

Application of Valves

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Compressors

Main Components of an Electrical Air Compressor

- Some examples of Electric Air Compressor



Main Components of an Electrical Air Compressor



Check Valve

- The check valve keeps the pressure in the tank constant.



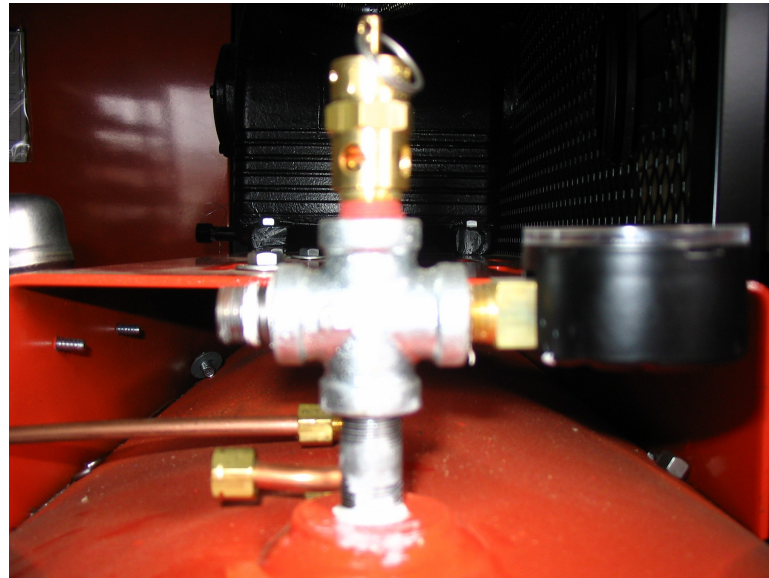
Supply Valve

- The supply valve is the valve that supplies air to the facility or shop.

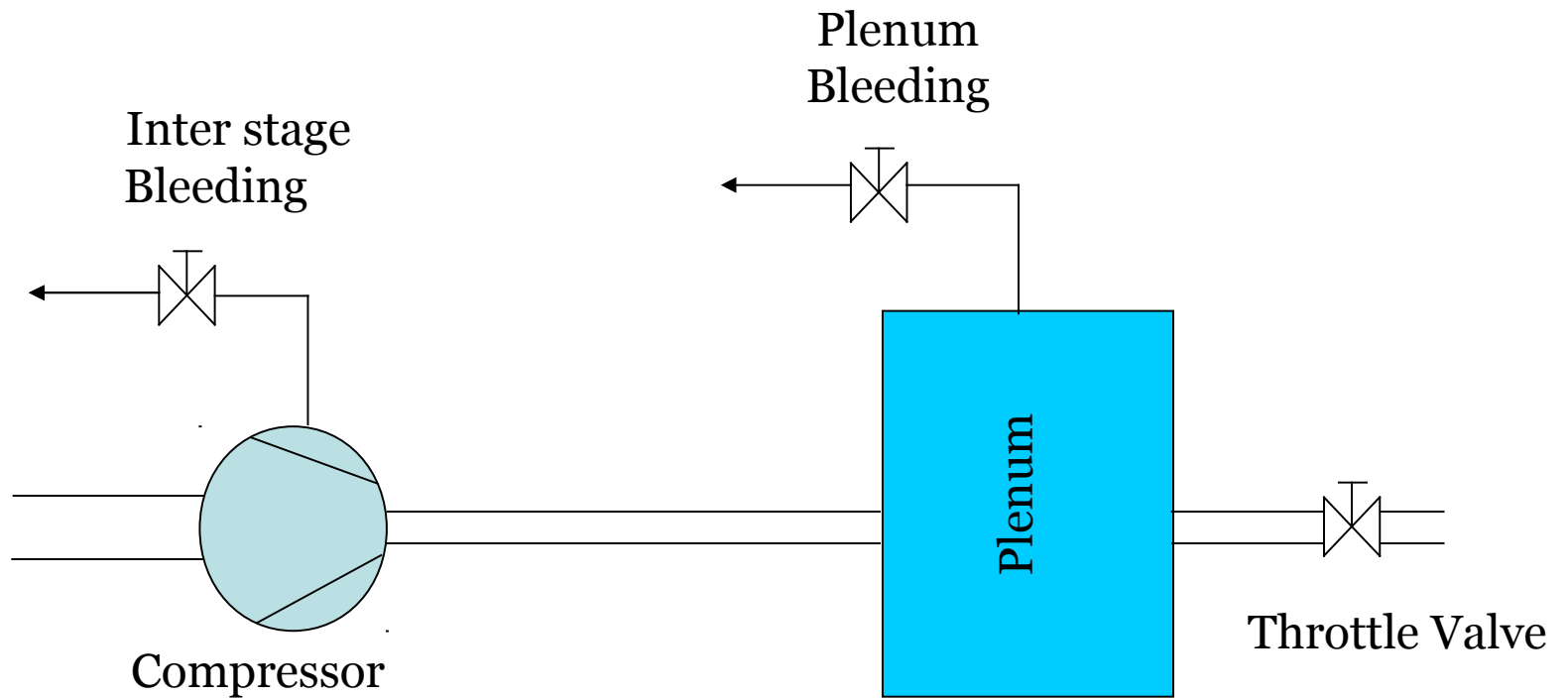


Pop-Off Valve

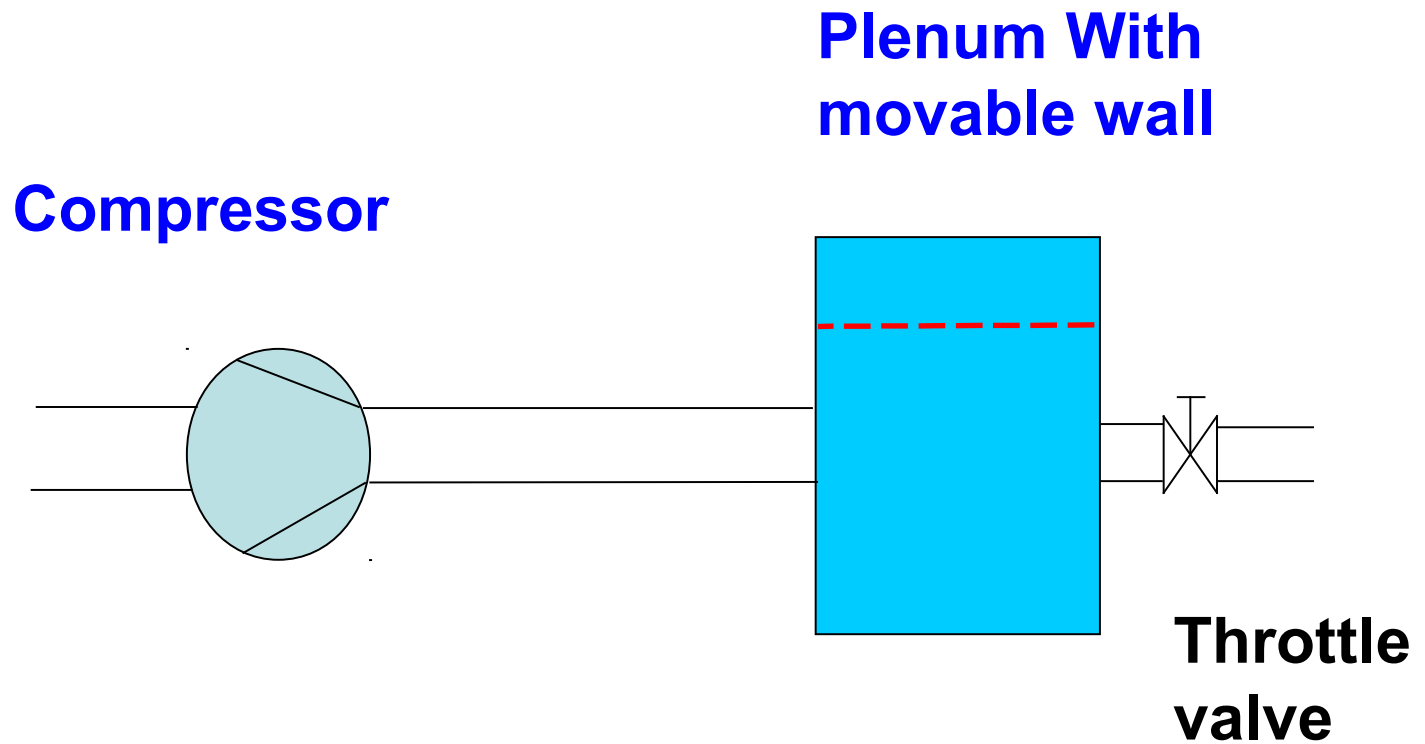
- The pop-off valve is a critical part of an air compressor because it releases air out of the tank into the atmosphere if too much air pressure is inside the tank.



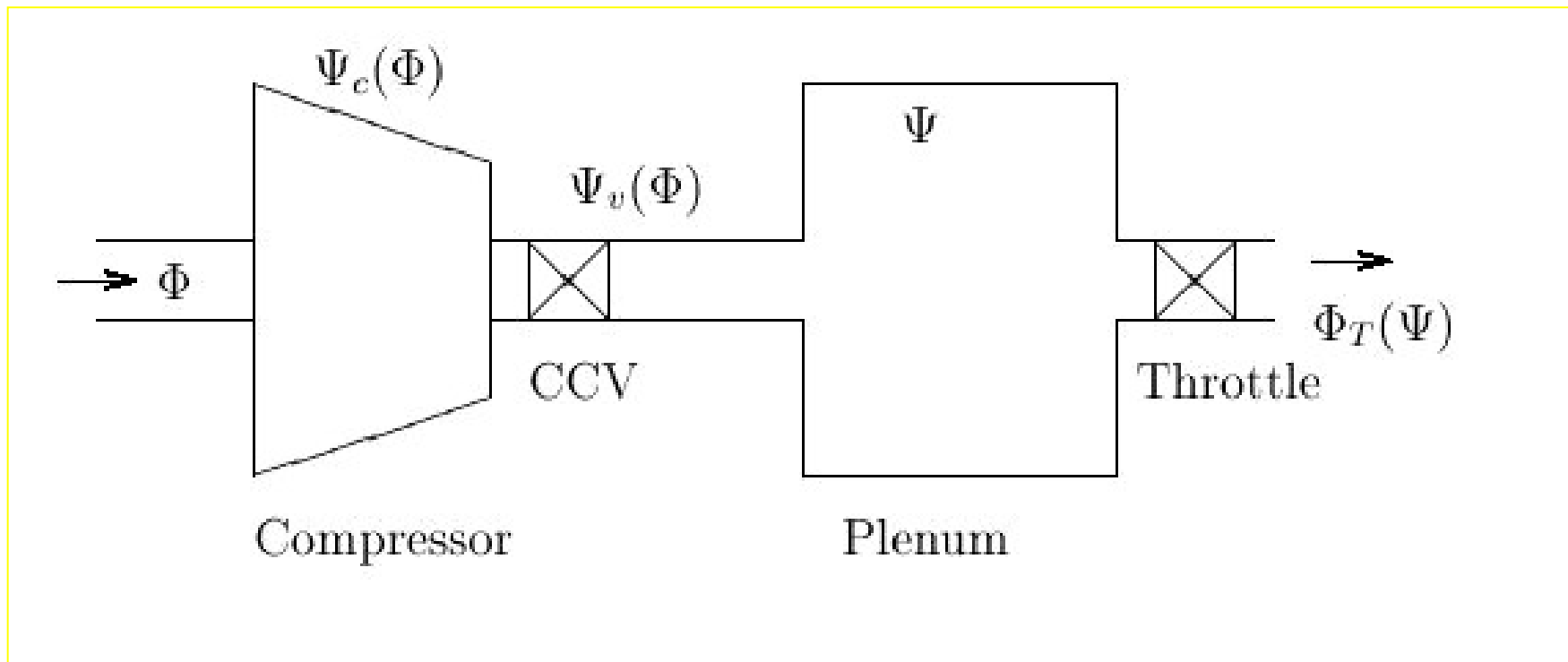
Air Bleeding

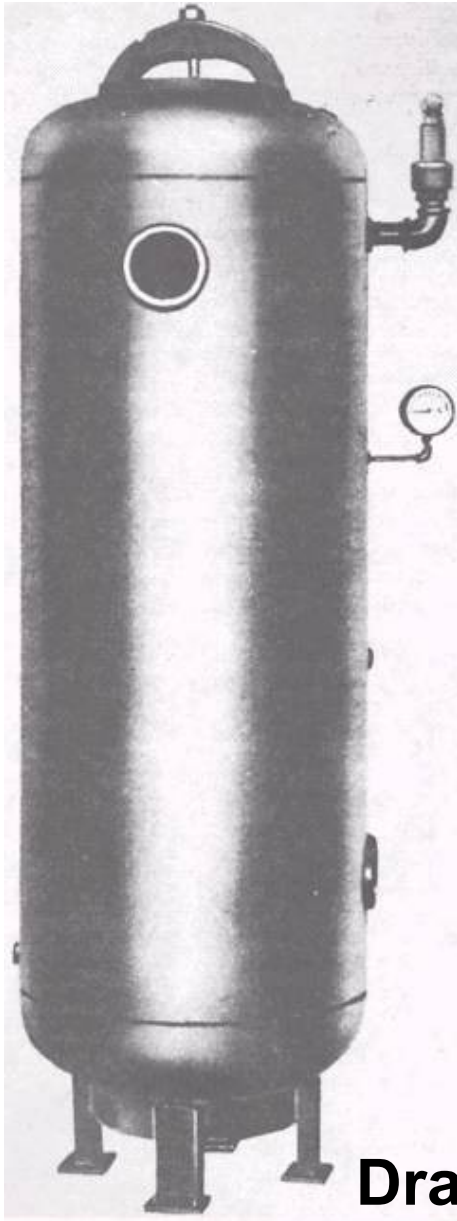


Movable plenum walls



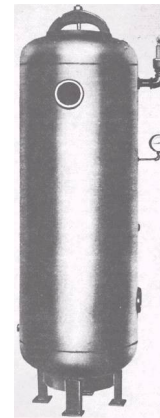
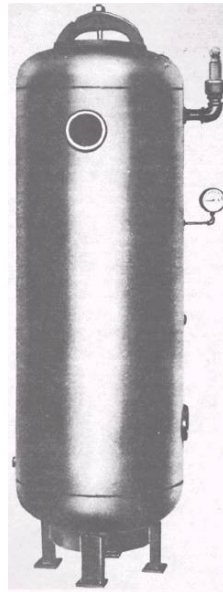
Closed Coupled Valve





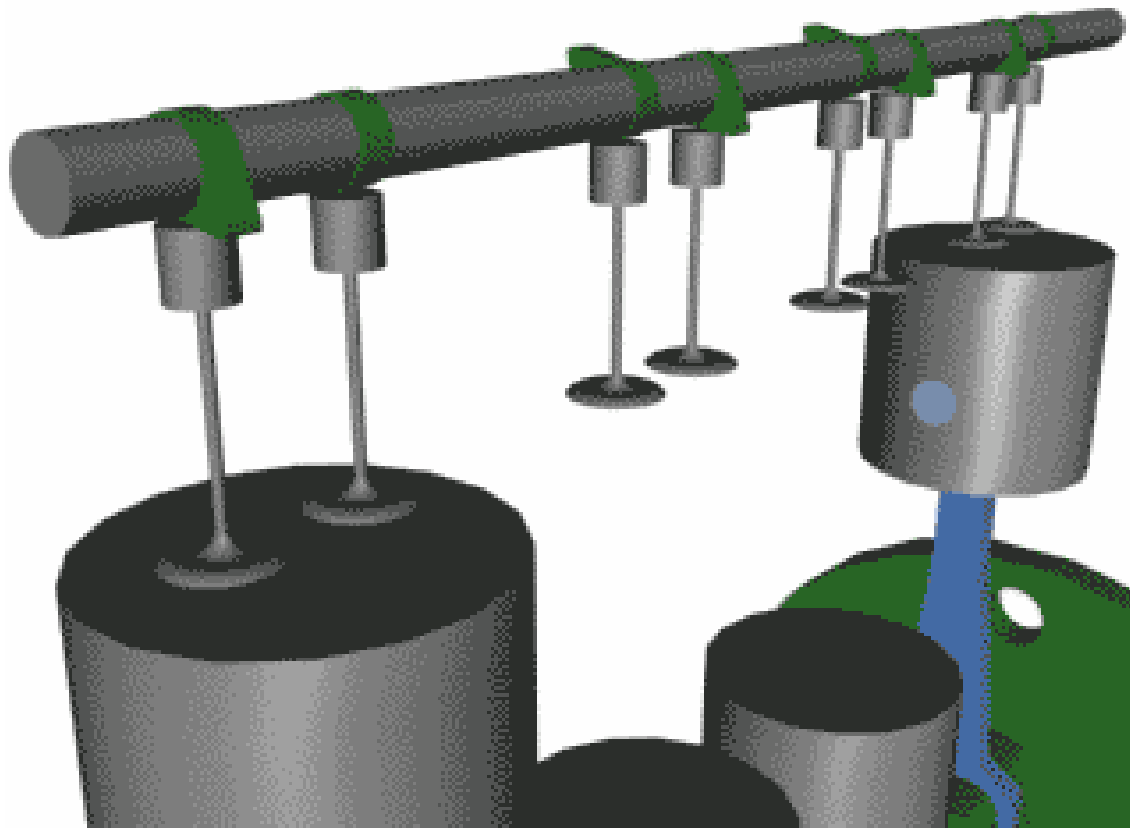
Safety Valve

Air receiver

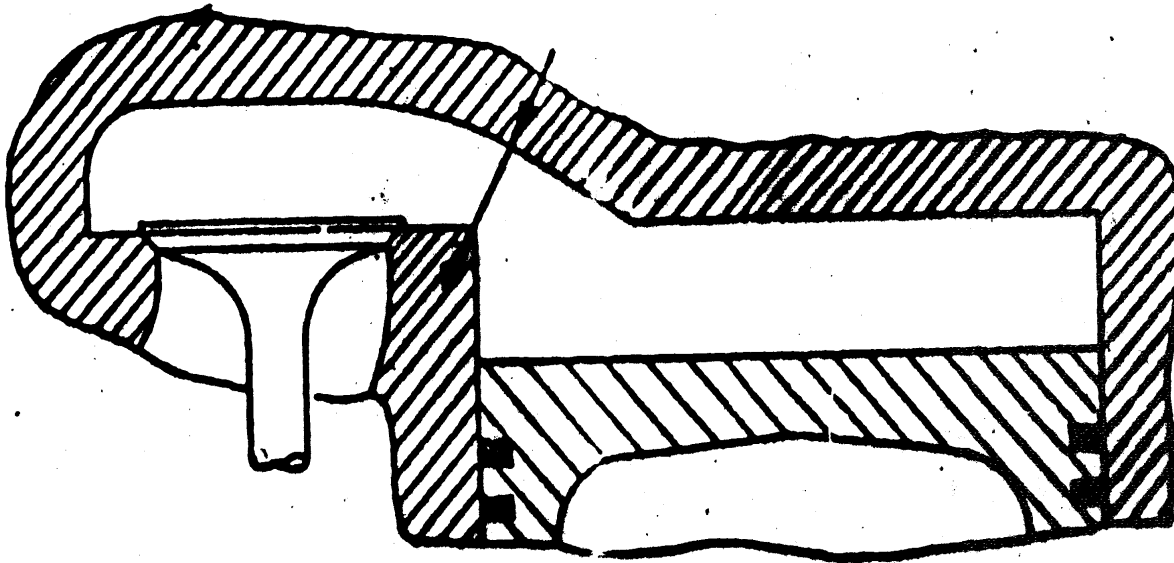


Drain valve

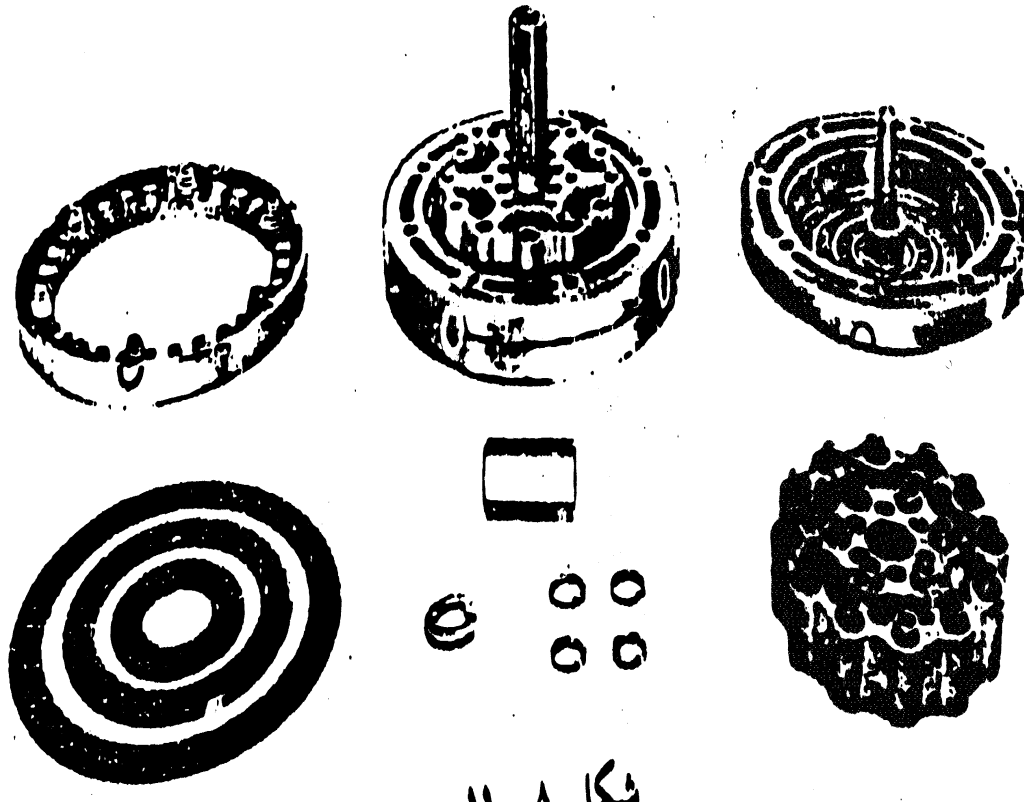
Poppet valve



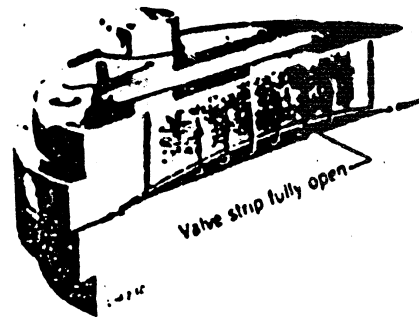
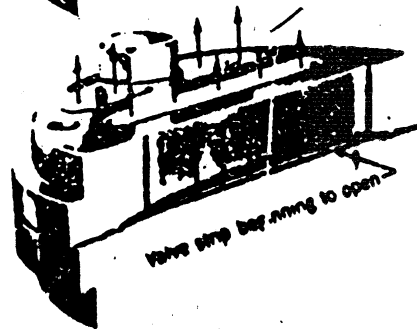
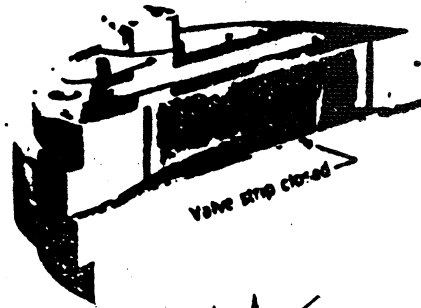
Poppet valve



