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PRINCIPAL CONTENTS

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Steelfoundry Productivity

The British Steel Founders' Association have issued a Report, an abstract from which is printed elsewhere in this issue, which sets out the progress made in the steel-castings industry since its productivity team returned from America. When it was presented to a conference last week, it was obvious that the lay Press would have liked to have a simple figure—preferably, of course, one which would make headlines—giving increased production. Such a figure, however, is difficult to obtain; for example, a rush of orders for very heavy castings would show an increased output for the industry, but if these heavy castings were absorbing exactly the same number of man/hours to produce, then productivity would be static. If, on the other hand, the order book was short of just one 100-ton casting but contained a demand for 8,000 twenty-eight-pound components of various sorts, and these were made at half the expenditure of man/hours previously used, then there would be vastly increased productivity, but no extra production.

There is, however, an index which does reflect increased productivity, and that is selling prices. Here, the Association was wise to display a chart showing, not the Board of Trade general indices, but those of industrial materials and manufactures, as compared with the selling price of steel castings. In the former case, prices had risen for an article costing £57 10s. at the end of 1939 to £198 10s. (345 per cent.). During the same period, with wages alone rising 134 per cent., steel castings had gone up from £57 10s. to £95 (165 per cent.). This ratio is of cardinal importance, because it is only by producing more goods at lower cost that inflation can be staved off, and the harassed housewife can obtain some sort of value for the money she spends. This approach should appeal, one would think, particularly to the man in the street. Nevertheless, Mr. Frank Rowe, the chairman of the B.S.F.A., registered a complaint that his industry was not receiving the co-operation of the executive committee and permanent officials of the Amalgamated Union of Foundry Workers—the major trade union in the industry. This is to be regretted, as lowered selling prices are just as beneficial as a larger pay packet.

The chairman was fulsome in his appreciation of the benefits his industry had derived from the Reports made by the Jobbing Ironfounders and the Brass and Bronze Founders. Steelfounders had also, with advantage, used the information contained in the Anglo-American Productivity Council's publication on " simplification " and various phases of management. He was conscious that progress would have been made even if the American steelfoundry industry had not been so carefully investigated and emulated, but to quite a limited extent. On being pressed, he and his colleagues guessed the increased productivity to be of the order of 15 per cent. If this be true, and we have no reason to doubt it, the industry well merits the congratulations of the public and the Government. The latter should take cognisance of this Report and change their policy from frustration to one of helpfulness. Productivity is and must be the main-plank in the economic policy. There is no other practical remedy against inflation, and even the reduction of waste and excessive manpower in Government services are but palliatives. We exhort every section of our industry to search for every means possible to increase its productivity and if not lower selling prices, at least keep them as low as possible. It is by its selling prices that the efficiency of industry will in the future be measured.

Notes from the Branches

Sheffield

Sheffield Branch of the Institute of British Foundrymen held its first meeting in Doncaster on Wednesday evening October 3. This was very successful, there being 85 in the audience. Mr. W. J. Colton took the Chair and explained the activities of the Institute. His remarks were followed by a short address from Mr. E. Burgess, managing director of John Fowler & Company (Leeds) Limited, Sprotborough, who referred to the growth of the foundry industry in and around Doncaster. Dr. C. J. Dadswell, senior vice-president, then spoke in support and gave a cordial invitation to all members of the audience of appropriate status to join the Institute. A lecture illustrated with lantern slides was then given by Mr. J. H. Pearce and Mr. G. D. Whitehouse entitled "Casting Design in Relation to Production." The meeting closed with a hearty vote of thanks to the organisers, proposed by Mr. J. G. Bailes, past-president of the Sheffield branch, and seconded by Mr. J. P. Cummings of International Harvester Limited. The next Doncaster meeting is to be held on December 5, 1951, in the Doncaster Technical College commencing at 7.0 p.m., when Mr. W. W. Braidwood will present a Paper entitled "A Decade of Progress in British Ironfounding.'

