Welder – Transparencies

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Welder – Transparencies

CENTRAL INSTRUCTIONAL
MEDIA INSTITUTE, MADRAS

AN INDO – GERMAN PROJECT

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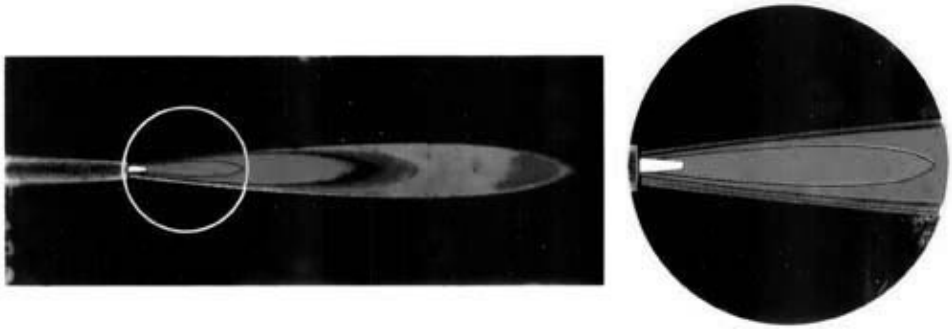
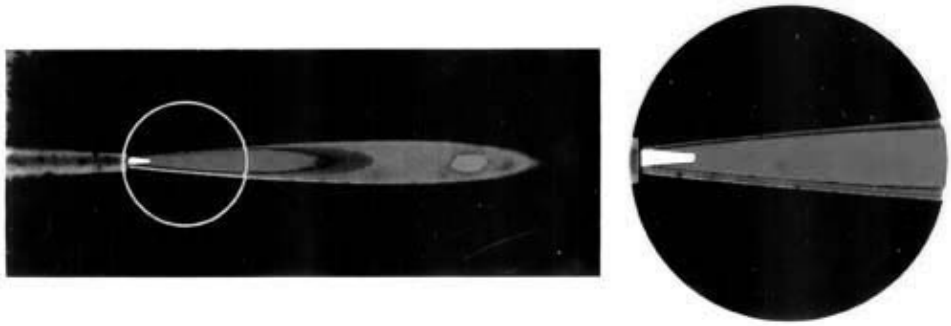
Types of Oxy–acetylene flame

TR 03 01 11 01 95



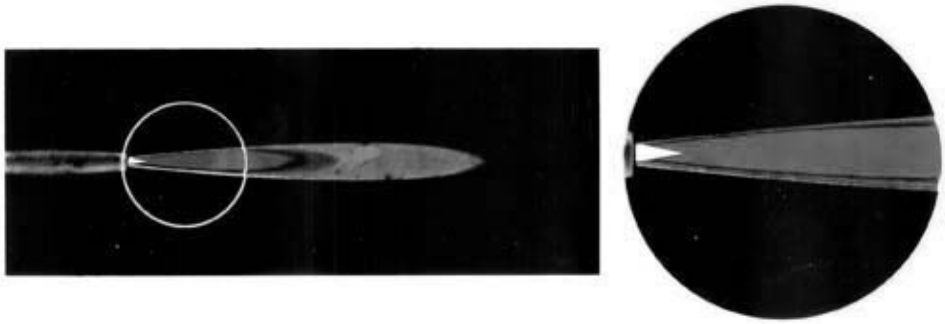
CARBURISING FLAME

Application: Acetylene is proportionally more, useful for stelliting (hard facing).



NEUTRAL FLAME

Application: Both Oxygen and Acetylene are mixed in equal proposition, useful for mild steel, cast iron, stainless steel, copper, and aluminium.

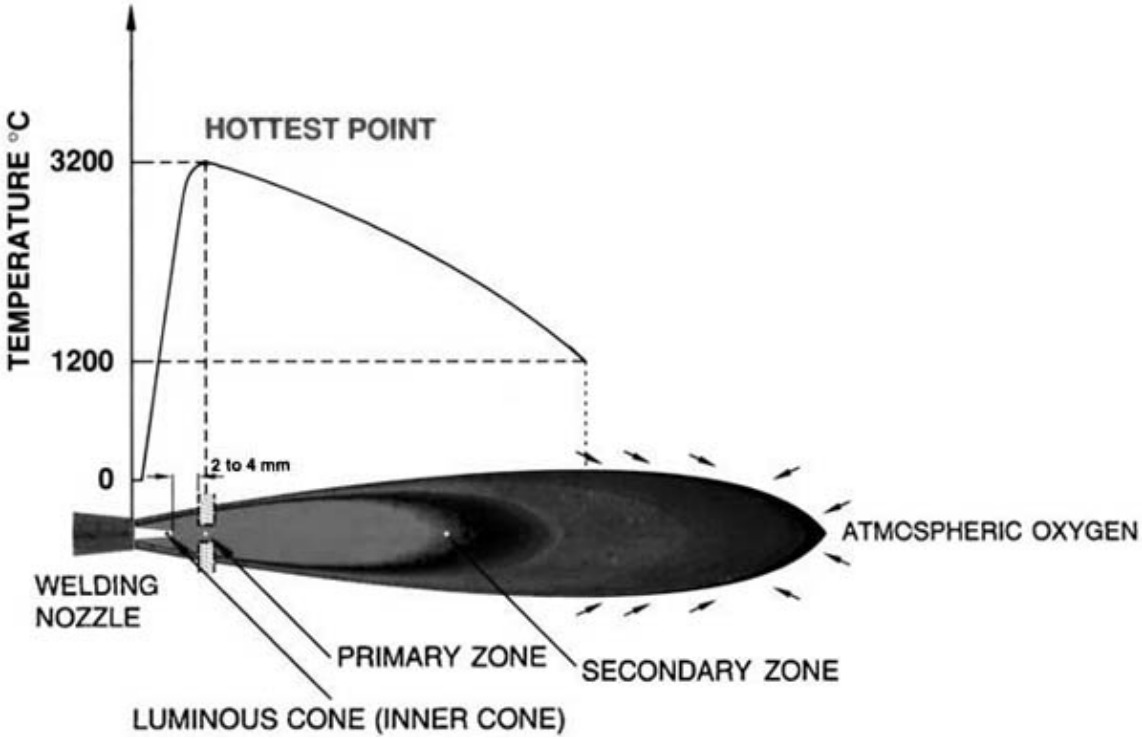


OXIDISING FLAME

Application: Oxygen is proportionally more, useful for welding of brass and brazing of ferrous metals.

Chemistry of Oxygen – Acetylene flame

TR 03 01 11 02 95



The temperature is varying at different zones of the flame.

The hottest zone being 2–4 mm away from the inner cone.

Influence of discharge velocity and amount of heat

TR 03 01 11 03 95

DISCHARGE VELOCITY AND AMOUNT OF HEAT

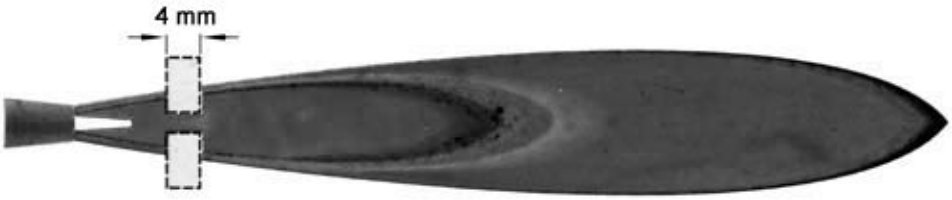
Low – (Soft Flame)

• For soft flame the discharge velocity is low – it is suitable to weld up to 2 mm thickness.

DISCHARGE VELOCITY AND AMOUNT OF HEAT

Medium – (Medium flame)

• For medium flame the discharge velocity is also medium – it is suitable to weld up to 3 mm thickness.



DISCHARGE VELOCITY AND AMOUNT OF HEAT

High – (Hard Flame)

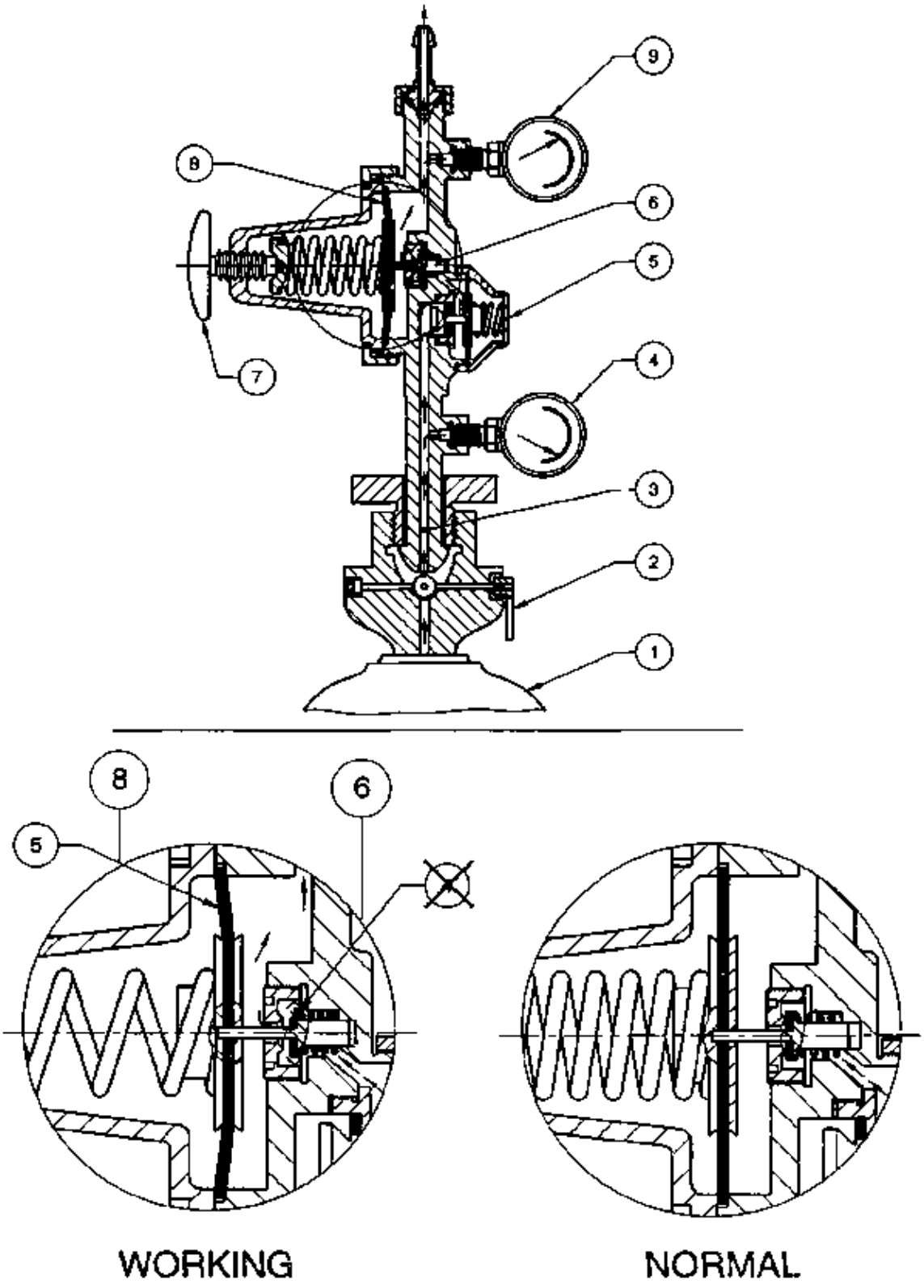
• For hard flame the discharge velocity is high – it is suitable to weld up to 4 mm thickness.