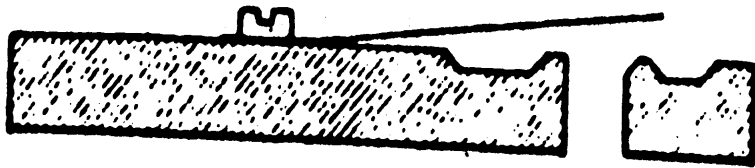
Ring plate Valve



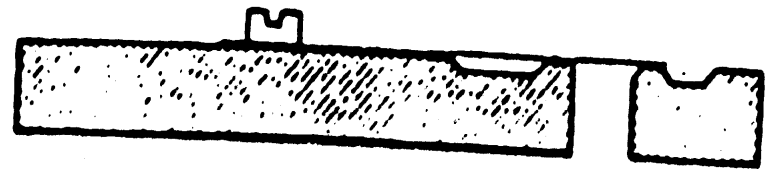
Feather Valve



Flapper Valve

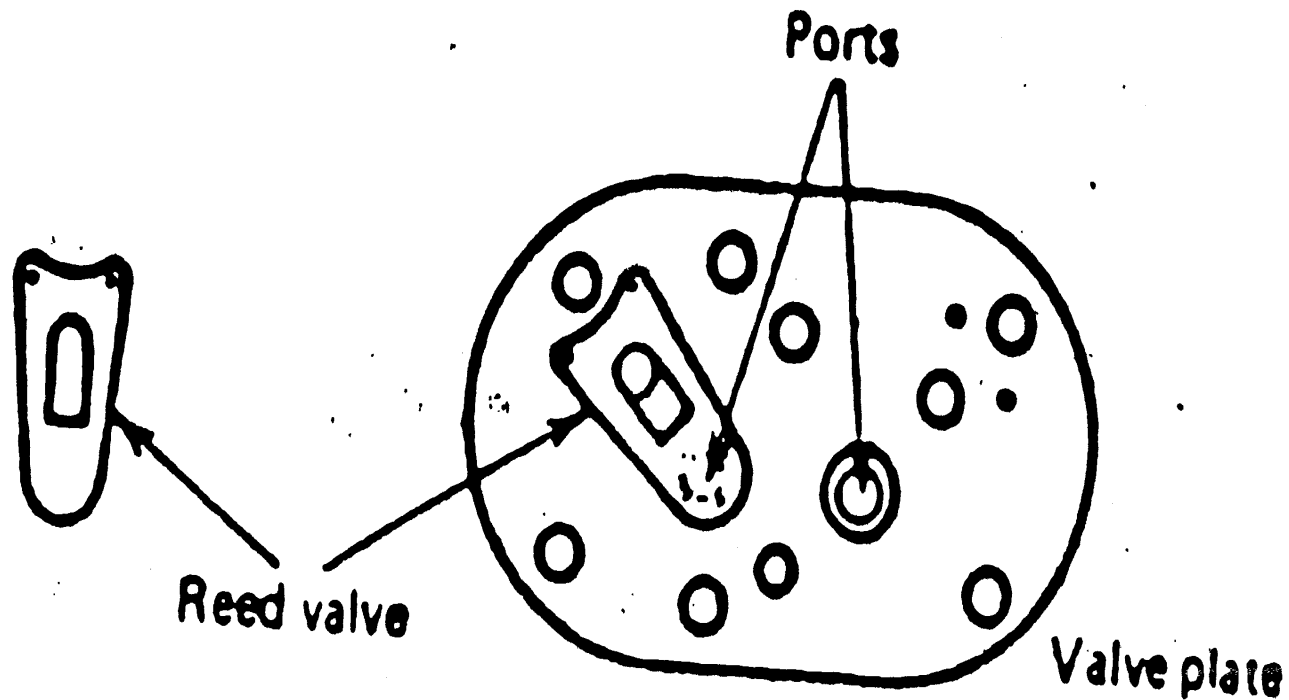


Open

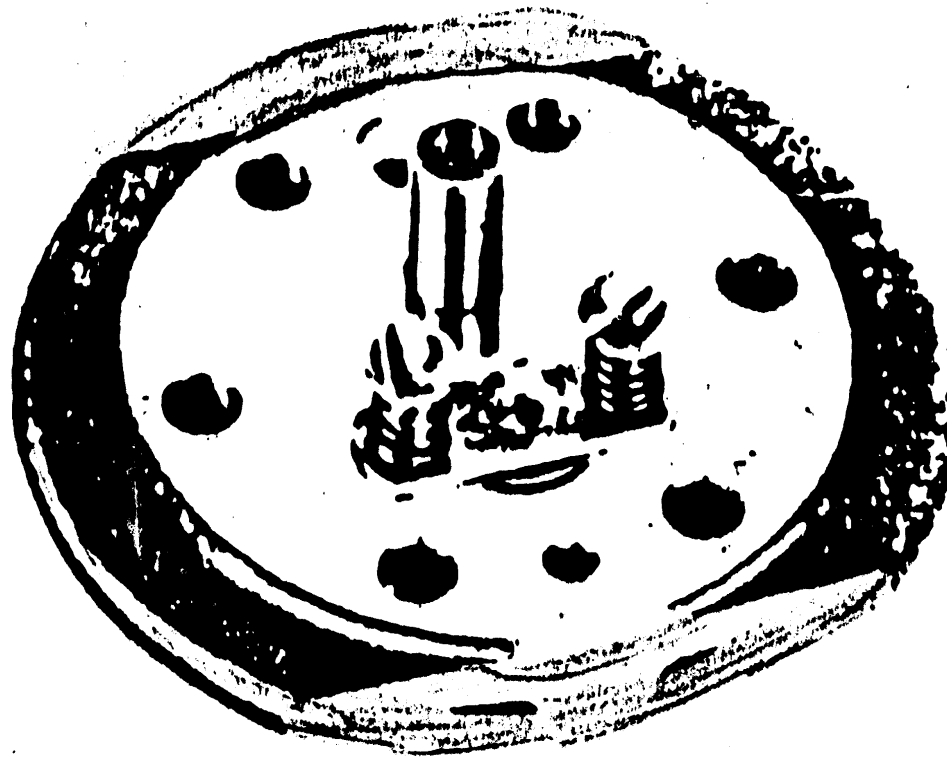


Closed

Beam Valve

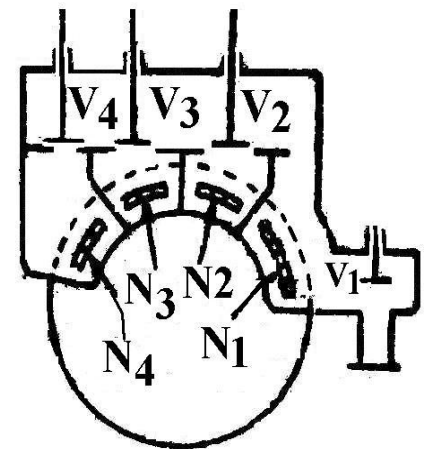
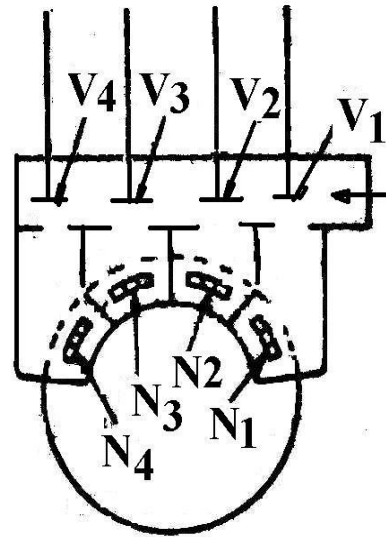
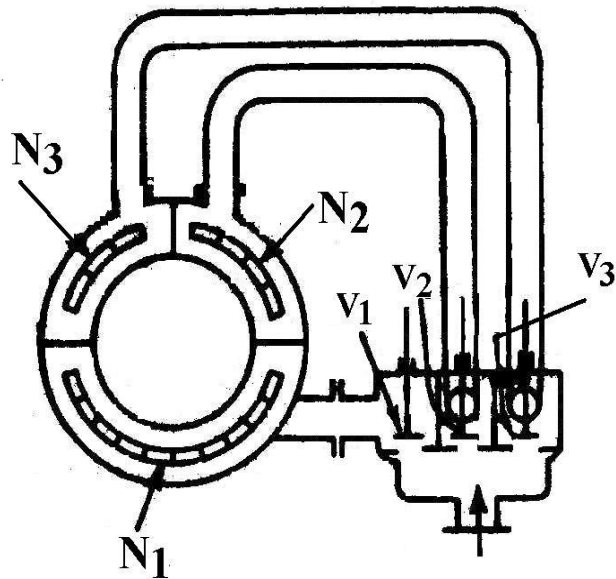