Foundry as a Career

Three booklets have been received from the Ministry of Labour and National Service, numbered 19, 20 and 21, and bearing the captions of "The Foundry Industry;" "The Moulder" and "The Patternmaker." The first costs 1s. 3d. and the other two 9d. each. These booklets are factual, if not very fascinating. Really they should be considered as three of a series, but we have not so far seen the others. No doubt uniformity of presentation has rightly been sought. They are particularly clearly illustrated. There was really no need to issue one on patternmaking as there is no dearth of entrants to this craft, yet completeness of cover may have been sought for the series. In spite of the difficulty of writing for a whole industry instead of one or a group of plants, the authors have done exceedingly well.

Pig-iron Shortage

Owing to the shortage of hematite pig-iron, Ley's malleable Castings Company, Limited, Derby, will have to curtail production by 20 per cent. from October 15 until further notice. There will be no unemployment, and it is hoped that the difficulty will be overcome in a few weeks' time. At Qualcast, Limited, Derby, production has been affected in some degree since the end of June. Although Aiton & Company, Limited, Stores Road, Derby, do not use hematite pig-iron, the supplies of ordinary pig-iron are not satisfactory, but so far production has not been affected.

Higher Technological Education.—The Government has issued a White Paper bearing the above title. It is published by H.M. Stationery Office (price 3d.) and states that when conditions are less straightened, the Government intend giving increased financial aid to the existing technical colleges—which is praiseworthy—and to go ahead with the formattion of College of Technologists, an action which does not have the approbation of most of those people who have taken the trouble to examine the situation.

Conference Paper Author

Mr. F. H. Smith

Mr. F. H. Smith, A.I.M., the Author of the Paper on "Production and Properties of Aluminium Casting Alloys" (printed on the opposite page) is development officer of the Association of Light Alloy Refiners (ALAR, Limited). He was educated at Coopers' Company School, London, and studied chemistry at the University of London. He was employed as a metallurgical chemist by Standard Telephones & Cables, Limited, from 1929 to 1939, and as chief chemist and metallurgist by Kent Alloys, Limited, of Rochester, until 1945. In that year he joined ALAR, Limited, which had just been formed. Mr. Smith is a member of a number of British Standards Institution technical committees engaged in aluminium-alloy standardisation.

National Works Visits

Last Friday was the occasion when the London branch of the Institute of British Foundrymen acted as hosts to the rest of the Institute for a series of morning and afternoon works visits and an evening social function. This was the second event of this type, the last being organised by the Birmingham branch about a year ago. About 230 members participated in last week's visits to 13 foundries* in London and the home counties, establishments being mostly grouped in pairs. Luncheon was provided at the foundries or at points convenient to the parties, and was in most cases at the invitation of the firm or firms being visited. Two were whole-day visits, the one to Ford Motors having the largest single party. This visit included transport and sightseeing by river boat between Westminster and Dagenham.

In the evening, many of the participants joined other members, making a total of 120, at the Holborn Restaurant, London, for dinner and entertainment. Mr. L. G. Beresford, London branch president, took the chair and welcomed the visitors. Suitable reply was made by Mr. Colin Gresty, president of the Institute. He mentioned indebtedness to Mr. R. B. Templeton, for it was he who, when national president, strongly advocated the inauguration of a day of national works visits as an annual function. A very enjoyable evening followed, the whole event being voted an unqualified success.

Latest Foundry Statistics

According to the British Bureau of Non-Ferrous Metal Statistics, the output of copper castings during August was 500 tons whilst that of copper-base castings was 5,250. During the first eight months of this year, the production of castings entering into the latter category, was 41,654 tons, as against 30,088 during the same period last year.

FROM THE WEEK commencing October 22, 1951, the head office of Keith Blackman, Limited, Mill Mead Road, Tottenham, London, N.17, will operate on a five-day week basis, thus:—Mondays to Thursdays, 8.45 a.m. to 5.30 p.m.; Fridays, 8.45 a.m. to 6.00 p.m.

* It is intended in the near future to publish brief particulars of all the works visited—EDITOR.

Production and Properties of Aluminium Casting Alloys*

By F. H. Smith, A.I.M.

Beginning with a brief history, the Author next outlines the present state of the aluminium industry, indicates potential sources for metal recovery and the means of exploitation available. This leads to the development and use of secondary metal in foundries. The preparation of this metal is then fully described, section by section, covering such subjects as raw materials; their collection and sorting; sampling; preparation for melting; furnaces and their operation; refining; casting and control methods. Finally, there are notes on alloys available to the founder and a number of appendices dealing with production and consumption statistics, standard specifications, trade names and casting characteristics.

