

ABLUTION FOUNTAIN See WASHING FOUNTAIN.

ABLUTIONARY APPLIANCES See WASTE APPLIANCES.

ABOVE GROUND DRAINAGE

A system of pipes which conveys surplus water or liquid sewage down to the house drains. The systems must be designed so as to prevent foul air from the drain entering the building. The above ground drainage system could be designed to remove either foul water from soil and waste appliances (see SANITARY PIPEWORK) or to remove surface water from roofs (see GUTTERS and RAINWATER PIPES). See also RAINWATER CONNECTIONS TO SOIL DISCHARGE STACKS.

ABS

Abbreviation for ACRYLONITRILE BUTADIENE STYRENE.

ABSOLUTE PRESSURE

The gauge pressure plus the ATMOSPHERIC PRESSURE. The gauge pressure is created by the head of water only:

$$\text{gauge pressure} + \text{atmospheric pressure} = \text{absolute pressure}$$

ABSOLUTE ZERO See TEMPERATURE.

ABUTMENT

The position where a roof meets a wall or surface which extends above its surface. A good example would be where a chimney passes up through the roof.

AC See ALTERNATING CURRENT.

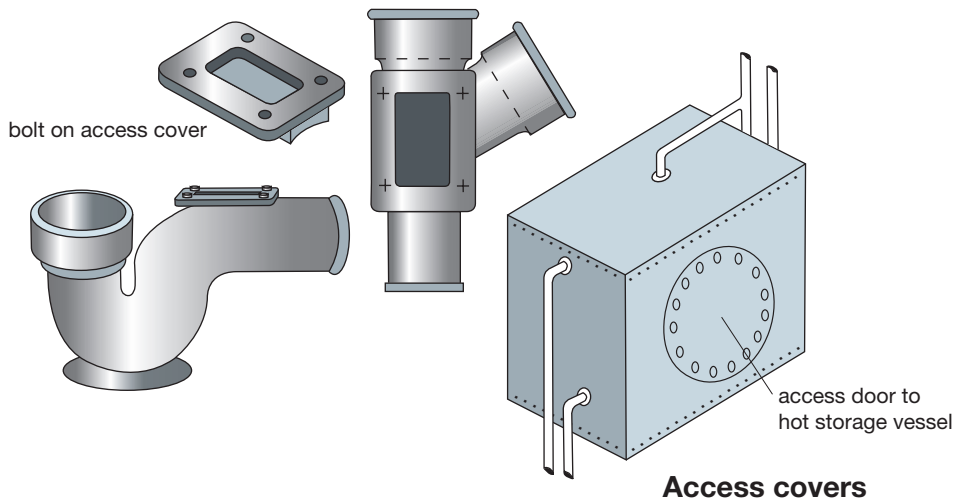
ACCELERATED CIRCULATION

The speeding up, for example of water circulated through a hot water system, by means of a pump.

ACCESS COVER (ACCESS CAP OR PLATE/INSPECTION CAP, EYE)

A bolted on cover used to gain access to the inside of a drain or waste pipe, see ACCESS POINT. An access cover could also be fitted to a hot storage vessel, a boiler, or a flue pipe, etc. for internal inspection.

(See illustration over.)



ACCESS GULLY (INSPECTION GULLY)

A trapped gully which has a rodding point to permit easy cleaning. For example, see GULLY.

ACCESS PANEL

A removable panel set in the side of a wall or floor. Its purpose being to gain access to concealed pipework.

ACCESS POINT

A position where access can be gained for inspection and maintenance to a soil, waste or discharge pipe. All installations should be designed so that all internal pipework is within rodding distance and particular attention should be given to areas where blockages are most likely to occur, such as bends, branch junctions, and changes in gradients such as RAMPS and BACKDROPS. The top of a ventilating pipe is regarded as an access point, as is the removal of a trap. There should always be a rodding eye at the highest point of a drain and no drainage run should exceed 90 metres in length. See also ACCESS COVER.

ACETONE

A solvent used to dissolve acetylene gas to enable the acetylene to be compressed into cylinders for use when welding, etc. Acetone will dissolve and absorb about 25 times its own volume of acetylene gas at atmospheric pressure.

ACETYLENE GAS

A gas used in the oxy-acetylene welding process. Acetylene is produced by bringing calcium carbide into contact with water, when the two meet acetylene gas is given off freely and collected. In its natural state acetylene gas cannot be compressed or pressurised because it is prone to self-detonation and explosion, therefore it must first be dissolved in ACETONE to stabilise it. Acetylene needs to be pressurised in order to be stored and used in cylinders on site. When the acetylene gas has been dissolved in acetone it is often referred to as DA (dissolved acetylene). The cylinders

used are painted a maroon colour for easy identification. It must be noted that the thread into which the regulator screws is left-handed. See WELDING EQUIPMENT.

ACID RAIN

Rain that has fallen through the atmosphere and absorbed the gases present, to include CO₂ and SO₂. Industrial areas burning large volumes of fuel tend to increase the amount of gases within the environment and therefore increase the amount of acid rain. Owing to its high acidic nature, acid rain damages the environment in several ways including damage to trees, freshwater life and the erosion of stone buildings.

ACIDIC

A term used to mean having the properties of an acid. When dry this is of no significance but in the presence of water this property may cause chemical reactions to take place. Few building materials are acidic in nature but some timbers such as oak and red cedar are. When water is said to be acidic it implies that it has a corrosion tendency like 'acid'. Rain water which has fallen through the atmosphere absorbs small amounts of gases such as carbon dioxide and when it reaches the Earth it is no longer pure water but a mixture of water and carbon dioxide, in this state it could be called a weak carbonic acid. This water could then percolate through decaying vegetation and peat, introducing more carbon dioxide thus becoming more acidic and more aggressive to metals. Acidic water is often called SOFT WATER, see also ALKALINE and PH VALUE.

ACRYLIC (PERSPEX)

A THERMOPLASTIC which is extensively used in the manufacture of sanitary appliances. It is very tough and has a good resistance to abrasion.

ACRYLONITRILE BUTADIENE STYRENE (ABS)

A common THERMOPLASTIC material used extensively for small diameter waste and discharge pipes. It can withstand high water temperatures for long periods of time and also retains its strength in cold conditions, unlike PVC (POLYVINYL CHLORIDE). It is distinguished from PVC by the fact that it has a dull matt surface unlike PVC which is shiny, also ABS will burn if ignited, PVC will not.

ACTIVE FLUX See FLUX.

ACTUAL CAPACITY

The volume or capacity of a cistern measured up to the water line. See also NOMINAL CAPACITY.

ACTUATOR

A device that converts an electrical signal into a physical action. For example, the operation of a motorised valve could be triggered in this way. The valve may receive a signal between 0 and 5 V, which in effect corresponds to the fully closed and open positions. Thus a signal of 2.5 V would allow the valve to open only half way. See also COMPENSATOR.

ADAMS SEWAGE EJECTOR See PNEUMATIC EJECTOR.

ADJUSTABLE SPANNER See SPANNER.

ADVENTITIOUS AIR/VENTILATION

Air that enters a building through gaps in doors, floors and window openings. In calculating the size of a VENTILATION GRILLE, adventitious air is taken into account when allowing for a supply of combustion air.

AERATED BURNER

A gas burner which has had air mixed with the gas prior to ignition; the most common example would be a Bunsen burner. The type of burner used for NATURAL GAS should be of this type otherwise the gas will not completely burn and will be unstable and rather smoky. For example, see GAS BURNER.

AERATED FLAME (BUNSEN FLAME)

A flame which burns at the point of combustion when using an AERATED BURNER. The flame tends to be noisy and has a bluish colour. Because air is added to the gas before ignition at the burner jet, it is possible that LIGHT BACK may occur. This can result if the gas velocity is too low.