NOTE:

The size of the nozzle being same the velocity and heat can be varied.

Double stage regulator (Function)

TR 03 01 11 04 95



The regulator is fitted on cylinder (1) after removing dust particles from the socket of the cylinder – use the cylinder key (2) open. After opening the cylinder gas enters in regulator passage (3) and gas passes through the cylinder content gauge (4) and reaches stage one pressure reduction mechanism (5). The gas flow is stopped at valve (6). The volume of gas required for welding is adjusted by controlling the screw knob (7). By the actuation of the knob (7) the diaphragm (8) is bent and gas enters through valve (6) to the working pressure gauge (9) and hose pipe

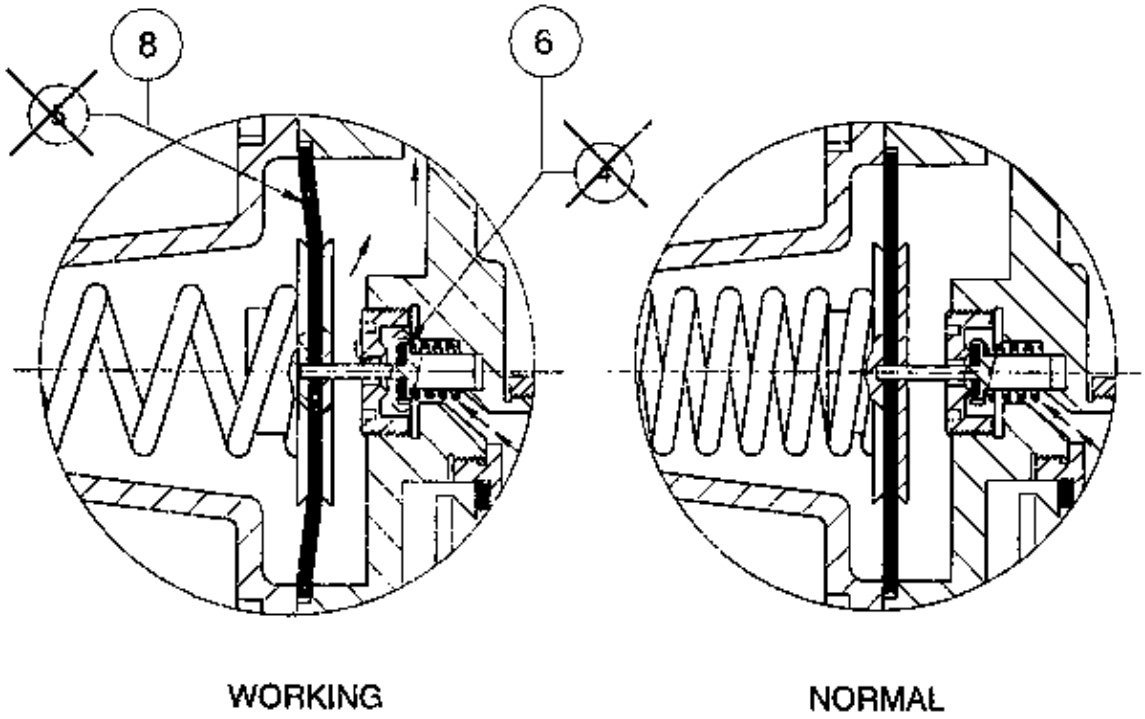
NOTE:

- Use this key for the transparency on double stage regulator and diaphragm (function).
- Note also the correction in numbering.

• Use the wallchart No. CH 03 01 04 02 95 along with this.

Regulator diaphragm (Function)

TR 03 01 04 02 95



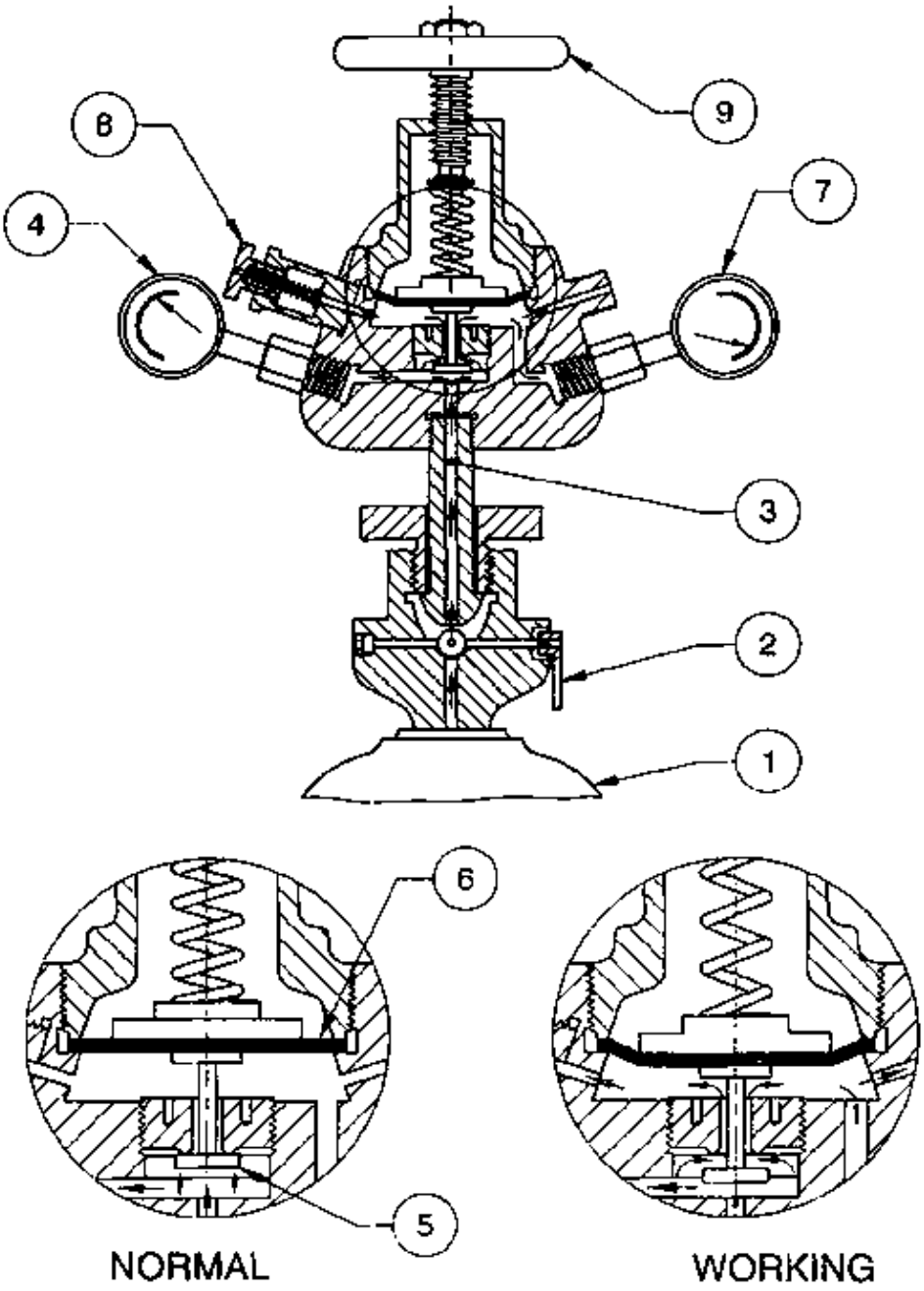
The regulator is fitted on cylinder (1) after removing dust particles from the socket of the cylinder– use the cylinder key (2) to open. After opening the cylinder gas enters in regulator passage (3) and gas passes through the cylinder content gauge (4) and reaches stage one pressure reduction mechanism (5). The gas flow is stopped at valve (6). The volume of gas required for welding is adjusted by controlling the screw knob (7). By the actuation of the knob (7) the diaphragm (8) is bent and gas enters through valve (6) to the working pressure gauge (9) and hose pipe

NOTE:

• Note the correction in numbering.
• Use this wallchart along with CH 03 01 04 01 95

Single stage regulator (Function)

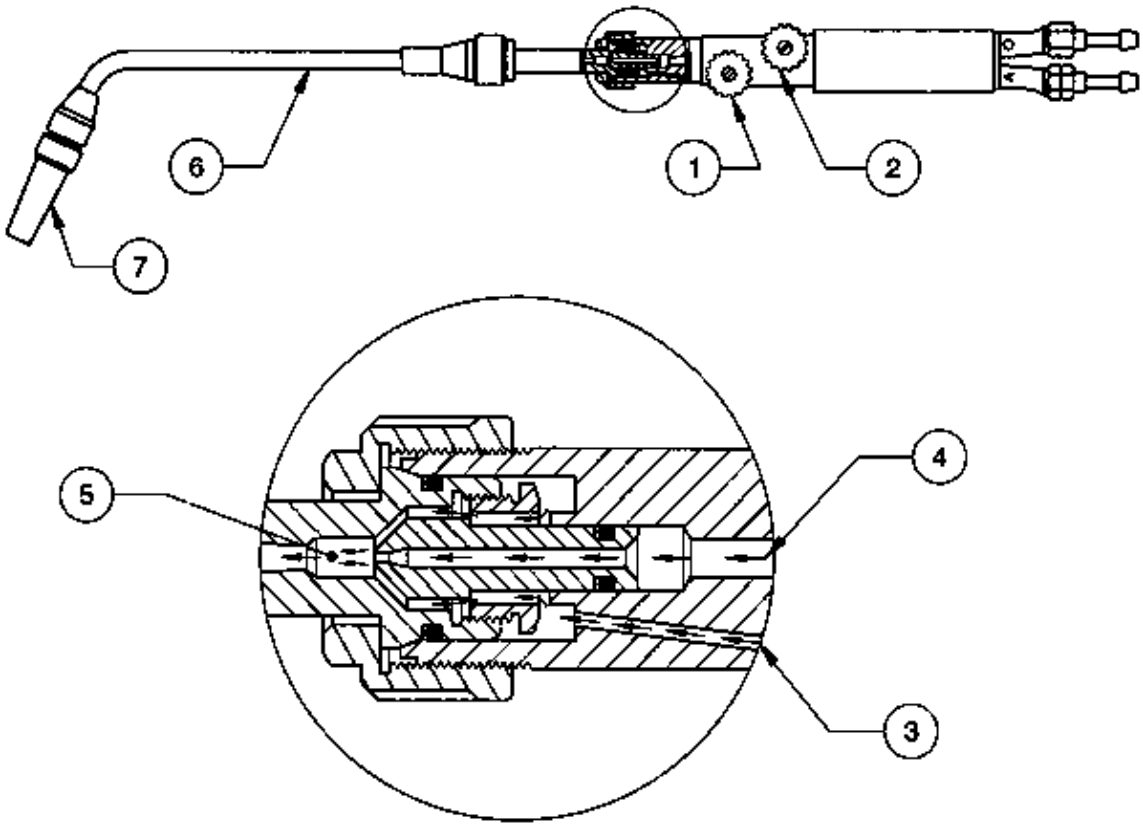
TR 03 01 04 03 95



The regulator is fitted on the cylinder (1) socket after removing the dust particles (cracking). Use cylinder key (2) to open the cylinder. After opening, the gas enters in regulator passage (3) and the cylinder content gauge (4) and he gas flow is stopped at valve (5). When the pressure adjusting screw (9) is tightened the diaphragm (6) is bent and the valve (5) opens. The gas now enters in the working pressure gauge (7). The working pressure is indicated in the gauge (7). A safety valve (8) is provided to release the pressure in case of diaphragm failure.