Introduction

At first sight it may be a little difficult to believe that the commercial founding of aluminium alloys dates only from the beginning of the present century. There can be very few products in the modern world in the making of which aluminium does not play some part, and yet the metal has been produced by the present industrial process for only a little over 60 years, and the oldest aluminium casting, and in fact the oldest piece of aluminium in the world, is not yet 100 years old. The plaque, shown in Fig. 1, is believed to be the oldest piece of aluminium in existence. It was cast in 1856 by the French scientist Deville, and is reproduced by kind permission of the Royal Ontario Museum of Archæology in Toronto, Canada. Compared with copper, the oldest known casting of which was probably made about 3200 B.C.,[1] and with iron, cast by the Chinese in 600 B.C., aluminium is still in its infancy.

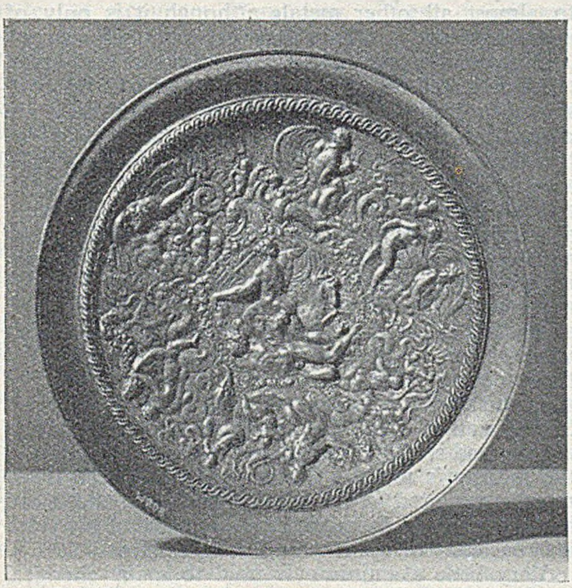


FIG. 1.—*Aluminium Plaque believed to be the Oldest Piece of Aluminium in Existence. It was Cast in 1856 by the French Scientist Deville, and is Reproduced by Kind Permission of the Royal Ontario Museum of Archæology, Toronto, Canada.*

Unlike his counterpart to-day, the founder of 50 years ago was not faced with the problem of selecting a suitable composition from a wide range of alloys. Initially aluminium was used in its unalloyed form, but the fact that the metal was soft, not very strong and rather difficult to cast, limited its use, in the form of castings, mainly to other than engineering applications. The first European attempts to improve the properties of the metal were by alloying with zinc, but although greater strength was obtained, quite a high proportion of zinc had to be added, and not only did this addition markedly increase the specific gravity of the aluminium, thus detracting from one of the most attractive characteristics of the metal, but it did nothing to improve the castability. Copper was found to be a much more effective alloying element than zinc in this respect and was used, to the extent of about 3 per cent., to replace part of the zinc. The addition of copper produced an alloy of greater strength, although to some degree at the expense of ductility, and with improved casting characteristics. Compared with many present-day compositions, however, the aluminium-zinc-copper alloy is not easy to cast, and although the earliest castings were made only in sand, the variety and relative complexity of some of them reflect considerable credit on the skill of the founder. Some excellent examples of castings produced in 1903 appeared in an illustration to the Paper[2] by Caven and Keeble presented to the Cheltenham Conference in 1949.

Development of Alloys

Binary aluminium-copper alloys containing 7 to 12 per cent. copper soon supplemented, and for some applications replaced, the aluminium-zinc-copper alloys. The binary alloys were easier to cast and, although inferior in ductility, had the advantage that they were less affected by the temperatures encountered in the internal combustion engine, a field of

* Paper presented to the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen, with Mr. J. J. Sheehan in the chair.