AEROMATIC CYLINDER

A design of single feed cylinder, see SINGLE FEED HOT WATER SUPPLY.

AGA

A proprietary name for a continuous burning cooker, fuelled usually by either solid fuel or oil. These cookers are popular in rural districts where gas is unavailable; the cooker also provides a hot water supply and limited heating.

AGRÉMENT CERTIFICATE See BRITISH BOARD OF AGRÉMENT.

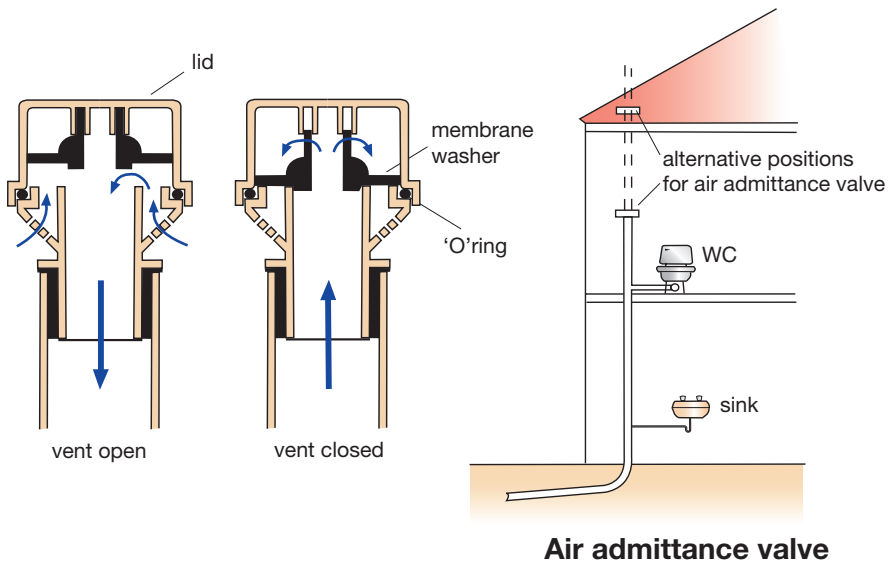
AIR

A mixture of gases that surrounds the Earth forming the atmosphere in which we live.

Composition of air (approximate)	
Gases	Percentage
Nitrogen	78.084
Oxygen	20.946
Argon	0.93
Carbon dioxide	0.04
Helium	
Hydrogen	
Krypton	
Methane	
Neon	
Nitrous oxide	
Xenon	
Water vapour	
Total	100%

AIR ADMITTANCE VALVE

A large valve fitted to the top of ventilating pipes which terminate internally within the building. It is designed to allow fresh air into the pipe but prevents odours from escaping. Air admittance valves should not be used on discharge stacks connecting to a drain which has an INTERCEPTING TRAP or to drains which are subject to SURCHARGING as it could result in the trap seal loss of appliances. There should only be a limited number of dwellings within the local vicinity fitted with these valves thus ensuring a good air circulation within the drain.



AIR BAG STOPPER See INFLATABLE STOPPER.

AIR BLAST BURNER See FORCED DRAUGHT BURNER.

AIR BREAK See AIR GAP.

AIR CHANGE

The rate at which air in a room is changed by ventilation. A good healthy living room condition requires about 17 m³ of air per person per hour. To achieve this, a room requires about two air changes every hour; any more could reduce the heat of the room and cause cold draughts; any less might cause one to feel rather stiff and tired.

AIR COCK See AIR RELEASE VALVE.

AIR COCK KEY (RADIATOR KEY)

A small key used to operate a manually operated AIR RELEASE VALVE.

AIR COMPRESSOR

A machine which is designed to compress air, thus giving it a pressure which can be used as a force to assist in the operation of lifting liquids such as in PNEUMATIC CYLINDERS and EJECTORS. The compressed air can also be used to operate pneumatic power tools or simply used to fill up car tyres.

AIR CONDITIONING

A process in which the air within an environment is monitored to provide the correct temperature, moisture content and air movement to maintain the well being of the occupants or equipment used, such as computer equipment. The air may be either cooled or heated as necessary within an air-handling unit and filtered to remove airborne dust or pollen.

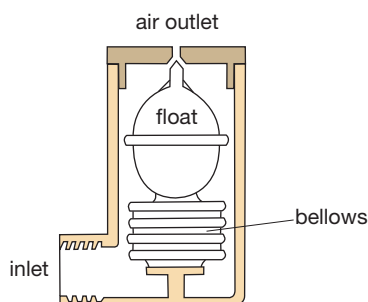
AIR CURTAIN

A system in which a stream of warmed or cooled air is blown directly downwards or across a door opening to prevent any sudden in-rush of un-conditioned air from outside. Air curtains are typically found at the entrances to shops.

AIR CUSHION See AIR VESSEL.

AIR ELIMINATOR

An automatic air release valve fitted in steam heating systems. Should water be present, a float inside the fitting seals off the air outlet; should steam be present, a bellows containing a VOLATILE FLUID expands and likewise seals off the air outlet.



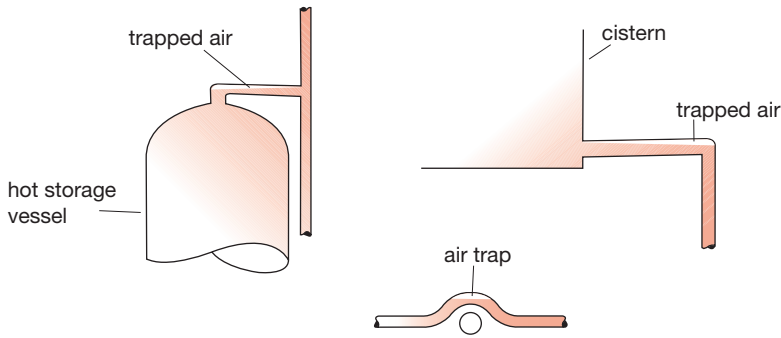
Air eliminator

AIR GAP (AIR BREAK)

The vertical distance between the water inlet or feed pipe to an appliance and the highest possible level the water could rise in that appliance. For example, see BACK-SIPHONAGE.

AIR LOCK

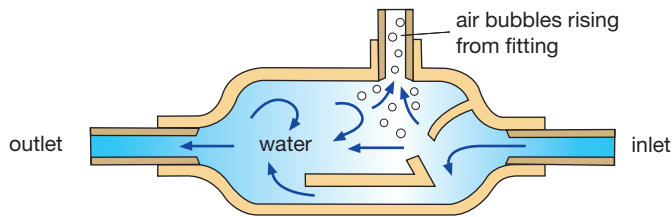
The entrapment of air in a pipe stopping or reducing the flow of water. Air locks are only found in water systems fed via a cold water storage cistern with little pressure and are the result of bad pipework installations. All pipes fed from storage cisterns must be run truly horizontal or with a slight fall allowing the air to escape from the system when filling.



Common causes of air locks

AIR PURGER (AIR SEPARATOR)

As water pushes through a pipe it forms small air bubbles which can cause CAVITATION and air pockets. An air purger is a device which when fitted into the pipeline of a CLOSED CIRCUIT causes turbulence of the water and allows the air to rise to the top of the fitting where it can escape from the system via a vent pipe or an automatic air release valve. See also DE-AERATOR.



Air purger

AIR RELEASE VALVE (AIR COCK)

A manually operated valve used to release trapped air from pipework or vessels. These valves are located in the top of radiators or any high points in low pressure pipework where air might be trapped. The valve is operated by the use of a special air cock key.