Low pressure blow pipe (Function)

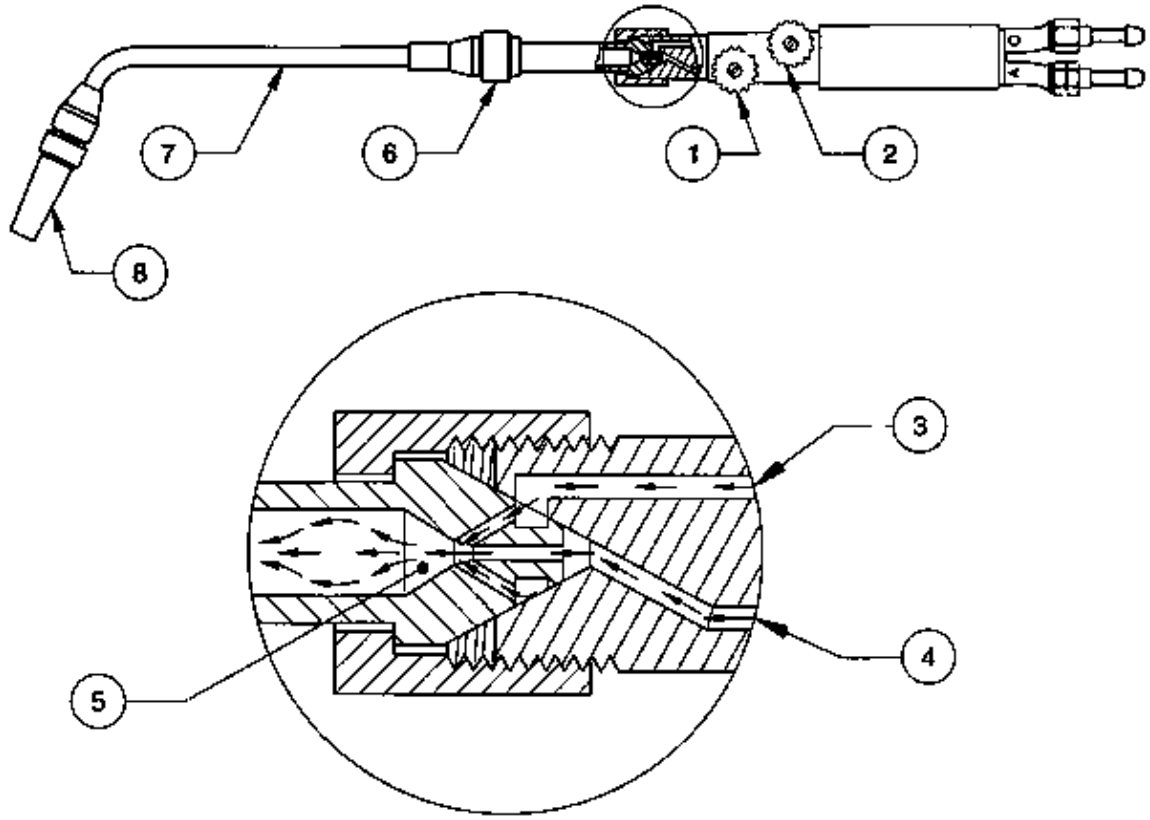
TR 03 01 05 01 95



Acetylene valve (1) when opened the low pressure gas enters into the injector (5) through passage (3). When the valve (2) is opened the oxygen gas enters through passage (4) with high pressure. When gas reaches injector (5) it sucks the low pressure acetylene and reaches the nozzle (7) through the neck (6)

High pressure blow pipe (Function)

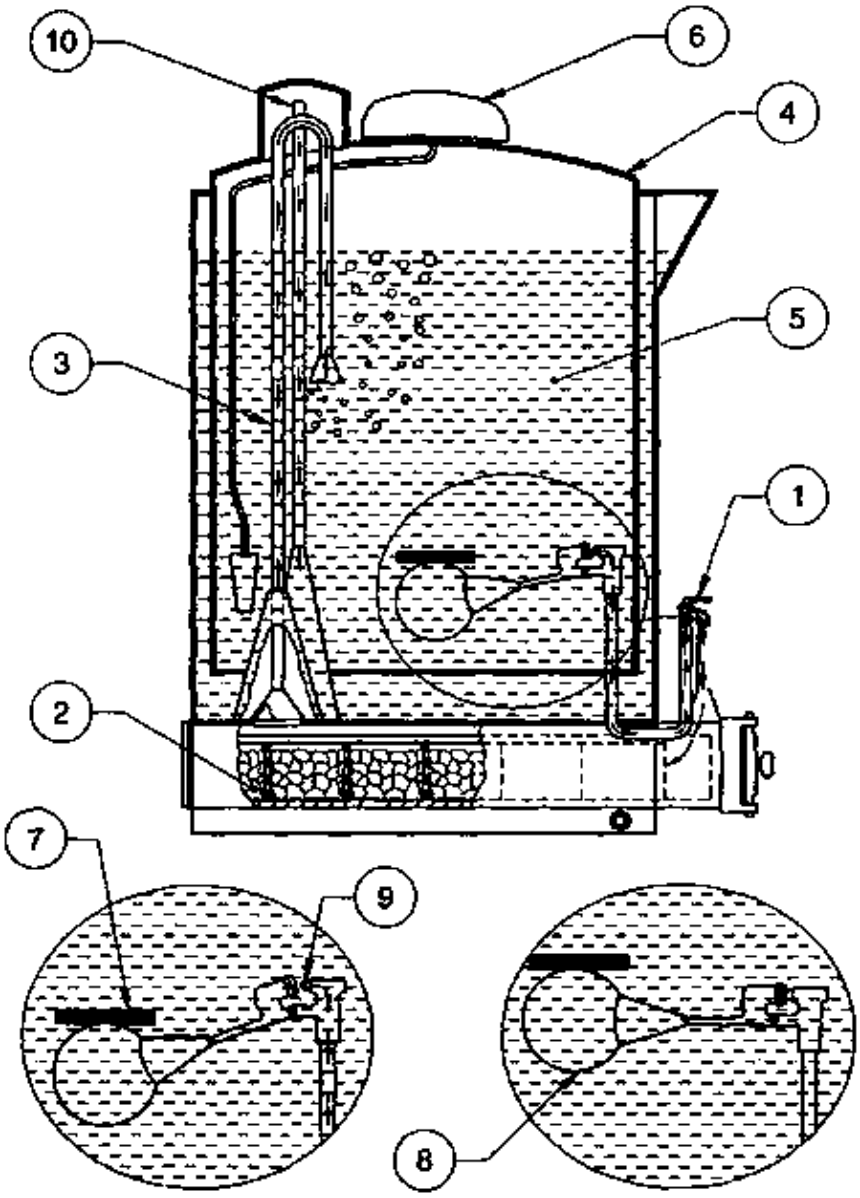
TR 03 01 05 02 95



Acetylene valve (1) when opened, the gas enters into the mixing chamber (5) trough passage (4). When oxygen valve (2) is opened oxygen gas also enters into the mixing chamber (5) through passage (3). Both high pressure gases are mixed in the mixing chamber and passes through neck connector (6) and to the neck (7) and finally reaches the nozzle (8). Long or short neck can be used depending upon the size of the job.

Water to carbide generator (Function)

TR 03 01 06 01 95

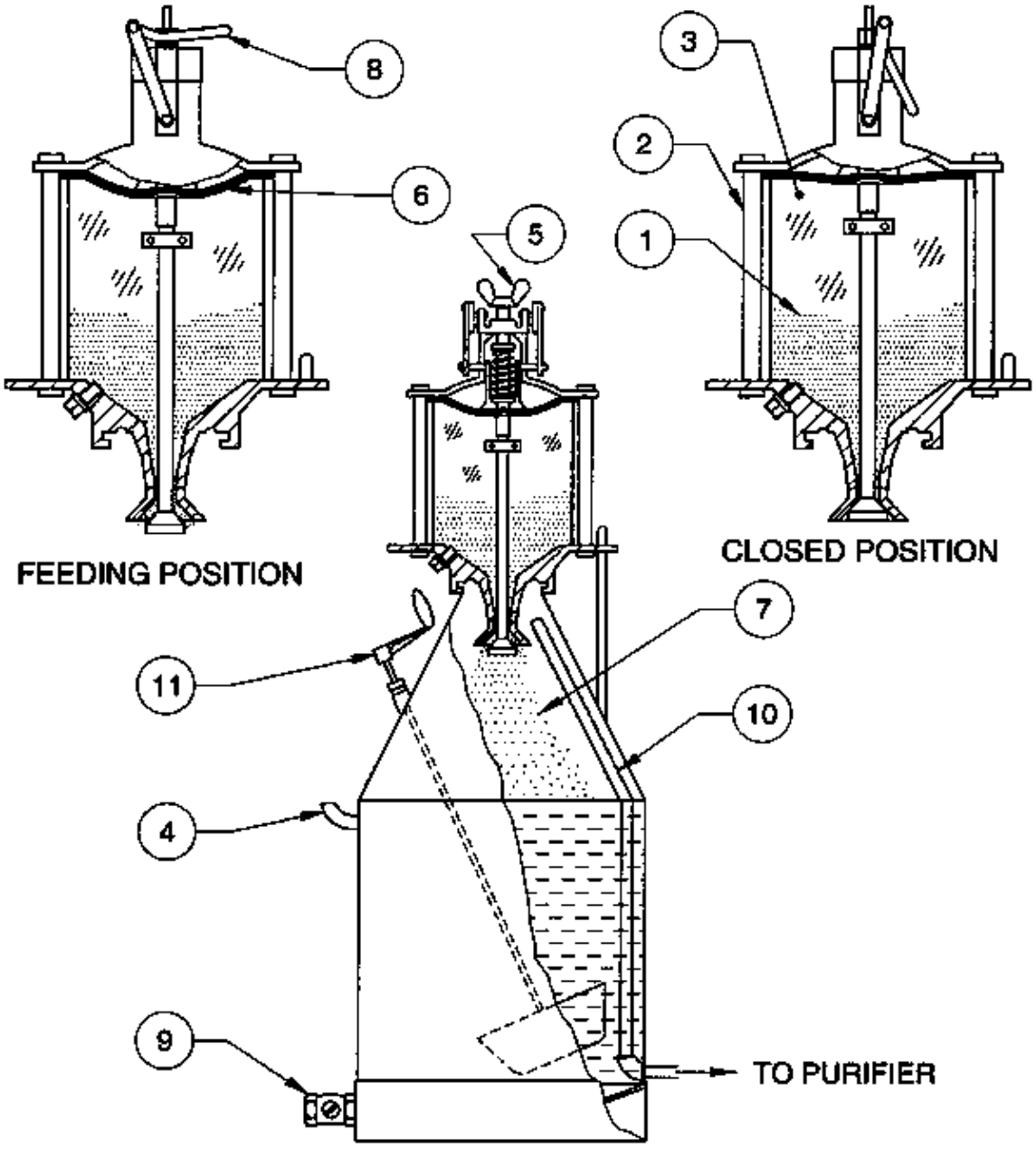


WORKING

When the valve (1) is opened water enters in the carbide chamber (2) and due to chemical reaction acetylene is produced. The gas passes through gas collecting pipe (3) and reaches the raising bell (4) rough water (5). The gas is stored under pressure with the help of a cast iron block (6). The raising bell is automatically lifted because of the gas pressure inside. The bar for operating valve (7) which is connected with gas raising bell will also be moved upward along with the float ball (8) which is connected to water supply mechanism and plugs the water inlet (9). This stops the production of acetylene. The produced gas will be collected through pipe (10) and sent to blow pipe. When the gas is reduced, the gas raising bell comes down along with the bar for operating valve (7). This presses the floater ball and production of acetylene starts again.

