Fulmer Research Institute

ON Wednesday, July 2nd, the Fulmer Research Institute Ltd., near Slough, was officially opened by Sir Stafford Cripps, the President of the Board of Trade. A large company of friends and guests were present. The Institute has been founded in order to provide a research centre where firms can use first-class facilities, backed by the services of a team of scientists of wide knowledge and experience. The results of the research work remain the sole property of the firm. So far the scope of the Institute has been confined mainly to the metallurgical field, but it may be later expanded in other directions.

It does not compete with any other research centre in Great Britain, and it is hoped that it will fill a long-felt need, and will play a part in this country comparable with that played in American industry by the Battelle, Mellon and other American research institutes.

The directors of the Fulmer Research Institute are Colonel W. C. Devereux, F.R.Ae.S., chairman; Mr. Nigel Balchin; Mr. E. A. G. Liddiard, M.A., F.I.M.; Mr. W. R. Merton; Mr. Spence Sanders, and Mr. H. G. Warrington. The staff includes forty members working under the following senior officers: director of research, Mr. E. A. G. Liddiard, M.A., F.I.M.; principal scientist, Dr. P. Gross, Phil. D.; principal physicist, Mr. H. Sully, M.Sc.; metallurgists, Mr. E. A. Brandes, B.Sc., A.R.C.S., Dr. H. K. Hardy, M.Sc., A.R.C.M., Ph.D., and Mr. C. S. Campbell, M.A.; physical chemist, Mr. D. L. Levi, M.A., B.Sc.; engineer, Mr. E. W. W. Double, B.Sc., A.I.M.M.E., and librarian, Miss S. P. Foster, A.L.A.

In introducing Sir Stafford Cripps, Col. W. C. Devereux outlined in brief the background of the new venture, which he said had its real birth two years ago, when he was forming a new group of companies and the question of finding and providing research facilities for them had to be considered. Sir Stafford, he went on to say, had taken a kindly interest in the scheme right from the beginning and had given it every support and encouragement throughout its development.

Sir Stafford outlined the various research methods such as those operated by the D.S.I.R., the Universities, Government and private bodies, upon which British industry depended, he said, for its vitality and progress. Amongst these organisations there were a number of gaps, the principal of which was in the range of the smaller but enterprising firms which could not of themselves afford to set up research departments proportionate to their vigour. The Fulmer Research Institute was particularly designed to fill part of that gap, and it was the prototype of the kind of research organisation which would largely fill the gap altogether. It was founded on three principles; first, that it was absolutely first rate in its staff and equipment; secondly, that the results of research sponsored by an individual firm were retained by that firm, whether in the form of "know-how" or of patents, and, thirdly, it was non-profit-making. Another convenient arrangement was that made for members of the staff of the sponsor firm to come and work in the Institute so that they would thus be in a position to translate the results back to the factory. It also economised in scientific effort, and he wished it every success.