AIR SEPARATOR See AIR PURGER.

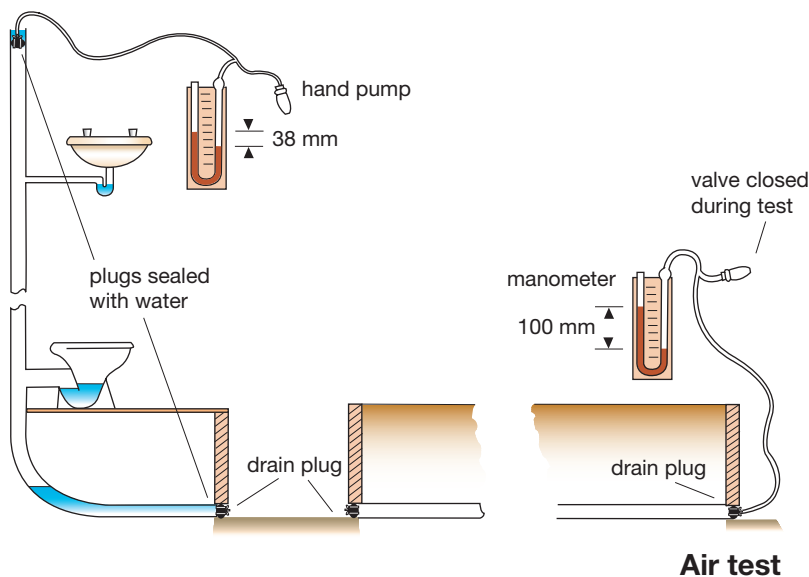
AIR TEST (PNEUMATIC TEST)

For gas installations see TIGHTNESS TESTING.

A pressure test applied to above and below ground drainage installations to check for leaks. An air test will find the smallest of holes therefore it is advisable to test in sections as you install your work to save a lot of time and trouble searching for leaks on completion.

The procedure for testing above ground drainage is as follows: fill all traps and stop up with DRAIN PLUGS any open ends remaining, then seal off the plugs with water; the water will block up the smallest of holes through which air could escape. The MANOMETER should now be connected to the pipework and air is pumped into the system. When the manometer reads 38 mm the hand pump valve is shut off (see sketch), and the pressure should hold for at least three minutes.

For below ground drainage the procedure is very similar except that there are no traps to fill and in most cases it is not possible to seal off the drain plugs with water, due to the pipe being horizontal. Air is now pumped into the pipework until a pressure of 100 mm reads on the gauge. Over a period of five minutes there must not be a pressure drop of more than 25 mm. Should a leak be evident the joints can be smeared with soapy water, which would bubble up as the air is escaping. See also SMOKE TEST and WATER TEST.



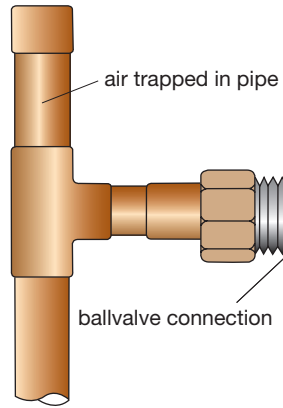
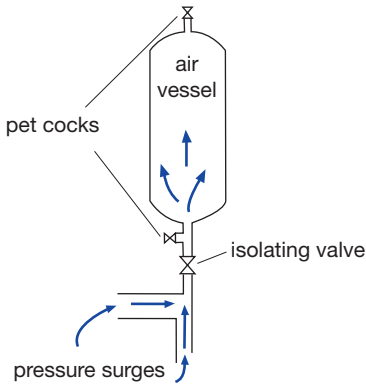
AIR VALVE See AUTOMATIC AIR RELEASE VALVE.

AIR VENT

A non-adjustable grille or duct, that will allow the passage of air at all times. See VENTILATION GRILLE.

AIR VESSEL (AIR CUSHION/SURGE VESSEL)

An enlarged pipe or vessel fitted in a pipeline or on an appliance to overcome problems caused by WATER HAMMER. Shock waves created by pressure surges in water pipes are taken up compressing the air, in the vessel, thus it acts as a cushion. Because water absorbs air, the vessel has to be periodically recharged with air. This is done by turning the isolation valve off and opening the pet cocks draining out the water. It must be noted that if the air vessel is fitted it must be installed in the vertical position, entrapping the air. Also shown in the sketch is a method sometimes employed by plumbers when connecting to a ballvalve in the roofspace; the upstanding pipe traps air to form a cushion. A disadvantage of using an air vessel is that the water which absorbs the air over a period of time can give rise to corrosion problems. Another method which does not allow gases to be absorbed by the water but basically works on the same principle is a HYDROPNEUMATIC ACCUMULATOR. An air vessel will also be found on the delivery side of a LIFT or FORCE PUMP to absorb the force of the lifting action of pumping.



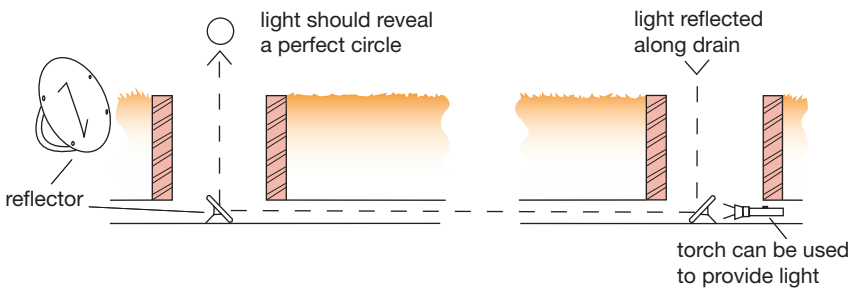
Types of air vessels

ALDEHYDES

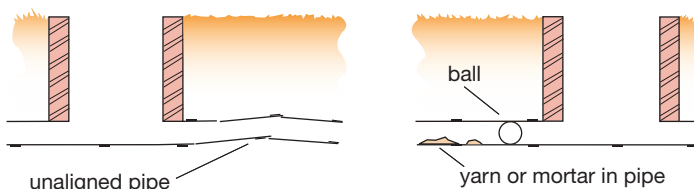
A gas produced as the result of incomplete combustion of fuel. Aldehydes are basically oxidised alcohol and, when present within the atmosphere due to SPILLAGE of combustion products, cause irritation to the eyes.

ALIGNMENT TEST

A test to inspect drains for internal obstructions. One of the most common tests is the reflection test in which a light is reflected along the drain; the internal bore can be inspected by looking in another reflector placed further along the drain. Another test is the obstruction test in which a ball, 13 mm smaller than the diameter of the pipe, is inserted into the pipeline, in the absence of any obstruction it should roll freely down the INVERT of the drain.



Reflection test



Obstruction test

ALKALINE

A term used to mean having the properties of an alkali. When dry this is of no significance but in the presence of water this property may cause chemical reactions to take place. Alkaline building materials include cement and lime. When water is said to be alkaline, it means that it contains calcium bicarbonate, calcium sulphate and magnesium sulphate and is often referred to as **HARD WATER**. When rain water, which contains dissolved carbon dioxide, falls upon and soaks into soils containing limestone or chalk, the lime or chalk is dissolved and taken into suspension. See **TEMPORARY HARD WATER** and **PERMANENT HARD WATER**. Alkaline waters are not as aggressively corrosive as **ACIDIC** waters.

ALLEN KEY

A small hexagonal steel rod used as a tool to turn the recessed hexagonal head found in an 'Allen screw'. Generally these tools are supplied as a set to cover a range of sizes.

ALLOY

An alloy is a mixture of two or more metals or a metal mixed with a non-metallic element.

