

THE BRITISH COAL UTILISATION RESEARCH ASSOCIATIONInformation Circular No. 17The Coke-Fired Downjet Furnace in Industry

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1. INTRODUCTION

The principle of the coke-fired Downjet furnace has been described in Information Circular No. 2; small, automatic steam generators and coke-fired Downjet steam generators were dealt with in Information Circulars No. 3 and 4. The purpose of this Circular is to describe, after a brief review of the scope for the Downjet furnace in industry, the furnaces which are already at work in industry and those which are in the process of being installed.

2. THE FIELD FOR DOWNJET2.1 Preheated Air

The admission of air by a nozzle not in contact with the fuel, and the low excess air with which it can be worked, make the Downjet furnace eminently suitable for high-temperature processes such as crucible melting of ferrous alloys and firing or testing of refractories. Temperatures in excess of 1 600°C. have been obtained without difficulty using cold air; an experimental furnace with air preheated to 350°C. gave a temperature of over 1 750°C. Air preheat is not used on the Downjet furnaces now working in industry nor is it envisaged for any at present under construction.

No existing type of recuperator can work with a gas inlet temperature above 1 200°C. and remain tight against a pressure difference of 6-10 in. w.g. The gases could, if not cooled to about 1 000°C. by the process itself, be cooled with air in a mixing chamber before entry into a recuperator, but the mixing chamber would be large as, in extreme cases, the volume of air required for cooling would be as great as the volume of gas to be cooled. Alternatively, recuperators relying on gas radiation might be designed.\* The use of a regenerator would be complicated in many ways.

The problem of recuperation from high-temperature gas having been solved, the limit of temperature would be set by the materials available for building the furnace.

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\* Such a recuperator was designed, but not built, by the Furnace Department in 1947. Others have since been described (e.g. Escher, World Power Conference, 1947).