Carbide to water generator (Function)

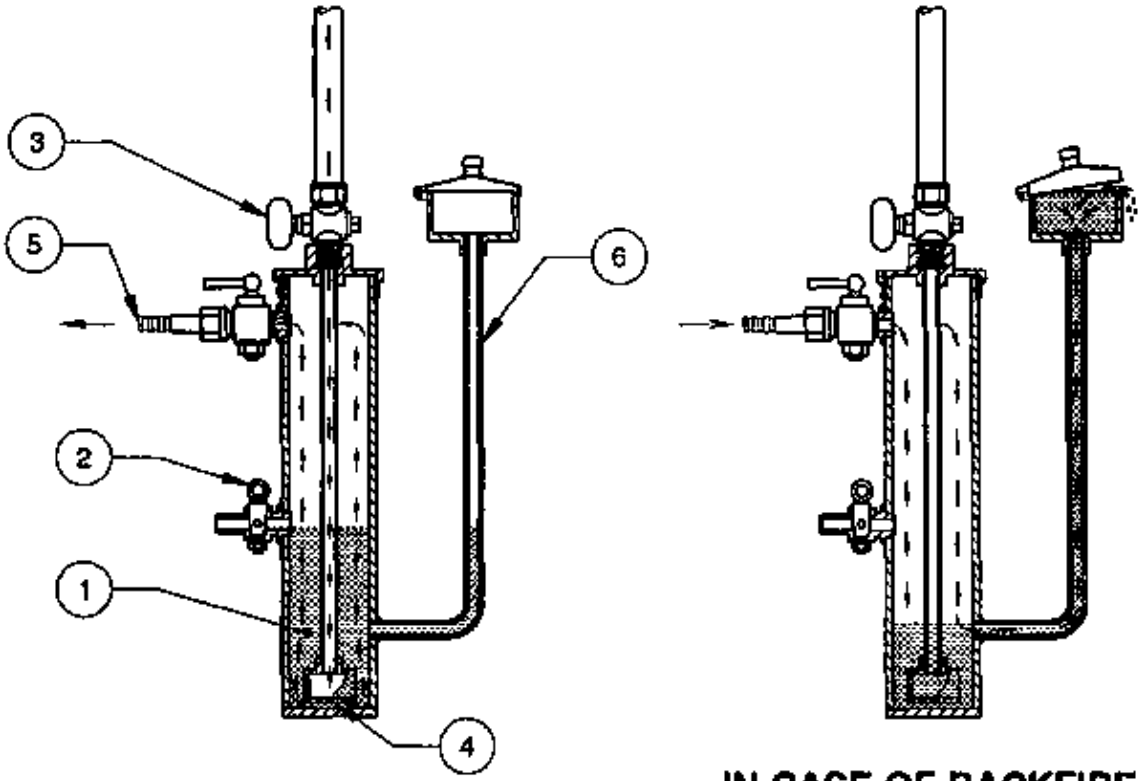
TR 03 01 06 02 95



Check the quantity of calcium carbide powder (1) in the hopper (2) through glass (3). Check the water level by opening the cork (4). Tighten the feeder screw (5) to press the diaphragm (6) and lift the lever (8). Powdered carbide will now pour into water (7) producing gas. Carbide flow is adjusted by moving the feeder lever up and down (8). Use agitator pedal (11) for generating gas without waste of calcium carbide. Drain the sludge through drain cork (9). Produced gas is collected by the tube (10) and goes to the purifier.

Hydraulic back pressure valve (Function)

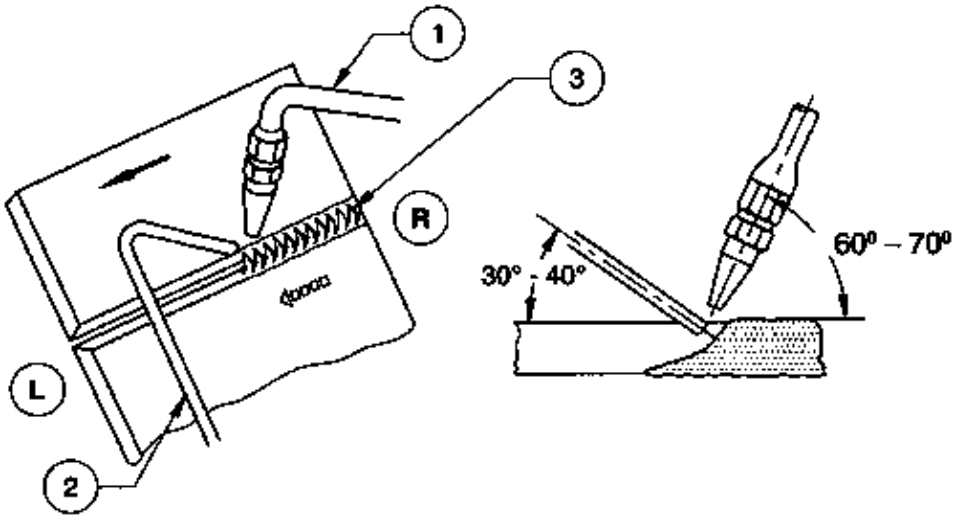
TR 03 01 08 01 95



Fill the water (1) by opening the water level cock (2) and then close. Open the gas inlet valve (3) gas enter into Hydraulic back pressure valve through perforated sheet (4) to blow pipe through tap (5). In the event of back fire or flash back it enters to back pressure valve and depress the water level. Water is then letout through vent pipe (6) to atmosphere and preventing fire getting into the low pressure generator.

Gas welding techniques

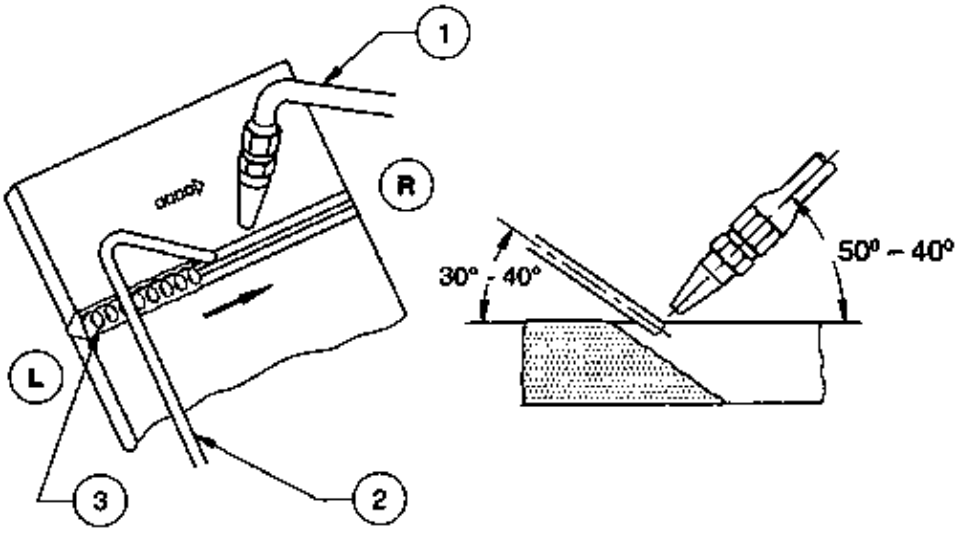
TR 03 01 10 01 95



Leftward welding

Leftward welding

The welding which commences on the right hand edge (R) of the joint and proceeds towards the left (L). The blow pipe (1) and filler rod (2) are given a forward motion with just sufficient side movement (3) to maintain both edges melting at a desired rate.



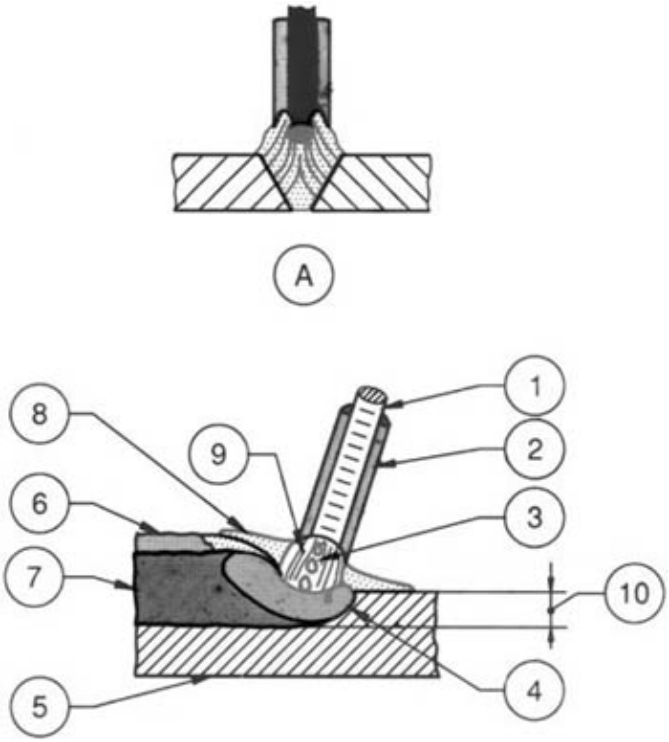
Rightward welding

Rightward welding

The welding which commences at the left hand end (L) and proceeds towards right hand (R) of the joint and the blow pipe (1) and filler rod (2) are moved towards right (R) This welding is quicker than leftward welding and consumes less gas