Some common alloys

Alloy	Components
Brass	Zinc and copper
Bronze	Copper and tin
Cast iron	Iron and 2–4% carbon
Gunmetal	Copper, tin and zinc
Mild steel	Iron and approx. 0.2% carbon
Pewter	Tin and lead
Solder	Lead and tin
Solder (lead free)	Tin and copper
Solder (lead free)	Tin and silver
Solder (lead free)	Tin and antimony
Stainless steel	Iron, chromium and nickel

ALTERNATING CURRENT (AC)

An electrical charge that changes direction of the electron flow from positive to negative, to positive again, etc. continually, unlike in a direct current (DC) where they always pass from positive to negative. In the UK this change of direction occurs at a rate of approximately 50 times per second (50 hertz). An alternating current is produced by a coil of wire rotating between the poles of a permanent magnet such as that found in an alternator at a power station. Direct current, on the other hand, is produced by items such as batteries, **THERMOCOUPLES** or dynamos.

ALTITUDE GAUGE

A gauge fitted on boilers of the larger type of central heating system to show the **HEAD** of water in metres. For an example of its workings see **BOURDON PRESSURE GAUGE**.



ALUMINIUM

A NON-FERROUS METAL produced for many uses, a plumber is most likely to come across it in sheet form. See also ALUMINIUM SHEET AND ROOF COVERINGS.

Chemical symbol	Al
Colour	bluish-white
Melting point	660°C
Boiling point	2467°C
Coefficient of linear expansion	0.0000234/°C
Density	2705 kg/m ³

ALUMINIUM SHEET AND ROOF COVERINGS

Sheet aluminium can be obtained in rolls with various widths ranging from 150 mm–900 mm. There are various thicknesses of the material available between 0.6 mm and 1 mm. Only two grades of aluminium are available for roofwork: super purity which contains 99.9% aluminium and commercial purity which contains 99% aluminium, the rest being made up of other elements. Aluminium has similar working properties to those of copper and in general aluminium roof details would be carried out along the same lines as those for COPPER SHEET AND ROOF COVERINGS. Aluminium does not CREEP but will become WORK HARDENED if COLD WORKED too much.

ALUMINIUM WELDING

To produce a good quality and well-contoured aluminium, weld cleanliness is essential. Aluminium melts at 660°C but the aluminium OXIDE which is present on its surface melts at 3000°C, therefore it is important to remove this film thoroughly with a wire brush and if necessary a degreasing fluid. When welding, a special BORAX and SILICON flux is required to dissolve and prevent any more oxide forming on the surface, making welding impossible. When welding aluminium the LEFT-WARD WELDING TECHNIQUE should be adopted and the blowpipe should produce a very slight CARBONISING FLAME. The work should be fully supported to prevent the molten metal falling away from the joint. To weld material 3 mm thick and over, the joint should be ‘veed’ to an angle of about 85° in order to give good penetration. The filler rods used are aluminium or an aluminium ALLOY with or without silicon. To weld aluminium successfully the TUNGSTEN INERT GAS WELDING approach is often adopted, which uses a gas shield to protect the surface from OXIDATION. See also VERTICAL WELDING.

AMBIENT AIR

The surrounding air.

AMMETER See MULTI-METER.

AMPERE (AMP)

The unit used to measure the amount of electrical current flowing through a conductor.

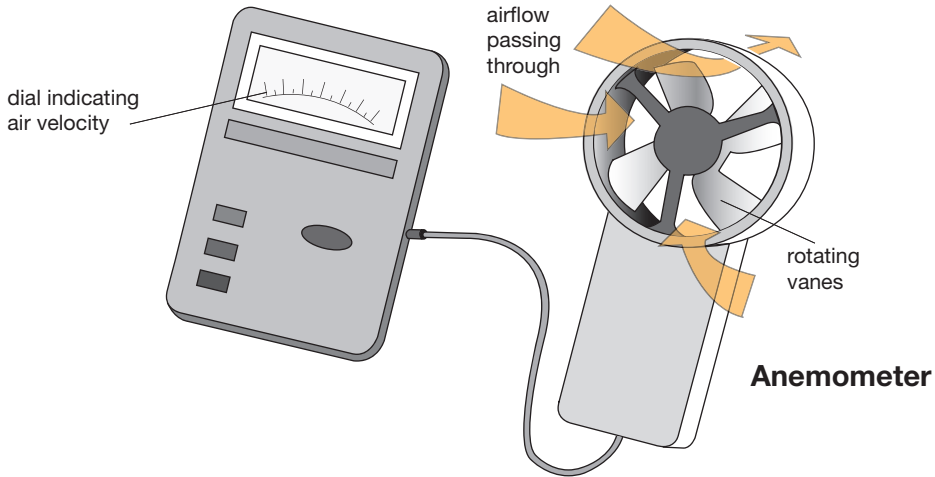
$$\text{amperes} = \text{WATTS divided by VOLTS}$$

ANACONDA See SEMI-RIGID STAINLESS STEEL.

ANCHOR BRACKET See PIPE SUPPORT.

ANEMOMETER

A device used to measure the velocity of airflow. A simple anemometer consists of a set of rotating vanes that, via a set of gears, conveys the air speed to a dial measuring in m/s.



ANEROID GAUGE

A gauge designed to measure gas pressures within a pipeline up to a pressure of approximately 300 mbar (aneroid means 'not liquid'). The gauge consists of a small flexible bellows that expands and contracts in response to the pressure within the supply. The movement of the bellows is transferred through a lever to a pointer that registers on a scale.

ANGLE BASIN (CORNER BASIN) See WASH BASIN.

ANGLE BRANCH

 (SPLAY BRANCH)

A branch in which the pipe or channel joins the main run of pipe at an angle of less than 90°. See BRANCH for example.

ANGLE WELDED JOINT

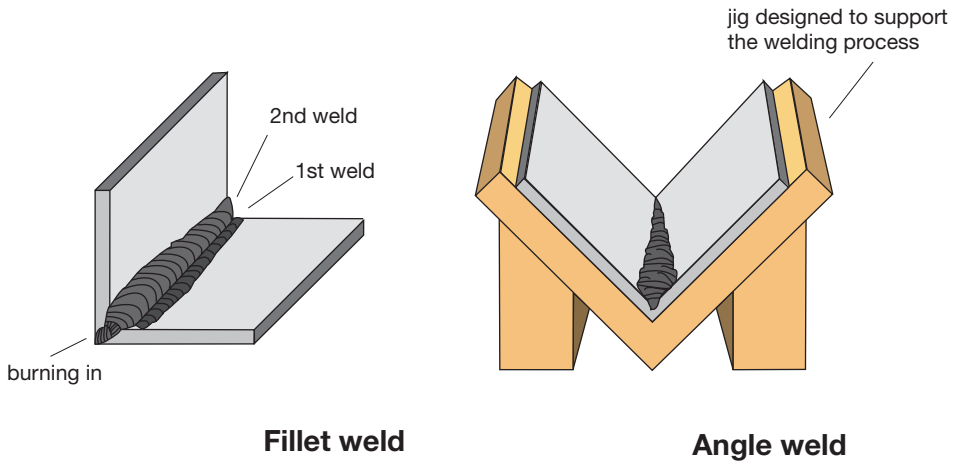
 (FOR LEAD)

The welding of two sheets of lead lying at different angles. The weld is achieved by first fusing the two surfaces together (burning in) not using any filler rod, then applying two reinforcing welds. Where one sheet is in the vertical position (sometimes known as fillet welding) care must be taken to avoid UNDERCUTTING the metal and if at all possible it is easier to incline the work supporting it in a jig as shown. See also LEAD WELDING.