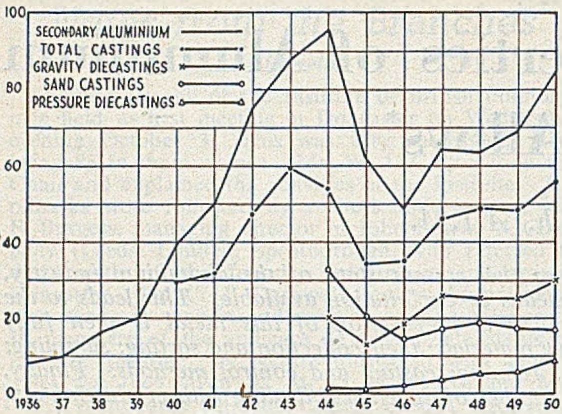


FIG. 2.—*U.K. Production of Secondary Aluminium and Castings in Thousands of Tons.*

application which absorbed a large part of the early aluminium alloy castings production. As the potentialities of this new metal became recognised, alloy developments succeeded each other in quick succession. The introduction of the N.P.L. "Y" Alloy—the first heat-treatable, high-strength casting alloy—in 1920, and the RR alloys of Hall and Bradbury in 1927; the development of the aluminium-silicon alloys and the discovery of the modifying effect of sodium by Pacz in 1920; the introduction of the aluminium-magnesium alloys in 1929 and of the heat-treatable aluminium-silicon-magnesium alloys in 1932, and more recently of the high purity alloys aluminium-5 per cent. copper and aluminium-10 per cent. magnesium, have been reviewed by West[3] in his Paper to the 1948 Conference in London, and will be referred to later. The year 1940 saw the official recognition of five "secondary" alloys (LAC. 10, 112, 113 and DTD 424 and 428).

Although not every type of British alloy is included above, it can be seen that in the 50 years following the production of aluminium in this country the choice of materials available to the light metal founder has expanded from the unalloyed metal of 1890 to a range of alloys with widely differing compositions, properties and characteristics. Statistics are not available for the annual production of aluminium alloy castings prior to 1940—estimates vary from 10,000[3] to 30,000 tons,[4] but Table I shows the Ministry of Supply returns for the last ten years. The production is shown pictorially in Fig. 2 to have fallen temporarily from the wartime peak of nearly 60,000 tons to about 35,000 tons in 1945 and 1946, since when the output has steadily increased and approaches the maximum of 1943.

The output of castings is, of course, a measure of the consumption of casting alloys, and this remarkable growth of the light alloy foundry industry could only have been achieved with a corresponding expansion of the production of casting alloys. Fully to understand how this greatly increased production was brought about and the fundamental principles of alloy composition and make-up which were involved, it is necessary to consider the growth of the aluminium industry as a whole and the principles of metal recovery.

Aluminium Recovery

In every industry, whether the materials it uses be metal, textile, rubber, wood, glass, etc., there must be waste in the form of processing scrap; furthermore, for every product of industry there must be a limited useful life. The use to which the repeatedly arising scrap and the obsolete or worn-out products are put depends on the nature of the materials of which they are made and the values of those materials both commercially and in the national economy. Metals have the advantage over most other materials that they do not become irrecoverable as a result of mechanical disruption. Many non-metallic waste products from industrial processes find useful application in quite different forms, but the turnings formed in the machining of a bar of metal can, subject to some qualification, be used to produce another such bar. This elementary principle will be known to every foundryman, but the extent to which it is applied and the limitations imposed by the characteristics of different metals are less well understood.

From 7,000 tons of aluminium in 1900, the world production of new metal has grown until in the peak year of 1943 it approached the imposing figure of two million tons. In the manufacture, fabrication and use of this metal in the form of sheet, tube, extrusions, castings, etc., a very large tonnage of process scrap is produced, and as the aluminium industry grows year by year, so does the annual tonnage of the obsolete and outworn products of earlier years.

The re-employment of waste products and scrap is a sound economic principle which is practised in all efficient industrial processes. In the metal industry it is applied not only to aluminium but to almost all other metals although it is only of aluminium and its alloys that the term "secondary" is still commonly used. The amounts of reclaimed metal returned to circulation in this way differ considerably from one metal to another as they are dependent upon a number of factors. Many of the forms in which metals are used, for example, are such that recovery of the metal is impossible or at least impracticable, *e.g.*, powders used in explosive mixtures and paints; the collection of many metal products at the end of their life is not economically practicable; large quantities of some metals are used in the form of chemical compounds such as oxides and salts, and scrap often provides a convenient and inexpensive source of metal for making these compounds—considerable amounts of scrap zinc and lead are consumed each year in this way. Scrap is an essential raw material in the production of iron and steel and comprises some 63 per cent. of the industry's metal. Fortunately no special treatment is required for iron and steel scrap, and it can be incorporated in most furnace charges, provided it is basically of the required composition.

