

The fluid-bed combustor and turbine blade test section being built at BCURA. (Courtesy, BCURA Gazette.)

about 700°–800° C. At this temperature, the ash does not form solid lumps of clinker, but remains in the finely divided form which is essential for the formation of the fluidized bed. Because the bed is almost 95 per cent ash and only 5 per cent coal, very poor grades of coal with a high ash content can be used, and coal preparation costs can be minimized. The high heat extraction rates mean great reductions in boiler size, and because the temperature is comparatively low, fouling and corrosion of the boiler tubes should be slight.

Even greater economies are possible if the entire boiler is operated at high pressure, and work at the British Coal Utilization Research Association is directed at developing this concept. Even further reduction of the boiler size is possible (down to 1/20 the size of conventional boilers), and the exhaust gases, after cleaning, are used to drive a gas turbine. By the end of this year the staff at BCURA hopes to have precise calculations of the costs of a 140 MW unit, in which 20 MW would be generated by a gas turbine and the rest by a steam turbine. Much depends on how efficiently the exhaust gases can be cleaned before they enter the gas turbine, and the test programme at BCURA includes the construction of a pressurized boiler whose exhaust will impinge on Nimonic turbine blades to gain information about rates of erosion, corrosion and deposition. The hope is that the low combustion temperature will minimize the amount of corrosive alkali metal compounds in the exhaust gases.

Another test rig at BCURA uses a second fluidized bed in series with the first, vertically above it in the boiler. The function of this bed is to act as a heat exchanger, because some further method of extracting heat is needed; the primary bed extracts only 50–60 per cent of the heat available. The second bed, operating at a lower temperature than the first—around

260° C—would also act as a trap to prevent carry-over of particles, and with suitable additions it could be used as a means of removing sulphur from the exhaust.

The staff at BCURA is well aware that time is running out. "The time-scale must be short," says Mr A. G. Roberts, who is responsible for the test facility. If fluidized bed combustion is not realized commercially within five to ten years, it will be too late. But if all goes well, BCURA sees opportunities in industrial scale plant as well as in the export market. At the moment, nobody really believes that the Central Electricity Generating Board can be swayed from its devotion to nuclear plants; equally, nobody is admitting this publicly, least of all Lord Robens.

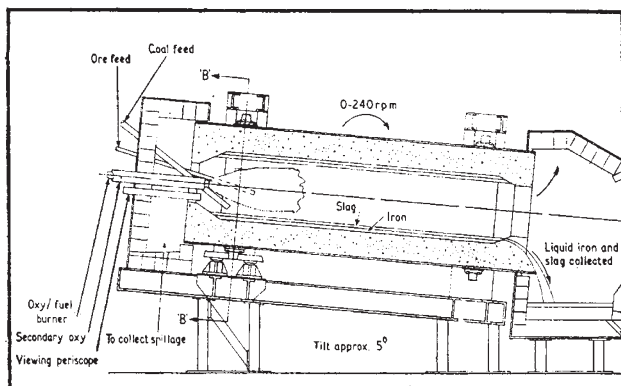
Meanwhile, BCURA is to regularize its relationship with the National Coal Board by becoming a wholly owned subsidiary. It will still, however, undertake work for industry on a contract basis, and is now actively looking for work of this sort. Although the laboratory knows most about coal, it has gathered over the years a great deal of experience in combustion, high temperature technology, automatic control, and the characterization and handling of solids.

STEEL RESEARCH

Change Round at BISRA

SIR CHARLES GOODEVE, who retires this week as director of the British Iron and Steel Research Association, can look back on an enviable record. BISRA is a thoroughly good organization and Sir Charles, who has been director since 1945, deserves a good deal of the credit. Unlike other research associations, BISRA has never allowed "collaborative research" to be a synonym for mundane investigations of members' problems. BISRA does its share of trouble-shooting, but at the same time it has managed to undertake ambitious and far-reaching research programmes, and this in an industry not noted for its willingness to innovate.

Two of the important investigations in progress illustrate this well. The Ironmaking Division, with support from the Physics Department, is working on the continuous production of iron direct from the ore, using a tube-shaped furnace rotating at high speed. In effect, the furnace is a cylinder tilted at about 5° from the horizontal, and rotating about its axis. Iron ore, coal and oxygen are fed in at the upper end of the cylinder, and react as they flow down the furnace to the lower end. Coal is used as a cheap reducing agent, and reacts (as carbon) with the ore to produce iron and carbon monoxide. The heat for the furnace is supplied by the reaction of the carbon monoxide with oxygen to produce carbon dioxide. A similar process, developed in Sweden, suffered from excessive refractory wear because the inner surface of the furnace was constantly wetted by the flow of molten iron ore. BISRA is attempting to get round this difficulty by the bold expedient of rotating the furnace fast enough for it to behave as a centrifuge, with the heaviest constituent, iron, thrown to the outer layer. The hope is that the iron, by forming a layer over the refractory surface, will protect it from liquid iron ore. The chief doubt is whether the heat transfer from the hot gas core of the furnace to the solid reactants at the perimeter will be sufficient to maintain the reaction. To



The continuous ironmaking plant being built by BISRA.

determine this, it was decided that a prototype plant was essential, and one is being built at the Tees-side laboratories of BISRA.