(See illustration opposite)

ANNEALING

The treatment of a metal or alloy to reduce its brittleness and improve ductility. Annealing is often referred to as softening of a metal. If a metal becomes WORK



HARDENED it may require softening before work is continued, otherwise it might fracture. Annealing is achieved by the application of heat. All metals are annealed at different temperatures and a method of gauging when the correct temperature is achieved is described below.

Annealing of metals

Aluminium	Heat until when a matchstick is drawn across the surface of the metal it leaves a charcoal line.
Copper	Heat until a dull red colour is seen then allow the metal to cool or quench it in cold water.
Iron	Heat to a cherry red colour, then allow it to cool slowly.
Lead	Heat the metal for a short period then 'spit' on it, if the spittle is seen to fly off the lead it is fully annealed, but if it just bubbles on the surface the right temperature has not yet been achieved.
Zinc	Heat until the metal is warm to the touch. Do not overheat.

ANNULAR SPACE

The void between two pipes or surfaces, such as that found between the walls of a twin walled flue pipe or between a flue lining and the chimney. See also ANNULUS.

ANNULUS

- (1) A type of HEAT EXCHANGER fitted inside a hot storage vessel. For example, see INDIRECT CYLINDER.
- (2) The space between two concentric circles (circles with the same centre but with different diameters).

ANODE

A metal which would be destroyed by a cathode in ELECTROLYTIC CORROSION. Copper would be an anode to silver whereas it would be a cathode to aluminium, see ELECTROMOTIVE SERIES.

ANODISING

A process in which a protective metal OXIDE coating has been applied to the surface of metals such as aluminium or magnesium in order to give CATHODIC PROTECTION. See also SHERADISING.

ANTHRACITE (HARD COAL)

A SOLID FUEL which consists of a black hard coal, representing the final product of the natural coal-forming process within the ground. Anthracite burns at a relatively slow speed with a pale-blue flame and intense heat but produces very little smoke. It is, therefore, particularly suitable for domestic use. Anthracite is sometimes mixed with the more bituminous coals to reduce smoke production.

ANTI-CAPILLARY GROOVE or **GAP** (CAPILLARY GROOVE)

A groove or gap which has been cut into the vertical timber face of a lead drip to prevent CAPILLARY ATTRACTION from taking place resulting in water possibly entering the building. For example, see LEAD SHEET AND ROOF COVERINGS.

ANTI-CORROSIVE BANDAGE

A wrap round protective tape used on underground pipes to protect them from CORROSION. The bandage is made from cotton or hessian impregnated with petroleum jelly. 'Denzo tape' is a well-known trade name for this type of wrapping.

ANTI-DRAUGHT FLAP (DRAUGHT FLAP)

A flap which is sometimes found fixed to the end of overflow and warning pipes to prevent cold draughts from blowing up the pipe into the building and storage cistern. The flap is usually made of copper and soldered to copper overflows. The biggest problem with these devices is due to continued coats of paint, with lack of use they become seized up and block up the pipe. With the introduction of plastic pipe these flaps are now rarely fitted. To prevent draughts from blowing up the overflow pipe it is a requirement to turn the overflow pipe down into the water at its connection to the storage cistern.

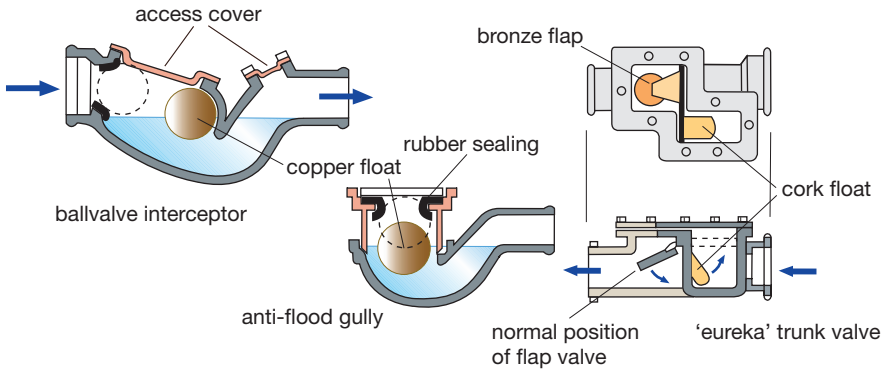
ANTI-FLOOD INTERCEPTOR See ANTI-FLOOD VALVE.**ANTI-FLOOD VALVE**

A drainage fitting designed to prevent SURCHARGING of the drain. Anti-flood valves are often only recommended for use with SURFACE WATER drains. With the ball type shown, when backflow or surcharging occurs the ball rises up to the underside of the access cover until it finally sits into the rubber seating, preventing any further flow in either direction until the flood water subsides. With the trunk valve any backflow causes the float to rise, thus turning the flap valve to close.

(See illustration opposite)

ANTI-FLOODING GULLY (TIDAL GULLY)

A gully fitted with a ball which floats and blocks its inlet should SURCHARGING of the drain occur. See ANTI-FLOOD VALVE.



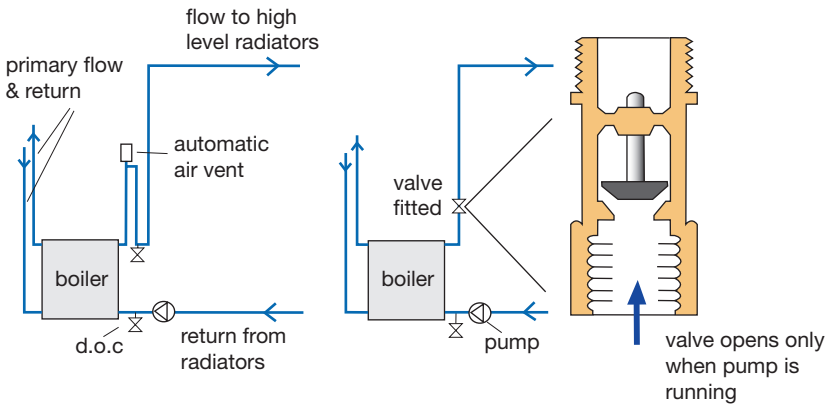
Anti-flood valves

ANTI-GRAVITY LOOP

A pipe which runs up vertically to a minimum height of one metre then down again, sometimes fitted in a non-circulating pipe to overcome the problems of unwanted GRAVITY OF ONE PIPE CIRCULATION. At the top of the loop an automatic air release valve should be fitted to let out any trapped air.

ANTI-GRAVITY VALVE

A valve fitted vertically in the pipeline, designed to overcome unwanted GRAVITY CIRCULATION in central heating pipes. During the summer months when the boiler is used to heat the domestic hot water the radiators will sometimes get hot due to gravity circulation; by fitting an anti-gravity valve in the flow pipe to the radiators this problem can be overcome. The valve will only open when pressure is created by a pump. The pressure exerted by CONVECTION CURRENTS is insufficient to cause the valve to lift, see sketch.



Anti-gravity loop

Anti-gravity valve

ANTI-LEGIONELLA VALVE

A special valve sometimes found installed on the inlet pipe to an expansion vessel. It is designed to ensure that fresh water is drawn into the vessel as it enters the system, rather than the existing system water, thereby minimising the possibility of bacteriological growth within the vessel itself.

ANTIMONY

A silvery white-coloured metal which expands slightly when it solidifies. It is used in some lead/tin solders to give the joint a certain degree of hardness. It also makes the joint more resistant to corrosion.

ANTI-SIPHON PIPE See TRAP VENTILATING PIPE.

ANTI-SIPHON TRAP See RESEALING TRAP.