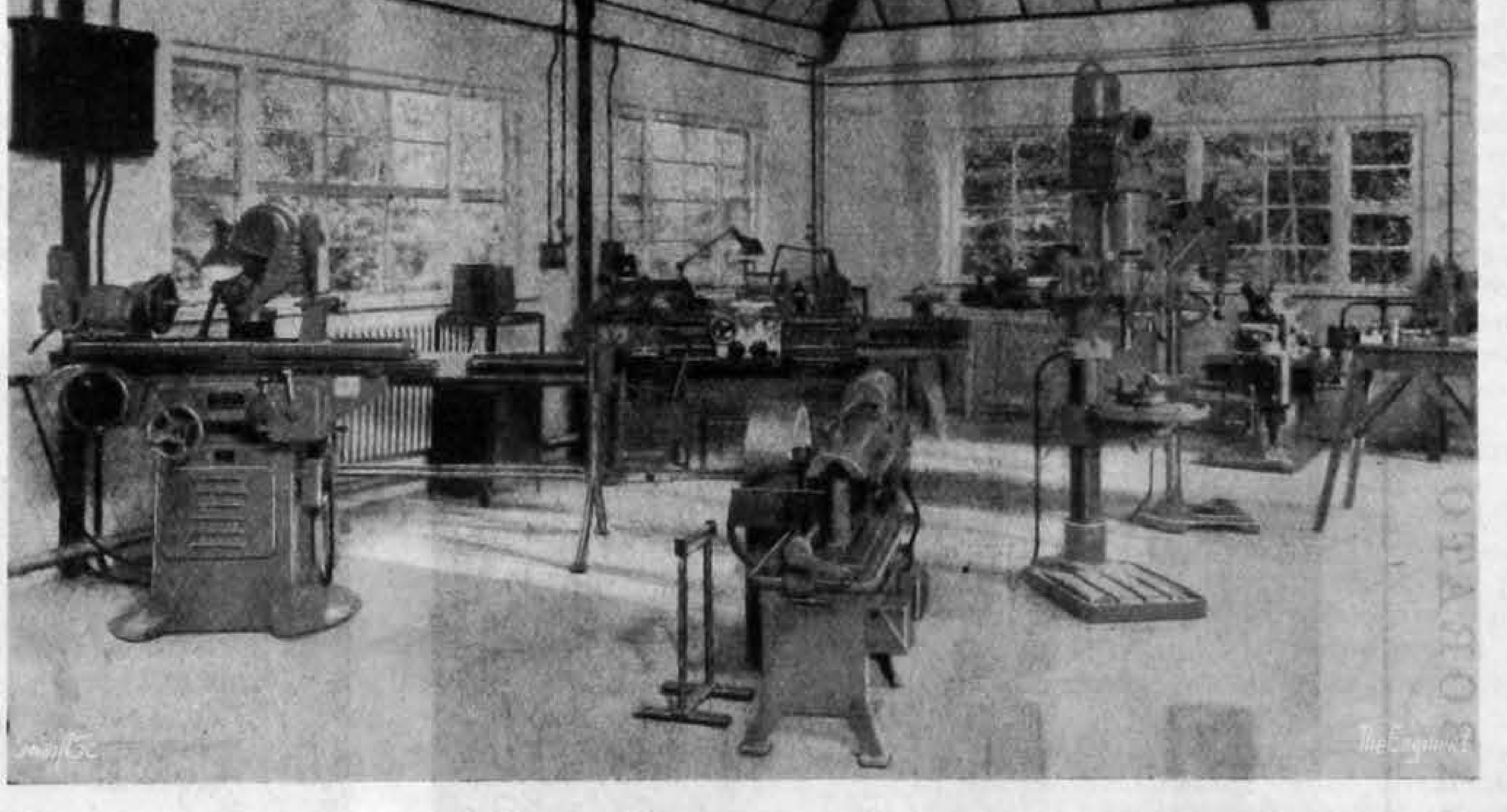
MAIN BUILDING

Mr. Liddiard thanked Sir Stafford and Lady Cripps and said that the will to succeed which was inspired by the chairman, Colonel Devereux, permeated the whole of the Institute's staff, which worked as a team. The problems on which they were working, and of which more were wanted, were those involving physical metallurgy, metal purification, and distillation, the application of thermodynamics to industrial metallurgy, protection and finishing problems, and the development of new casting processes, and procedures. It was hoped to attract private firms, and to work for groups of firms or for a particular section of industry. He pointed out that the fine aluminium portable building in which tea was served had been lent by the associated firm Structural and Mechanical Development Engineers, which was responsible for its design fabrication and quick erection.

The Main Building

The main laboratories and the library, also the administrative offices, are housed in a converted Edwardian country house, while the workshops, casting and heat treatment laboratories are situated in a new building close to the original house. The accompanying engravings show the main building and an interior view of the engineering shops. The buildings stand in about ten and a half acres of ground, with five acres of orchard and garden, along with a paddock of some five and a half acres, giving ample room for future expansion.