Diaphragm Valve

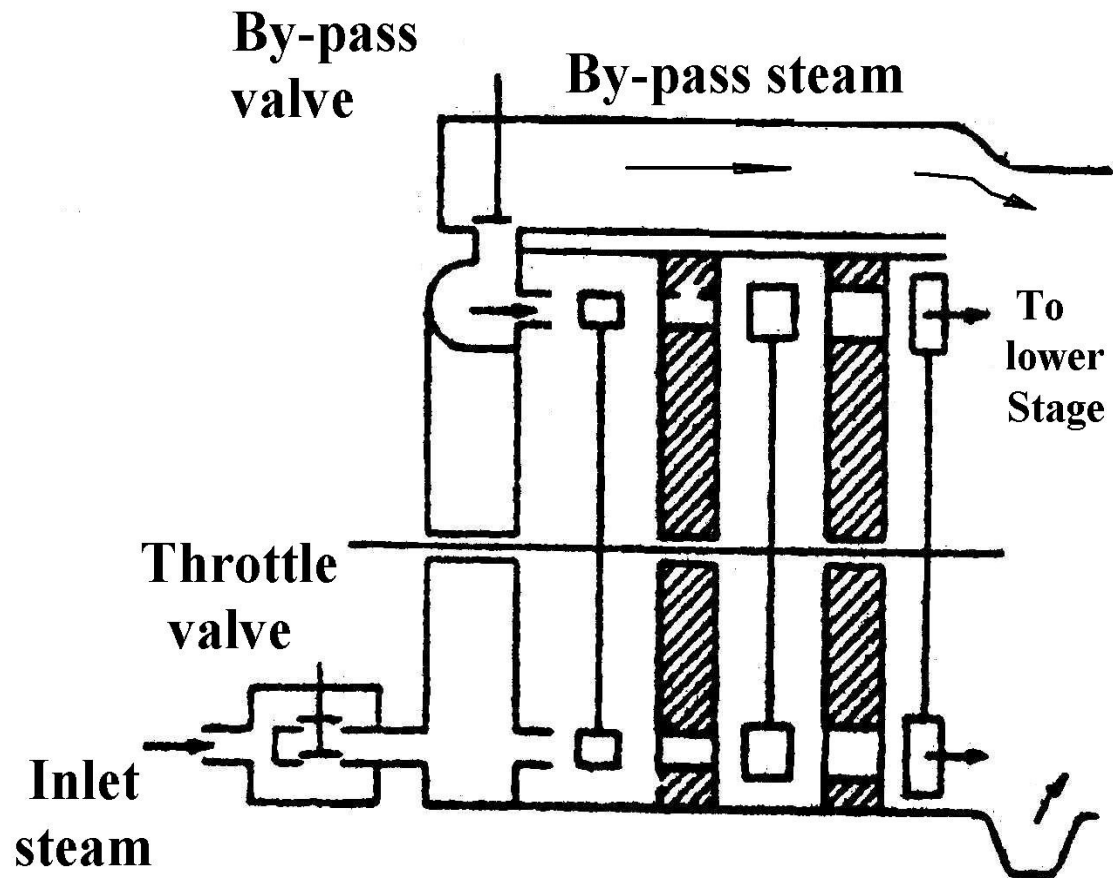


Steam Turbines

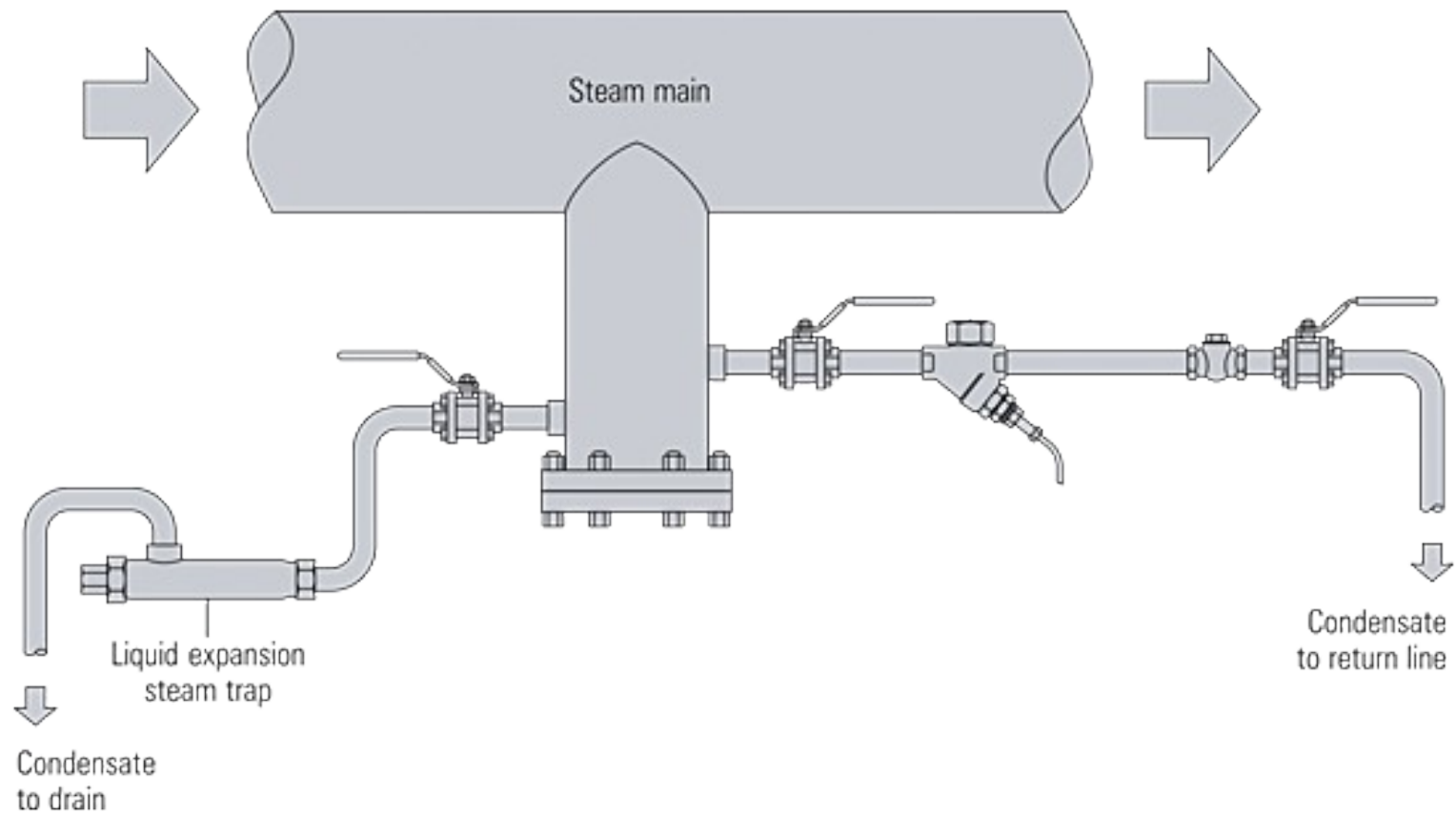
Steam Turbines Controls



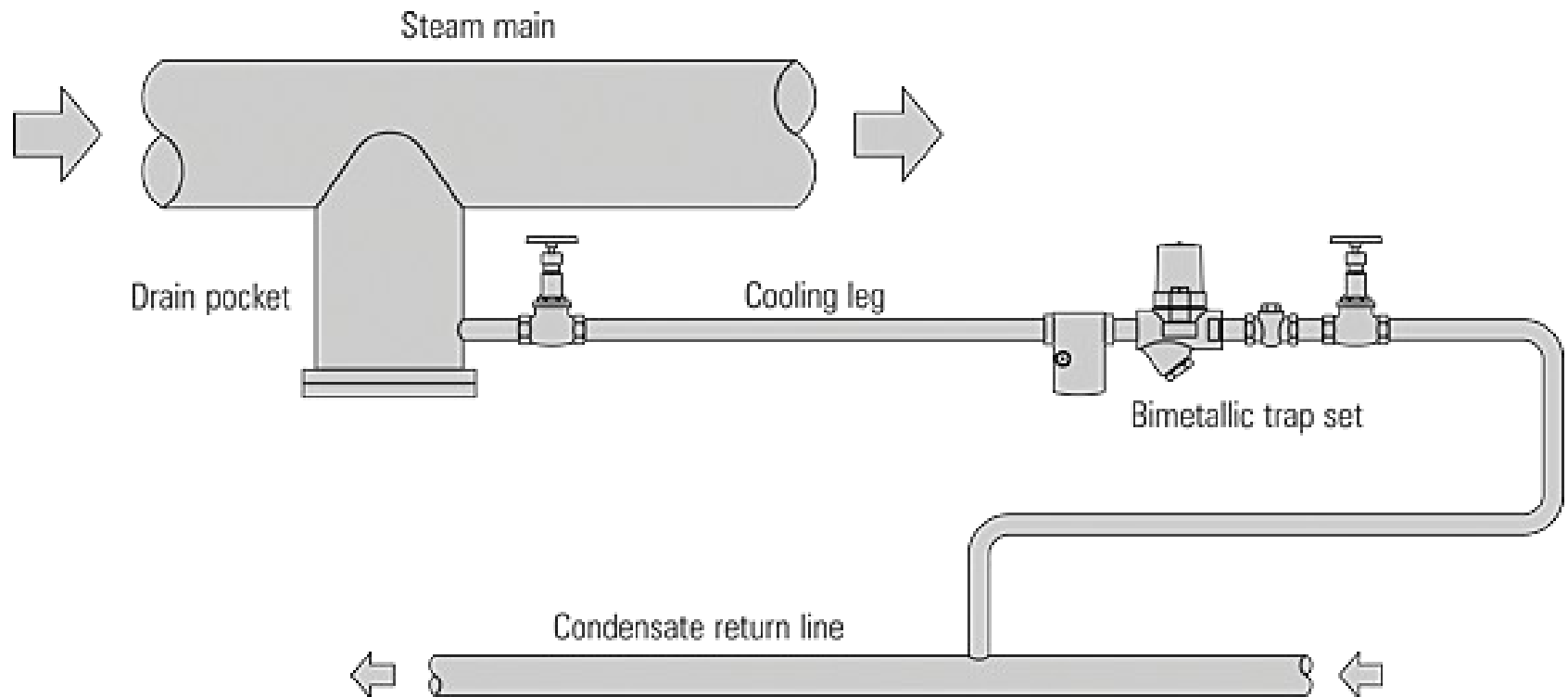
Steam Turbines Controls



Installation of a liquid expansion steam trap

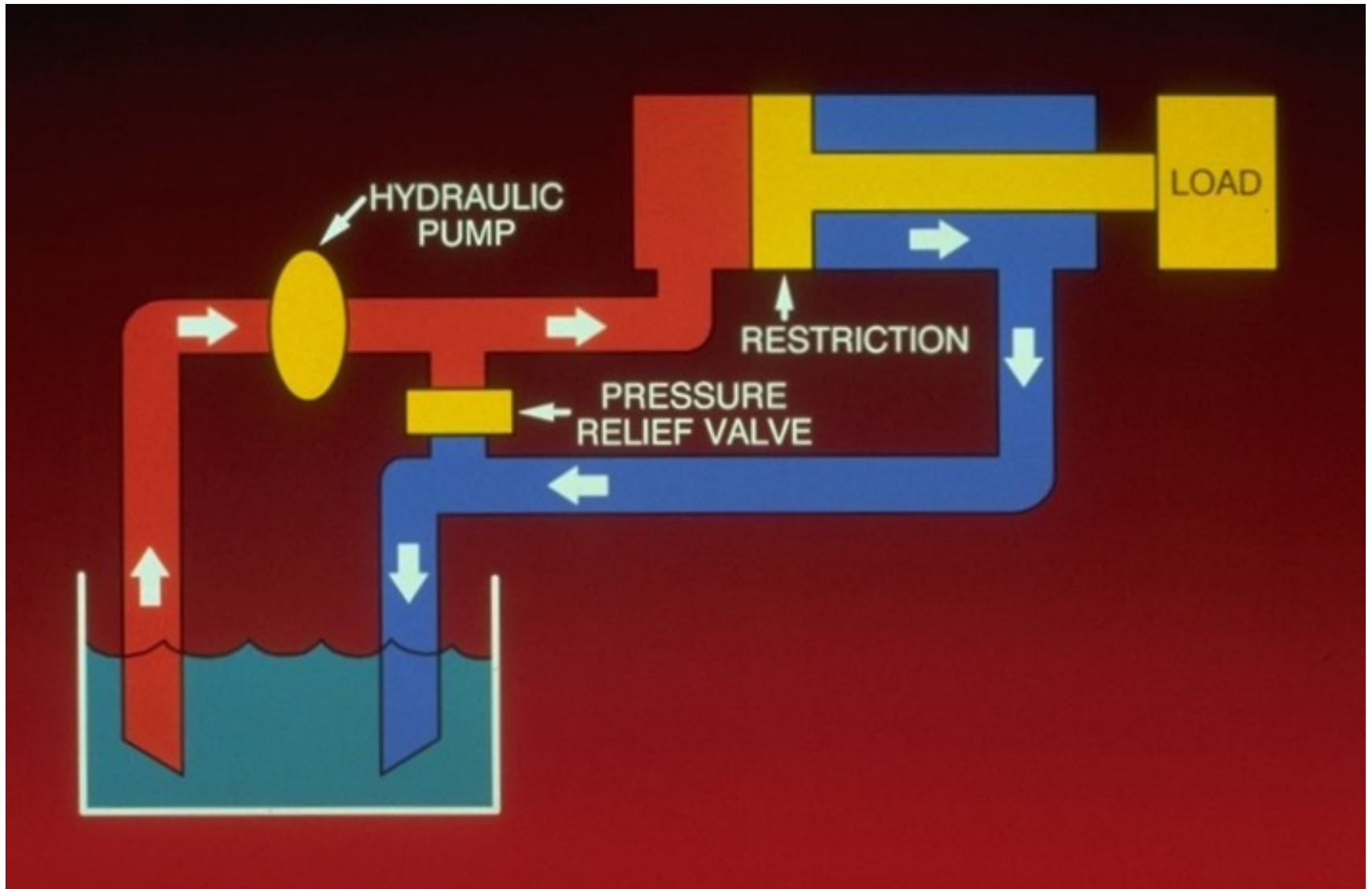


Bimetallic steam trap with cooling leg

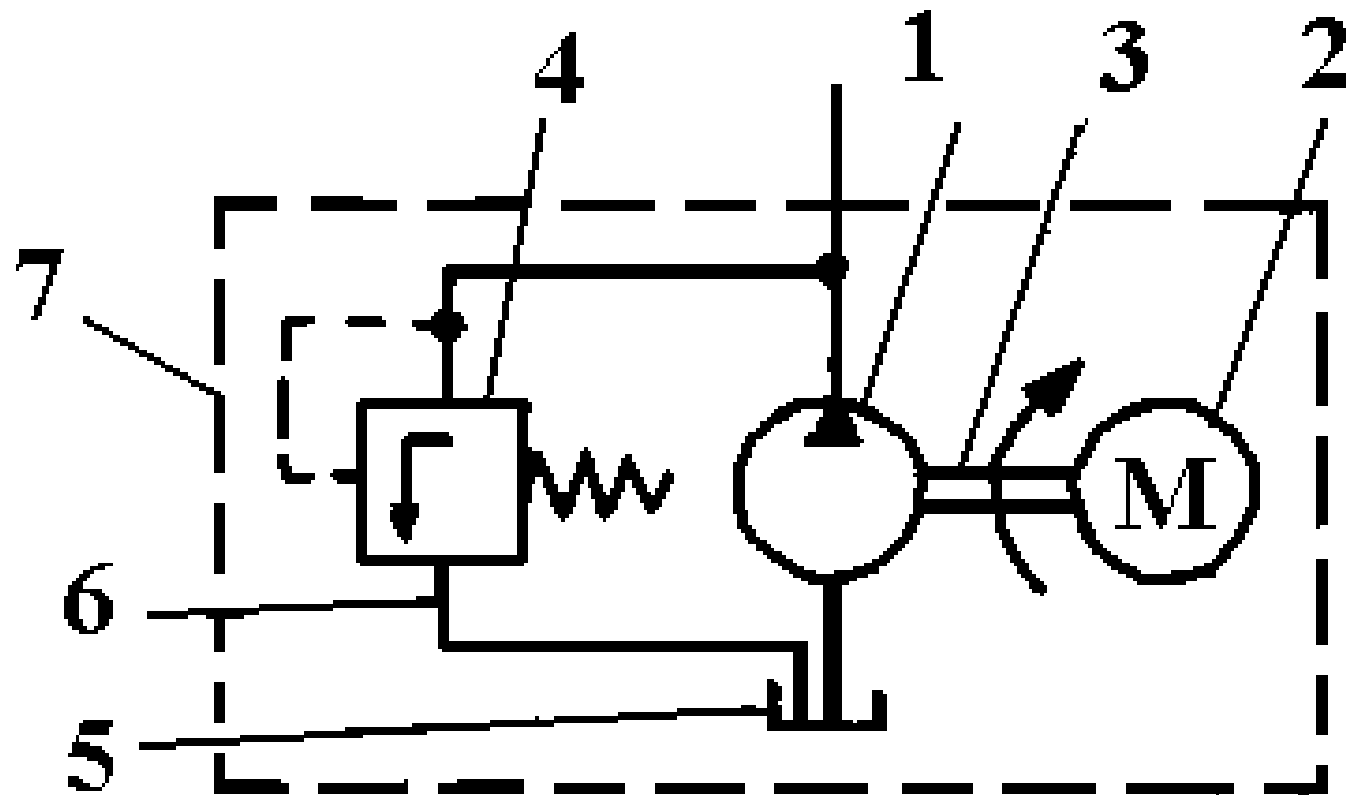


Hydraulic systems

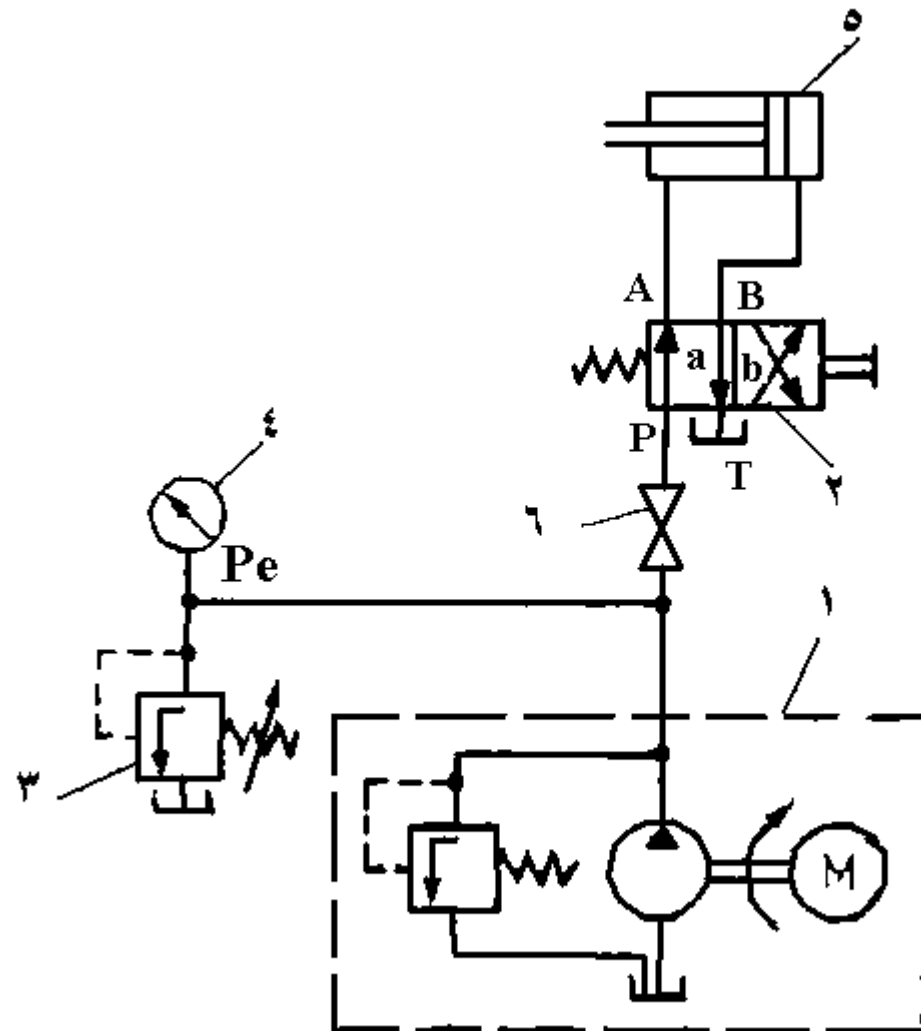
Pressure Relief Valve



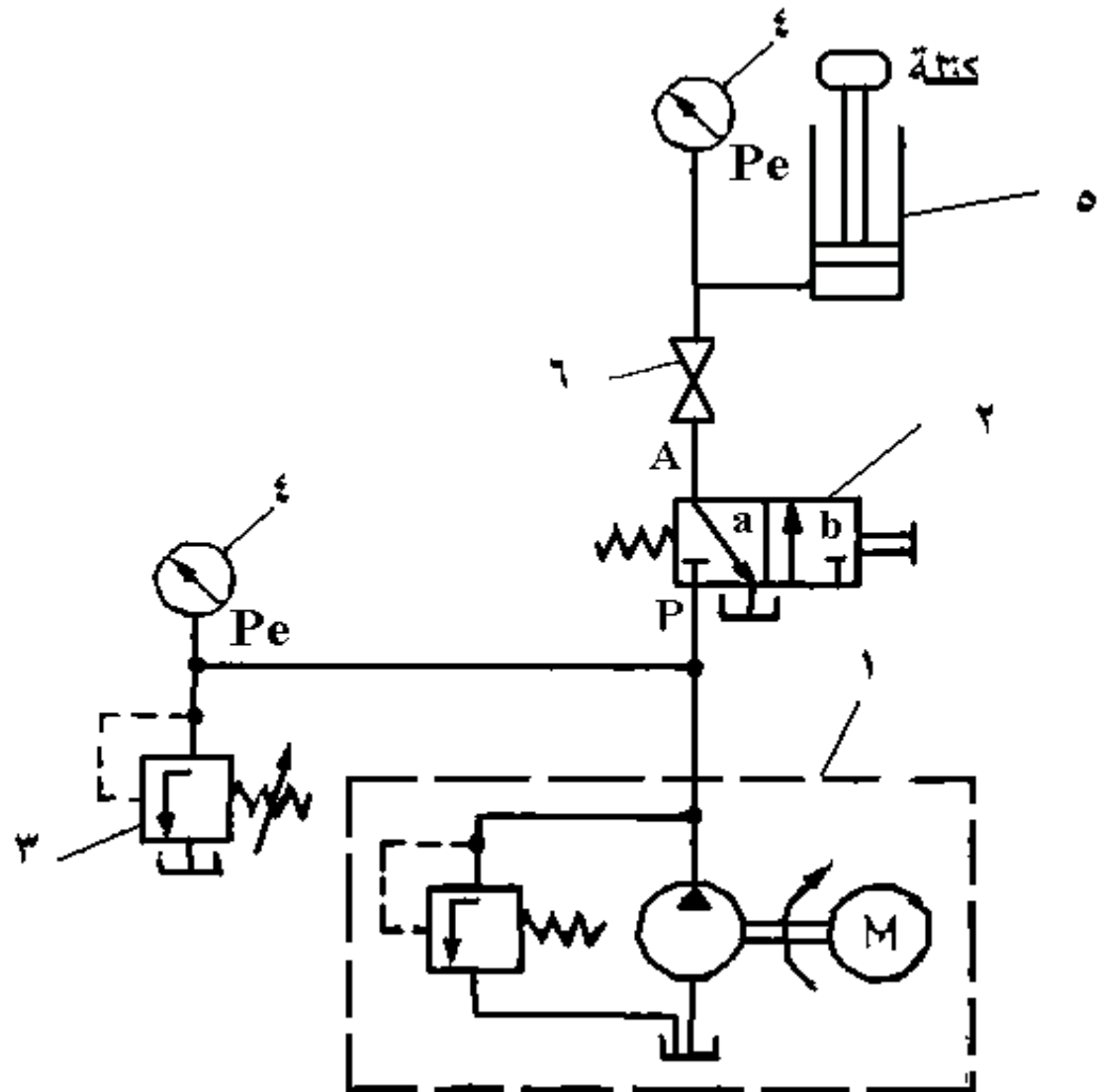
Power Unit



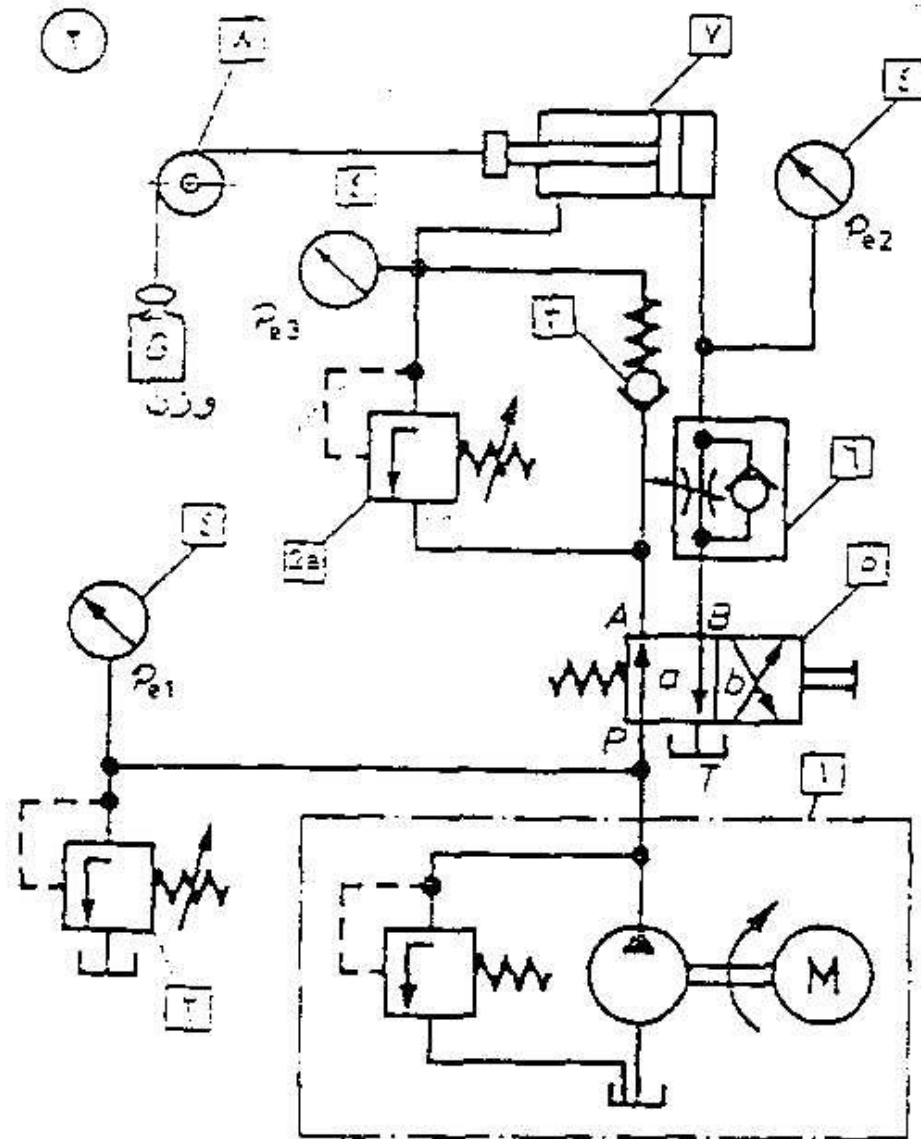
Hydraulic System



Hydraulic System

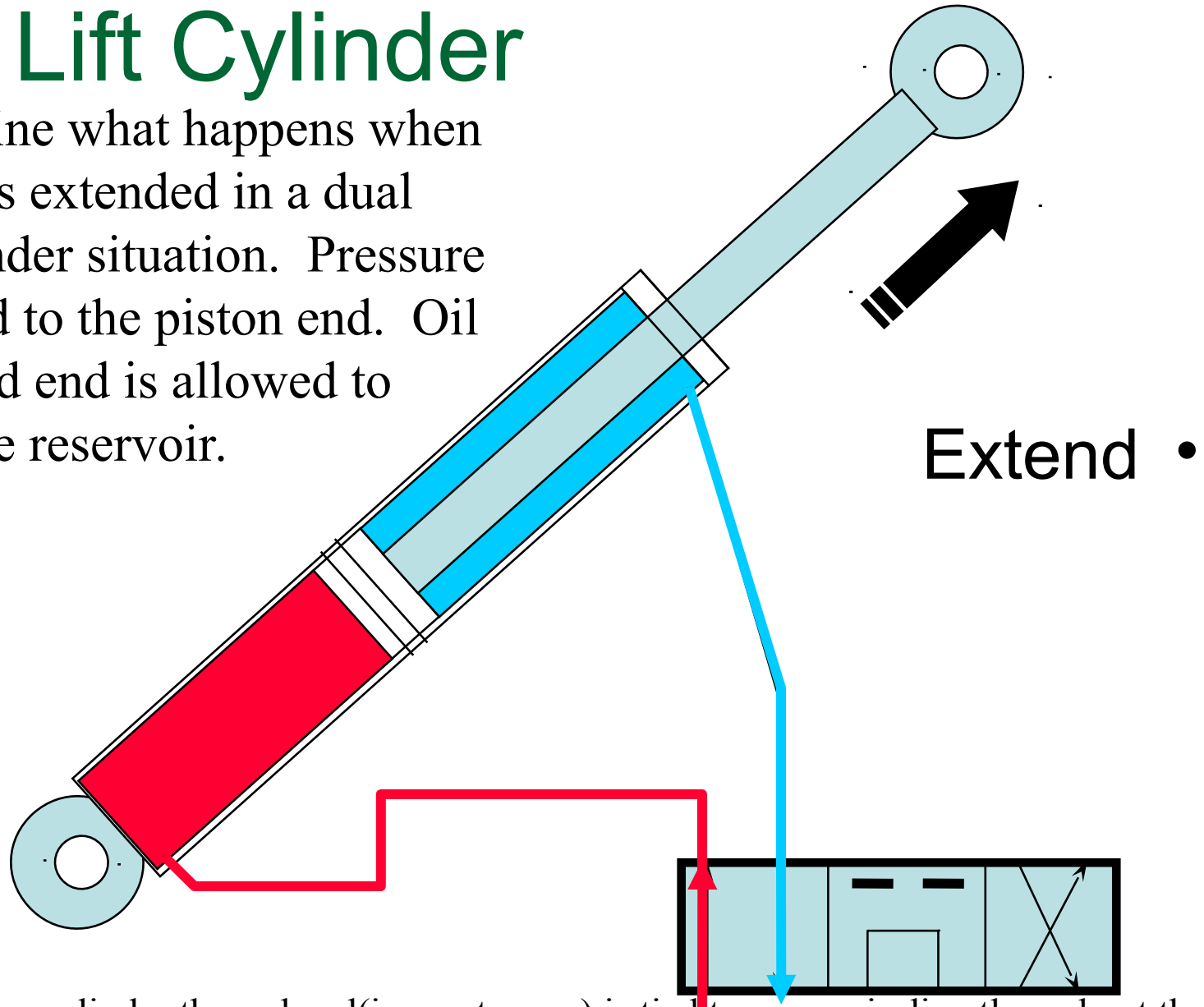


Hydraulic System

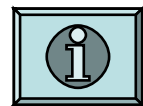


Lift Cylinder

Let's examine what happens when a cylinder is extended in a dual acting cylinder situation. Pressure oil is routed to the piston end. Oil from the rod end is allowed to return to the reservoir.

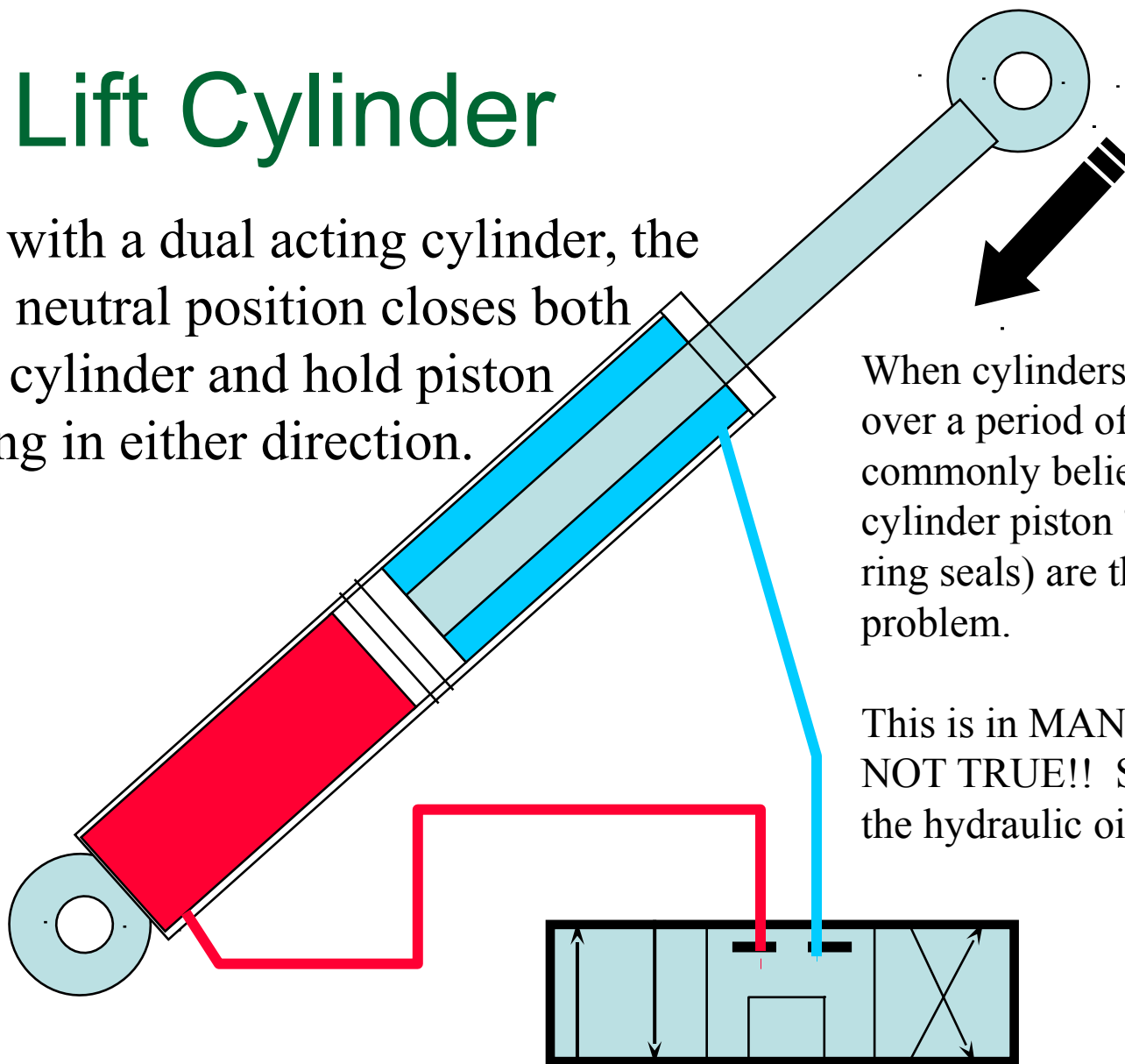


In a single acting cylinder the rod end(in most cases) is tied to reservoir directly and not through the valve or may not have a hose on it at all. Release of oil on head end through valve and weight of implement would lower in this case.



Lift Cylinder

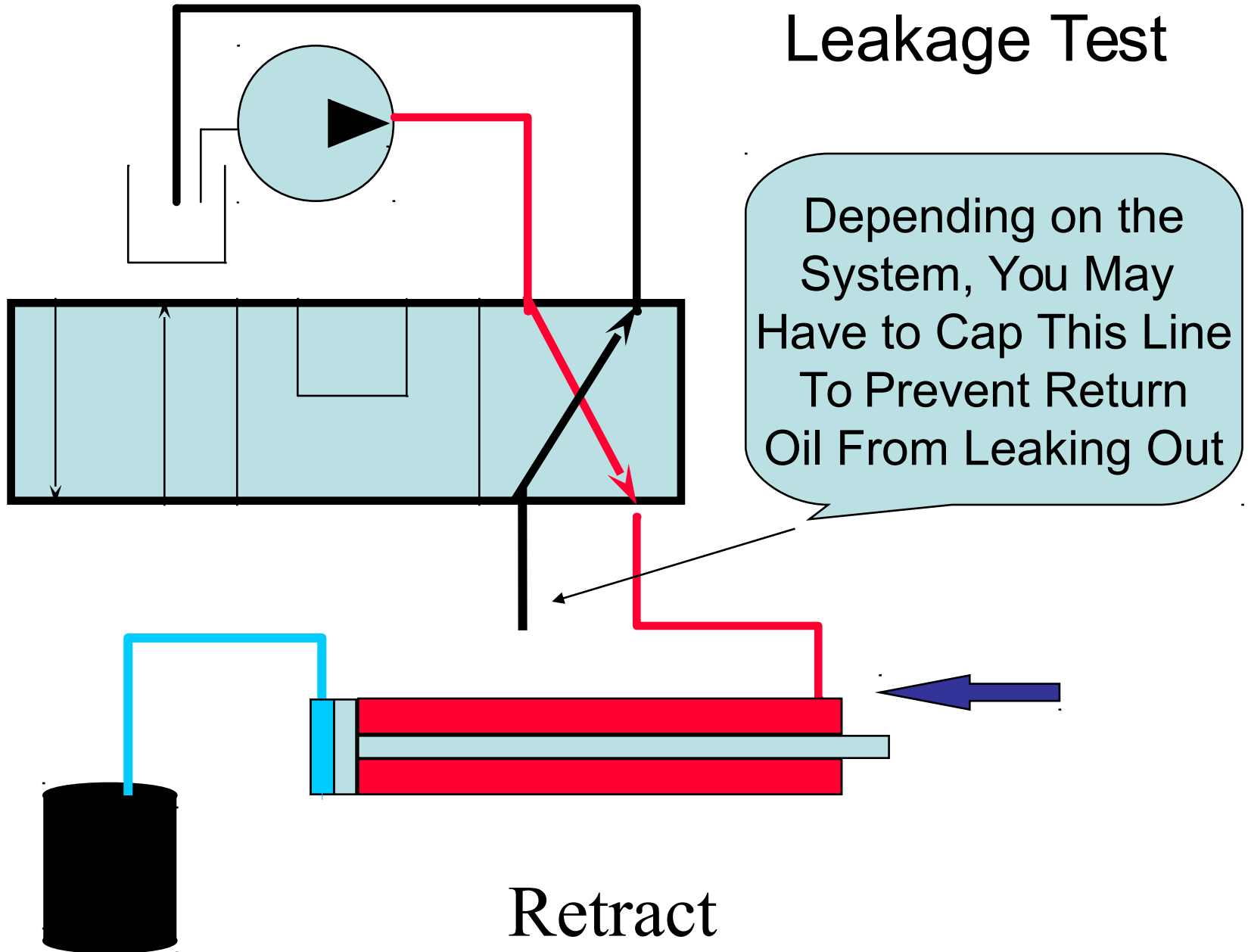
In this case with a dual acting cylinder, the valve in the neutral position closes both sides of the cylinder and hold piston from moving in either direction.



