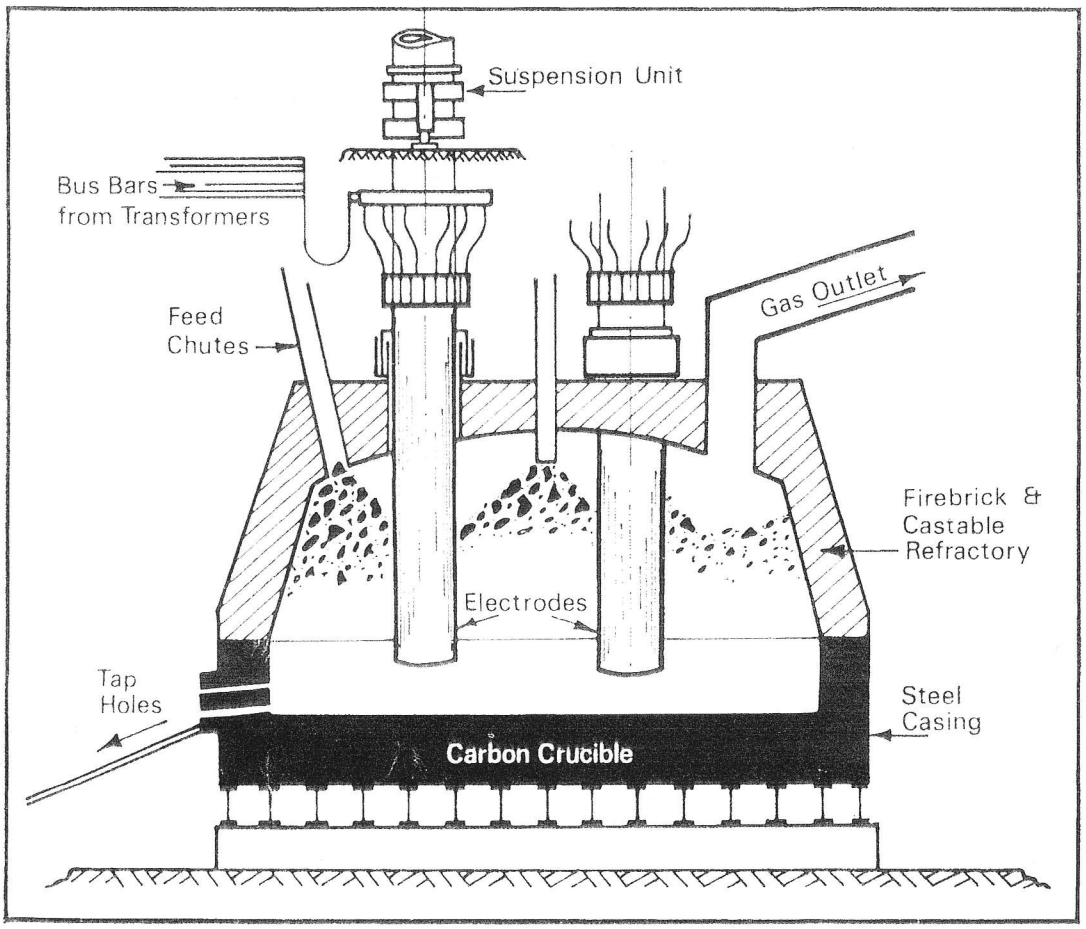
MAKING PHOSPHORUS

The phosphorus furnaces at Oldbury have closed. At Portishead they will be closing down again soon.

But phosphorus production is still one of the most important activities in Albright + Wilson. It continues in the big new furnaces at Long Harbour, Newfoundland, at Varennes, not far from Montreal on the Canadian mainland, and in Australia.

Although they vary in size and in detail all phosphorus furnaces work on the same principle. Here, *Albright Magazine* presents a simple guide to the electrothermal method of making phosphorus.



Phosphorus is extracted from phosphate rock, which is impure tricalcium diorthophosphate. It is mined on a large scale in Idaho, Florida, Morocco, Algeria, Tunisia, the Kola Peninsula, Christmas Island in the Indian Ocean, in Nauru and Ocean Island in the Pacific, in Israel, Egypt and Jordan.

A+W's North American plants get phosphate rock from Florida. Marchon, who make phosphoric acid by the 'wet process' without producing phosphorus, are supplied from Morocco.

Phosphate rock is mixed with silica and carbon (usually in the form of anthracite or coke) and fed to an electric furnace. In some plants (Newfoundland for example) the rock is powdered and then made into marble-size pellets before going to the furnace.

Left:
Heat is generated in the furnaces by striking an arc between the carbon electrodes and the furnace melt. In the big Newfoundland furnaces the electrodes have a 55 inch diameter and 10 foot sections are joined together to make 70 foot lengths. The Newfoundland furnaces are designed to consume 60 megawatts – enough electricity to keep 600,000 standard 100 watt light-bulbs going – but they will almost certainly run at more than that. The temperature of the melt in the furnace is about 1550°C.

Phosphorus vapour and carbon monoxide escape continuously from the top of the furnace; the slag collects at the bottom and is removed either continuously or as frequently as the load demands. The carbon electrodes slowly burn away and new lengths of carbon are fixed to the top to replace this loss. The furnace is worked continuously until the carbon crucible is worn out; this should last for a number of years.

Below:
A diagram of the whole process. The phosphorus vapour and carbon monoxide pass from the furnace to a dust precipitator and then on to condensers. The carbon monoxide passes on and is used as a fuel. The phosphorus is condensed by sprays of warm water and is collected as a liquid under water at the bottom of the tower.