Some 20,000 square feet of area is available in all the buildings, of which 7000 square feet are available for experimental laboratories, 1000 square feet for workshops, 2,300 square feet for laboratory storage, 2275 square feet for studies, offices, and conference room, and 525 square feet for the library. The limited area of cellerage has made it necessary to install the heavier equipment of the melting testing laboratories on the ground floor, making use of separate concrete bases at ground level for heavy or vibrating machinery, the first floor being reserved for the laboratories calling for lighter equipment. Gas mains have been laid in anticipation of a local supply and, meanwhile, use is being made of "Calor" gas fed to all essential points from individual gas cylinders. The Institute is provided with three-phase electric power at 50 cycles frequency and 415 volts line voltage, and in most laboratories 230 volts single-phase supply is also available. Direct current for corrosion tests, etching, polishing and engineering laboratories is furnished by rectifiers. Heating is by hot water from a coke-fired boiler, and good laboratory ventilation has been provided. In the new building similar power and heating facilities are installed, the heating being supplied from an oil-fired boiler.



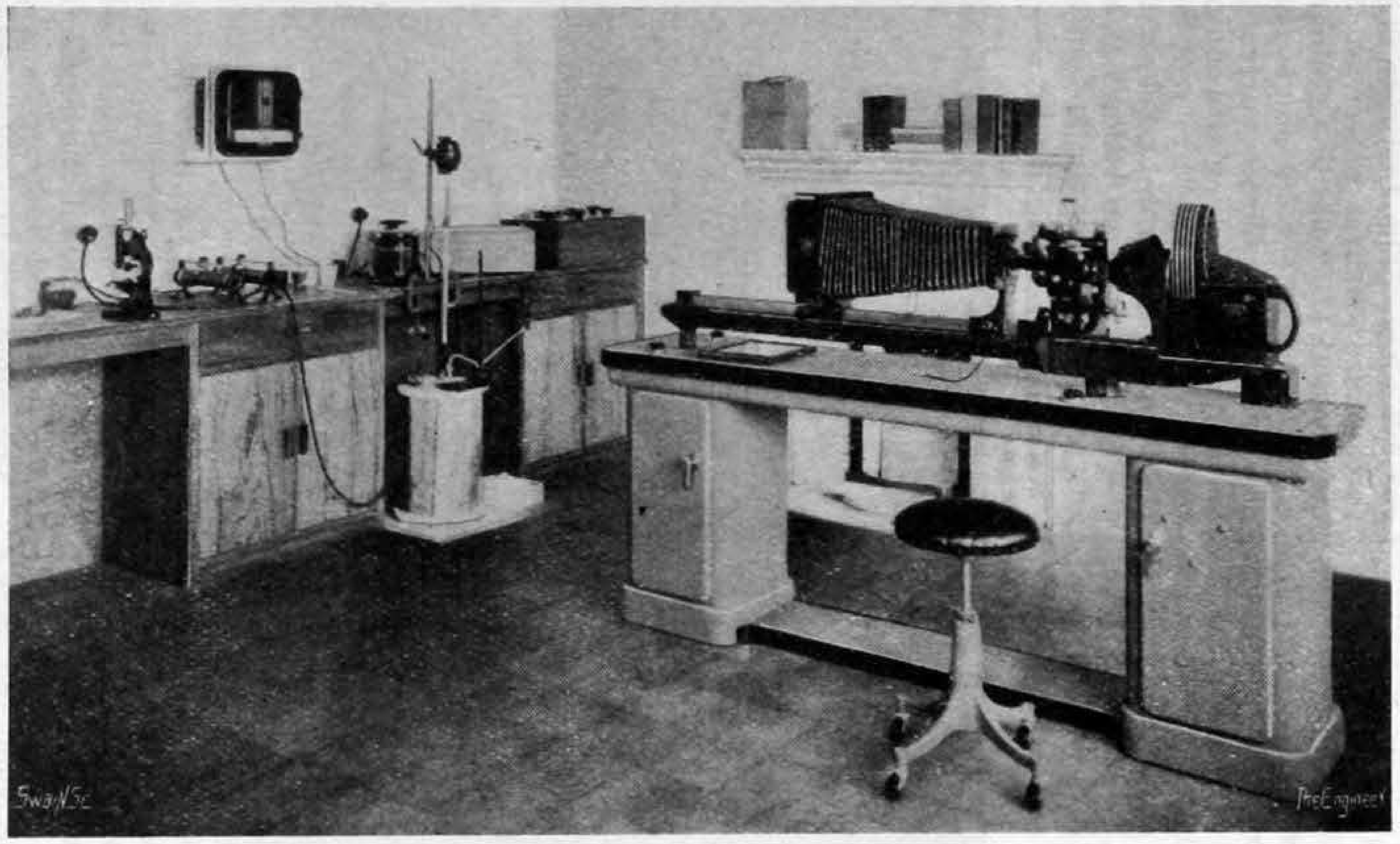
MACHINE SHOP

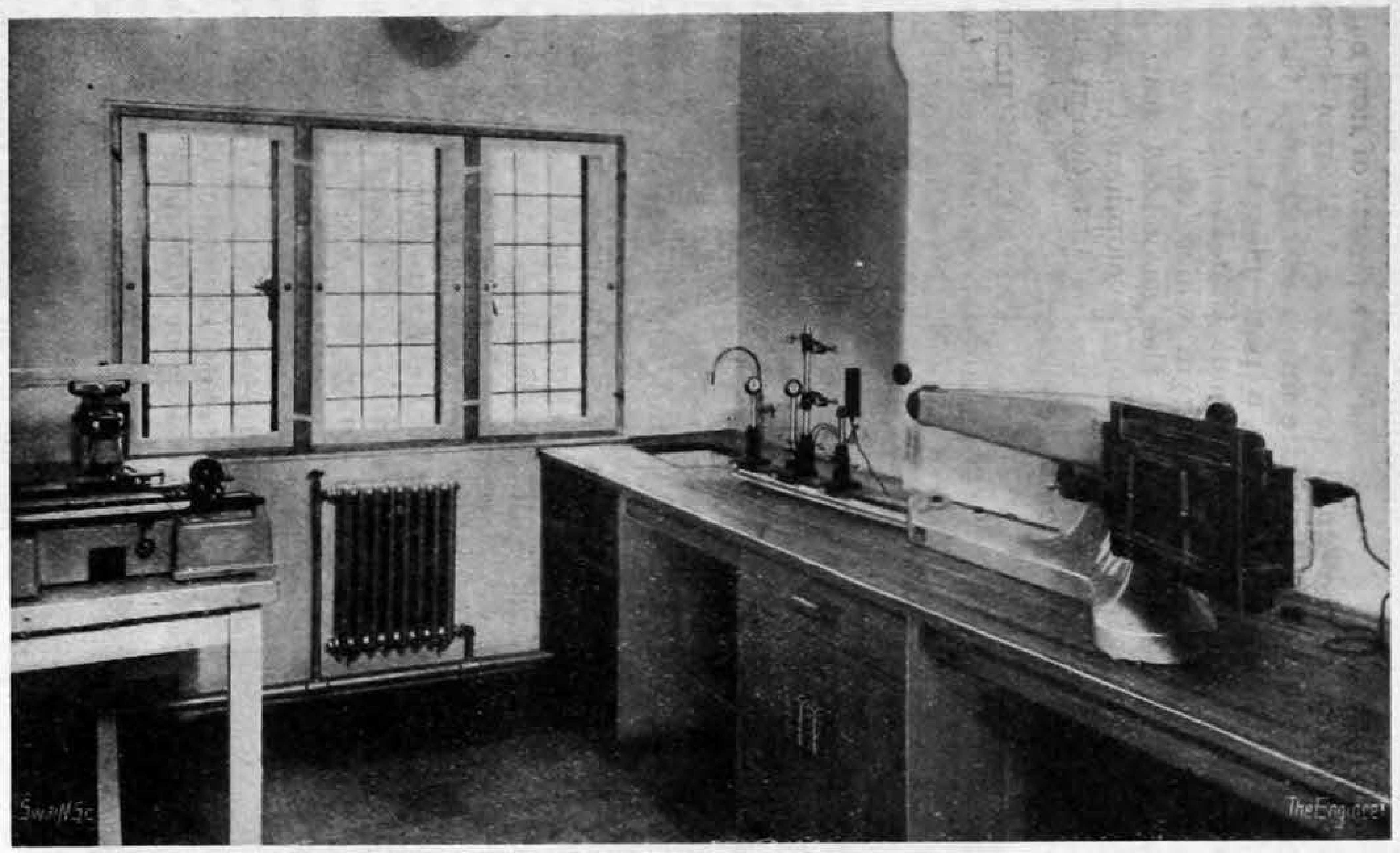
The administrative offices which include the director's office and the conference room, face the main entrance; thus all administrative work is concentrated at one end of the building.

