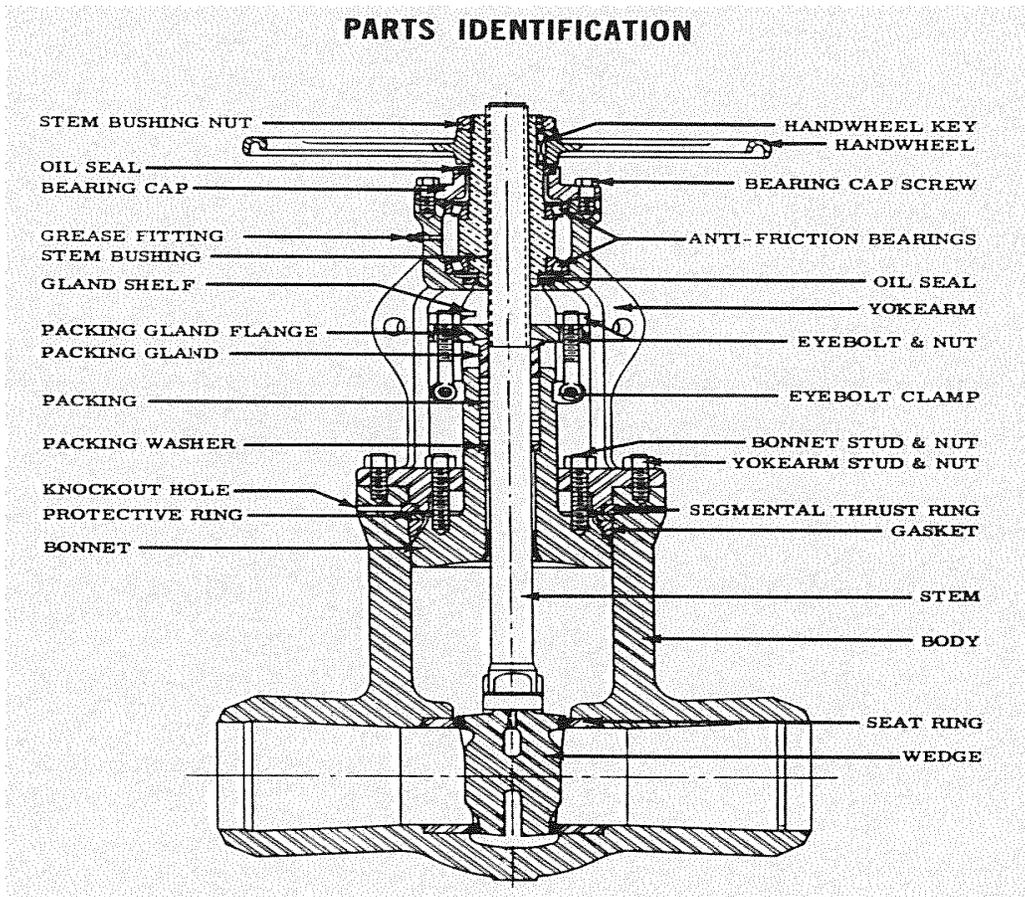
### PROCEDURE FOR REPAIRING: (CAUTION: See note 7 on page 15)

1. Seat Leakage—If valve seat leaks, it will be necessary to replace the disc (part 4). If valve has integral seat, refinish seat in body with seating tool.
  - a. Remove cap (part 3) by removing the nuts (part 2) from the body bolts (part 1). Use wrench and turn in a counterclockwise direction.
  - b. Remove disc (part 4) and replace with new disc.

# PRESSURE SEAL VALVES

## OPERATIONAL and REPAIR PROCEDURE

### PARTS IDENTIFICATION



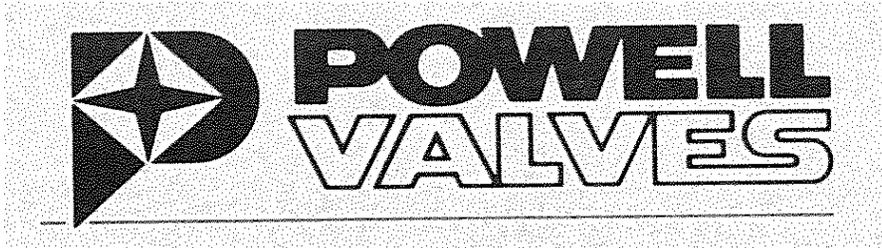
### OPERATION AND MAINTENANCE PROCEDURE

(CAUTION: See note 7 on page 15)

1. PACKING LEAKS should be corrected promptly by pulling up on the packing gland. Failure to do this may result in damaged stem or packing and inability to stop the leak until new packing is installed.
2. Powell Pressure Seal Valves have a backseat on the stem, which seats against a stellited backseat in the bonnet when the valve is fully opened. This sea will hold pressure if both surfaces are clean; however, this is difficult to determine, and consequently, packing a valve under pressure is hazardous and not recommended.
3. LUBRICATION of the stem bushing is required periodically. This is accomplished by a grease fitting on the side of the bushing housing, and application of lubricant directly to operating threads. See note 3 page 15 for lubrication recommendations.
4. SPECIAL TOOLS are available for the general maintenance of Powell Pressure Seal Valves.
  - (a) Torque Wrench
  - (b) Laps for Pressure Seal Joint
  - (c) Grinder for Pressure Seal Body Seat
  - (d) Tools for repairing valve sealing surfaces
5. REPLACEMENT PARTS are seldom necessary when a Powell Pressure Seal Valve is properly installed and maintained. However, it is wise to stock packing for each valve. If a valve is disassembled for any reason a new gasket should be installed.
6. For more complete information on operation and maintenance of Powell Pressure Seal Valves, refer to Powell publication 69-1.

### VALVE IDENTIFICATION AND REFERENCE

1. A NAMEPLATE is located on the yokearm of all Pressure Seal Gate and Globe Valves, and on neck of body on all check valves.
2. WHEN ORDERING REPAIR PARTS or REFERRING TO A VALVE for any reason whatsoever, reference should always be made to the serial number located at the bottom right-hand corner of the nameplate. In addition, size and Figure Number located on the nameplate should be included.



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