ANTI-SPLASH FLOOR CHANNEL

A block channel designed to overcome the problems of spillage over its edges. The cross-section of its waterway is more than half a circle, for example, see URINAL.

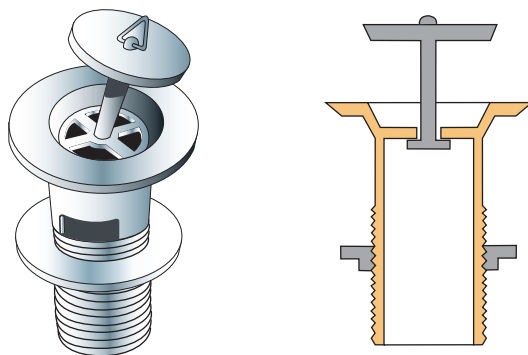
ANTI-SPLASH RAINWATER SHOE See RAINWATER SHOE.

ANTI-SUCTION VALVE

A valve sometimes found fitted to the inlet to a gas compressor. It is designed to cut off the supply of gas should the pressure within the pipeline fall to a set amount above ATMOSPHERIC PRESSURE, one purpose being to prevent the gas meter imploding should the suction be too great. Today these valves are generally being superseded by pressure switches, which close some form of SAFETY SHUT OFF VALVE.

ANTI-THEFT WASTE PLUG (CAPTIVE PLUG)

A waste fitting designed so that the plug cannot be completely removed.

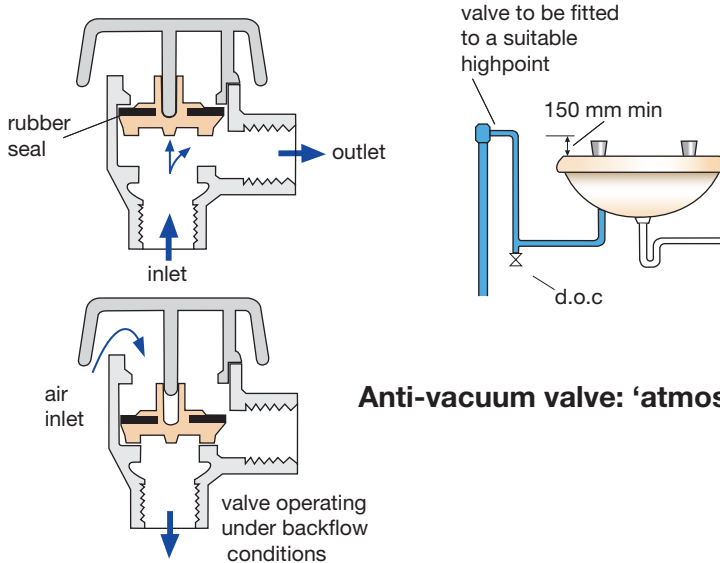


Anti-theft waste plug

ANTI-VACUUM VALVE (VACUUM BREAKER)

A valve designed to open a pipe to ATMOSPHERIC PRESSURE should the pressure within the pipe line drop, to below that created by the atmosphere, see sketch. There are basically two types of anti-vacuum valves; the 'atmospheric' type which opens by the force caused by atmospheric pressure and the spring loaded 'pressure' type. Anti-vacuum valves can be of assistance to overcome problems such as BACK-SIPHONAGE, and would be fitted downstream to a CHECKVALVE. Should there be a negative pressure within the pipe the valve would open admitting air, thus breaking

the SIPHONIC ACTION. Anti-vacuum valves, when fitted, must be installed at a suitable highpoint at least 150 mm above the highest possible contaminated water level. In addition to being fitted to pipes and on vessels anti-vacuum valves are also used on appliances such as some types of RE-SEALING TRAPS.



ANTI-VIBRATION MOUNTINGS

Devices, usually made of rubber, that are designed to prevent the transfer of noise and movement from plant such as motors or pumps.

APPLIANCE SHUT OFF DEVICE

Term sometimes used referring to an ISOLATION VALVE located next to an appliance to facilitate turning off the gas or water supply.

APPRENTICESHIP

An agreement (known as an indenture) between an employer and an employee in which the employee agrees to work under a skilled craftsman on reduced pay for a number of years on the condition that the employer teaches him/her a craft.

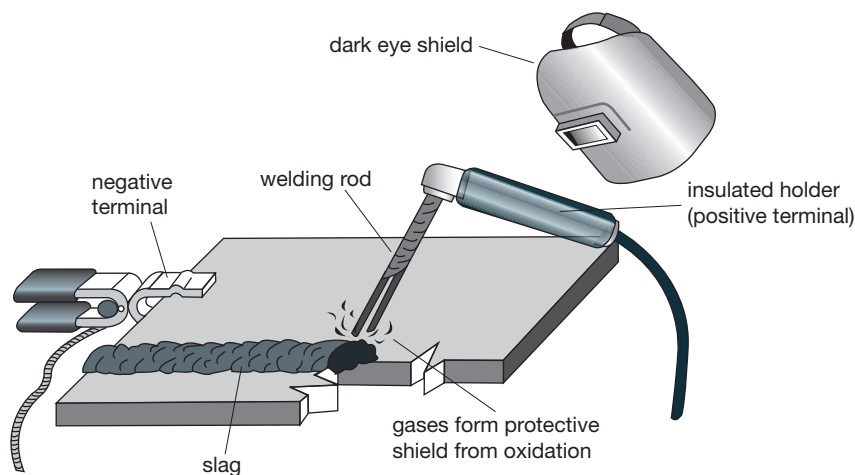
APRON FLASHING

A COVER FLASHING which lays out over a sloped roof structure as it meets an ABUTMENT. It is designed to prevent the entry of water into the building. For example, see CHIMNEY FLASHING.

ARC WELDING

A method of welding metals by using a heat source which is generated by an electric current made to 'arc' across from a positive to a negative terminal. Arc welding is carried out by first connecting the negative terminal to the work to be welded, then a welding rod (welding electrode) is fixed into the insulated electrode holder which is the positive terminal. When the welding rod is brought down to a close proximity to

the work to be welded, an electric current arcs across the two and fuses, welding the joint. The welding rod has a special coating which shields the molten metal from OXIDATION during welding. This coating burns to form a slag which is less dense than the molten metal and thus floats to the surface. As the weld cools the slag solidifies and is easily chipped off. Once one has mastered the art of maintaining the correct gap the process of welding is quite easy to carry out. As a safety precaution always use the correct eye shield with this type of welding as the intensely bright flame can burn your eyes. See also TUNGSTEN INERT GAS WELDING and METAL ARC GAS SHIELDED WELDING.



Arc welding

ARGON ARC WELDING See TUNGSTEN INERT GAS WELDING.

ARTESIAN WELL

A well or borehole driven through the impervious strata of the Earth's surface into strata that receives water from a higher level than the well. With a true artesian well there is sufficient pressure of water to force the water flow up the well without the need for any pumping arrangement. See WATER TABLE and WATER CYCLE.

ASBESTOS

Fibrous material used in the form of cloth and rope or mixed with cement to form asbestos/cement pipes, cisterns and sheets. It is highly resistant to heat and was often used in the manufacture of flue pipes and fittings. The use of asbestos can be detrimental to health, therefore precautions should be taken when working with it.

For a comprehensive guide to working with asbestos, referral should be made to the *Asbestos Regulations* (HMSO), but as a general guide one should at least observe the following basic precautions:

- (1) Avoid making dust and breathing it in. This can be achieved by dampening the material.
- (2) Do all the cutting of material outside.
- (3) Upon completion, change clothes and wash or shower as necessary.

ASBESTOS CEMENT

A mixture of cement and about 10% asbestos fibre. See ASBESTOS.