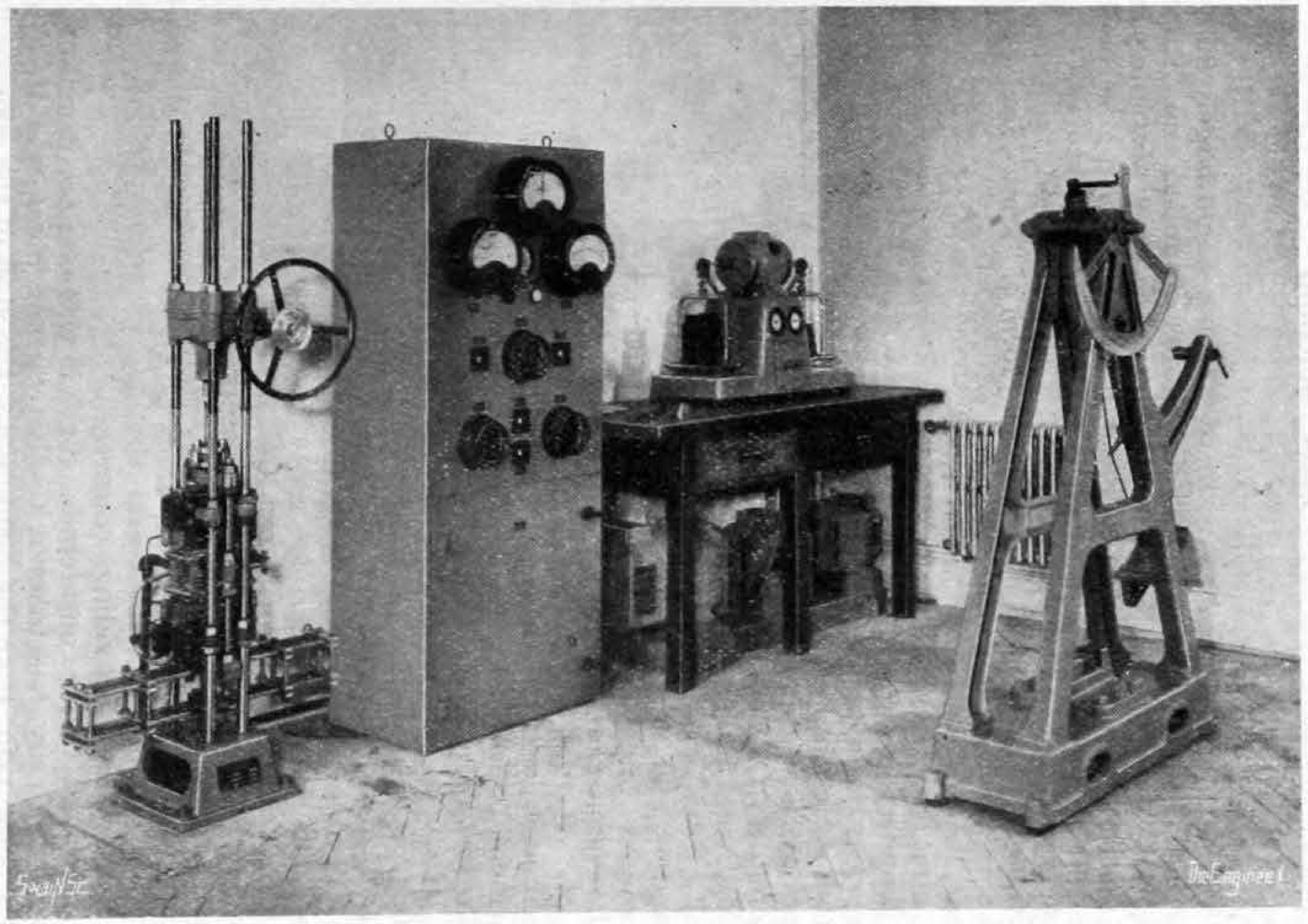
Metallographical Equipment

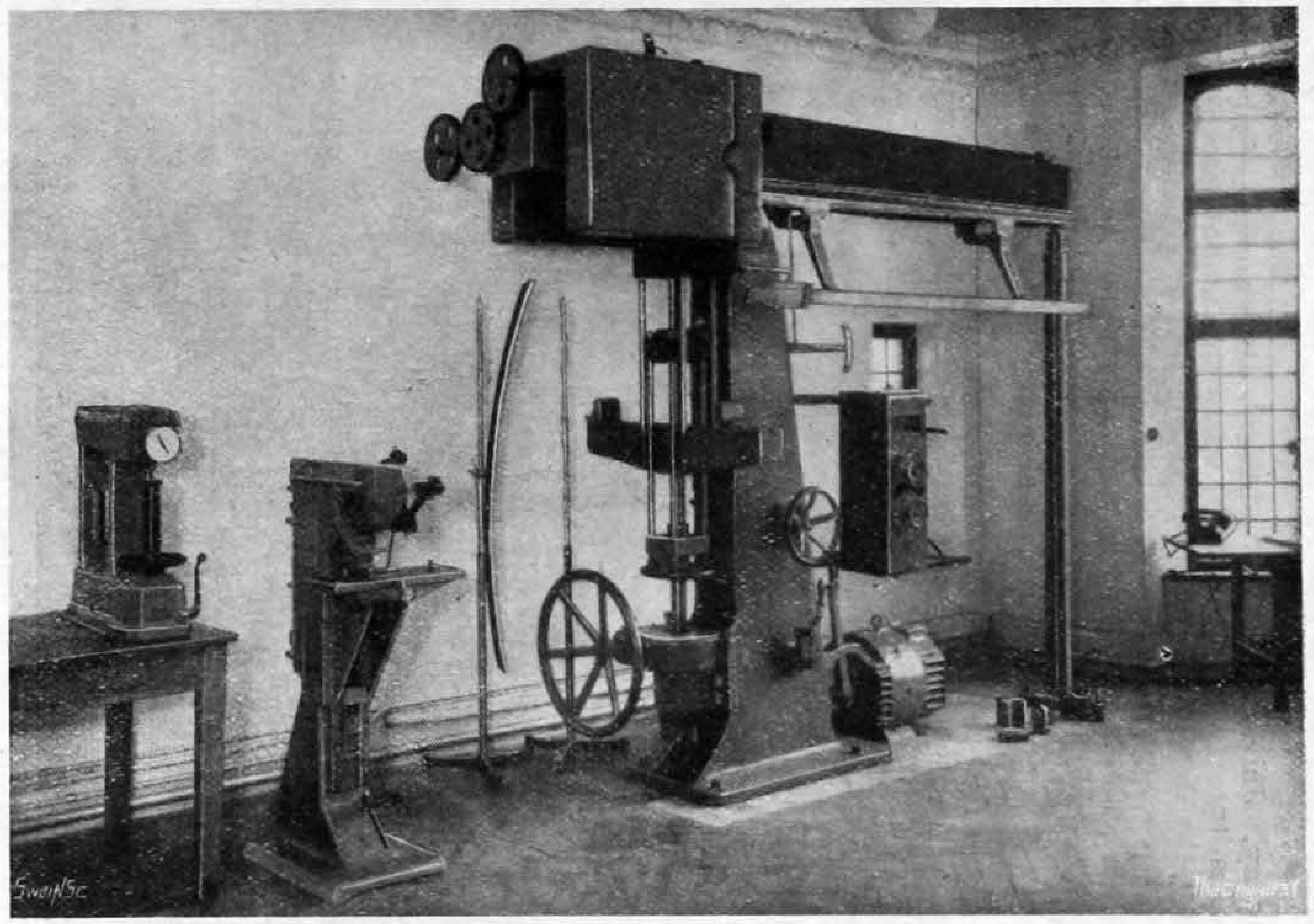
The metallographic and photographic sections are in the east wing, on the first floor. The largest room of the three faces south and

