The bare rod is fed into the weld puddle, where it melts and mixes with the base metal

Equipment Either AC or DC welding units can be used for gas-shielded arc welding, depending on whether the weld is wide, deep, or narrow, whether the job is to be performed on a permanent fixture or a portable machine, and whether it is to be a manual or machine welding operation

DC may be used with a reverse polarity or a straight polarity hookup, with current supplied by a generator or rectifier The AC supply may be obtained through a transformer or high-frequency generator

The manufacturer of the welding equipment should be consulted as to the specific job before the equipment is installed, especially when high-frequency AC is used, otherwise, there may be interference with radio transmission

Argon, helium, and gas mixtures are supplied by manufacturers in cylinders similar to oxygen cylinders Since cylinder pressures range from 2200 to 2640 psi, argon and helium cylinders should be stored and handled like other high-pressure gas cylinders

Carbon dioxide, although not strictly an inert gas, is sometimes used as a shield gas when steel is welded by the gas-shielded arc welding process It is usually supplied in partially liquid and partially gaseous form in cylinders at approximately 835 psi pressure These cylinders should therefore be handled like other high-pressure gas cylinders

To supply gas to the welding torch, a regulator must be used to lower the pressure to 25 psig or less, and a flowmeter should control the volume of gas If more than one torch is used from the same gas line, a flowmeter should be installed at each torch connection

Air is used to cool the torch and electric current cables Water is also used for cooling, generally where the welding current is more than 250 amp The water supply line, even if city water is used, should be equipped with a strainer to keep out impurities which might get into the torch and plug the water cooling passages

In the gas-shielded tungsten arc torch (Fig 31-9), gas is conducted to the welding point through orifices in the torch around the electrode holder Cooling water goes through passages through the torch handle and about the holder In the smaller torches, ceramic cups are used A torch for heavier work generally has a water-cooled gas cup

Other Welding and Cutting Processes

There are several heat sources for welding and cutting which are presently in the experimental stage, such as friction, ultrasonics, and lasers During each stage of their development, these heat sources require guarding and the evolution of a set of safe practices

For example, the *laser* (Light Amplification by Stimulated Emission of Radiation) presents the hazard of eye damage from the optically amplified light beam, which because of its intensity, can do damage even at great distances All employees should therefore be given preemployment and periodic followup eye examinations Most companies require that employees work in pairs when using laser equipment

To confine the laser beam, suitable shields should be developed and installed Since a reflected laser beam is also hazardous, the work area should contain no glossy surfaces

Power supplies for lasers are high-voltage equipment, which should be operated with the precautions developed for this type of equipment

See discussion in Chapter 38, "Personal Protective Equipment," Chapter 41, "Industrial Hygiene," and Chapter 44, "Ionizing Radiation"

Common Hazards

Light rays

Electric arcs and gas flames both produce ultraviolet and infrared rays which have a harmful effect on the eyes and skin upon continued or repeated exposure The usual effect of ultraviolet is to "sunburn" the surface of the eye, which is painful and disabling but temporary in most instances However, permanent eye injury may result from looking directly into a very powerful arc without eye protection Ultraviolet may also produce the same effects on the skin as a severe sunburn

Production of ultraviolet radiation is high in gas-shielded arc welding For example, a shield of argon gas around the arc doubles the intensity of the ultraviolet radiation, and, with the greater current densities required (particularly with a consumable electrode),