ASBESTOS-CEMENT CORD (PC4)

Jointing material which was sometimes used to join large diameter socketed drainage pipes, it was packed into the joints in a wet condition to bring about the chemical reaction needed to unite the asbestos fibres with the cement.

ASBESTOS CEMENT PIPES

A material once used for drainage and large diameter water mains pipework. It comes in long lengths and thus reduces the amount of joints required. Some soils tend to be aggressive to this material and destroy it, therefore protection of the pipe may be required. Asbestos cement pipes were also used for flue pipes to some gas appliances in which case socket and spigot joints are used, the joint being made with fire cement and the socket fitted uppermost, see FLUE PIPES.

ASBESTOS MAT

A specially designed piece of matting used to pass around pipes when making joints which require a flame. The mat protects the decorations, other pipework or more flammable material which might come into contact with the flame.

ASCENDING SPRAY (DOUCHE SPRAY)

A rose which sprays upwards, unlike shower roses which spray water downwards. Ascending sprays are found in sanitary appliances such as BIDETS and EYE WASH FOUNTAINS.

ASIATIC CLOSET (ASIAN CLOSET) See SQUATTING WC PAN.

ASTRAGAL JOINT

A socketed joint used on lead rainwater and discharge pipes which incorporates an ornamental moulding called an astragal.

ATMOSPHERE

The envelope of gases and vapour, surrounding the Earth. See ATMOSPHERIC PRESSURE.

ATMOSPHERE SENSING DEVICE (ASD)

A device that senses the condition of the atmosphere in order to determine whether it is safe to allow the continued operation of a gas burner. Should continued spillage be occurring with an open flued gas burning appliance, the environment would eventually lack oxygen (i.e. become vitiated) and CARBON MONOXIDE would be produced leading to the possible death of the occupants of the room.

Two types of ASD are found:

- (1) Those that sense the temperature of the area around the draught diverter. Where spillage occurs a THERMISTER positioned there becomes hot and breaks the electrical circuit, usually via a THERMOCOUPLE INTERRUPTER.
- (2) Those that detect vitiated air. These cause the pilot flame to burn incorrectly and away from the thermocouple tip. Hence it cools and the THERMOELECTRIC VALVE closes.

ATMOSPHERIC BURNER (NATURAL DRAUGHT BURNER)

A burner design that obtains all the primary and secondary air that is used for combustion directly from the atmosphere, drawing in the air due by natural means. These are unlike those burners in which an electric fan is used to suck and blow in the air; these are referred to as FORCED DRAUGHT BURNERS.

ATMOSPHERIC CORROSION

Corrosion caused by the gases and moisture in the atmosphere. FERROUS METALS corrode by rusting. This is a reaction brought about by the oxygen in the air combining with the metal to form an oxide coating commonly called rust. Rust falls away exposing fresh metal underneath and the process continues until it rusts away completely. NON-FERROUS METALS are attacked by such gases as sulphur dioxide and carbon dioxide, which are present in the air, but the film which forms on the surface of non-ferrous metals does not flake off like rust, instead it tends to protect the metal from further corrosion. In areas around factories and towns corrosion is much more of a problem than in country areas, because of the increased level of gases, such as sulphur dioxide, in the atmosphere. Along the coastline where there is a lot of salt in the air aluminium should not be used, as the rain water would tend to be a strong alkali which destroys this metal.

ATMOSPHERIC PRESSURE

The pressure created by the weight of the atmosphere pushing down on to the Earth. The pressure at the top of a mountain is different from that in a valley below sea level. The pressure created at sea level would be 101.3 kilonewtons per metre squared (101.3 kN/m²).

ATOM

The smallest chemical particle into which a substance can be divided. An atom, however, is made up of smaller parts, namely a central nucleus and electrons that orbit around it. See also MOLECULE and CONDUCTOR.

ATOMISATION

The break-up of a liquid into a fine spray. It is generally brought about by passing the liquid through a small hole under pressure. See ATOMISING BURNER.

ATOMISING BURNER

A burner jet used on oil fired boilers. Basically the burner works on the principle of breaking up the oil into a very fine misty spray (atomisation) which can be ignited by an electrode. The more common type of atomising burner is the pressure jet type, for example, see PRESSURE JET BURNER. See also VAPORISING BURNER.

AUGER (PIPE GOUGE/SCALLOPE)

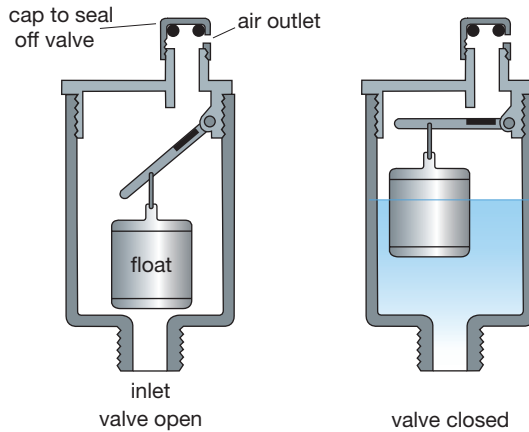
A tool which has a conical shaped cutting edge and is used to make holes in lead sheet and pipe; for example, see GIMLET. See also DRAIN AUGER.

AUTOGENOUS WELDING

A welding process in which the two surfaces being welded are of the same material; the filler rod, if used, is also of the same material. A prime example would be LEAD WELDING.

AUTOMATIC AIR RELEASE VALVE (AUTOMATIC VENT)

A valve designed to discharge air from and admit air into a water pipe, sometimes fitted to a high point on a low pressure plumbing system to overcome the problem of an AIR LOCK. The type shown works on the principle that should water be evident in the pipe the float would rise due to its buoyancy and seal off the opening. See also AIR ELIMINATOR.



Automatic air release valve

AUTOMATIC BYPASS

A device that opens or closes automatically depending upon the pressure build-up within a fully pumped central heating system. As the motorised valves or thermostatic radiator valves (TRVs) close, the pressure within the pipework would increase, causing the spring-loaded valve to open, thereby maintaining the correct water flow rate through the boiler and minimising noise build-up.

AUTOMATIC CHANGE-OVER VALVE See REGULATOR.**AUTOMATIC FLOW CUT OFF DEVICE**

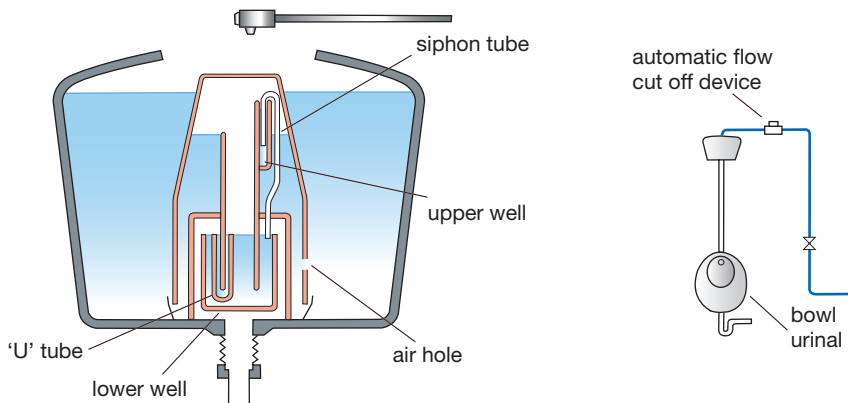
A valve fitted in the pipe line to automatically shut down the flow of water. Such a device could be either an electrically operated **MOTORISED VALVE**, being controlled from a time clock, or the valve could work only when the pressure builds up in the pipeline, such as a **HYDRAULICALLY OPERATED VALVE** which might be used to conserve water feeding an **AUTOMATIC FLUSHING CISTERN**.