Metallic arc

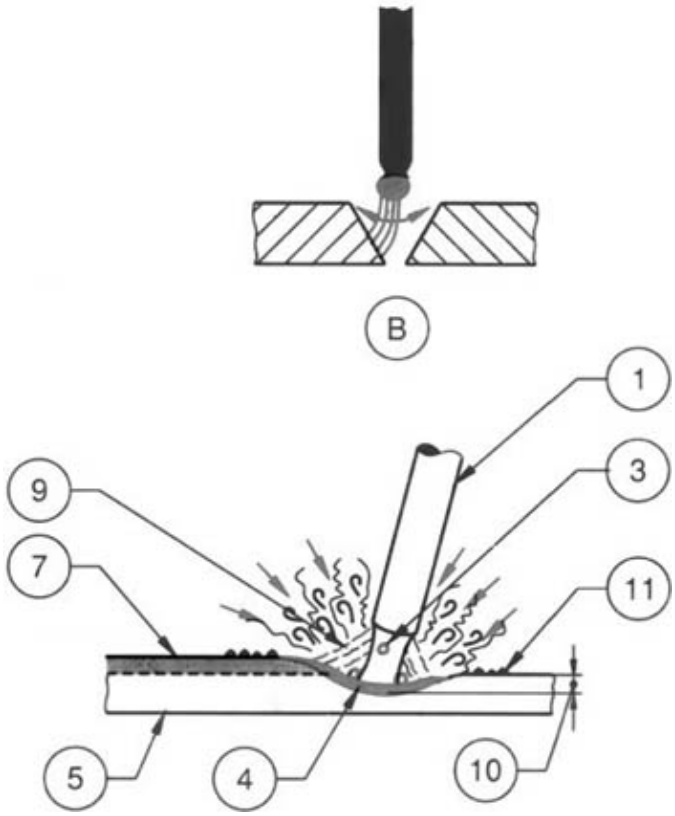
TR 03 01 04 01 95



ARC WITH COATED ELECTRODE

(A) Coated electrodes

- good penetration
- stable arc
- less spatters



ARC WITH BARE ELECTRODE

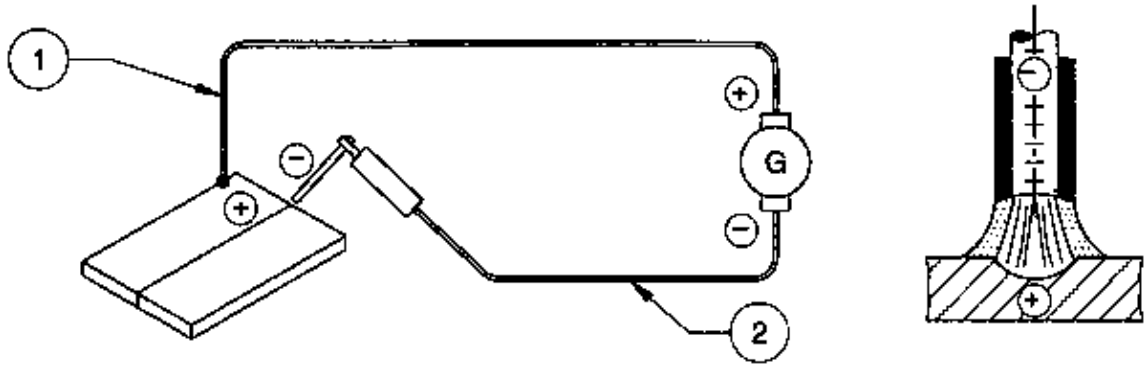
(B) Bare electrodes

- less penetration
- unstable arc
- more spatters

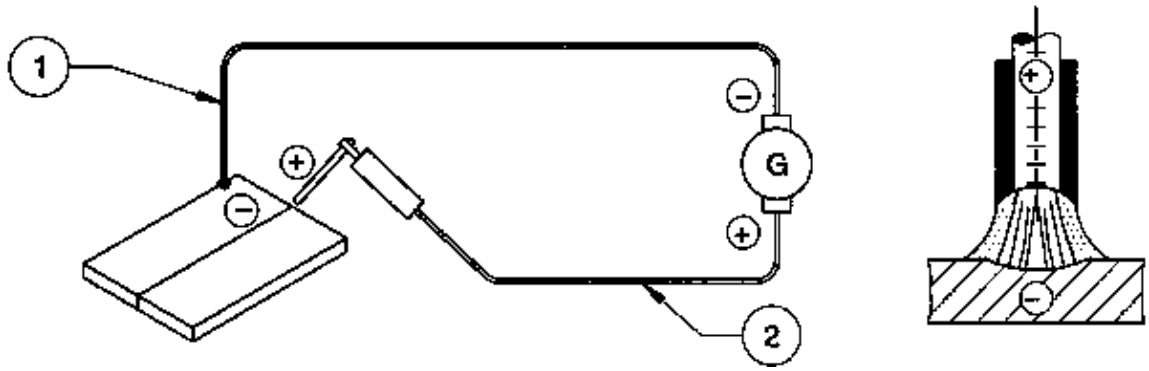
(1)	Bare electrode	(6)	Slag covering
(2)	Flux coating	(7)	Weld metal
(3)	Globules	(8)	Gaseous shield
(4)	Molten crater	(9)	Arc stream
(5)	Parent metal	(10)	Penetration
		(11)	Spatters

Polarity and its effects

TR 03 01 17 01 95



STRAIGHT POLARITY



REVERSE POLARITY

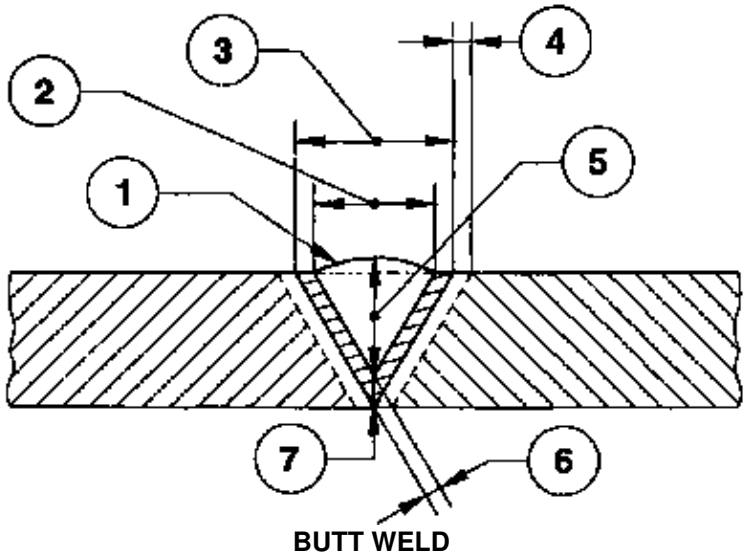
(1) Earth Cable
(2) Holder Cable

In DC welding 2/3 of the heat is produced from the positive end and 1/3 from the negative end.

Because of the unequal distribution of heat in the electrode and the base metal, the polarity is an important factor for successful welding

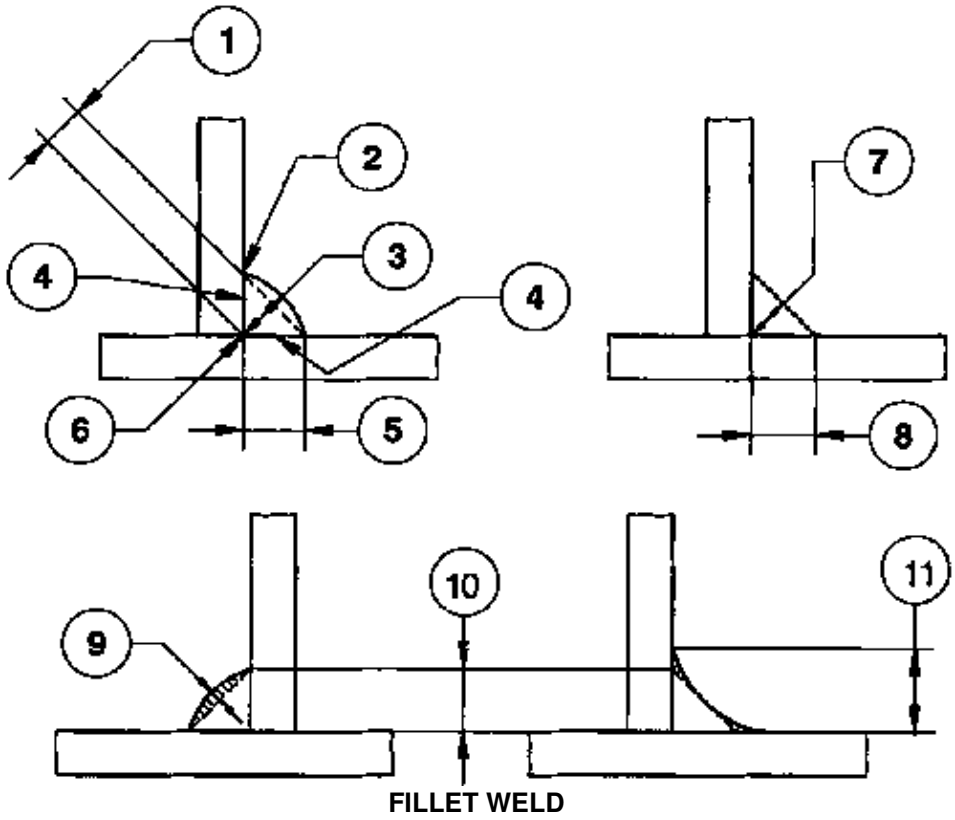
Nomenclature of weldments

TR 03 04 05 01 95



BUTT WELD

(1) Normal reinforcement (1/10th of the Plate thickness)
(2) Deposited metal
(3) Weld metal zone
(4) Heat affected zone
(5) Throat thickness
(6) Fusion zone
(7) Root



