

Chapter 5

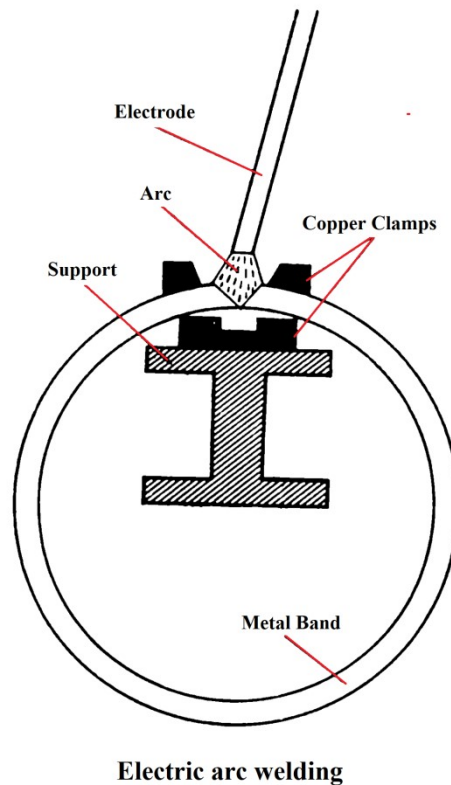
Reading: Welding

There are a number of **methods** of joining metal articles together, depending on the type of metal and strength of the joint which *is required*. Soldering gives a satisfactory joint for light articles of steel, copper or brass, but the strength of a soldered joint is rather less than a joint which is *brazed, riveted* or *welded*. These **methods** of joining metal *are normally adopted* for strong permanent joints.

The simplest **method** of welding two pieces of metal together *is known* as pressure welding. The ends of metal *are heated* to a white heat – for iron, the welding temperature should be about 1300° C – in a flame. At this temperature the metal becomes plastic. The ends *are then pressed* or *hammered* together, and the joint *is smoothed off*. Care *must be taken* to ensure that the surfaces are thoroughly clean first, for dirt will weaken the weld. Moreover, the heating of iron or steel to a high temperature causes oxidation, and a film of oxide *is formed* on the heated surfaces. For this reason, a flux *is applied* to the heated metal. At welding heat, the flux melts, and the oxide particles *are dissolved* in it together with any other impurities which may be present. The metal surfaces *are pressed* together, and the flux *is squeezed out* from the centre of the weld. A number of different types of weld *may be used*, but for fairly thick bars of metal, a vee-shaped weld *should normally be employed*. It is rather stronger than the ordinary butt weld.

The heat for fusion welding *is generated* in several **ways**, depending on the sort of metal which *is being welded* and on its shape. An extremely hot flame *can be produced* from an oxy-acetylene torch. For certain welds an electric arc *is used*. In this **method**, an electric current *is passed* across two electrodes, and the metal surfaces *are placed* between them. The electrodes *are sometimes made* of carbon, but more frequently they are metallic. The work itself constitutes one of them and the other is an insulated filler rod. An arc *is struck* between the two, and the heat which *is generated* melts the metal at the weld. A different

method is usually employed for welding sheets or plates of metal together. This **is known** as spot welding. Two sheets or plates **are placed** together with a slight overlap, and a current **is passed** between the electrodes. At welding temperature, a strong pressure **is applied** to the metal sheets. The oxide film, and any impurities which **are trapped** between the sheets, **are squeezed** out, and the weld **is made**.



Word study

Adopt (= take over, accept, put into use)

1. Various methods can be	} <i>adopted</i> {	to keep the temperature down.
2. We have		the conclusions reached in the report.
3. Paraffin is now		as a fuel because it is easily atomized.
4. Great Britain recently		the centigrade scale for temperatures.
5. The designers		a more compact form of construction for the machine.

Apply (= put on)

1. A pressure of x lb./in is	} <i>applied</i> {	to the piston.
2. When pressure is		to the ice, some of it will melt.
3. Insulation should be		to the wire in the form of a paste.
4. Grease may be		to the bearings with a grease gun.
5. This principle was successfully		to the design of high-speed aircraft.

Exploit, Utilize, Employ

1. The government intends to	} <i>exploit</i> <i>make use of</i> {	the natural resources of the country.
2. It will be difficult to		this invention commercially.
3. This country failed to		its five-year lead over other countries in jet-engines.
1. The properties of uranium are	} <i>used</i> <i>utilized</i> <i>employed</i> {	in nuclear reactors.
2. Electrical power from the generator is		in the motor.
3. Steam at boiler pressure is		to produce draughts of air in the boiler.
4. Different types of electric arc are		for various purposes.