Another investigation equally wide in its scope is being carried out at the Swansea laboratory and is aimed at the direct production of thin steel strip from powder. The cost of producing thin strip is very high, and the opportunities for reducing costs of conventional processes are not good. The thinner the strip, the more it costs to produce, which means that there are substantial opportunities for new processes. The one BISRA is investigating uses a mixture of iron powder and binder, which is coated on to a temporary substrate before passing through rolls to form a compact. The binder is removed by a flash heat treatment, which also partly sinters the strip. A second pass through rolls and another heat treatment follow, and the finishing touches may be applied either by planishing or temper rolling. So far, the experimental plant has produced strip which compares closely with conventional strip in properties, though to be economical the process needs to be operated at high speeds. If this can be done, the powder strip might be able to compete with conventional strip in the production of tinsplate. A more immediate prospect seems likely to be the production of stainless steel strip, and the pilot production line is now producing rolls for evaluation by customers.

Since nationalization of the steel industry, BISRA has also been known as the Inter-Group Laboratories of the British Steel Corporation, which should ensure that it continues to have an important part to play in the future. The new director, Dr R. S. Barnes, previously head of the Metallurgy Department at AERE, Harwell, takes over today (March 1).

SCOTTISH ASTRONOMY

Astronomer Royal Reports

from our Astronomy Correspondent

THE predicament which prompts British observational astronomers to seek sites overseas is neatly summed up by the Astronomer Royal for Scotland, Professor H. A. Brück, in his report for the year ending March 31, 1968. "With 77 nights suitable for photometric work, observing conditions on Blackford Hill have been above average during the past year." Blackford Hill, on the outskirts of Edinburgh, has been the site of the Royal Observatory of Scotland since 1895, when the

Victorian astronomers of Edinburgh moved their observatory from its original site nearer the centre of the city. But suburbia has once again caught up and the Royal Observatory has now taken a bigger step to Monte Porzio, near Rome, where a Schmidt telescope has been installed at Rome Observatory.

The need to make all their observations count may be one explanation of the emphasis on instrumentation at Edinburgh, which has recently seen the introduction of a computer at Blackford Hill and the development of an automatic measuring machine called Galaxy which will speed the analysis of plates exposed in the observatory's Schmidt telescopes. The Astronomer Royal for Scotland also reports work on the electronics of the twin 16 inch telescope at Edinburgh to prepare it for full on-line control, together with completion of the control system and of a three channel photometer with a computer output. Much of the research effort has been devoted to a study of the part played by dust in the galaxy, including observations of stars embedded in circumstellar clouds of dust and work on the grains of the interstellar medium. The report also records the completion of a new extension at Blackford Hill containing laboratories, workshops, offices and a new 20 inch telescope. But in view of the observatory's location in the poor climate of Britain and only a few miles from the centre of a major city, it is worth asking whether more of the facilities at Edinburgh ought not to be moved to Italy.

PLANNING

Campus in Bloomsbury

from our Planning Correspondent

A LAST-MINUTE attempt to frustrate London University's plan to demolish the Georgian houses in Woburn Square in Bloomsbury came to nothing last week when, at an extraordinary meeting of Convocation, a motion calling on the university to "halt the imminent demolition" of the square, and to "prepare new plans that will preserve at least the facades and the gardens", was defeated by 301 votes to 281. The university's plan is to replace the square with a new building designed by Denys Lasdun, part of the comprehensive outline scheme prepared in 1959 by Sir Leslie Martin for the development of the university precinct—a 35 acre site between the British Museum and Euston Road. The new building involves the complete rebuilding of the eastern side of Woburn Square to rehouse the Institute of Education, which has long since outgrown its accommodation in Senate House. There will also be an extension to the School of Oriental and African Studies.

The decision of Convocation, the university's graduate body, now means that the University Court can go ahead with the rebuilding. Money is available for the start of the development—some £3.5 million over the next two financial years. Final planning permission was obtained from the Greater London Council last year. There is only one snag, about which the university is not unduly worried—permission for the closure of Woburn Square to traffic has still to come from the Ministry of Transport. If the objectors have their way, there could be a public inquiry which could delay the start of the rebuilding, although probably not the demolition.