When cylinders “leak down” over a period of time, it is commonly believed that the cylinder piston “packings” (O-ring seals) are the cause of the problem.

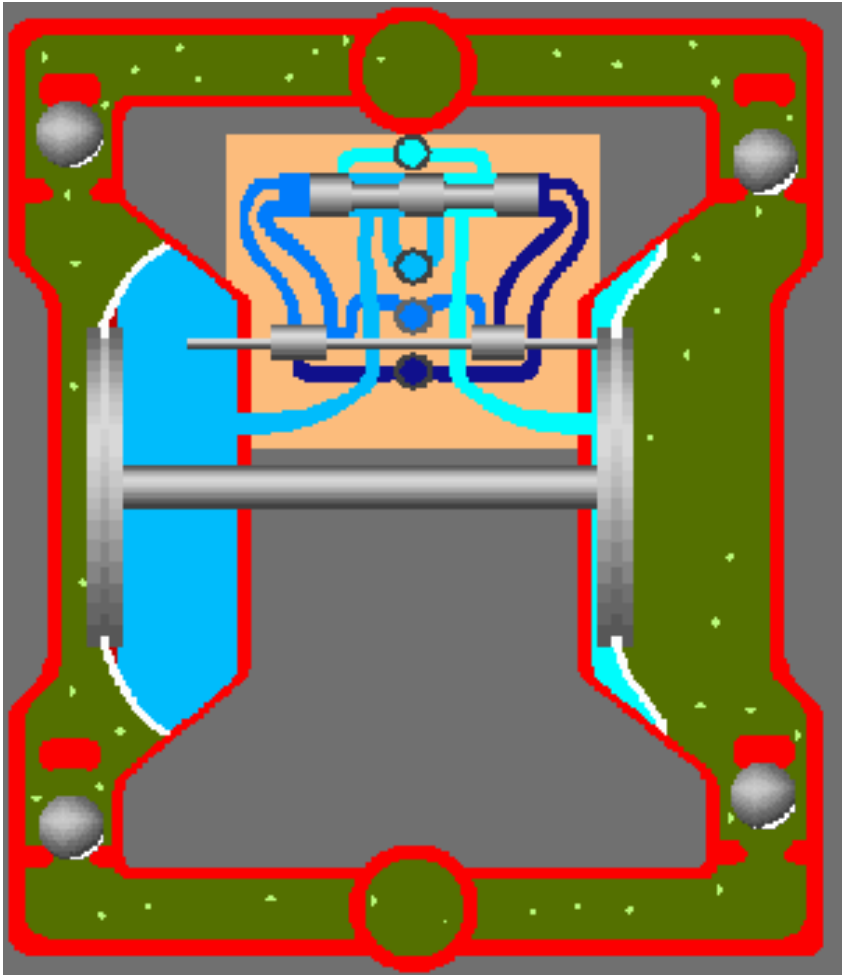
This is in MANY CASES NOT TRUE!! So where does the hydraulic oil go?

Hydraulic Cylinder Leakage Test



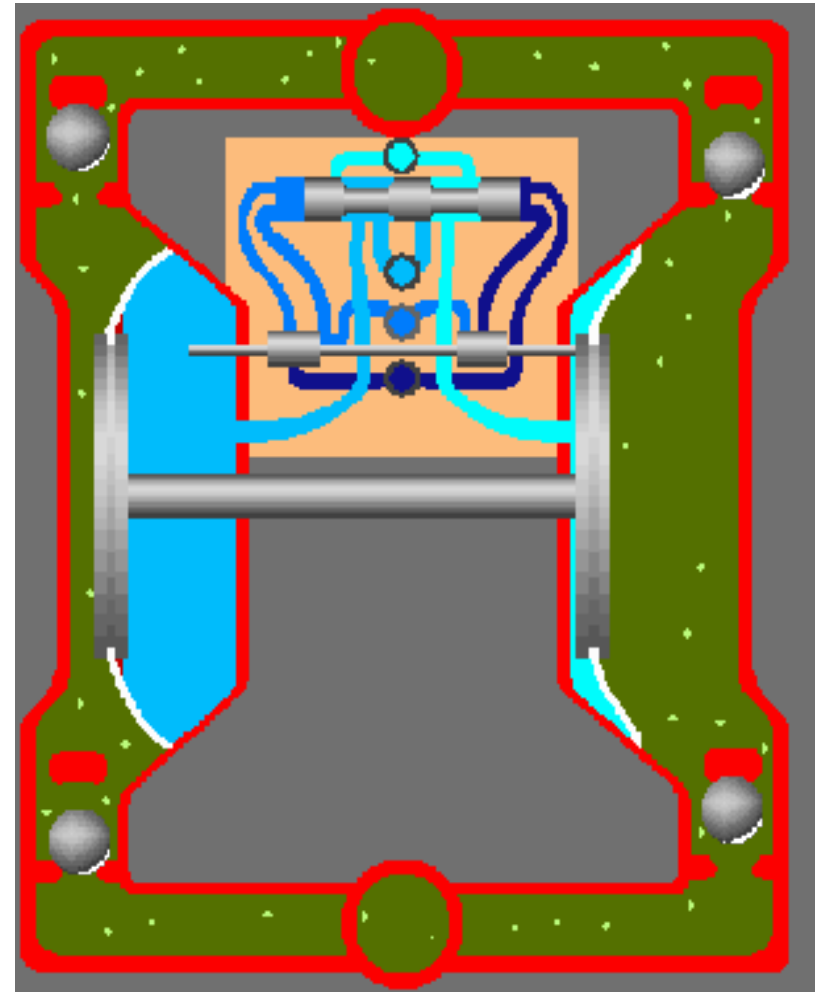
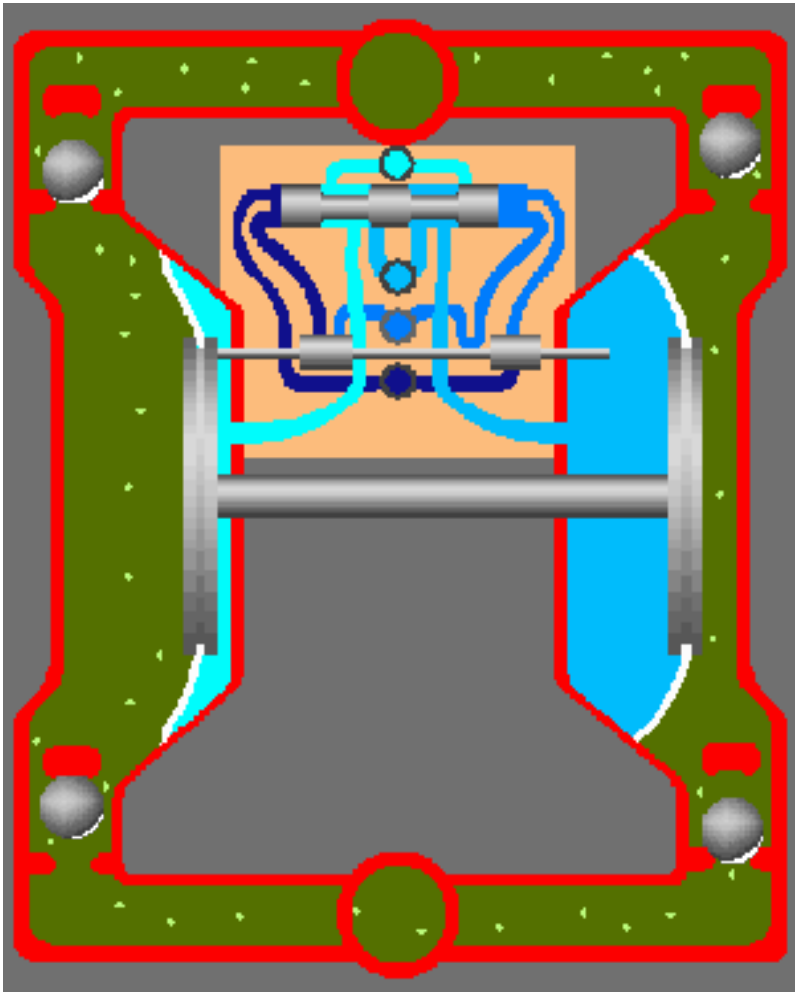
Diaphragm Pump

Double Diaphragm Pump

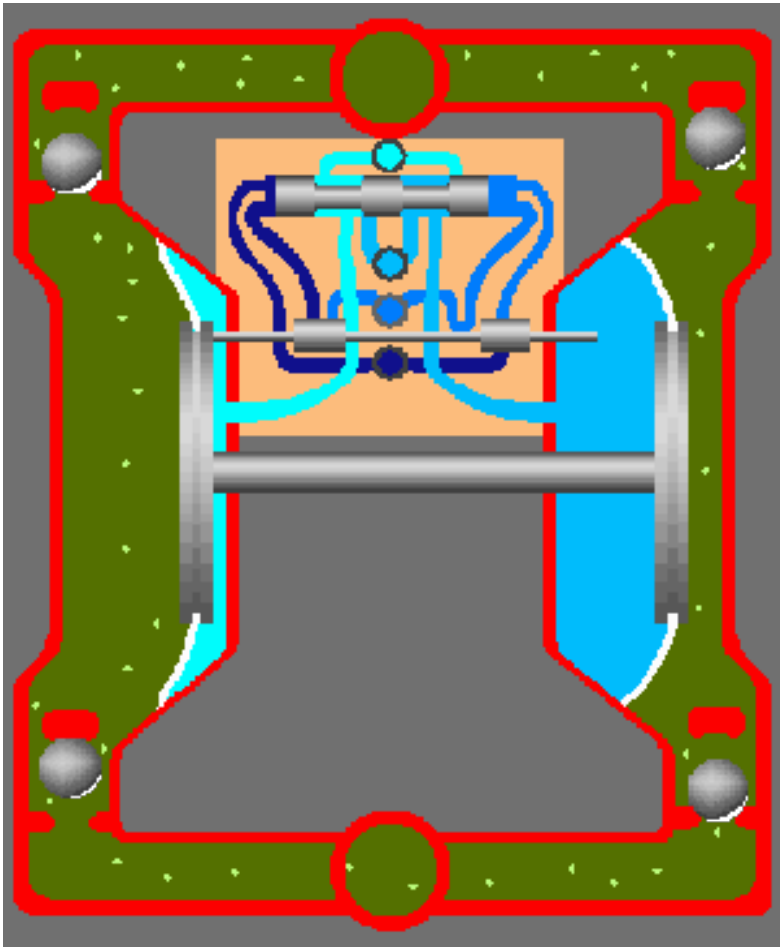


- Diaphragm pumps are very common and come in many sizes.
- Modern plastics are flexible and long lasting making this an ideal low-maintenance pump for many applications.

Double Diaphragm Pump

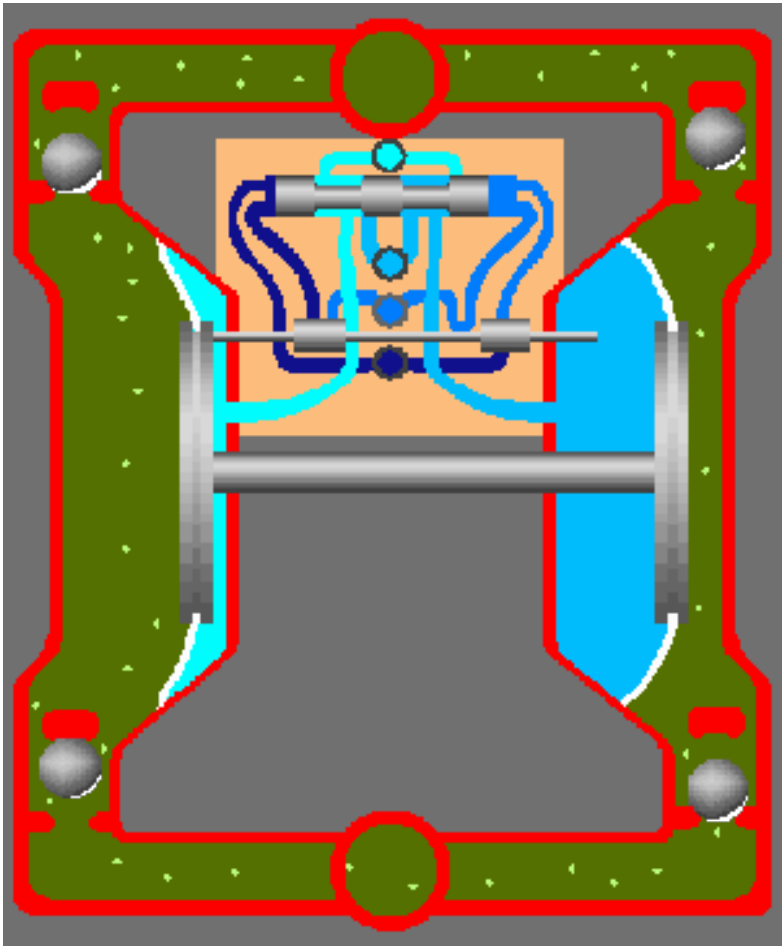


Diaphragm Pump



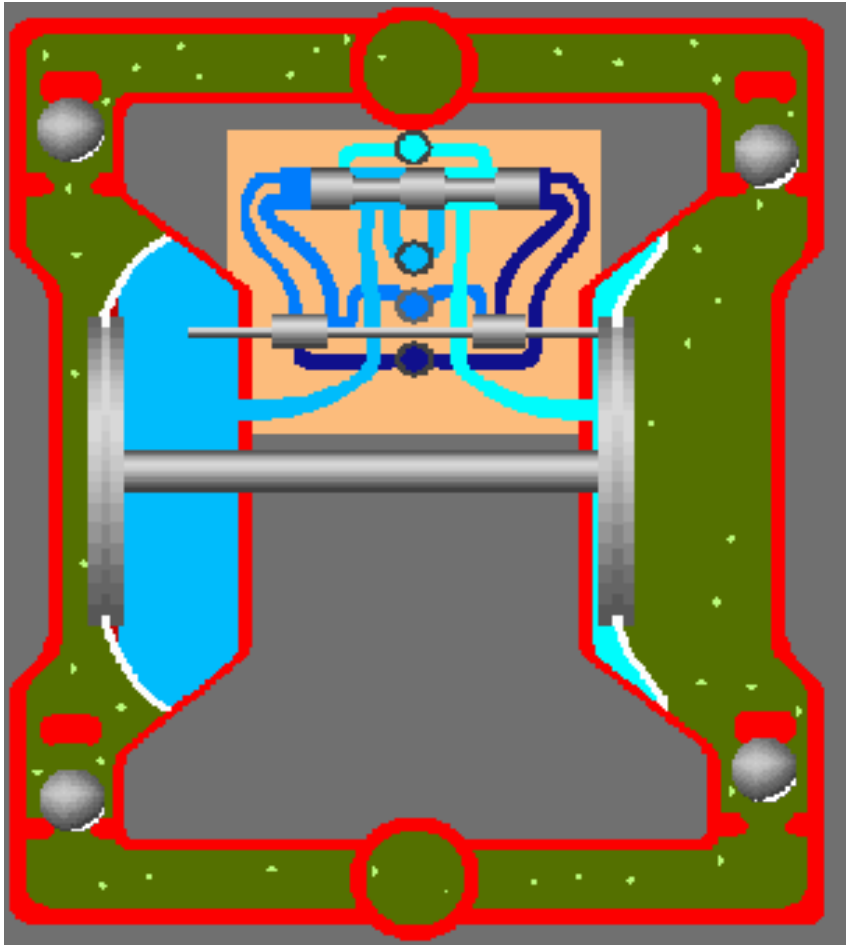
- The Air Operated Double Diaphragm pump is illustrated on the right. This pump uses a very simple valve system to move the DIAPHRAGM ROD.
- The flexible diaphragms (shown in white here) are round disks attached at each end of the Diaphragm Rod.

Diaphragm Pump



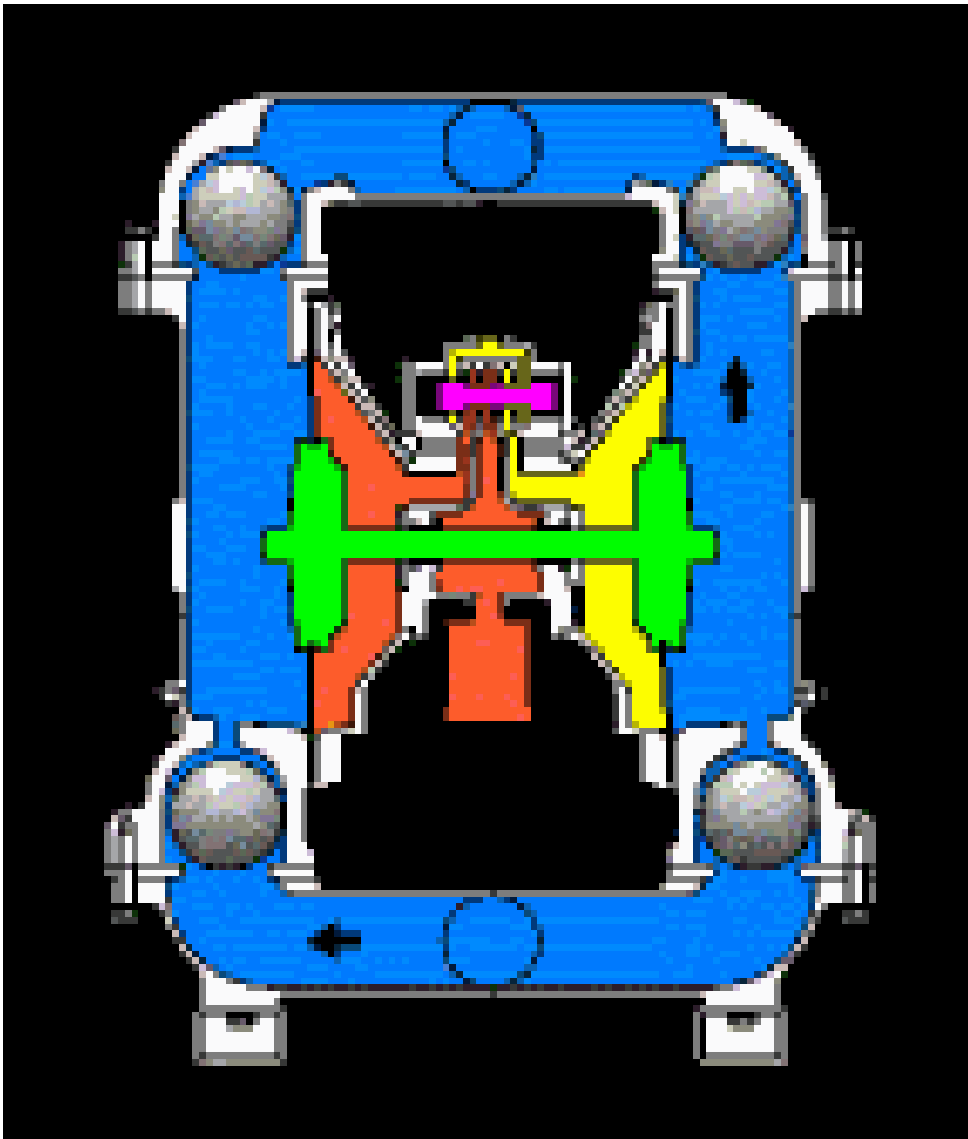
- The PILOT SPOOL (the middle of the three horizontal rods) is pushed back and forth whenever the Diaphragm Rod reaches the end of its throw.
- The Pilot Spool allows air to move the Air Distribution Valve (the top rod in this drawing) back and forth.
- The AIR DISTRIBUTION ROD controls air flow to the left or right air chamber, reversing on each stroke.

Diaphragm Pump

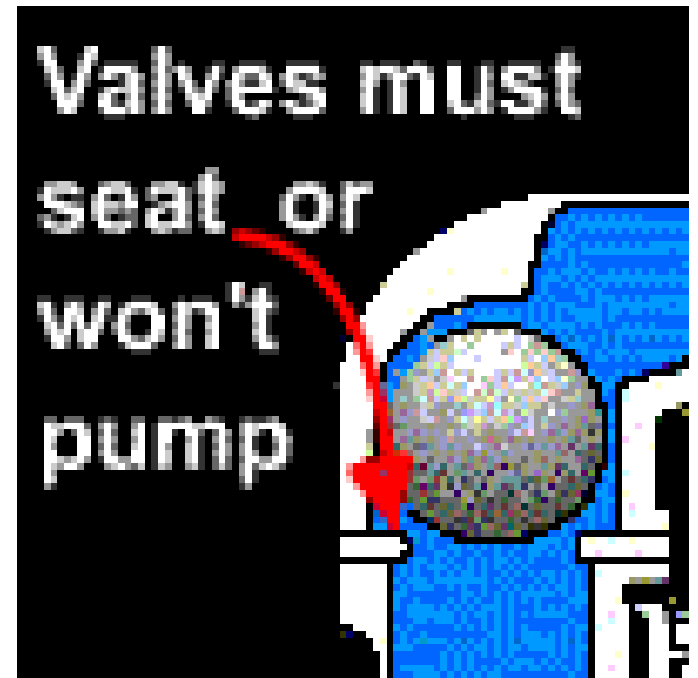


- The four **BALL VALVES** are free-floating and operated by pressure differences in the pumped liquid.
- Flapper valves are also commonly used.
- In the pump shown, liquid flow is from the bottom to the top.
- Sanitary Double Diaphragm pumps, often made of plastic and/or stainless steel, are used in the food industry to pump everything from sliced fruit, to sausage, to chocolate.