LABORATORIES OF THE FULMER RESEARCH INSTITUTE, STOKE POGES









METALLOGRAPHY—BAUSCH AND LOMB METALLOGRAPH
ENGINEERING LABORATORIES—FATIGUE AND IMPACT TESTING

SPECTROGRAPHIC LABORATORY
ENGINEERING LABORATORIES—TENSILE AND HARDNESS TESTING

houses the Bausch and Lomb metallograph, which we illustrate opposite. It provides for the examination and photographing of specimens at magnification from 50 to 2500, with attachments for dark field illumination and for examination by polarised light. Other apparatus we noted includes a Beck bench-type metallurgical microscope, and a Watson binocular microscope. Equipment for thermal analysis will also be housed in this laboratory. A second laboratory is arranged for polishing, mounting and etching specimens, while a third room is equipped for photographic work, with ample room for storing photographic material and negatives.

In the corrosion and plating laboratory a bench is used for electro-chemical measurements, and there are wall benches for special corrosion testing, with outside window space for atmospheric and spray corrosion testing. Apparatus under construction includes a salt spray cabinet and four-point loading stress corrosion testing apparatus. On the left-hand side is a bay for plating and anodising experiments, which has a lead-lined tray and is furnished with electric current.

Alongside this room is a general study room in which investigators can write up their reports and prepare drawings. Three other studies are provided for the senior scientific staff.

Next the study is a dark room for the development of spectrographic plates, and a small laboratory where spectrum lines are identified by a spectrum viewer, and their intensities measured by a microphotometer. The spectra are photographed in a third room facing south, which is completely screened for working with high-frequency sparking. A Hilger medium spectrograph is available (see opposite page), and electrical controls for d.c., arc and high-voltage high-frequency spark excitation are provided.

Vacuum Laboratories

Two interesting laboratories are those set aside for specialised work involving high vacua and temperatures. The first of these, facing south, is fitted with a flat-topped central fixed bench furnished with all services. Flat-topped marble benches are also available. Pumping equipment, designed to maintain a vacuum of 0.001mm of mercury, and platinum furnaces, giving temperatures up to 1500 deg. Cent., with appropriate controllers and recorders are installed. As this work involves reactions with metallic halides, fume cupboards and wall benches are provided for the preparatory and ancillary work. This work forms the basis of a process for the extraction of aluminium from comparatively dilute alluminium alloys produced by electro-thermal reduction and a process for the purification of aluminium.

Chemical Laboratories

The group of chemical laboratories on the first floor consists of a main general chemical laboratory, one laboratory set aside for colorimetric and absorptiometric work, with a small laboratory for microchemical analysis and other specialised work, along with a balance room. The main laboratory has a central bench and a wall bench with a fume cupboard and hood. One bench is set aside for glass blowing, and there is a small muffle furnace for ignitions and a thermostatically-controlled oven, together with the more general chemical apparatus. A Hilger-Spekker absorptiometer is installed. In the microchemical laboratory we noted a Tinsley polarograph, with its ancillary amplifier and recorder. The second floor contains a light chemical store and the duplicating equipment.

Material Testing and Creep Laboratories

On the ground floor are the mechanical testing and creep testing laboratories, views of which we reproduce herewith. Provision is made for testing the strength of materials at both room and elevated temperatures. The large testing machine is an Avery 10-ton single-lever machine, which is designed to carry out either tensile, bending or compression tests. There is a standard Izod impact testing machine and Vickers-Diamond and Rockwell hardness testing machines. the Rockwell machine being adapted for carrying out comparative hardness tests at high temperatures. The other view reproduced shows the 30-cwt Haigh fatigue testing machine for alternating, compressive and tensile stresses, with or without a mean tensile stress. The machine is designed to operate at 1800 reversals per minute, and it can also be modified for making tests at high temperatures. The Avery duplex Wöhler machine for reversed bending at 2000 reversals per minute with single-point loading is also shown in our illustration.