Fairly, Rather, Slightly

1. The temperature in the boiler is
normal (500° C).
slightly high (505 ° C).
fairly high (= this is an advantage).
rather high (= this is a disadvantage).
2. (Comparative)
The temperature in the boiler is
slightly above normal (505° C).
rather above normal (520° C).
slightly higher than it should be.
rather higher than it should be.

Note: *rather, not fairly*, is used with comparatives, hether they indicate an advantage or a disadvantage.

Patterns

1. The Impersonal Passive

In the first four sections, we avoid using the passive type of statement, and concentrated on the types of statement which are frequently made in the active form. But you must remember that the majority of statements in technical writing are in the passive form, because the technical writer wants to be objective and impersonal. He does not usually start a sentence with **I** or **you** or **the operator**, etc. From this section on, we shall be using the passive form very often. Here are a few examples of the change from active into passive.

<i>Active</i>	<i>Passive</i>
The driver starts the engine. He welds the plates together.	The engine is started. The plates are welded together.
The furnace smelts the ore. The man sharpened his tool. He welded the plates together.	The ore is smelted in the furnace. His tool was sharpened. The plates were welded together.
They will start the work soon. We must lubricate bearings. A lathe can cut screws.	The work will soon be started. Bearings must be lubricated. Screws can be cut on a lathe.

As you see, Passive constructions require this pattern:

(Pro) Noun + a form of *be* + Past Participle

2. Methods

1. a. Welding is one	<i>means</i> <i>method</i> <i>way</i>	of joining pieces of metal together.
b. There are many	<i>methods</i> <i>ways</i> <i>means</i>	of joining pieces of metal together.
c. One of the best	<i>methods</i> <i>ways</i> <i>means</i>	of joining pieces of metal together.
2. New <i>methods</i> of production were	<i>adopted</i> <i>put into practice</i> <i>employed</i> <i>introduced</i>	a few years ago.

This word is used very often in technical writing, with several slightly different meanings.

These machines *should be handled* with great care.
Safety precautions *should be observed* at all times.
The results of the experiment *should be plotted* on a graph.

N.B. This is sometimes used for politeness when must be is really meant.

The steel *should not contain* more than 0.5 % of carbon.
The maximum internal diameter *should be* 40 thousandths of an inch.

The process of cooling *should continue* for several hours.
This building *should be completed* by the end of next year.

1.
 - a. A trip-lever *actuates* the valve. (= makes it move).
 - b. A flexible belt *drives* the motor. (= makes it $\left\{ \begin{array}{c} \text{move} \\ \text{turn} \\ \text{work} \end{array} \right\}$).

- | | | | | | | | | |
|----|-----------|------------|----------------|------------|---|------|-----------------|-----------------|
| 2. | <i>a.</i> | The piston | <i>moves</i> | forwards. | | | <i>forward</i> | |
| | | | <i>travels</i> | backwards. | = | A(n) | <i>backward</i> | movement of the |
| | | | <i>slides</i> | up. | | | <i>upward</i> | piston |
| | | | <i>runs</i> | down. | | | <i>downward</i> | |

The **travel** of the piston is the distance it travels.

The piston *reciprocates*,
or *moves*, etc.

A reciprocating movement.
engine.

b.	The pendulum	<i>oscillates, or swings.</i>	An <i>oscillating oscillatory</i> movement.
c.	The cross-slide	<i>traverses crosses</i>	A <i>slideward transverse</i> movement.
d.	The wheels	<i>rotate. turn. revolve.</i>	A <i>rotational rotatory</i> movement.
e.	The liquid The steam The air	<i>circulates</i>	A <i>circulating</i> movement through a <i>circuit</i> .
3.	The machine is The machine is	<i>at rest. stationary in motion. moving.</i>	

3. Velocity

The	<i>velocity speed</i>	of the	aircraft fluid gas, etc.	<i>increases. rises. decreases. falls.</i>		
The aircraft	<i>increases speed. speeds up. accelerates.</i>		There is an	<i>increase</i>	in speed.	
	<i>decreases speed. reduces peed. slows down. decelerates.</i>			<i>decrease reduction</i>		
Opening the throttle of a car			makes it go faster. <i>accelerates it.</i>			
Applying the brake of a car			makes it go slower. <i>retards it.</i>			