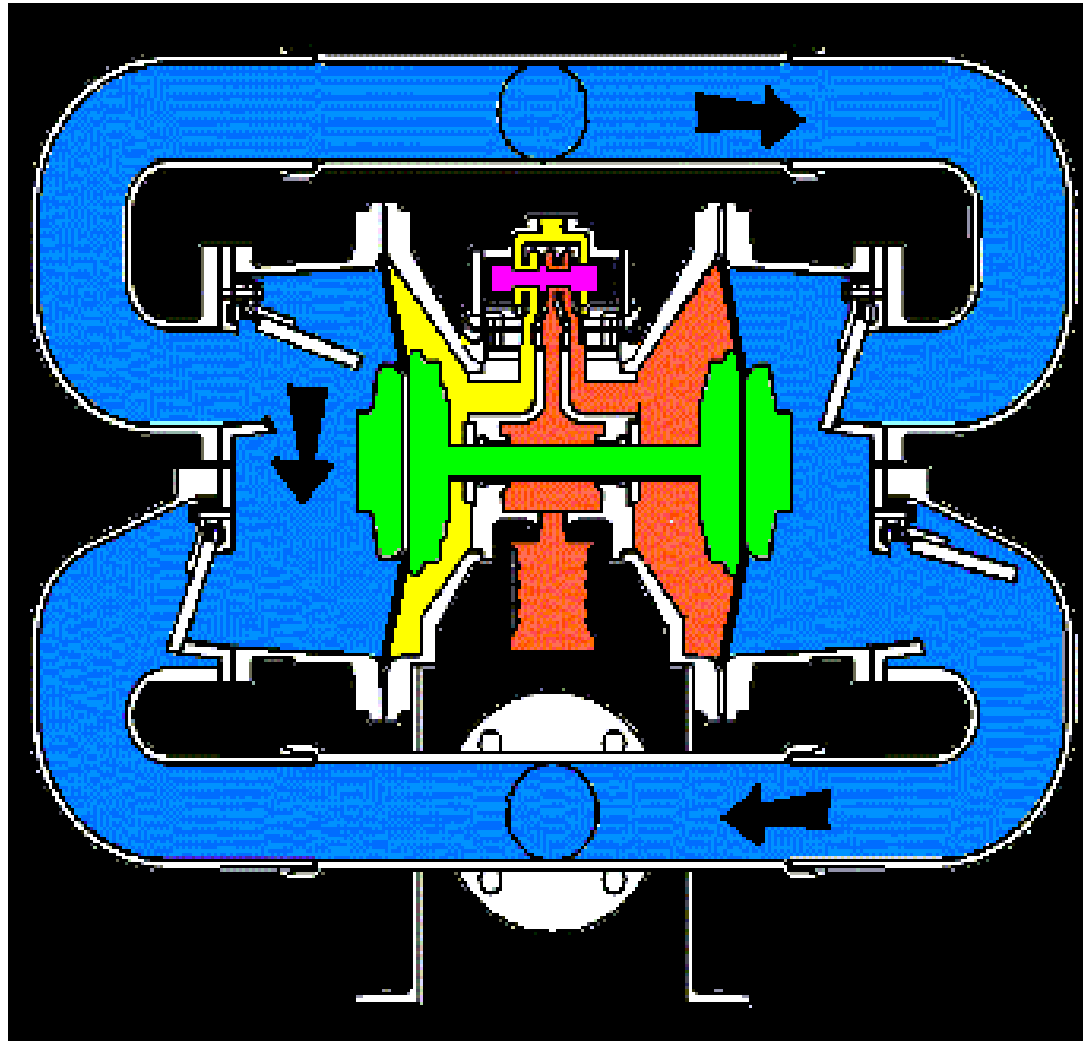
Diaphragm Pump



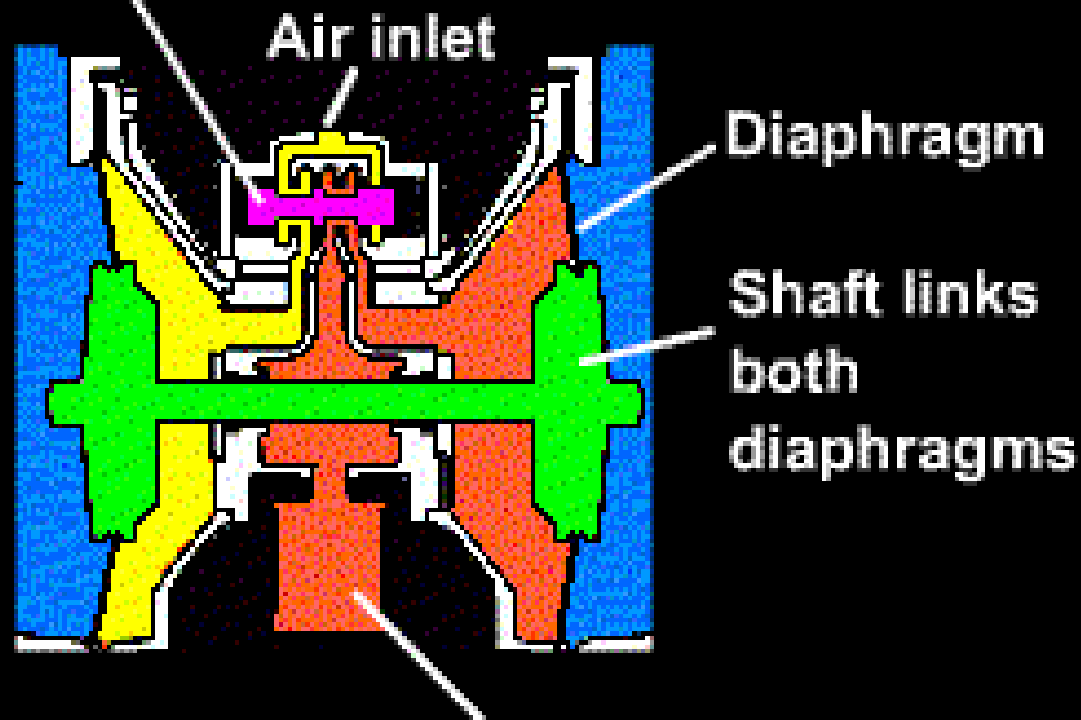
Valves must
seat or
won't
pump



Diaphragm Pump



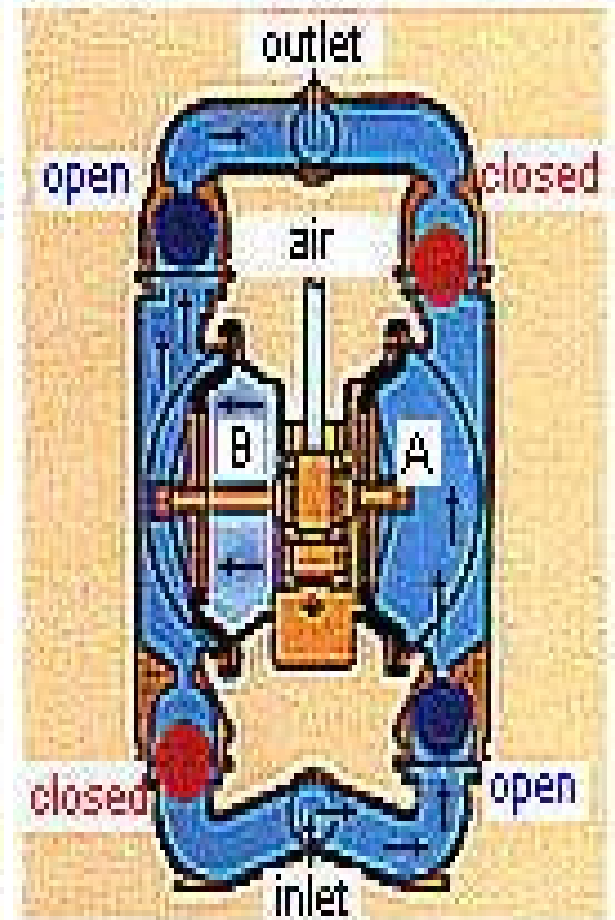
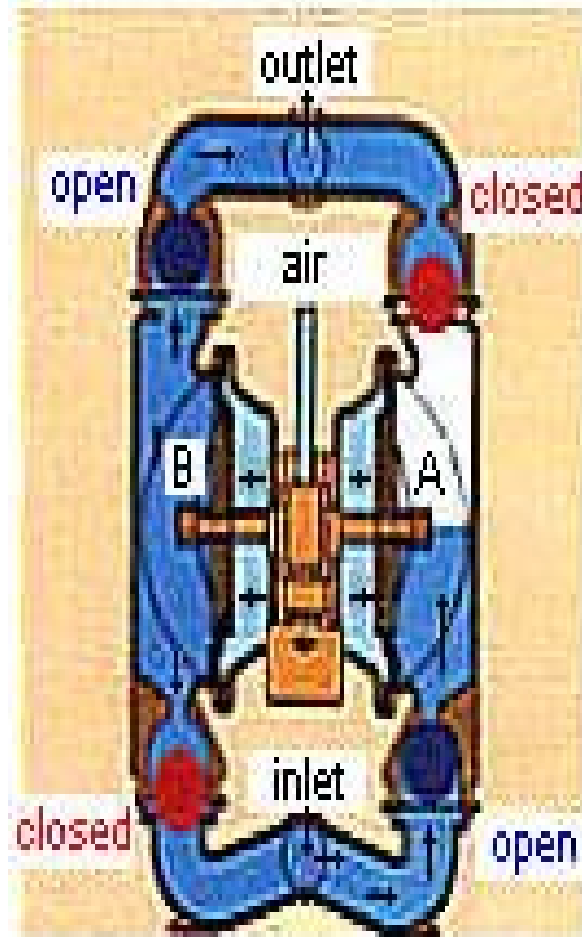
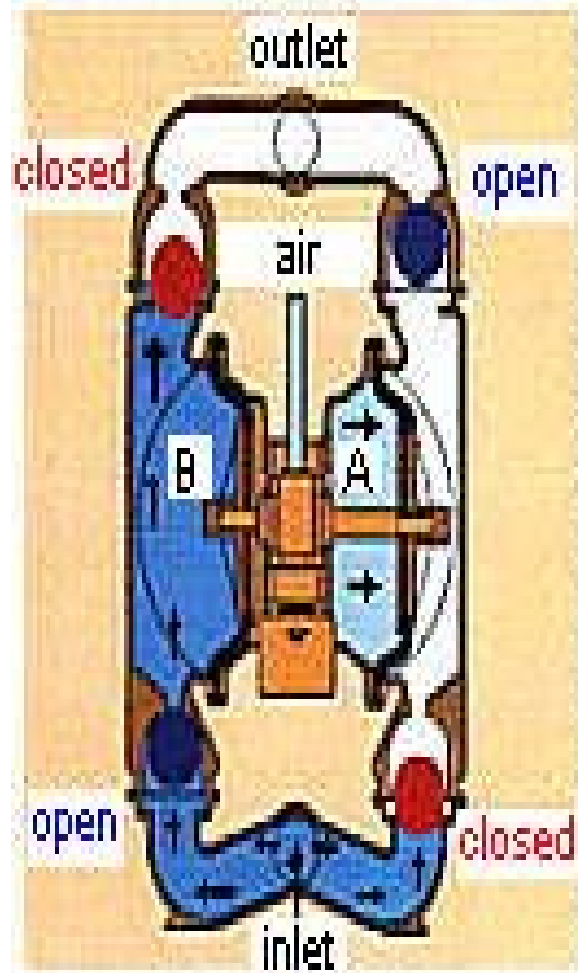
Air valve / pilot valve that shuttles back and forth to direct air to dry side of diaphragm (yellow), and vents air to exhaust muffler from behind opposite diaphragm (orange).

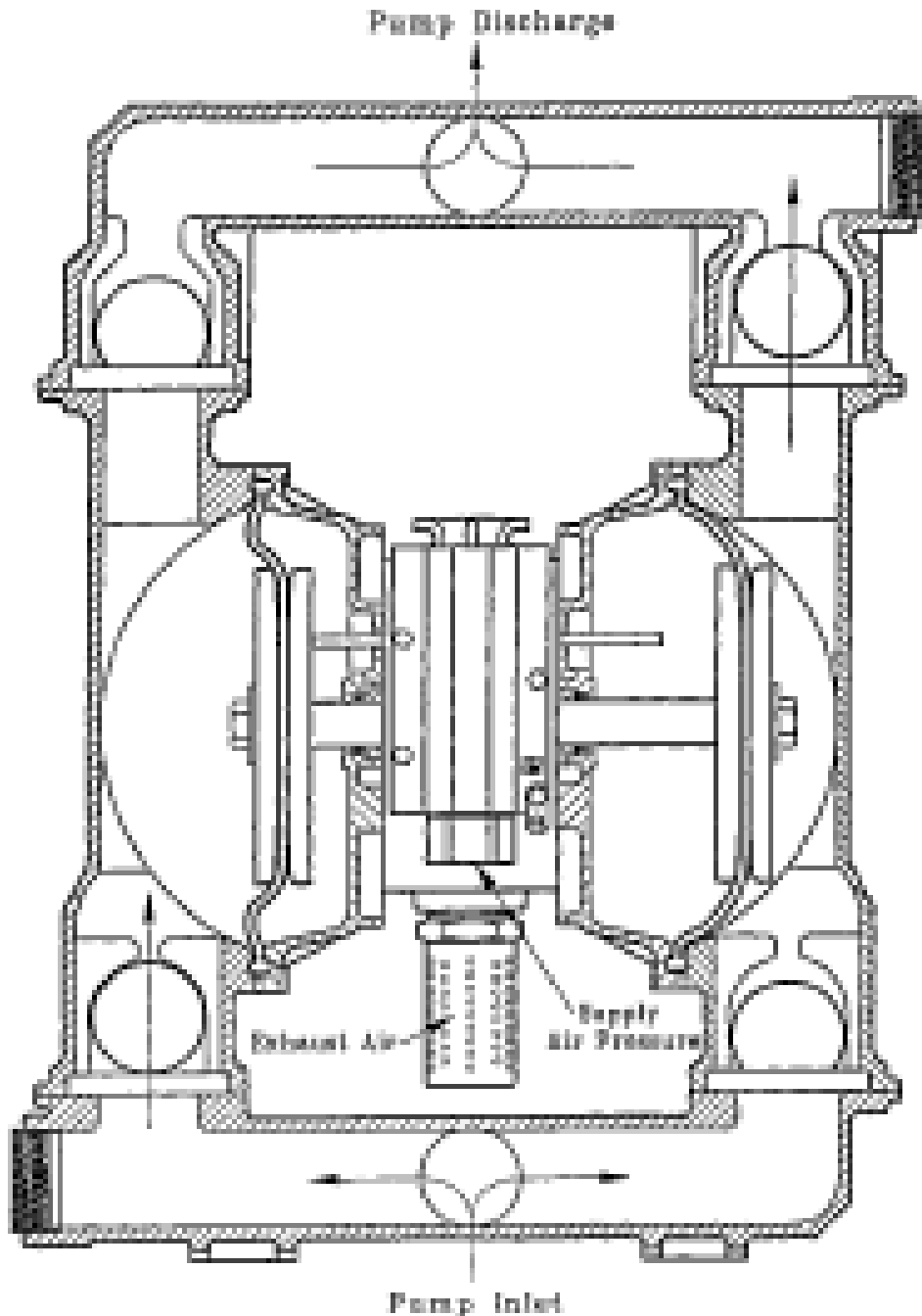


Muffler to reduce noise from air exhaust

Diaphragm Pump

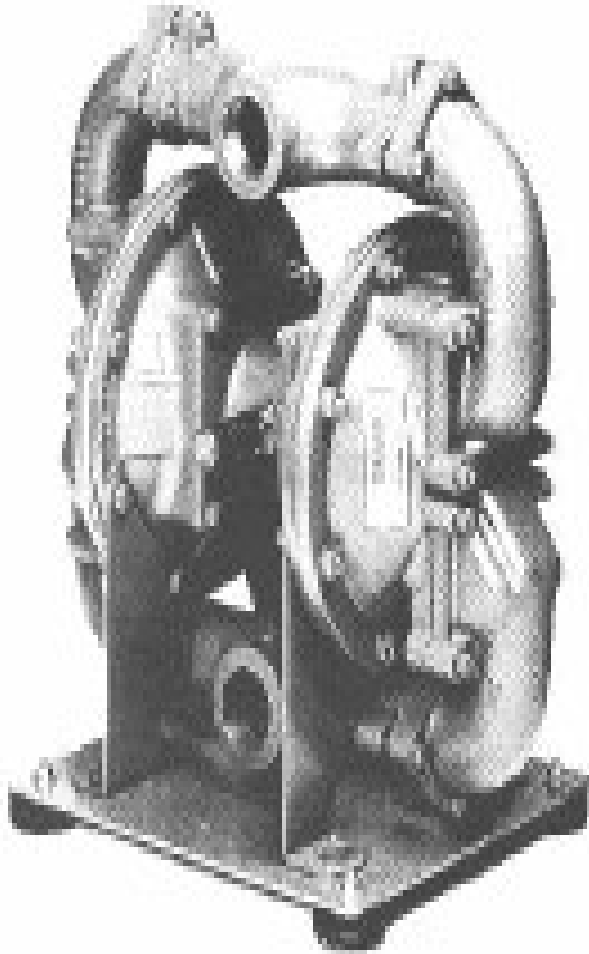
Operation of Diaphragm Pump





Cross-section
of an air-
operated
double-
diaphragm
pump with ball
check valves
(Ingersoll-Rand
Fluid Products)

Diaphragm Pump

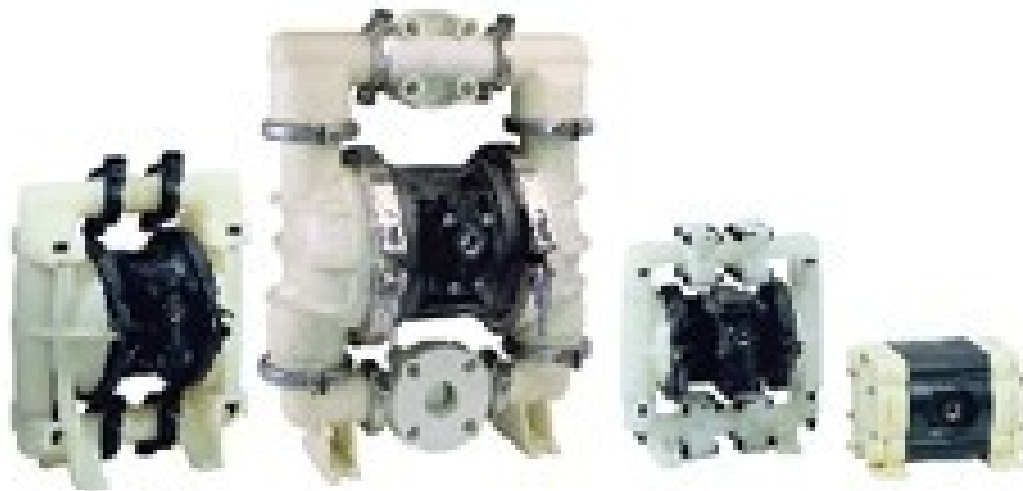


All Flo Diaphragm Pump



Diaphragm Pump

**Non-metallic
material**



Metal

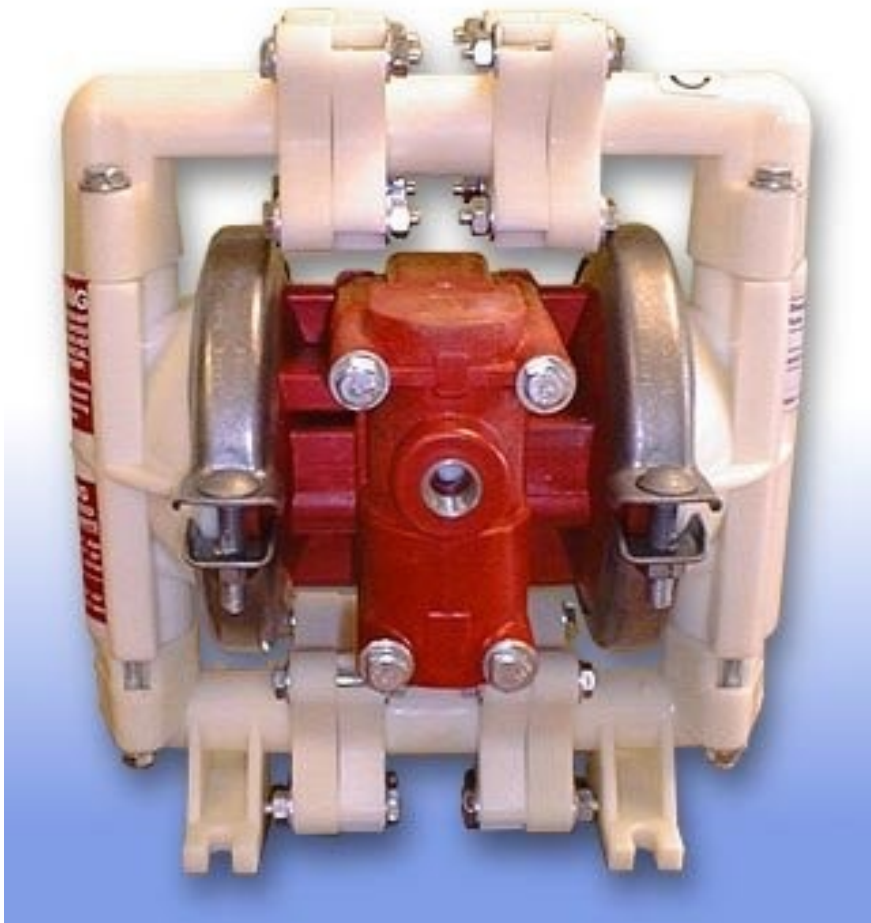


Wilden Diaphragm Pump

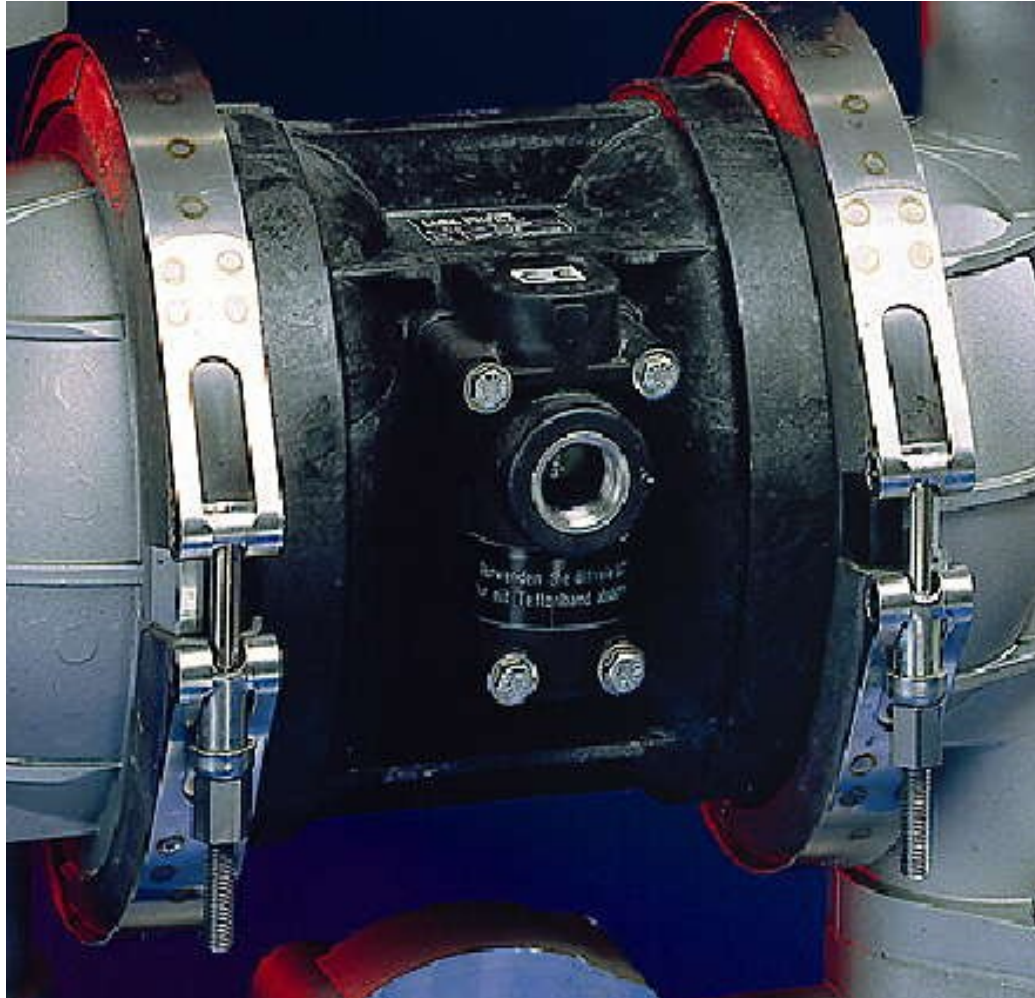


**ARO air-
operated
double-
diaphragm
pump with
flap check
valves
(Ingersoll-
Rand Fluid
Products)**

All Flo Diaphragm Pump

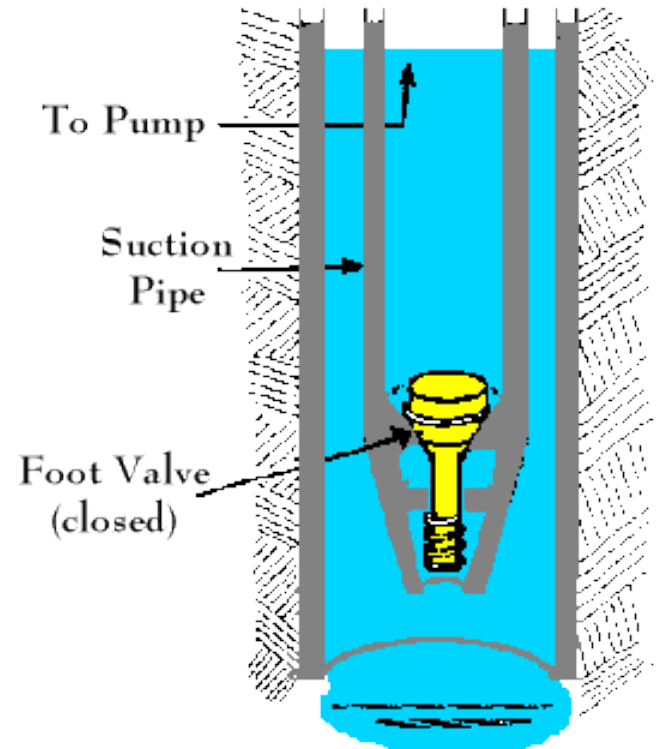


Air control valve system



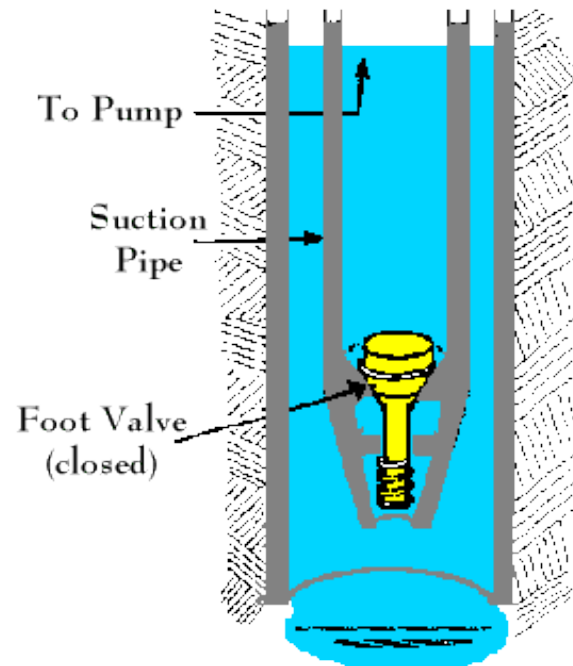
Pump Prime Control

- **Foot valves and check valves are usually supplied with your pump if they are considered necessary for maintaining pump prime.**
- **Both do the same kind of job, that is to permit water to move in only one direction.**



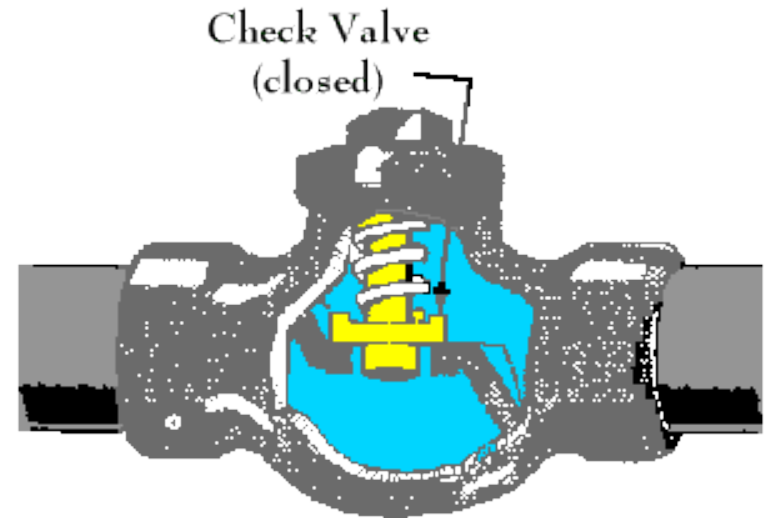
Pump Prime Control

- A foot valve is installed on the end of the suction pipe in the well. It keeps the suction pipe below the pump full of water while no pumping is occurring.
 - This is important for all centrifugal and turbine-type pumps, since their efficiency is greatly reduced if they pump air.
 - Foot valves help piston pumps to keep operating until the suction line can be repaired if the valves are worn or there is a small leak in the suction line.