The creep-testing laboratory, which we do not illustrate, has a concrete floor on which are installed two 5-cwt Denison lever pattern creep testing machines of the National Physical Laboratory type, designed for creep tests at temperatures up to at least 1000 deg. Cent. Some new additions to this laboratory are being built in the Institute's workshop, and they include machines based upon an N.P.L. design for creep testing miniature specimens in compression up to 1200 deg. Cent. as a quick sorting test in developing creep resistant alloys.

The Physics Laboratory

The main physics laboratory is on the ground floor and it has central flat-topped benches and wall benches. It is arranged for measurements of electric and thermal conductivity, instantaneous specific heat, static and dynamic strain, and the determination of the coefficient of thermal expansion and other dilatometric work. The calibration of thermo-couples is also undertaken in this laboratory. There is a Kelvin double bridge for electrical conductivity measurements, and a strain gauge bridge with cathode ray oscillographs, together with potentiometers, Wheatstone bridges and galvanometers. Other optical, thermal and dilatometric apparatus is in course of construction in the Institute's workshops.

Leading from the main laboratory is a small lead-lined room containing a Metropolitan-Vickers crystallographic X-ray set. Room is left, however, for a more powerful X-ray set for radiographic work, should this be needed. The cameras available, include Metropolitan-Vickers 9cm and 19cm powder cameras, a universal camera, and a goniometer head for work on single crystals. There is also a Unicam high-temperature camera for carrying out high-temperature studies in the constitution of metals and alloys at temperatures up to 1000 deg. Cent. An instrument for the precise measurement of X-ray films is in course of construction.

There is a fine library on the ground floor, with, in addition to bound "Transactions" of Scientific Societies, some 400 volumes of text and reference books and numerous reprints of articles of technical interest. A kitchen and canteen is provided for the laboratory staff, accommodating forty-eight persons at one sitting.

Engineering Workshop and Foundry Building

The new building, an interior view of which we give herewith, is excellently constructed to harmonise with the main building. The room for the heating boiler also accommodates the compressor for air supply. Melting furnaces are installed in a pit at the far end of the laboratory, which is supplied with single-phase and three-phase current and compressed air. The melting furnaces include a 20kVA Electric Furnace Company medium frequency (3000 cycles) induction furnace of the motor generator type designed for melting in special atmospheres or in vacuum. There is also a 27kVA "Silit" rod electric resistance furnace designed to melt 38 lb of aluminium. In addition, we noted a Morgan oil-fired furnace of 20 lb capacity and a tilting arc furnace suitable for precision casting. A large electrically-heated core-drying oven, which can also be utilised for low temperature heat treatment and a sand mill are installed in this laboratory.

Adjoining the foundry is the die-making and sand-testing department, with sand-testing equipment and a vibrating table for sieve shaking and consolidation for the "lost wax" type of mould used in precision casting.

Adjacent to the sand testing laboratory is a paint and enamel spraying booth, in which paint, metal and other forms of spraying are carried out.

Heat Treatment Laboratory

The north wing of the new building houses the heat treatment furnaces, which include a "Birlec" forced air circulation furnace, primarily reserved for the heat treatment of light alloys, and suited to temperatures below 700 deg. Cent. There are three other furnaces, one of which is a "Silit" rod furnace, designed for operation at temperatures up to about 1400 deg. Cent., while a gas-fired refractory kiln for temperatures up to 1800 deg. Cent. is also under construction. Space is reserved in this laboratory for the carrying out of special research work requiring small experimental plant, and for the installation of further metal working equipment.

The Engineering Workshop

The laboratory workshops, which are served by a staff of six persons are situated in the south wing, and are illustrated herewith. The equipment we saw running in the shop includes a 5in Holbrook precision lathe and four other lathes, all of which are electrically driven. There are four drilling machines for drills of 1¼in down to the smallest diameter. Other machines are the hacksaw and bandsaw, and a shaping machine, universal grinder and a universal milling machine. For sheet metal work a set of bending rolls and a brazing hearth with blowpipe equipment for cutting and welding, are available. Leading from the main workshop is a small room for the construction and maintenance of laboratory instruments.