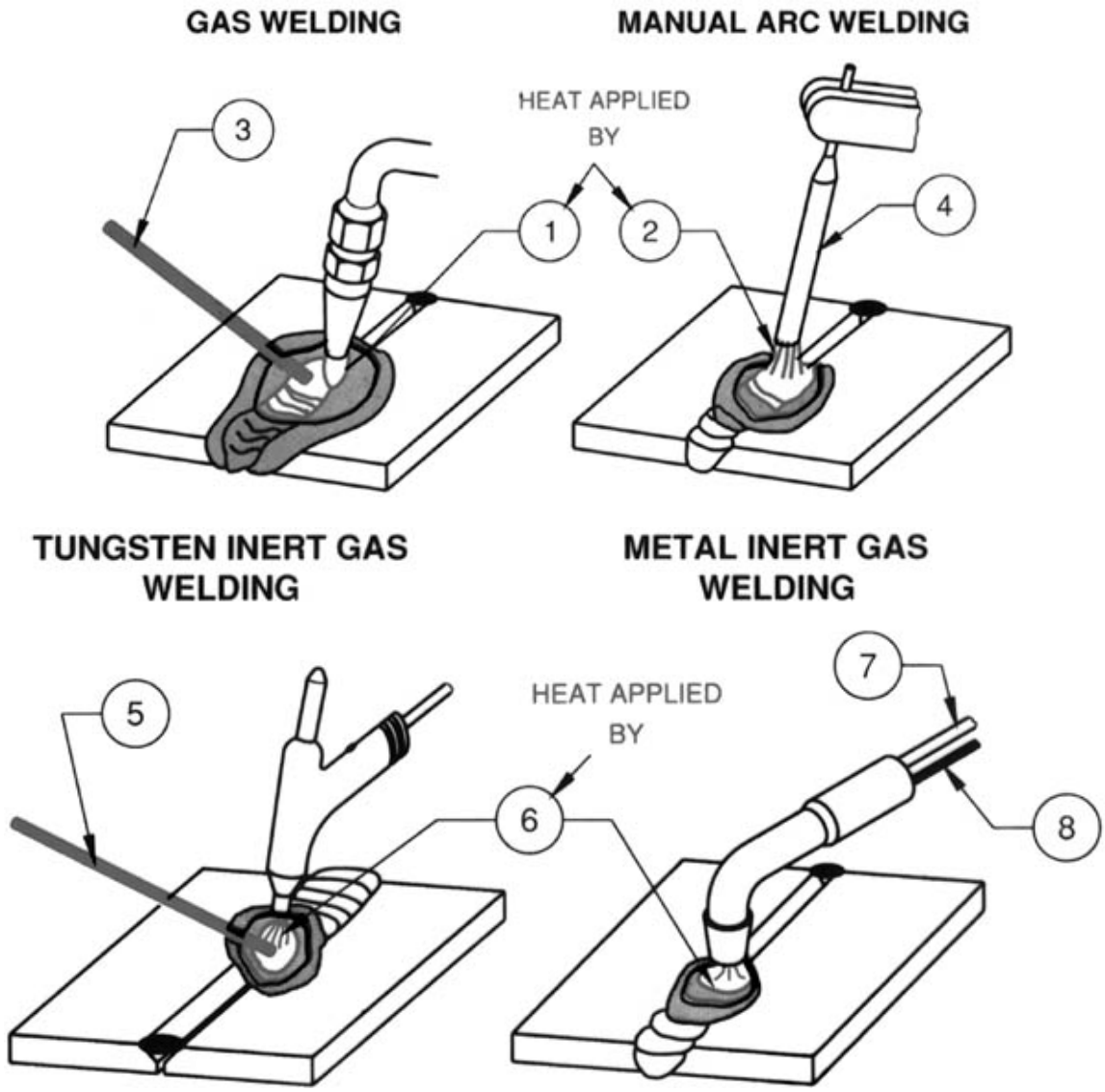
FILLET WELD

Convex & concave fillets with same effective throat thickness

(1)	Effective Throat Thickness	(6)	Root
(2)	Toe	(7)	Throat thickness (0.7 of leg length)
(3)	Throat thickness	(8) & (10)	Specified leg length
(4)	Fusion faces	(9)	Proud metal (Reinforcement)
(5)	Leg length	(11)	Actual leg length

Difference between fusion welding processes

TR 03 06 07 01 95



(1) Heating by flame
(2) Heating by arc
(3) Filler rod
(4) Coated electrode
(5) Filler rod (TIG)
(6)

i. Heating by arc using tungston electrode (TIG)
ii. Heating by arc using bare wire electrode

(7) Fault in weldments
(8) Work piece

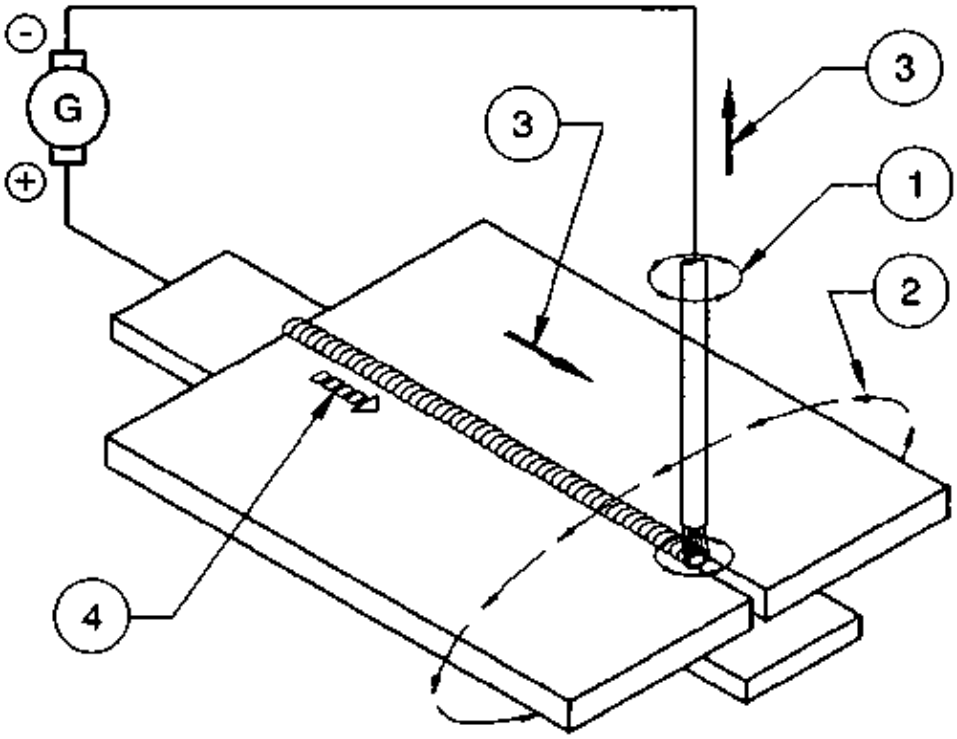
Effects of welding on parent materials

The characteristic of the parent material eg. tensile strength, hardness, toughness, elongation, wear and corrosion resistance are affected by the welding process.

When the weldability of the parent material is better, these characteristics are less affected by welding.

Arc blow and its effects

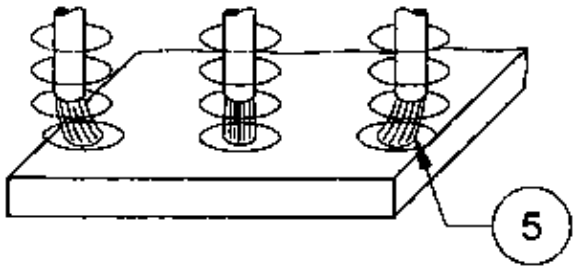
TR 03 01 10 01 95



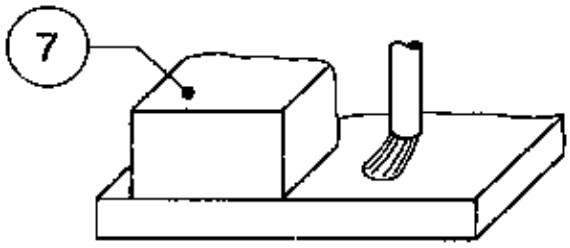
(1) Magnetic field around Electrode (2) Magnetic field around work piece