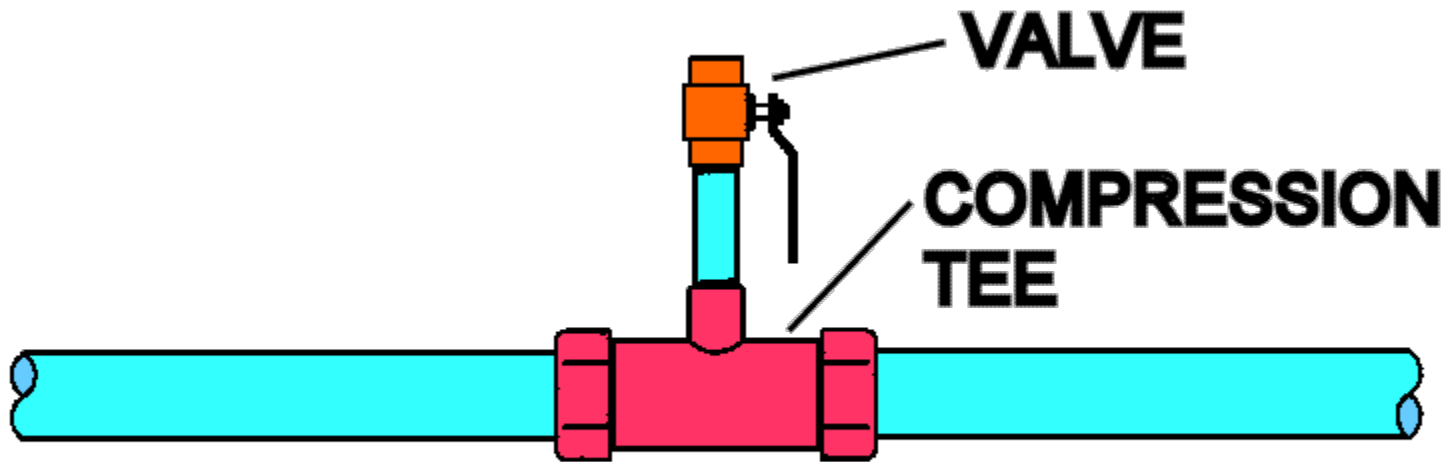


Pump Prime Control

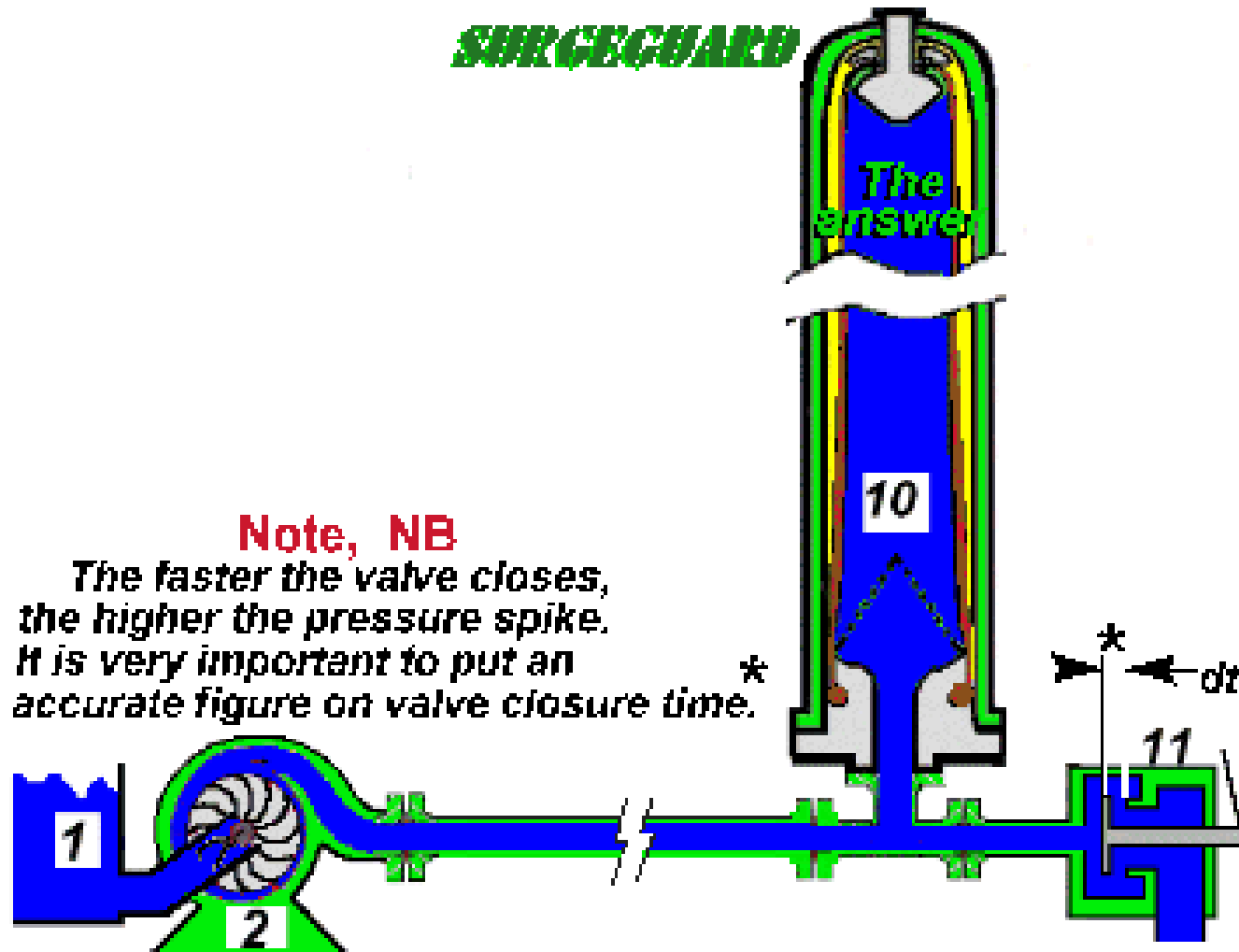
- On some self-priming pumps a check valve is used on the suction line next to the pump.
- It is also used where two or more pumps are supplying water to the same delivery line to protect one pump from the pressure being developed by the other; and where water must be held in a pressure tank.



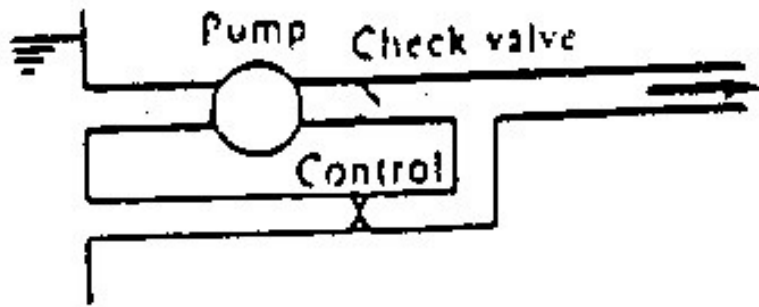
Water Hammer



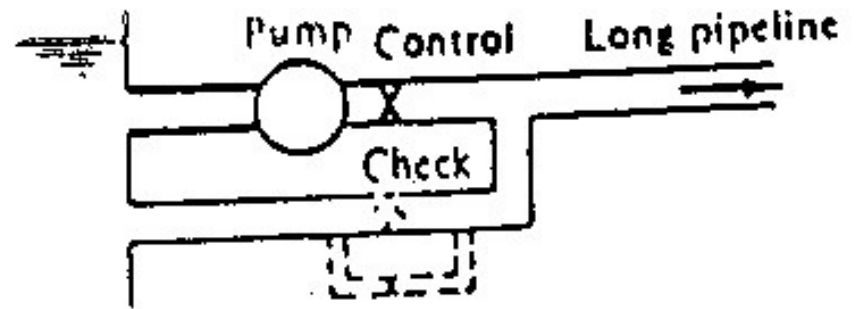
Water Hammer



By Pass to avoid Water Hammer



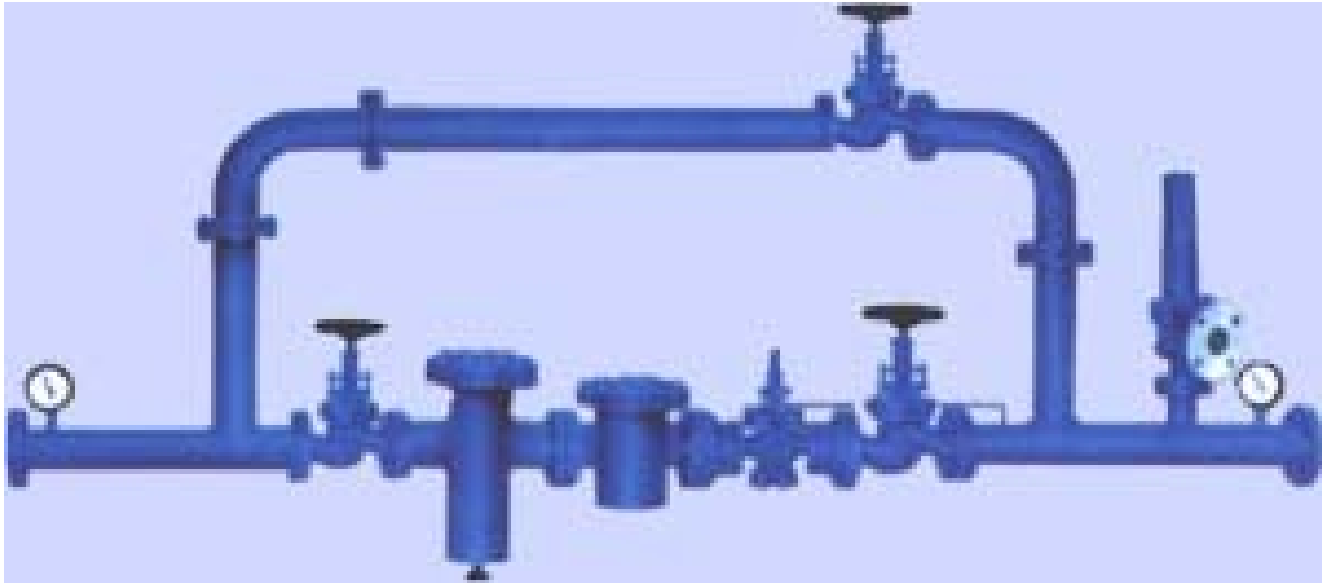
(a)



(b)

Stations

Pressure Reducing Station

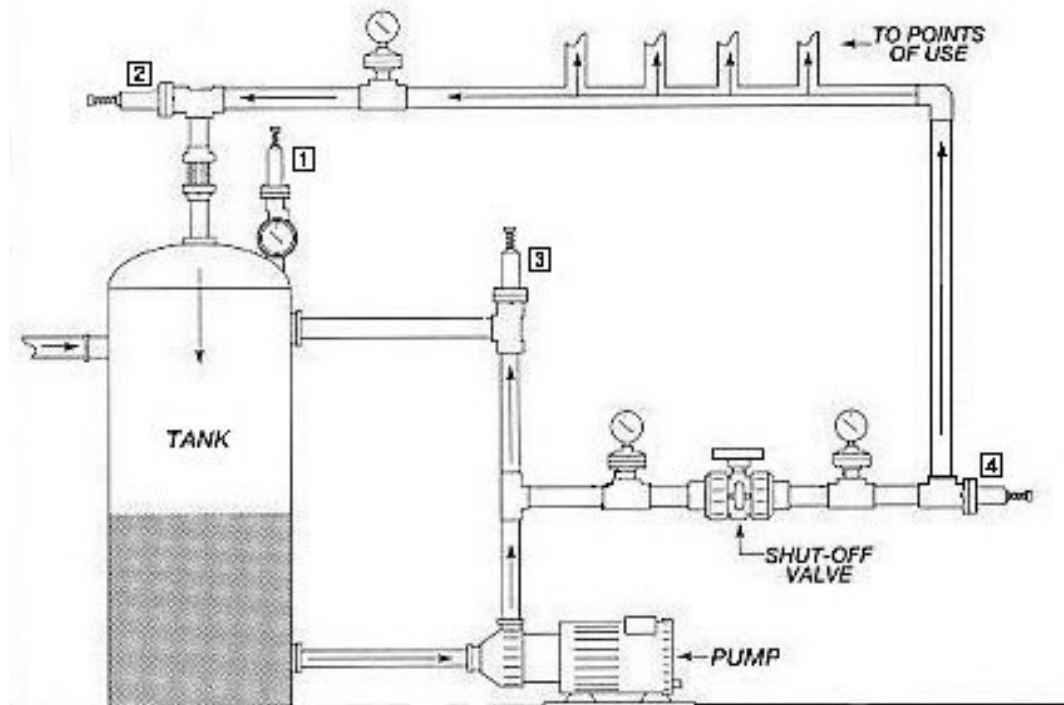


FLOW-TEK VALVES & CONTROLS

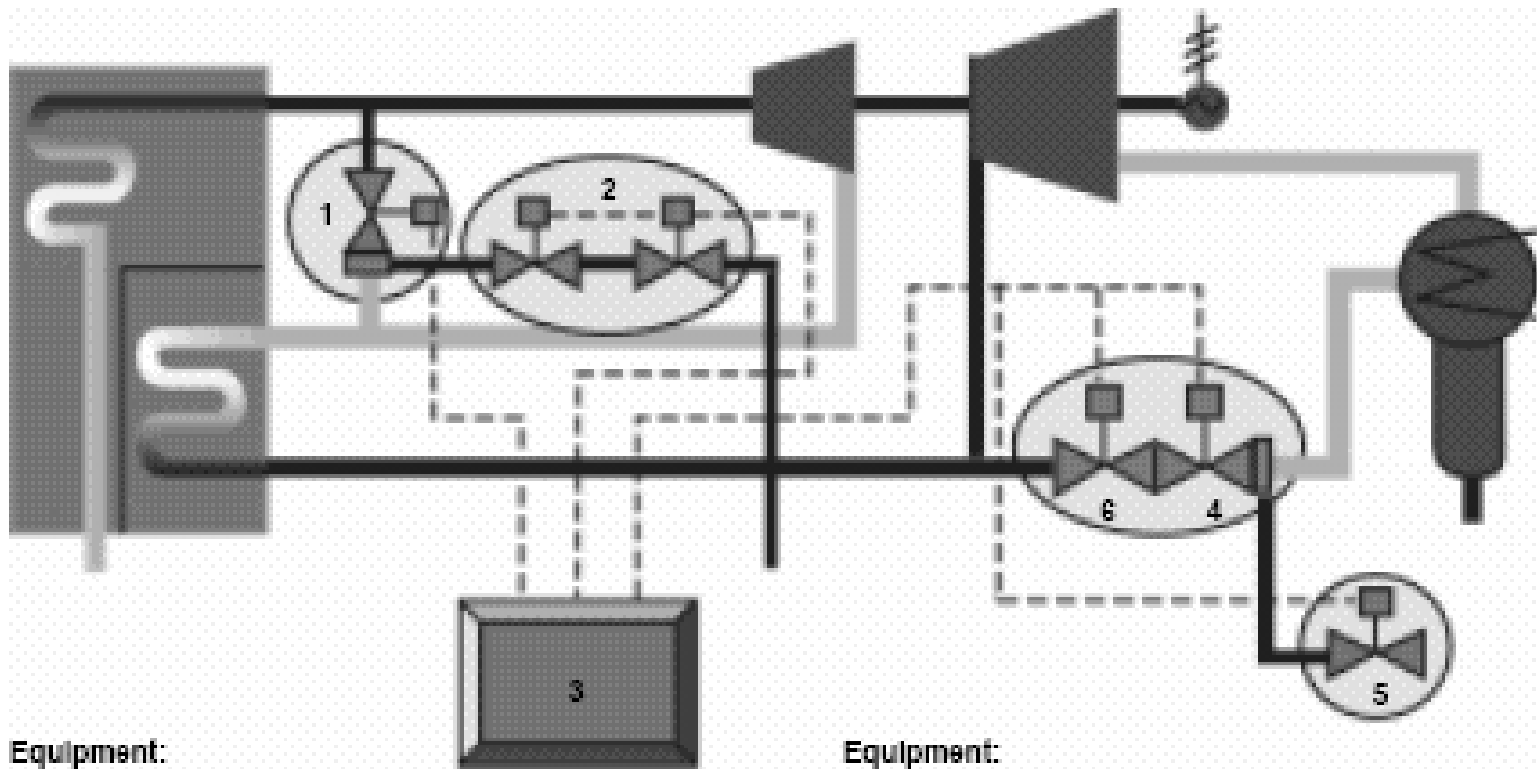
Pressure Reducing Station

APPLICATION DIAGRAM

*Illustrating Multi-Functions of
Plast-O-Matic Relief Valves*



Steam Conditioning Valves



- Equipment:
1. HP Turbine Bypass Steam Valves
 2. HP Turbine Bypass Control and Water Isolation Valves
 3. EHS Electrohydraulic System—
Electrical Control Logic
Hydraulic Control Logic
Accumulators and Accumulator Power System
Hydraulic Power Unit

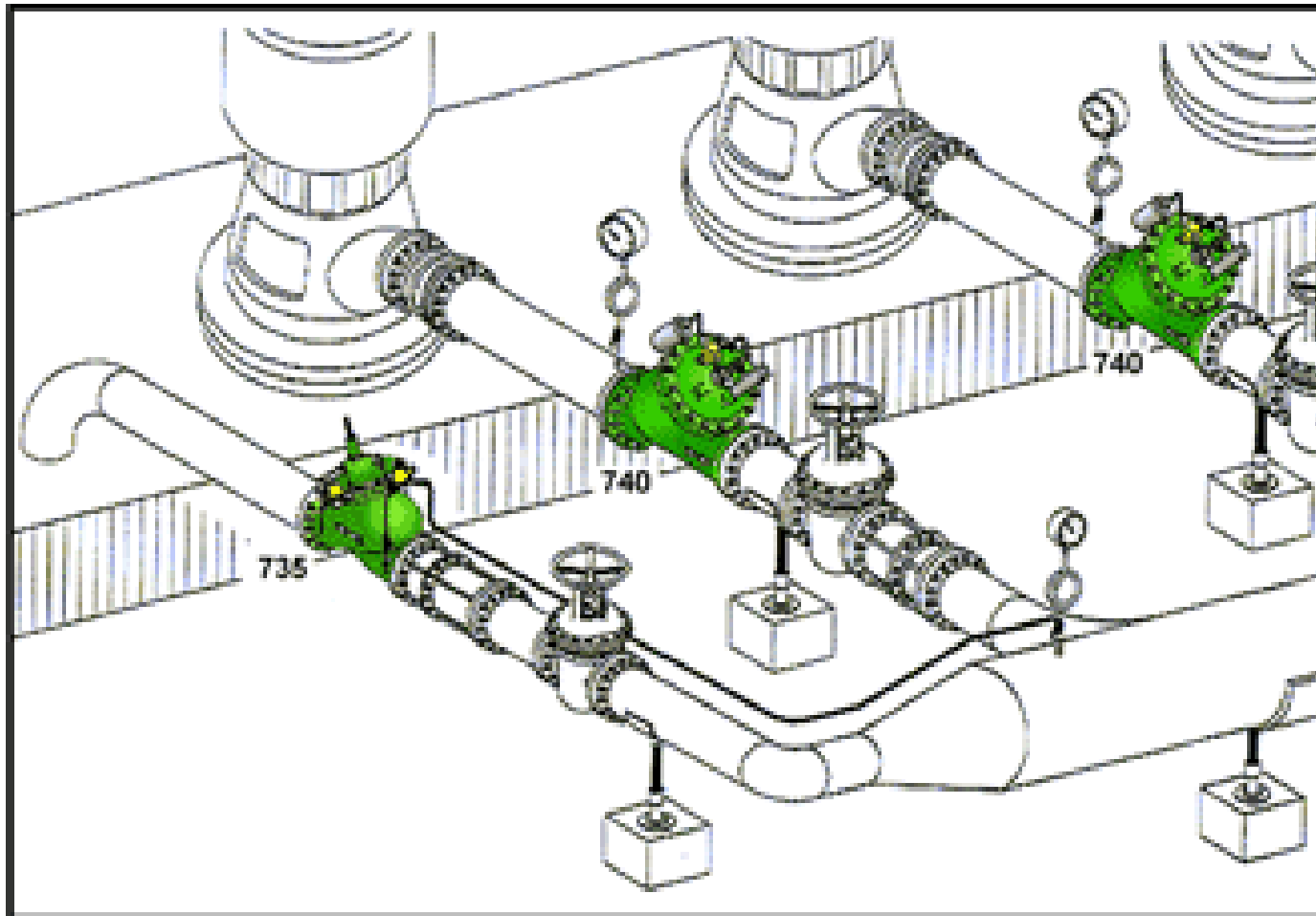
- Equipment:
4. LP Turbine Bypass Steam Valves
 5. LP Turbine Bypass Water Valves
 6. LP Turbine Bypass Steam Stop Valves (optional)
 3. EHS Electrohydraulic system