Very little aluminium is used to make chemical compounds, and not very much is lost annually in irrecoverable products; the price of aluminium is high enough to make the collection of scrap economically possible. For these reasons the proportion of metal reclaimed annually from scrap is quite high (most aluminium applications are still comparatively

TABLE I.—*U.K. Production in Thousands of Tons.*

Year.	Castings.				Ingot.		Per cent. secondary in castings.
	Pressure.	Gravity.	Sand.	Total.	Secondary.	Primary.	
1936	—	—	—	—	8.0	16.1	—
1937	—	—	—	—	10.0	19.1	—
1938	—	—	—	—	16.0	23.1	—
1939	—	—	—	—	20.0	24.8	—
1940	—	—	—	20.0*	30.0*	19.0	55
1941	—	—	—	31.6	50.3	22.7	65
1942	—	—	—	47.0	75.3	46.8	60
1943	—	—	—	59.4	87.7	55.7	56
1944	1.7	19.9	32.6	54.2	95.9	35.5	58
1945	1.2	12.7	20.2	34.2	61.9	31.9	72
1946	2.1	18.5	14.4	35.1	48.6	31.5	82
1947	3.9	26.1	16.8	46.7	63.7	28.9	81
1948	5.2	24.7	18.7	48.7	63.3	30.0	80
1949	6.0	25.0	17.0	48.0	68.6	30.3	84
1950	9.3	31.1	17.1	57.5	86.4	29.5	87

* Based on second half of year. The figures for secondary ingot for 1936-39 are estimated.

new). Aluminium scrap, for reasons which will be considered later, cannot be disposed of by the simple foundry methods employed for iron. Consequently an independent industry has grown up to treat this material and make it available once again as useful metal thus supplementing the production of new aluminium. As only about one sixth of the United Kingdom's aluminium requirements can be satisfied by home production, the national economic necessity of making the best possible use of all scrap should be obvious to everyone.

Secondary Aluminium

It has become customary, when it is necessary to distinguish between aluminium produced from the ore and metal obtained by remelting aluminium products, to describe the former as primary and the latter as secondary aluminium. These definitions are not wholly satisfactory since in some cases they imply a difference which, in fact, does not exist; for example, scrap arising from the manufacture of a primary aluminium product may be used to make the same or other "primary" aluminium product if remelted in the producers' works but becomes a secondary alloy if remelted elsewhere.

The annual production of secondary and primary aluminium in the U.K. is shown in Table I and in Fig. 2, and similar statistics for the U.S.A. and Germany are given in the Appendices. From these figures it can be seen that the production of secondary aluminium is, indeed, considerable (in 1944 the U.S.A. produced approximately three hundred thousand tons). In the U.K. for the last ten years the production of secondary aluminium has greatly exceeded that of primary, and even when the imported primary metal is taken into account, secondary aluminium amounts, on an average, to 44.7 per cent. of the annual primary consumption. The corresponding values for U.S.A. and Germany are 34.5 and 35.6 per cent.

Secondary aluminium is used, of course, for making both wrought and cast alloys, but this Paper is concerned only with the latter. Table I and Fig. 3 show that the proportion of secondary aluminium in castings has increased from 55 per cent. to 87 per cent. over the last ten years and has been above 80 per cent. for the last five years. The corresponding figure for the U.S.A. is believed to be 75 per cent. at the present time.

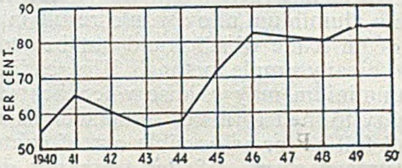


FIG. 3.—*Percentage of Secondary Metal in Aluminium Casting Alloys*

It will be readily understood from these figures why this Paper, which from its title is concerned with the production of casting alloys, describes the production of secondary aluminium. There are, it is true, certain casting alloys which must be made from high purity aluminium (99.7 per cent. minimum) in order to achieve certain desired properties. It is seldom practicable to produce such alloys from secondary raw materials. They are made simply by the addition of the alloying elements to selected aluminium pig, and consequently their production is not described in this Paper. Similarly the production of some of the more common alloys from primary aluminium is simply a matter of correct alloying and need not be enlarged upon.