AUTOMATIC FLUSHING CISTERN

A flushing cistern designed to discharge its contents of water at regular intervals into a urinal. The rate at which the water will flush depends upon the rate at which the water is fed into the cistern and for a single installation this should not exceed ten litres per hour. To prevent wastage of water from these cisterns, during times when the cistern is not used such as at weekends, an **AUTOMATIC FLOW CUT OFF DEVICE** should be fitted. See also **DISC FEED**.

The automatic flushing cistern shown operates as follows:

- (1) The water upon filling rises equally inside and outside the siphon until the air hole is reached.
- (2) As the water rises the air is trapped inside the dome thus becoming compressed and eventually, when enough pressure is created, the water is forced out of the 'U' tube and the air pressure inside the dome becomes reduced.
- (3) The reduced air pressure immediately allows SIPHONIC ACTION to start, thus flushing the appliance.
- (4) When the flush is finished, the water in the upper well is siphoned out through the siphon tube and refills the lower well and 'U' tube.



Automatic flushing cistern

AUTOMATIC FLUSHING TANK

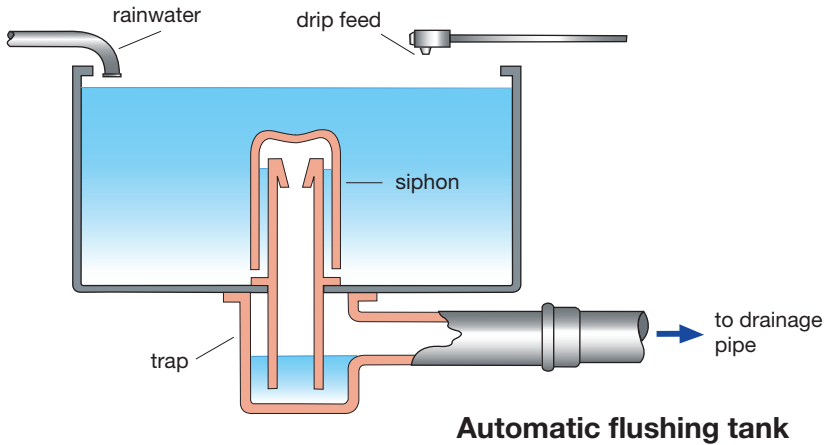
A vessel used to hold a quantity of water which is periodically discharged into a system of drains giving them a good flush through. They are used on drainage systems which do not have a sufficient fall to give them the required self-cleansing gradient. The tank is supplied via a drip feed from the water authorities main, or, if accessible, rainwater, which is free from foreign matter and will not block up the siphon. The automatic flushing tank works as follows:

- (1) The water upon filling rises up inside the tank and compresses the air inside the 'bell'.
- (2) When the water rises to a certain height it creates enough pressure to force the water out of the water trap. Air is then forced out allowing SIPHONIC ACTION to start immediately.
- (3) As the water level falls to the bottom of the bell, air is admitted and breaks the siphonic action.

(See illustration opposite)

AUTOMATIC PNEUMATIC COLD WATER SUPPLY

A system of cold water supply to a high rise building above the height to which the water main will travel. In this system water is pumped to the highest point. During



the on/off cycles of pumping an AUTOMATIC PNEUMATIC CYLINDER is used to give a constant pressure to all appliances and draw off points (see sketch). See also BOOSTED SYSTEM OF COLD WATER SUPPLY.

AUTOMATIC PNEUMATIC CYLINDER

A specially designed cylinder or tank used to give a constant pressure to the cold water supply in high rise buildings during the on/off cycles of pumping. Water is pumped into the bottom of the cylinder and compresses the air inside; when the water has filled to a predetermined level the pump switches off. The compressed air now acts as a force to push the water back out of the cylinder as it is required at the draw off points. Eventually the water level inside the cylinder falls to such a level that the pressure switch cuts in the pump to switch on again, re-pressurising the cylinder. After a period of use, some of the air inside the cylinder becomes absorbed into the water and therefore has to be replaced. This is achieved by an air compressor switching on when the water is at its highest level, as indicated by the FLOAT SWITCH. The compressor continues to run until the required air volume has been achieved. Modern systems employ the use of a large rubber bag into which the water flows. This separates the water from the air and thus prevents the air from being absorbed which also results in the compressor no longer being required. To conserve the air pressure inside the cylinder, a DELAYED ACTION BALLVALVE is fitted in the storage cisterns; this also reduces the frequency of pumping. See also AUTOMATIC PNEUMATIC COLD WATER SUPPLY.

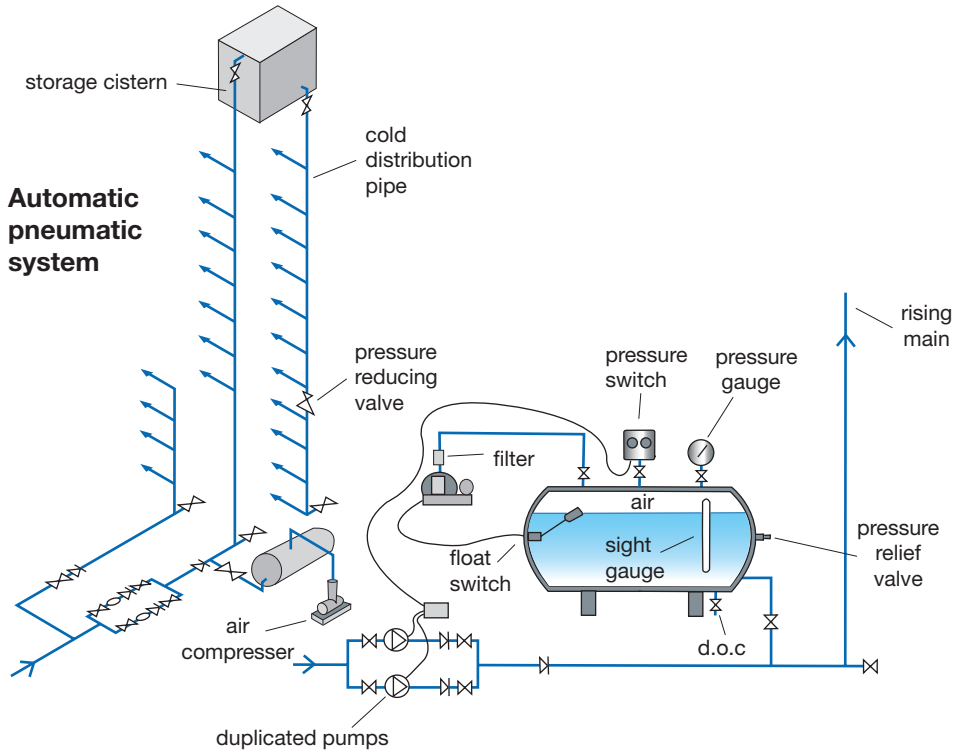
(See illustration over.)

AUTOMATIC VENT See AUTOMATIC AIR RELEASE VALVE.

AUXILIARY CIRCULATORS

A method of installing an alternative means of heating the domestic hot water supply during the summer months. During the winter the water could be heated by a BACK BOILER and during the summer it could be heated by a GAS CIRCULATOR.

AUXILIARY TANK See SUPPLEMENTARY STORAGE SYSTEM.



Automatic pneumatic cylinder

AXIAL FLOW FAN

A fan in which the impeller fins are connected directly on to the drive shaft of the motor, which in effect means that the air flow passes over the motor which is parallel to the axis of the fan. An example will be seen under the entry of CENTRIFUGAL FAN.