Pump Control Valve

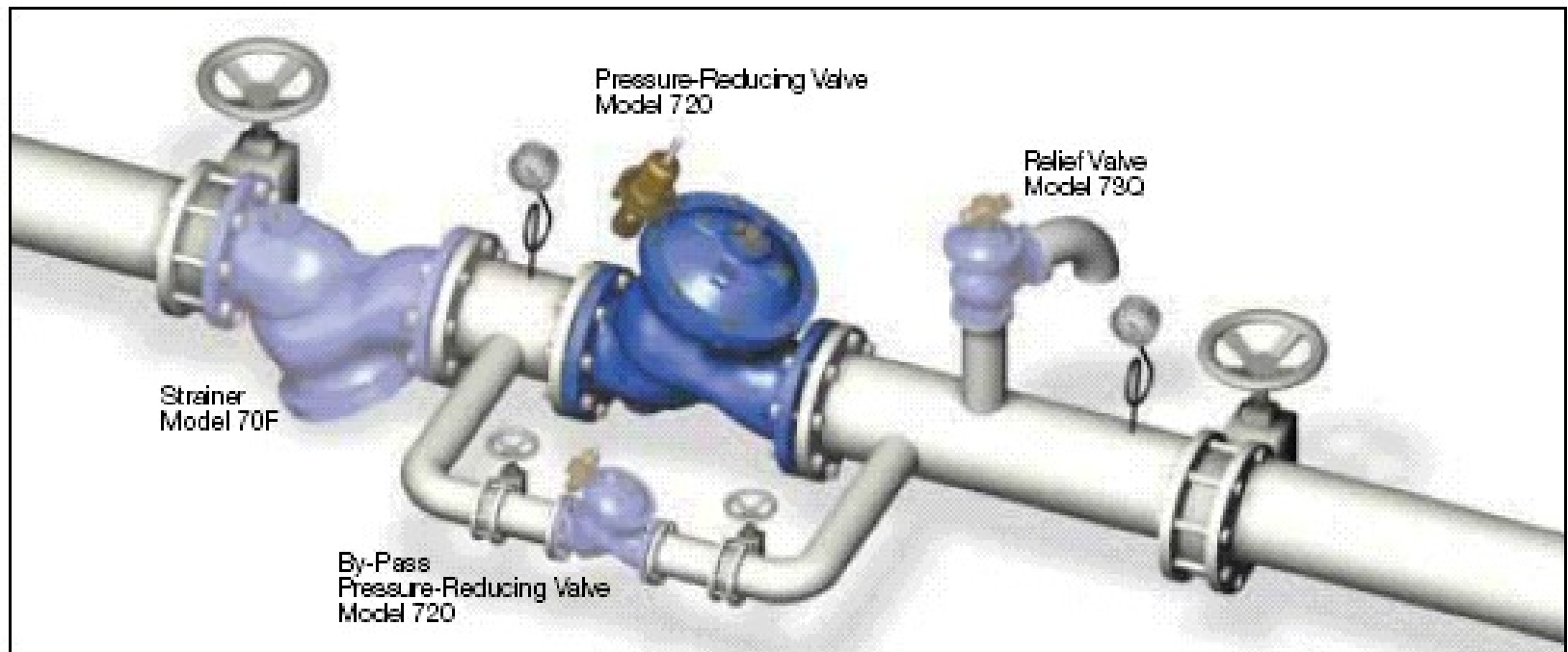
- The Model 740-Q **Pump Control Valve**, Booster Type is an automatic control valve designed to be installed on the discharge of a booster pump to prevent pressure surges caused by the starting and stopping of the pump.



Pump Control Valve



Pressure-Reducing System – Typical Installation

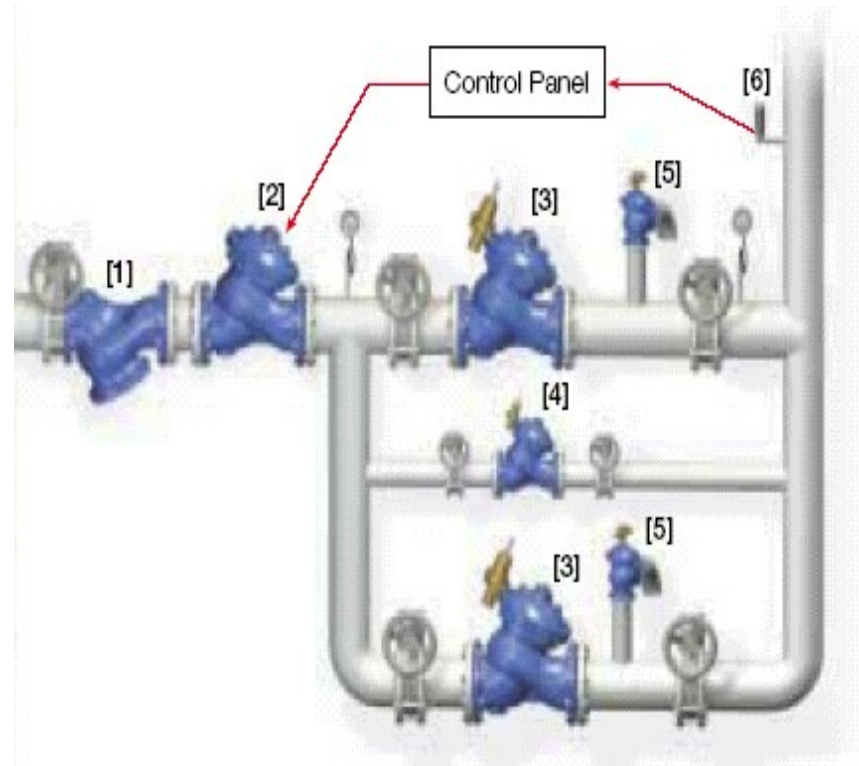


BERMAD Waterworks

Pressure-Reducing System – Typical Installation

- In addition to the **Model 720 Pressure-Reducing Valve**, BERMAD recommends that the system also includes:
 - ■ **Strainer Model 70F** prevents debris from damaging valve operation
 - ■ **Relief Valve Model 73Q** provides:
 - ☐ Protection against momentary pressure peaks
 - ☐ Visual indication of need for maintenance
 - ■ **By-Pass Pressure-Reducing Valve** saves on maintenance costs. The larger (more costly to maintain) valve operates during peak demand. The smaller by-pass valve cuts operating hours of the larger valve, achieving greater return on investment.

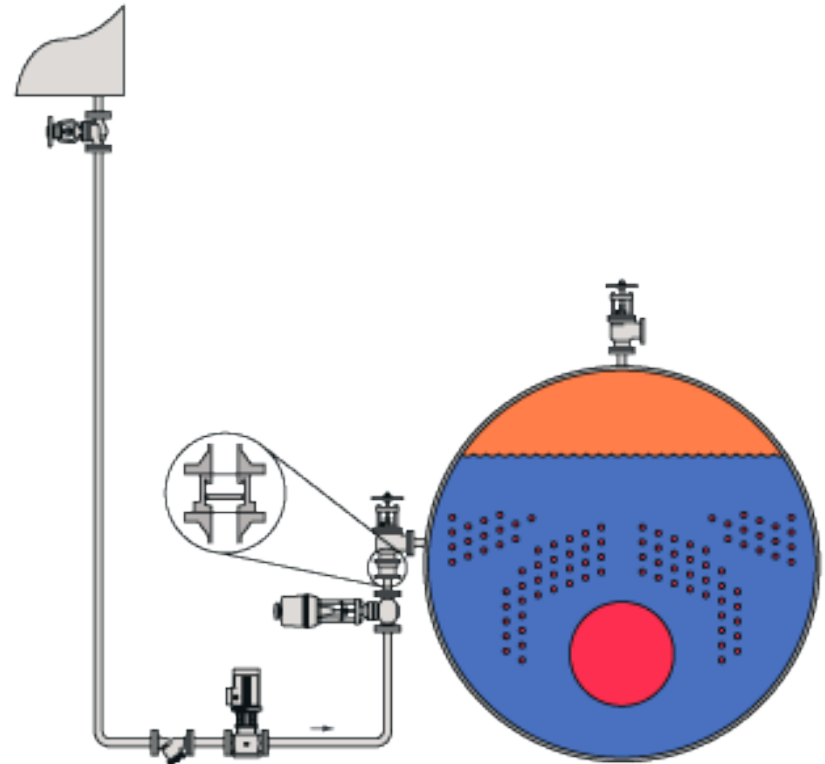
- **[1]** Strainer Model 70F
- **[2]** Emergency Pressure Reducing
- Valve Model 720-PD-59
- **[3]** Pressure-Reducing Valve
- Model 720
- **[4]** By-pass Pressure-Reducing
- Valve Model 720
- **[5]** Relief Valve Model 73Q
- **[6]** Pressure Switch



BERMAD Waterworks

Boiler feed lines

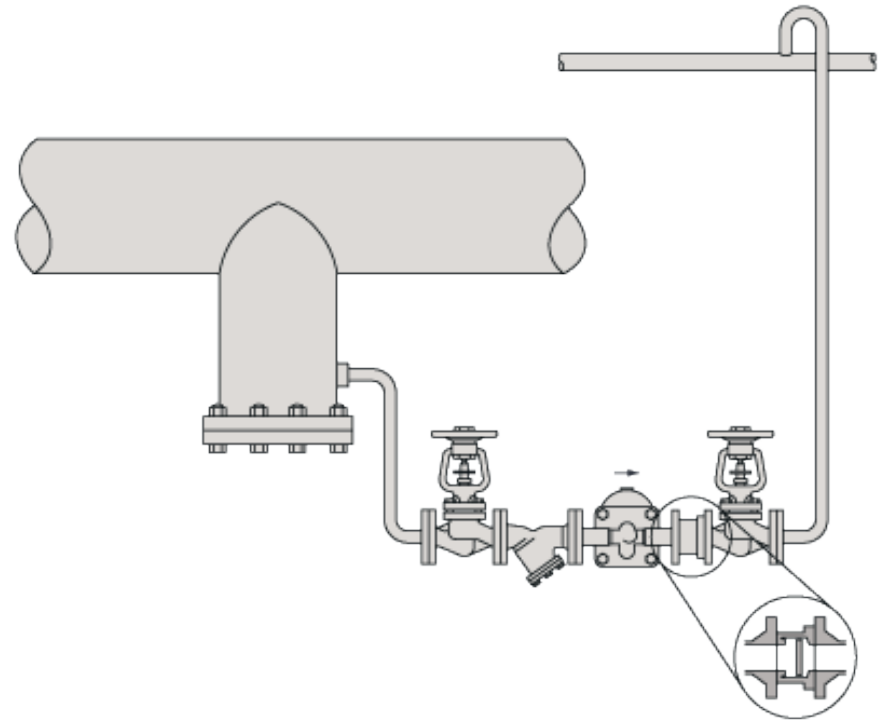
- **The check valve** is used to prevent boiler water being forced back along the feed line into the storage tank when the feed pump stops running.
 - Furthermore, a disc check valve with a heavy-duty spring and a soft seat can be fitted in the boiler feed line to prevent flow under gravity into the boiler when the feed pump is shut off.



Boiler feed line applications

- Other than with steam traps discharging to atmosphere, check valves should always be inserted after a steam trap to prevent back flow of condensate flooding the steam space.
- **The check valve** will also prevent the steam trap from becoming damaged by any hydraulic shock in the condensate line. It should be noted that when using blast discharge type steam traps, the check valve should be fitted at least 1 m downstream of the trap.

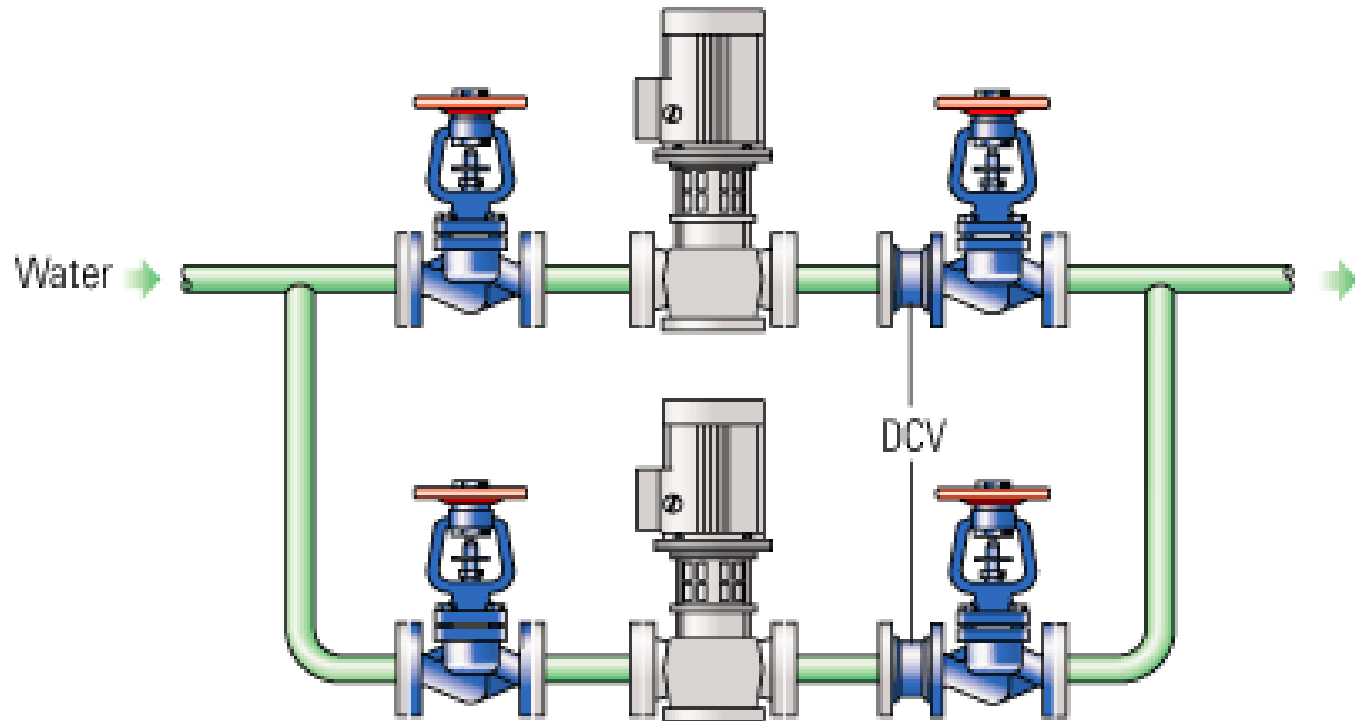
Steam traps



Steam trap applications

Hot water circuits

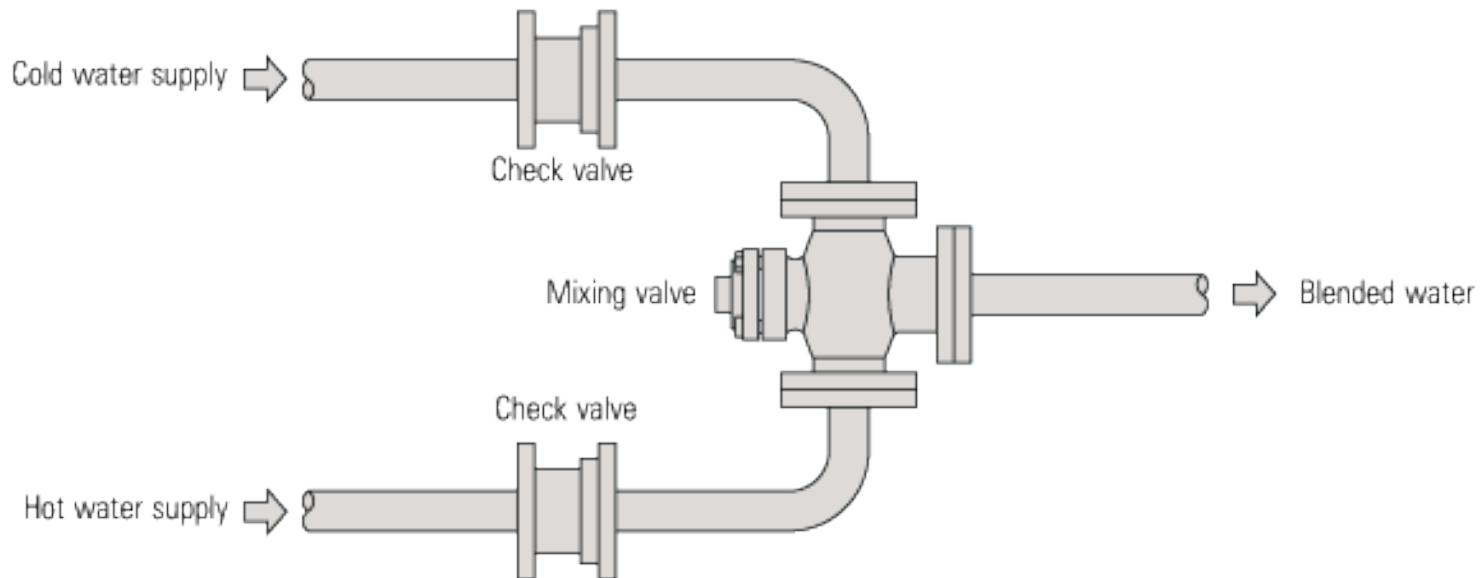
- A **check valve** should be installed after each pump to prevent reverse flow through the pump when it has been



Duplex pump set

- **A check valve** should be fitted in each supply line to prevent reverse flow along the different lines which will lead to contamination. A common blending application is the mixing of hot and cold water to provide hot water.

Blending



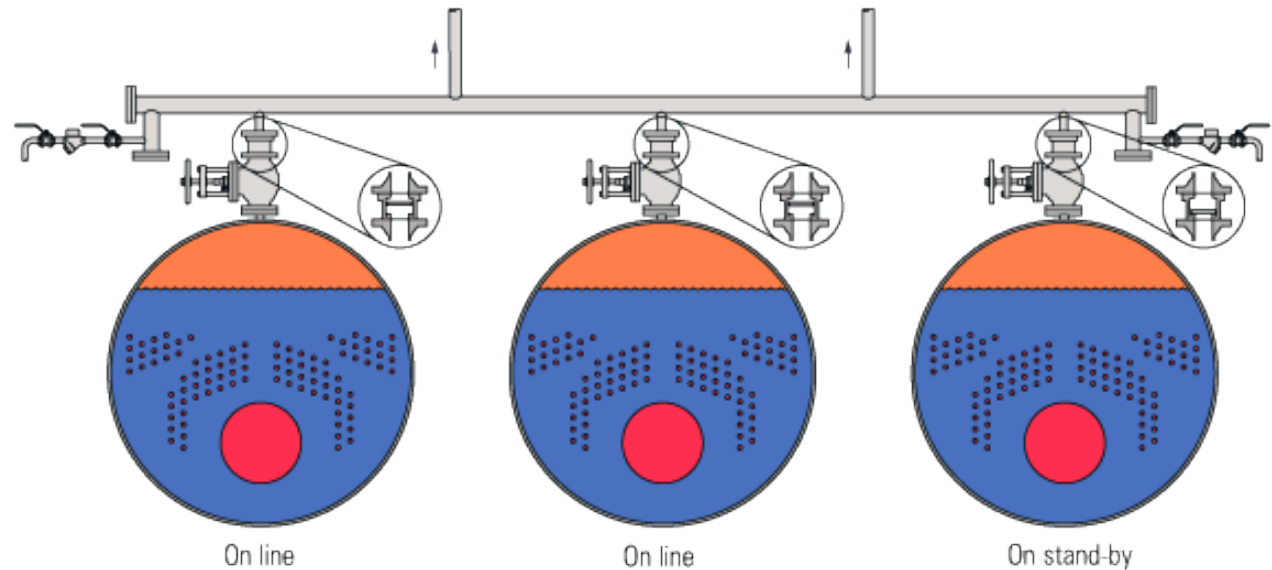
Blending applications

Pipeline fitting protection

- **Check valves** are used to prevent damage to equipment such as flow meters and control valves, all of which can be damaged by reverse flow. Check valves also stop the contents of strainers from being deposited in upstream pipe work by back flowing fluid.

Multiple boiler applications

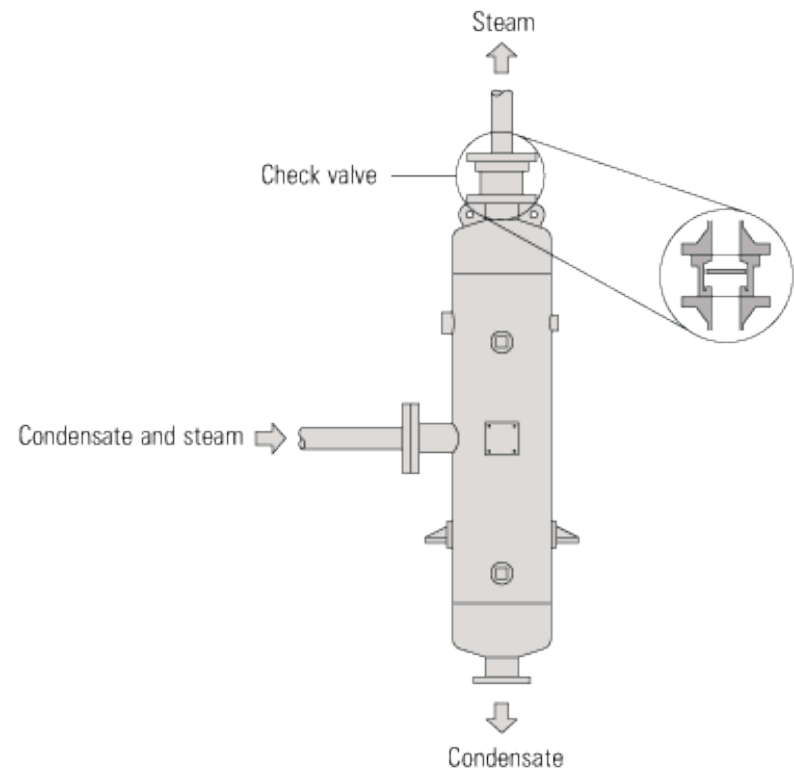
- **A check valve** must be inserted on the outlet of each boiler to prevent any steam flowing into boilers, which may be on hot stand-by.



Multiple boiler applications

Flash vessels

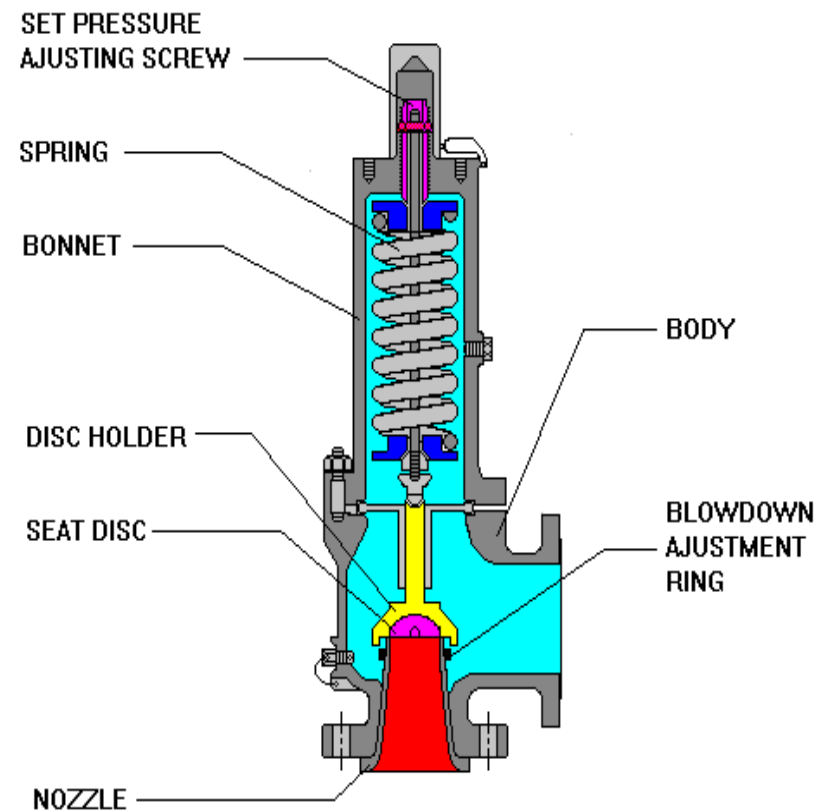
- **A wafer check valve** is installed at the flash steam outlet from the flash vessel; this ensures that steam from any make-up valve does not flow back into the flash vessel, see the next figure. A check valve is also installed after the steam trap that drains the flash vessel.