(3) Current flow (4) Direction of welding

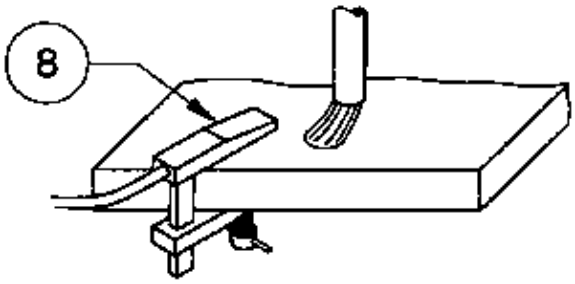
COMMON REASONS FOR THE ARC BLOW EFFECTS IN PARTICULAR WHEN USING DIRECT CURRENT



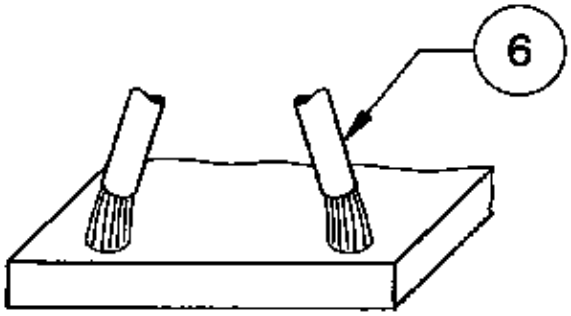
(5) Welding at the edge of work piece



(6) Welding close to large work piece



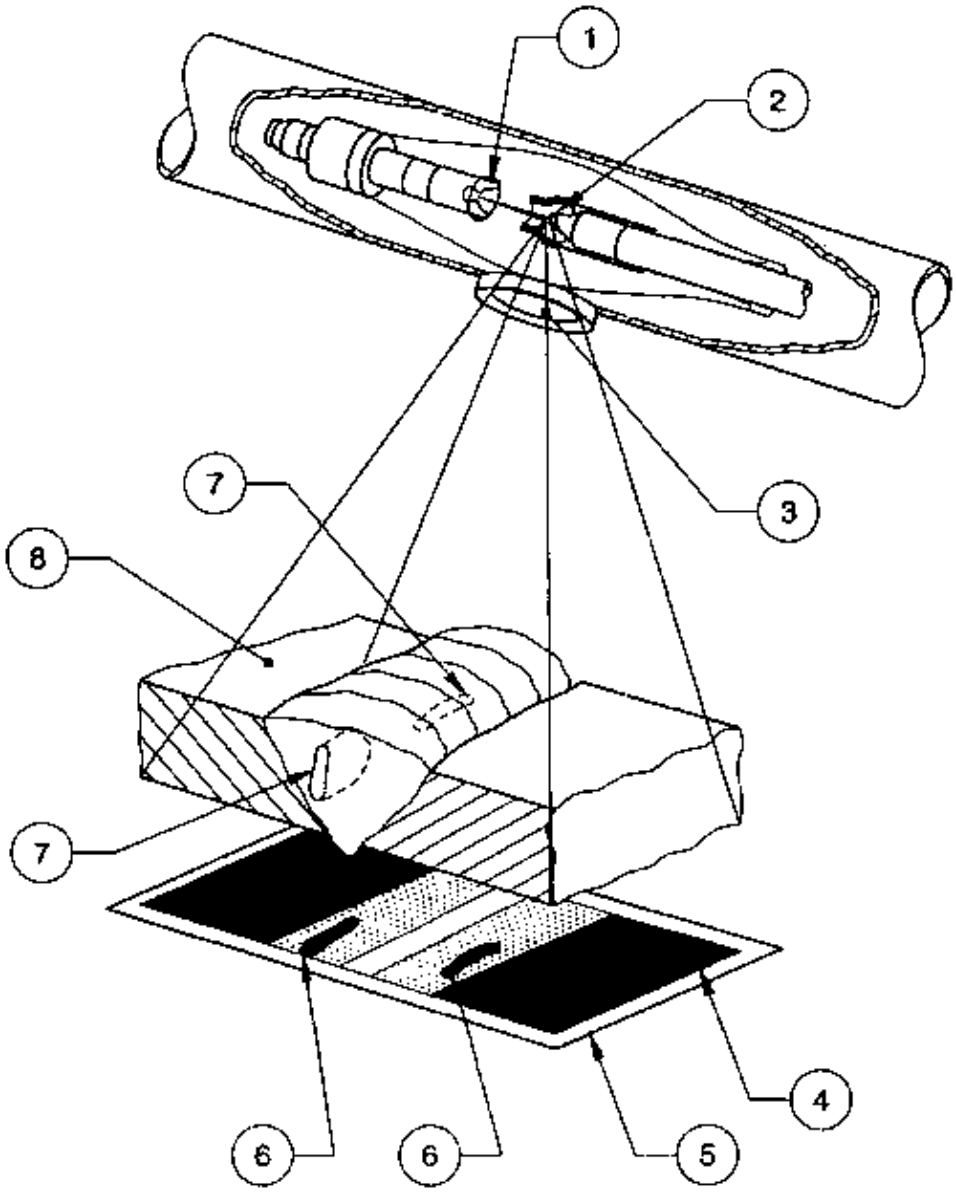
(7) Welding close to earth connection



(8) To avoid Arc blow change the electrode angle

Radiography test

TR 03 05 02 01 95

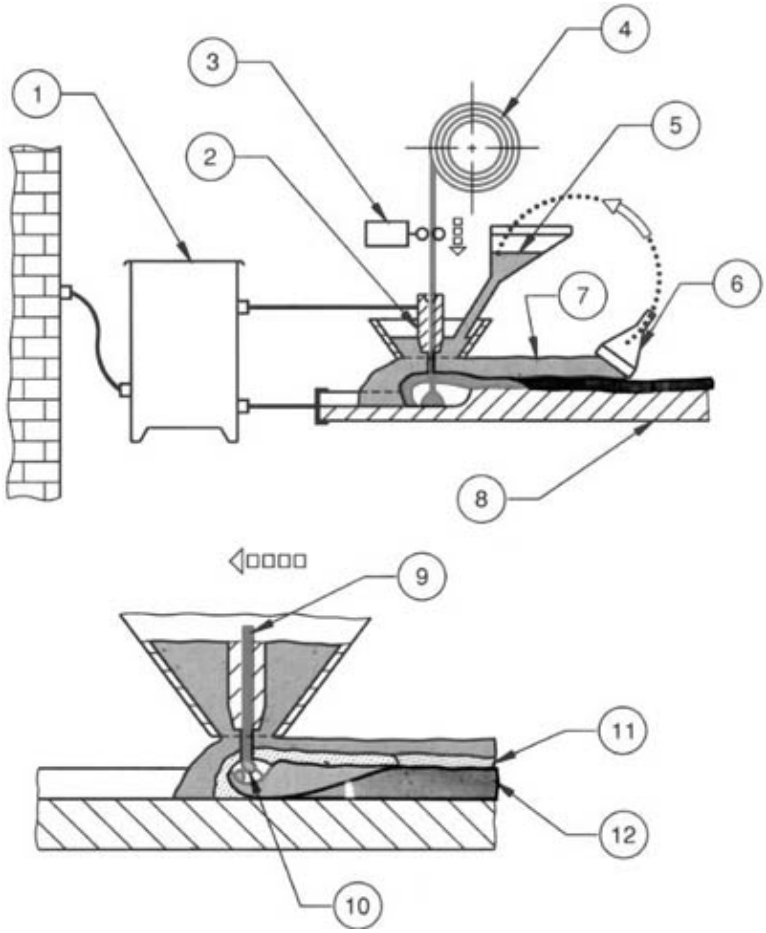


(1) Cathode
(2) Anode
(3) Exit window
(4) X−ray film
(5) Lead sheet
(6) Image of Defect
(7) Fault in weldments
(8) Work piece

The internal aspects of weldments can be verified by the use of this. The test specimen (8) is placed between the x−ray film (4) and cathode tube/radiography ray sources (1) (2) and (3). The defects of weldment are reproduced in the film (6). A leadsheet (5) is placed below the film to prevent further penetration of rays.

Automatic submerged arc welding

TR 03 06 03 01 95

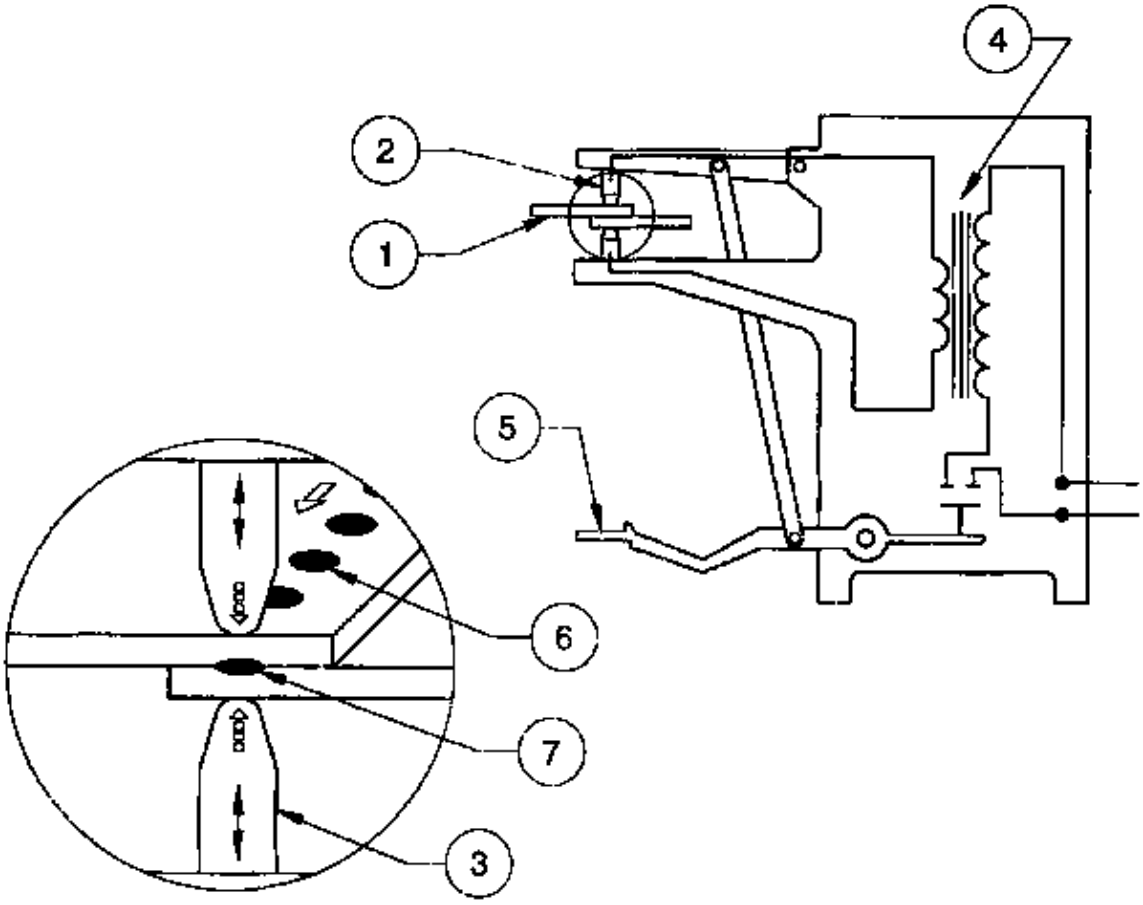


(1)	Welding current source	(5)	Hopper	(9)	Wire Electrode
(2)	Current contact Nozzle	(6)	Powder extration	(10)	Arc
(3)	Wire feed unit	(7)	Granular flux	(11)	Solid slag
(4)	Wire Electrode coil	(8)	Workpiece	(12)	Solid weld metal

The Welding current source is a transformer (1). The electrode wires (4) are in the form of a coil (4) and is fed by a wire feeding mechanism (3). The electrode wire passes through the current contact nozzle (2). When the electrode establishes the arc automatically, the flux contained in the hopper (5) also passes on the weld path thus shielding arc from outside contamination. The unburnt flux (7) is recovered and fed back to the hopper (5).

Spot welding

TR 03 01 19 01 95



(1) Base metal
(2) Moveable Electrode
(3) Stationary Electrode
(4) Transformer
(5) Foot pedal
(6) Spot weld
(7) Spot weld nugget

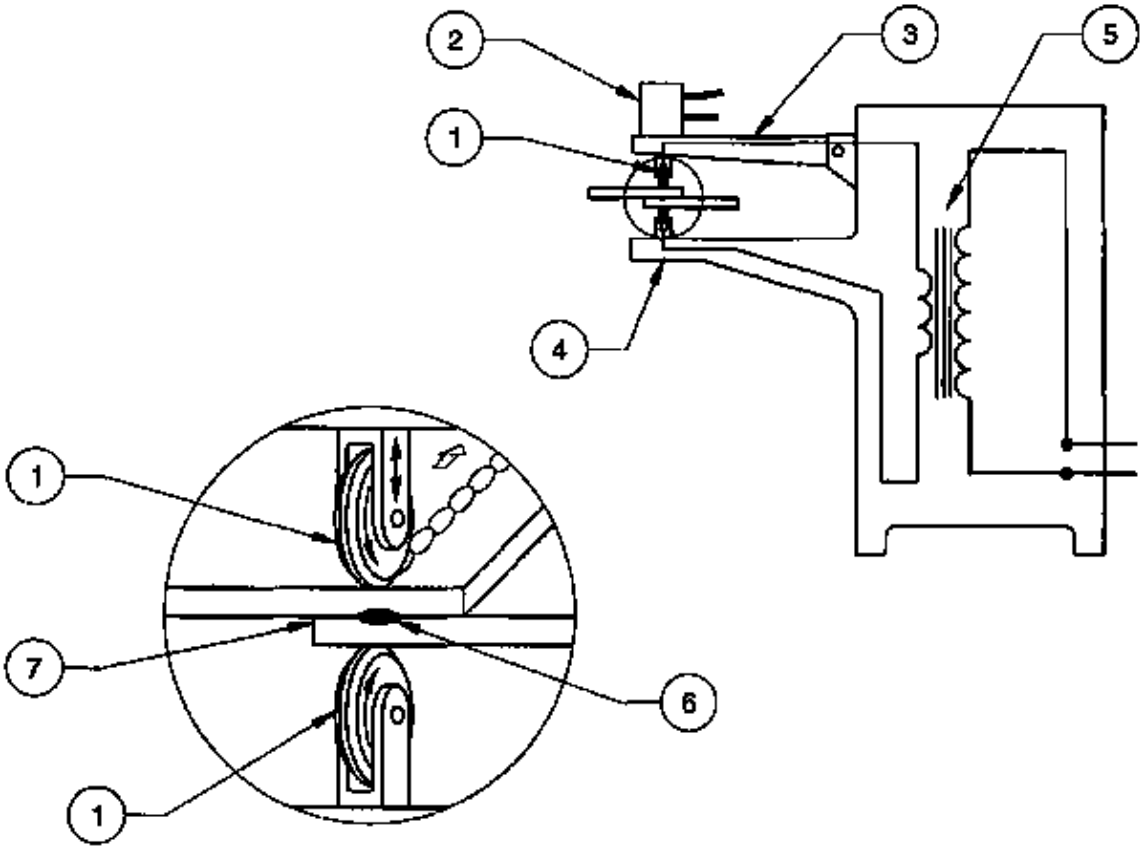
Principle/Process

• The first step is that the parts to be joined are clamped between the electrodes. In the second step, a high current is allowed to pass through the clamped members and the temperature is raised for welding to take place. In the third step the current is being cut off and high pressure is applied to form the joint. The nugget formed is shown. (7)

• Spot welding is utilized extensively for welding steel. When equipped with an electronic timer, it can be used for other materials, such as aluminium, copper, stainless steel, galvanised metals, etc.

