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*The Peak 1959
House mag of
International
Combustion Ltd*

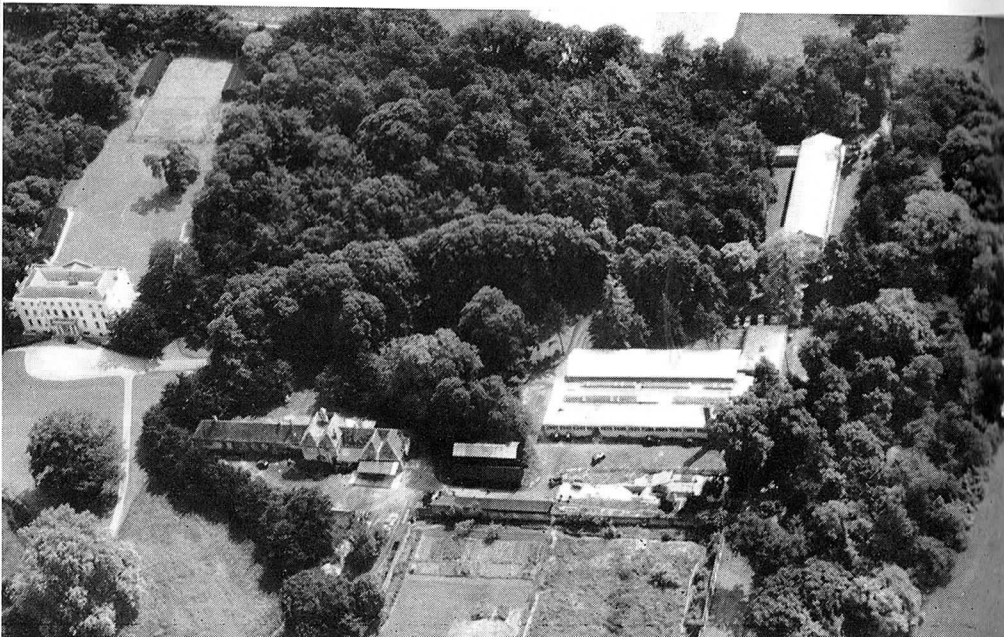
ADVANCE IN WELDING

WELDING, there is little doubt, will be the chief method of joining metals and the fabrication method of the future. Much has been done to explain the composition of the welded joint. The question of weld cracking has been closely correlated to composition, transformation characteristics, and hydrogen embrittlement. Tests on cooling rates, pre-heat, post-heat, and exclusion of hydrogen are the subject of past experiments, and satisfactory conclusions have been reached.

After attending conferences at the Institute of Welding in London, I visited the British Welding Research Association Station at Abington Hall, near Cambridge. This, a wooded estate in a rural landscape, is now devoted to welding experiments. Its activity is manifest in the new buildings, which are being constantly erected to cater for the expanding programme. The design of the buildings is part of the experiments, and incorporates a plastic frame. What was once a group of stables is now a place of 'up to the minute' spot and strip welding research.

Abington Hall, Cambridge

B.W.R.A.



The Association commenced its activities in 1935 and became the British Welding Research Association in 1946. Its main source of income is subscriptions from some 400 companies and associations, our own Firm being one. This is supplemented by a grant from the Department of Scientific and Industrial Research. Though the total income of the Association exceeds £160,000, it is expected that expenditure on research will increase to £250,000 per annum by 1963.



*Carbon dioxide
welding of
1" thick
mild steel*

B.W.R.A.

Apart from general research by committees, confidential research reports are completed for members. The researches over a number of years have provided a wide range of basic design data, but experience with problems submitted shows that this knowledge has not been absorbed by the many design offices.

A topical example may be taken from their list of problems. During proving and training tests with the 'sno-cats' used in the Transantarctic Expedition, welds in the track units cracked and the

tracks failed. The British Welding Research Association were asked to inspect these. Their examination showed that the welds had been made without the necessary control over welding conditions, including pre-heating, and controlled cooling after the welds were made. The Association was asked to undertake the welding due to the gravity of the situation. All the welds were machined out and welded under strict metallurgical control. In spite of the severe conditions experienced in the Antarctic, no weld failures occurred.

IN THE LABORATORIES I saw work in progress—resistance welding of ordinary and special metals, investigation of arc characteristics, brittle fracture tests on steels up to 3 inches thick, fatigue testing with special reference to relieving residual stresses by local heat, and investigation into the welding of the rarer metals, *e.g.* zirconium and titanium. A spectacular demonstration was the welding of 1 inch thick M.S. plates by a single pass from one side and without any edge preparation of the plates. Welding was carried out by an automatic gas-shielded machine using a carbon dioxide atmosphere and a bare consumable electrode $3/32$ inch diameter. The welding current was in the region of 700 amps, voltage 30, and a welding speed of 12 inches per minute. This method of welding is attractive as carbon dioxide gas is cheaper than argon and the saving in preparation of plates considerable.

Another demonstration of the same process used for welding 16-gauge stainless steel with $3/64$ inch wire, at an amperage of 120 and an arc voltage of 27 was equally spectacular since the welding was carried out in one pass at 12 inches per minute. In each case the plates were butted together and mounted on a grooved copper plate before welding. Etched sections of the completed joint showed perfect results. Other research work is supported by the University of Cambridge and the University College, Swansea.

It is advisable to consult the Association in the early stages of a design if doubts arise. It is unfortunately true that enquiries come to the British Welding Research Association when service failure has taken place and when it is too late to do anything except make minor changes in design.

Owing to the absence of instruction in welding technology in University and Technical College courses, welded design is being attempted by designers who have not had the opportunity of gaining fundamental welding knowledge. It is left to the industrial firms to provide this training but the British Welding Research Association are investigating the formation of a new design advisory service. It is evident that instruction is needed to enable design and production staffs to translate important research results into practical applications.