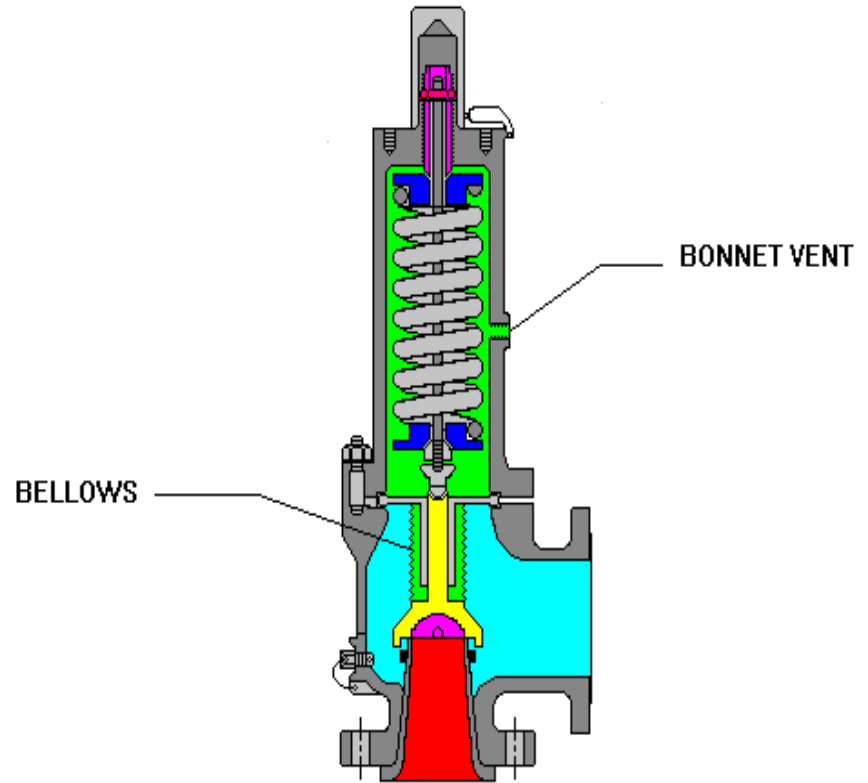
Flash vessel applications

Industrial Applications

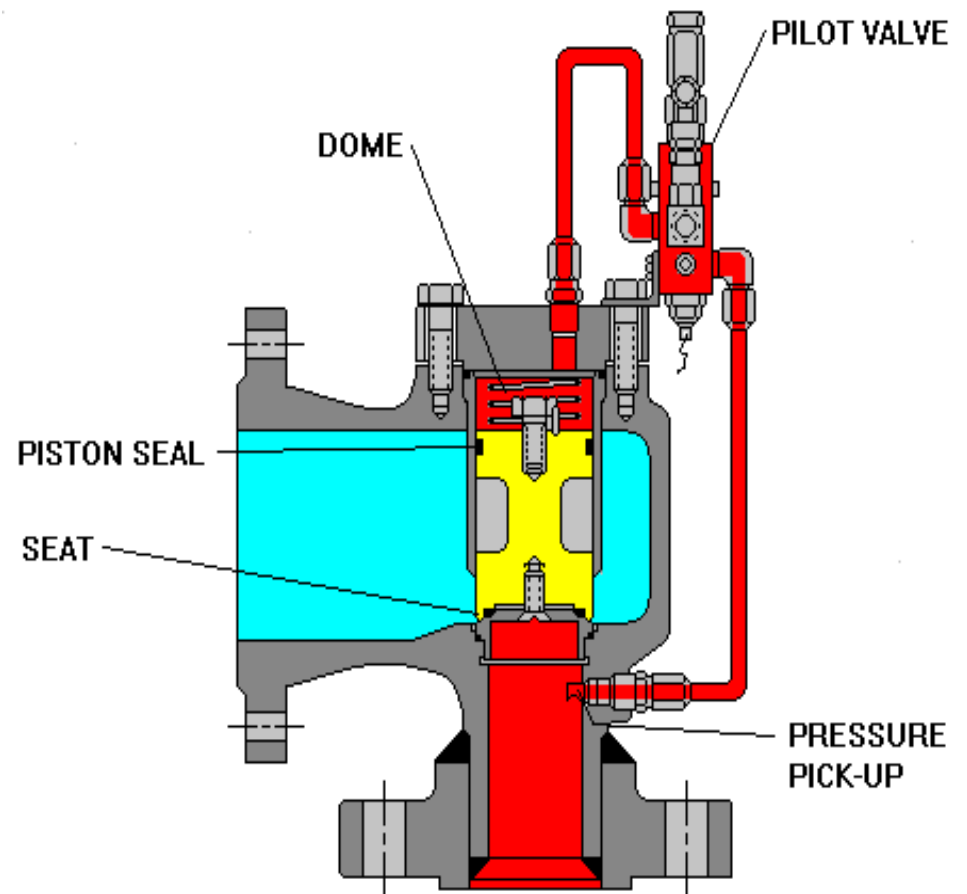




Spring loaded safety Relief Valve



Balanced Bellows Spring Loaded Safety Relief Valve



Piston Type Pilot Operated Safety Relief Valve

Another Applications





Becker Below Ground Regulator Station

Becker Below Ground Regulator Station



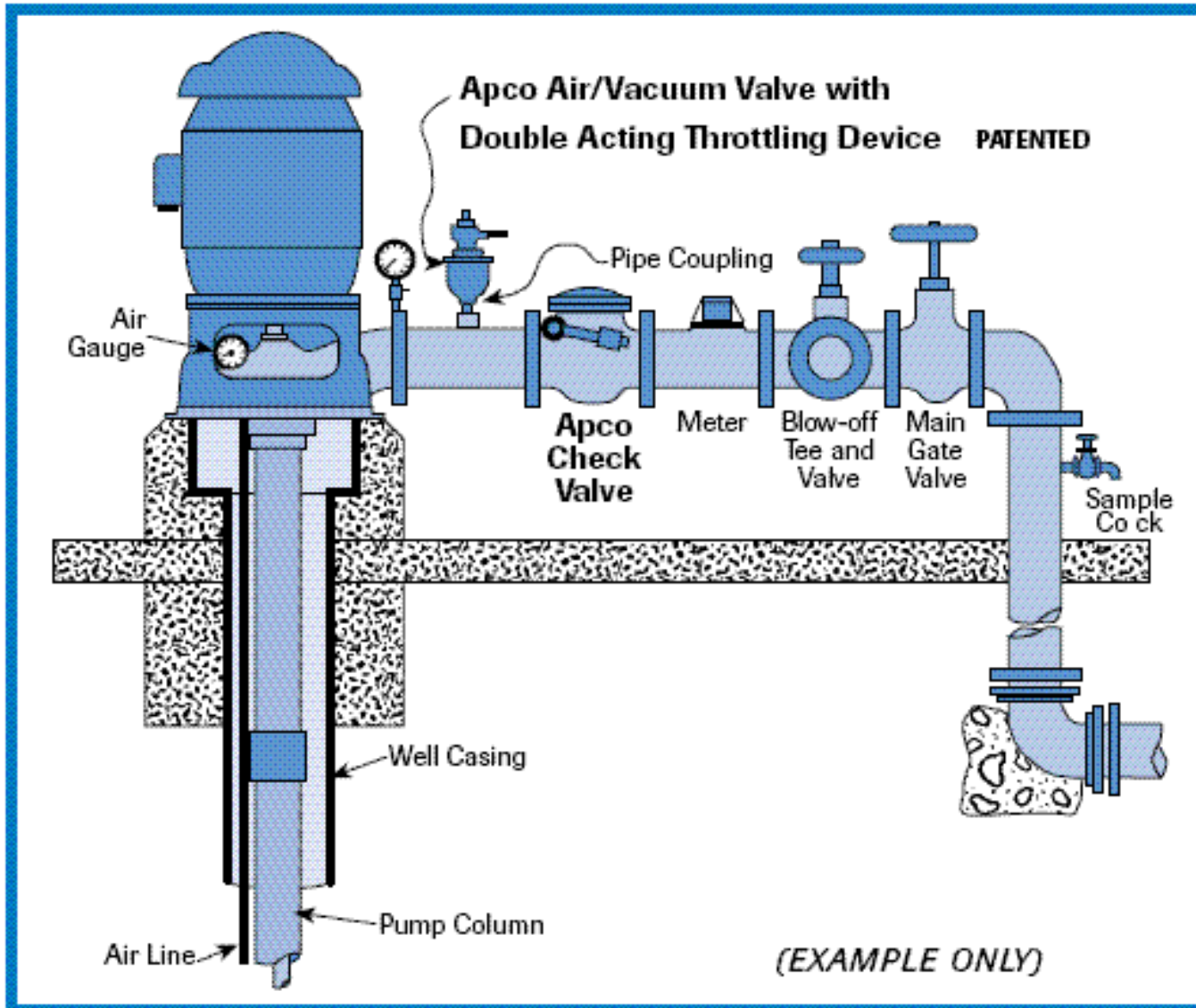
**Becker Below Ground Regulator Station
(after backfill)**



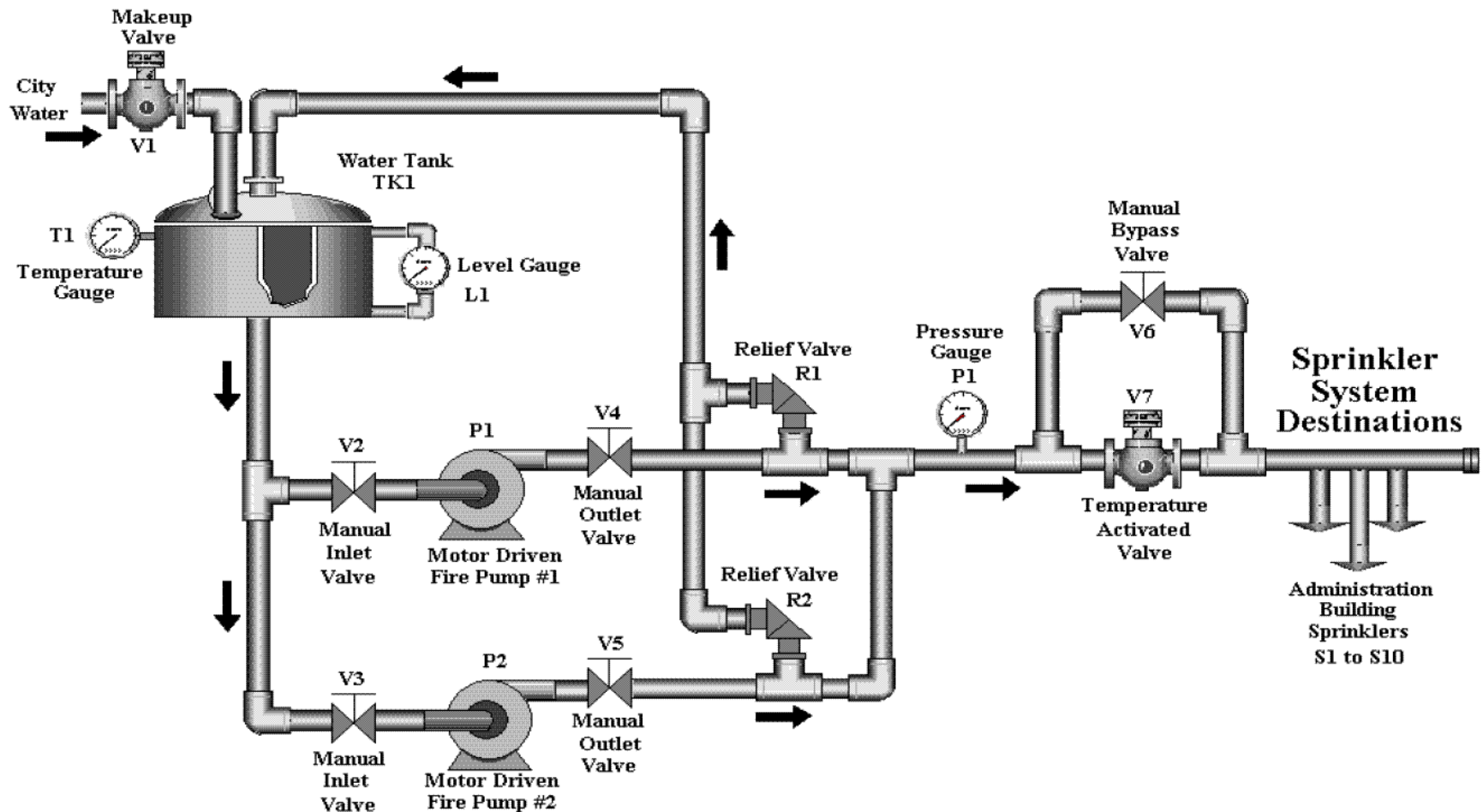
Abbreviations

- **ANSI:** Abbreviation for American National Standards Institute.
- **API:** Abbreviation for American Petroleum Institute.
- **ASME:** Abbreviation for American Society of Mechanical Engineers.
- **ASTM:** Abbreviation for American Society for Testing and Materials.

AIR/VACUUM VALVES FOR VERTICAL TURBINE PUMP INSTALLATION



Typical Reliability Centered Maintenance (RCM) Application



أنواع الصمامات

3- صمامات لاطلاق وإيقاف السريان السريع.	2- صمامات لاختناق وتنظيم السريان	1- صمامات لسريان السوائل وإيقافها
1- الصمام السدادى (Plug valve). 2- صمام الكرة (Ball valve).	1- صمام كروى (Globe valve). 2- صمام الزاوية (Angle valve). 3- صمام الإبرة (Needle valve). 4- صمام الفراشة (Butterfly valve).	صمام البوابة (Gate valve). 1- صمام البوابة ذو العامود الصاعد. 2- صمام البوابة ذو العامود الثابت.
6- صمامات خاصة.	5- صمامات التصريف	4- صمامات لمنع السريان العكسى
1- صمام زجاجة البيان. 2- صمام ذو القرص المطاط. 3- صمام التفوير. 4- صمام خطوط الإطفاء. 5- صمام سفلى لا رجعى.	1- صمام الأمان (Safety valve). 2- صمام التصريف (تخفيف الضغط) (Relief valve).	1- صمام عدم رجوع مفصلى . 2- صمام عدم رجوع رافع. 3- صمام عدم رجوع بياى (سوسته) 4- صمام عدم رجوع أفقى. 5- صمام عدم رجوع وإيقاف. 6- صمام عدم رجوع راسى.

Valve Operating Devices

- **Manual**

- Handwheel or lever is directly connected to the stem and is operated by hand

- **Hydraulic**

- Hydraulic pressure is applied to one side of a piston which is connected to the stem of the valve

- **Motor**

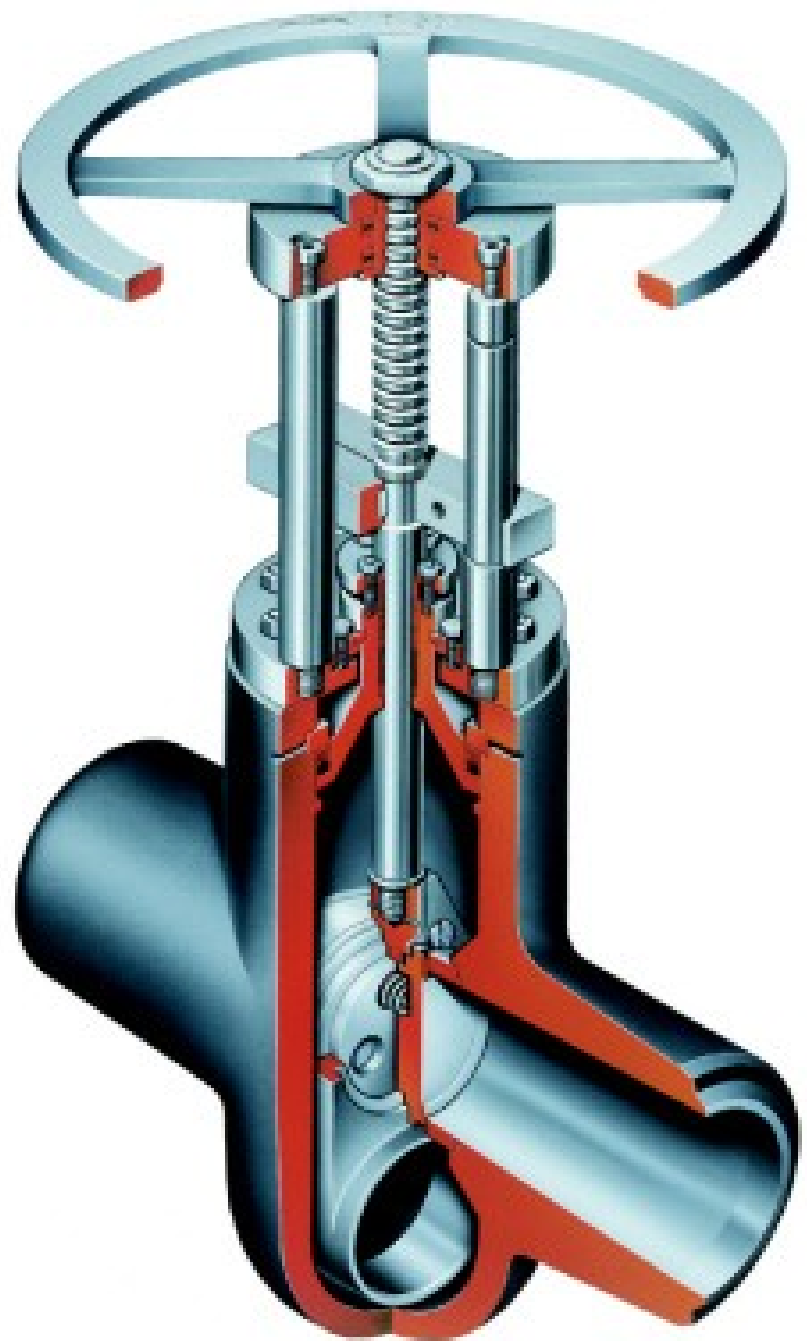
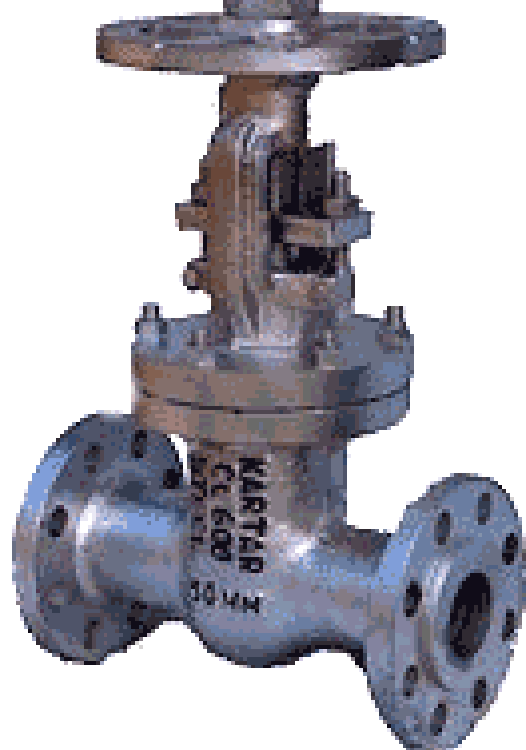
- A hydraulic, electric, or air driven motor is used to turn the stem of the valve

- **Solenoid**

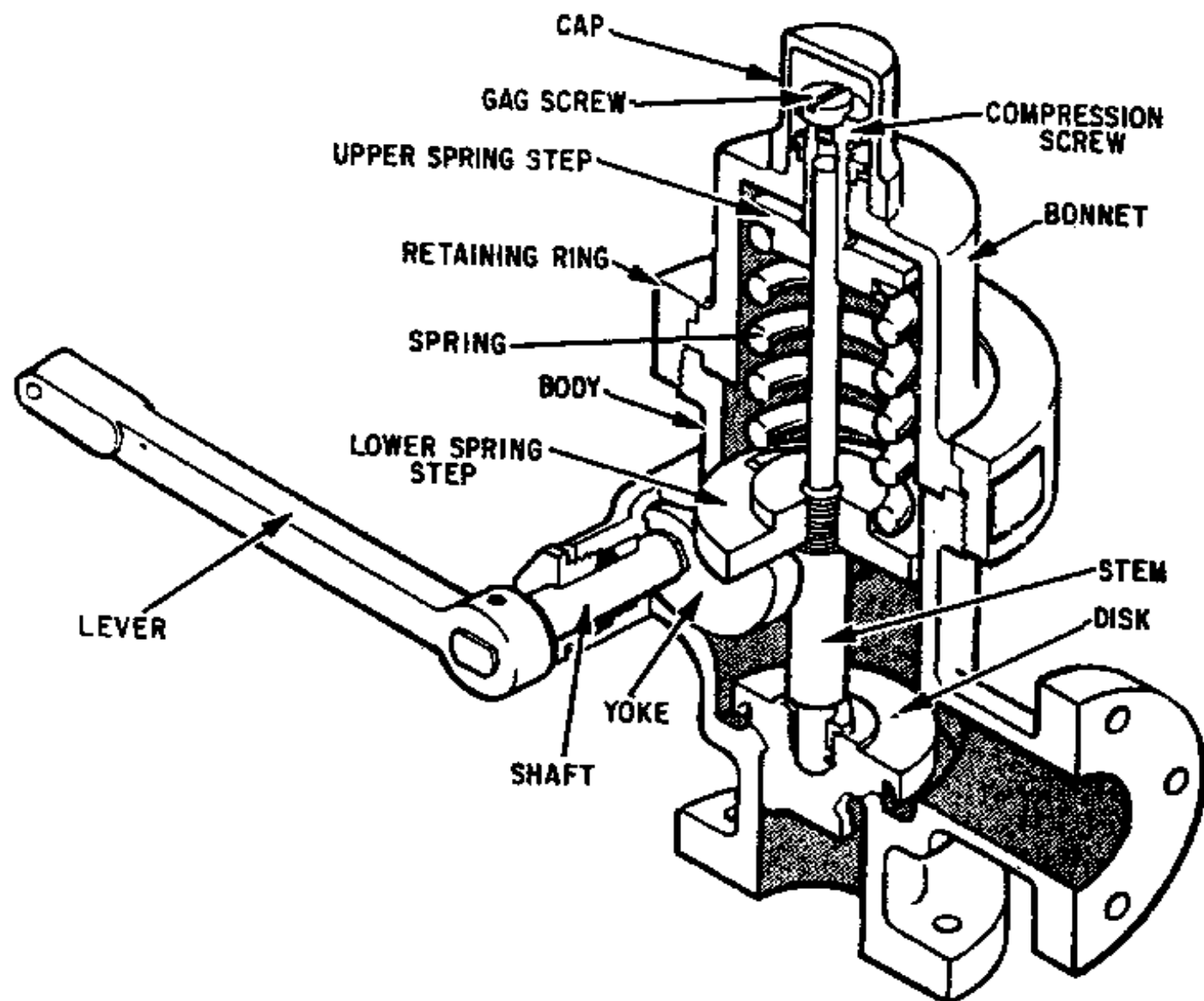
- Uses an electromagnet to open or close a valve against spring pressure













Prof Dr: Nazih Noaman Bayomi

**Thank you for your
attention**