Seam welding

TR 03 01 18 01 95



(1) Roller Electrode
(2) Pneumatic or Hydraulic cylinder
(3) Movable Arm
(4) Stationary Arm
(5) Transformer
(6) Weld Nugget
(7) Base Metal

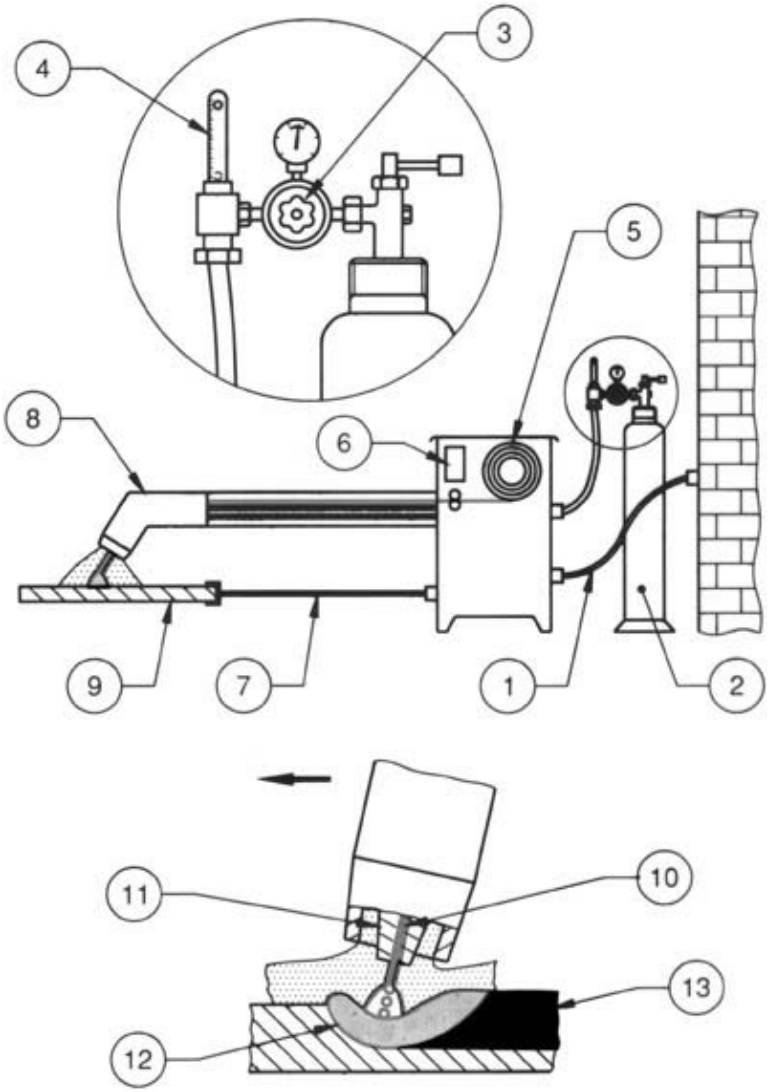
Principle/Process

• Seam welding is like spot welding except that the spots overlap one another, making continuous weld seam. As the electrodes revolve, the current is automatically turned 'on' and 'off' at intervals corresponding to the speed at which the parts are set to move. With proper control, it is possible to obtain airtight seams suitable for containers, water heaters, fuel tanks etc.

• Both lap and butt joints are welded by seam welds. In the case of butt joints, foils of filler metals are used on the joints.

Metal inert gas (MIG) welding

TR 03 06 02 01 95

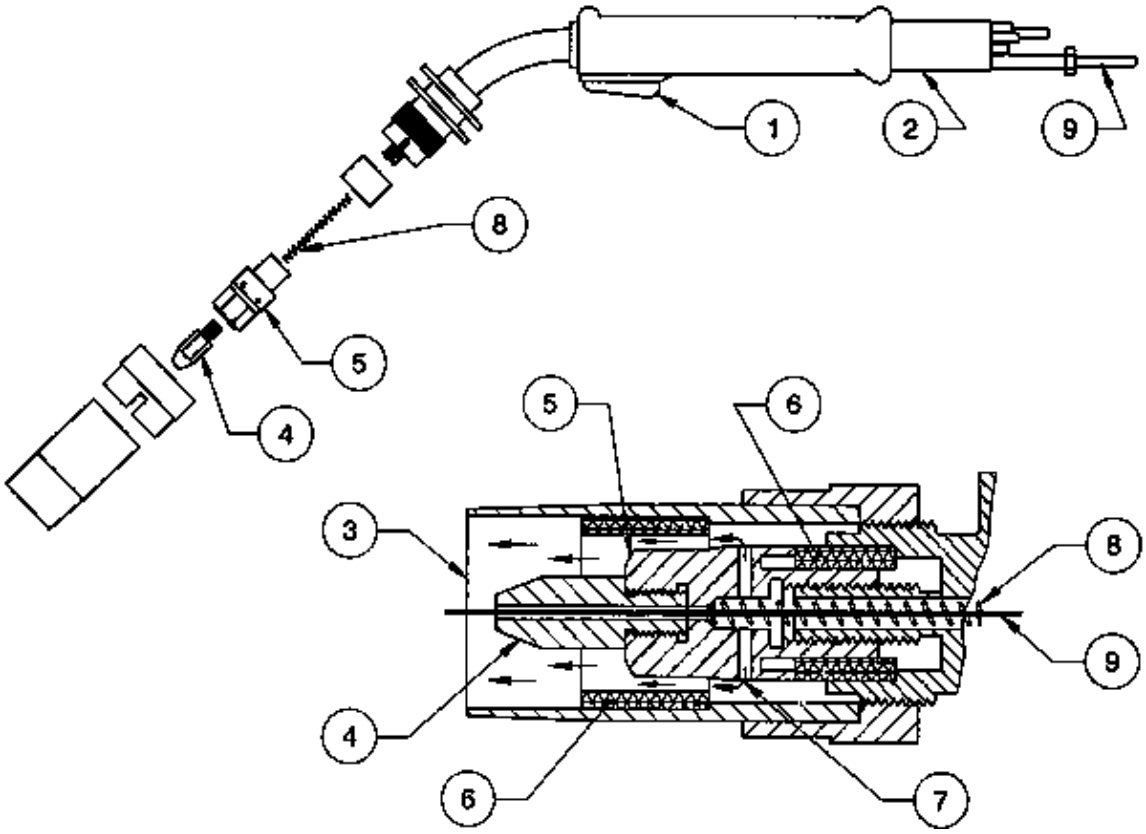


PROCESS/FUNCTION

Connect the current input cable (1). Open the inert gas cylinder (2) and check the gas pressure on gauge (3). Adjust the gas flow meter (4) as required. After setting put it in "AUTO". Run the wire from the wire reel (5) through wire feeding unit (6). Connect the Earth cable (7) to workpiece (9) Draw the wire through cable to welding torch (8). Adjust the electrode wire until the wire appear (10) at the tip of welding torch through current contact nozzle (11). Strike and establish the arc. In the figure molten pool (12) and welded metal (13) are shown.

Metal inert gas welding (MIG) torch

TR 03 01 21 01 95

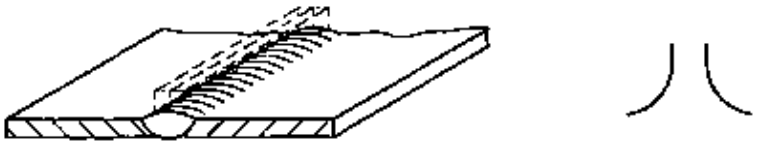


(1) Torch switch
(2) Hose Assembly
(3) Gas Nozzle
(4) Current contact nozzle
(5) Current contact holder
(6) Insulators
(7) Shielding Gas
(8) Spirally wound wire electrode guide
(9) Wire electrode

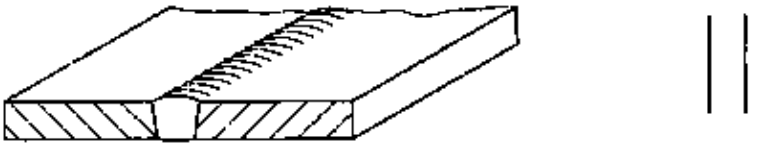
Welding symbols

TR 03 04 16 01 95

Butt weld between plates with raised edges (the raised edges being melted down completely

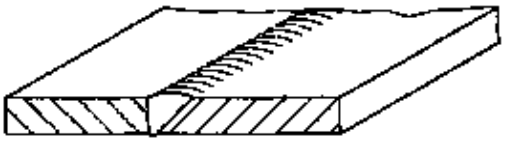


Square butt weld

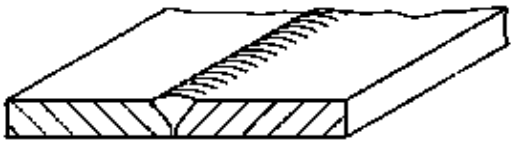


Single V butt weld

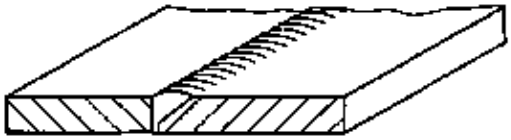
Single bevel butt weld



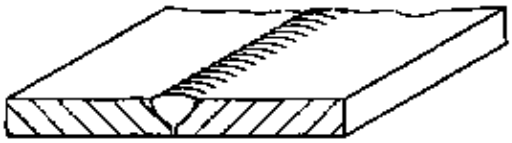
Single V butt weld with broad root face



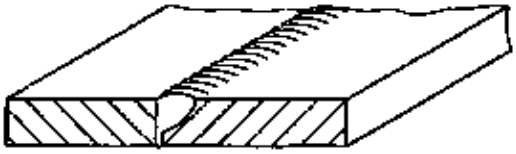
Single bevel butt weld with broad root face



Single U butt weld (Parallel or sloping sides)



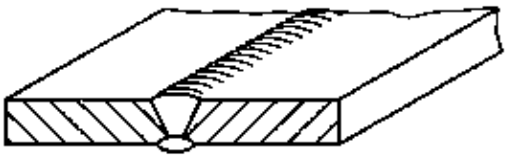
Single J butt weld



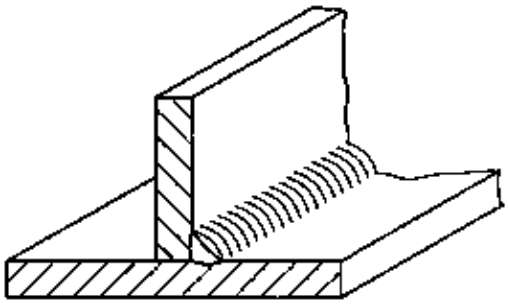
Welding symbols

TR 03 04 16 02 95

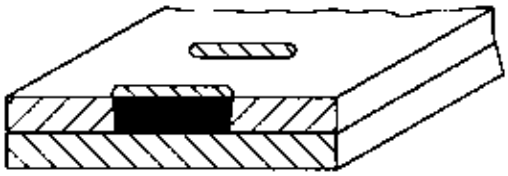
Backing run; back or back weld

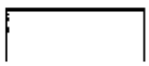


Fillet weld

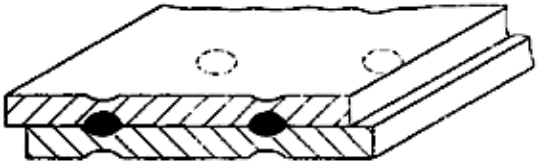


Plug weld: plug or slot weld/ USA

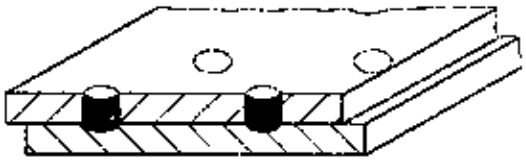




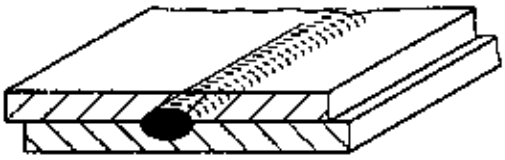
Spot welding



Spot welding



Seam welding



Seam welding