Characteristics of Aluminium

It is necessary in the first place to consider the peculiar properties of aluminium in order to understand why aluminium scrap is treated in refineries with specially designed equipment, and why most forms of scrap cannot be used directly by the founder for the production of castings.

Oxide Film

(1) One of the characteristics of aluminium is that the metal forms an extremely stable oxide, and this oxide readily appears as a film on any freshly exposed surface of the metal, and in the absence of corrosive chemicals prevents further oxidation. Consequently the progressive formation of oxide or hydroxide under conditions of atmospheric exposure, such as occurs in the rusting of iron, does not take place with aluminium.

The comparative ease with which aluminium oxidises, and the stability of the oxide, are highly desirable characteristics in the finished aluminium product, but they are also factors of very consider-

Aluminium Casting Alloys

able influence in the recovery of the metal. The presence of an oxide film on each piece of aluminium alloy becomes of increasing significance as the pieces become smaller and the ratio of surface to mass increases. Not only is it necessary to remove the surface film to enable small particles of molten aluminium to coalesce, but the oxide must be completely eliminated from the metal. It is not difficult to effect this removal when the correct technique is employed, but it is impossible to do so by ordinary foundry practice.

Stability of Oxide

The characteristics of the oxide also limit the extent to which composition changes may be made by refining. In many other metals oxidation and reduction are useful methods of removing or controlling certain elements, but oxidation treatment of a melt of an aluminium alloy would result in the formation of an oxide which could not be reduced to the metal by any simple method. The readiness with which aluminium may oxidise when heated makes it necessary to melt forms of scrap such as turnings, sheet and foil as far as possible out of contact with air or furnace gases. If this were not done, recovery efficiency would be low, and the resulting metal would be of inferior quality.

Chemical Activity

The chemical activity of aluminium is not confined to its affinity for oxygen. Under suitable conditions, aluminium (in the liquid state) will combine with nitrogen and with carbon to form nitrides and carbides each of which can have a most undesirable effect on the chemical and mechanical properties of the metal if not removed.

Gas Absorption

Compounds of hydrogen, such as water and oil, are common contaminants in most forms of aluminium scrap and, when added to molten aluminium, readily introduce hydrogen which, if not removed, produces gas cavities in castings. Although gas is removed from liquid aluminium by degassing treatment as a matter of routine in many foundries, this degassing operation will not reduce the oxides formed by the reaction of water vapour with aluminium, neither will it remove mechanically all the oxide or other non-metallic products formed in the reactions leading to the gas absorption.

Solution of Metals

Molten aluminium will readily dissolve many other metals such as brass, copper and steel which are commonly found in aluminium alloy components in the form of bolts and inserts. Most metal oxides are readily reduced by aluminium and are hence a possible source of unwanted impurity elements.

Appearance

An experienced sorter can distinguish most of the common copper-base alloys by their colour, but the aluminium alloys differ very little from each other in appearance. In the wrought forms they cannot be distinguished by eye. Certain subtle differences may be discernible between some of the cast alloys, but are identifiable only to the well-trained eye.

Not only is the would-be user of scrap faced, therefore, with the technical problems arising from the metallurgical characteristics of his raw material, but he has also to ensure that the composition of his scrap is such that his final product will be of the desired composition and properties. The difficulties confronting the refiner are considerable, but the difficulties to be overcome by a founder who wishes to produce good quality castings from scrap (other than clean fully identified castings) are very much greater.

Economic and Practical Limitations

It is appropriate at this stage to consider the economic limitations to the refining of aluminium scrap to reduce or remove alloying elements. It is possible to treat scrap by processes,[6, 12] which will remove the greater part of the common alloying elements and produce unalloyed aluminium of a high degree of purity. The reason why alloys are not made by the addition of the appropriate elements to pure aluminium obtained from such a process is simply a matter of economics. The processes are expensive to operate, and the elements removed cannot easily be recovered in a form in which they can be re-used. Consequently casting alloys produced in this way would be expensive and could not be competitive with the present types of alloys, the demand for which demonstrates how adequately they meet the industrial requirements.

For this reason the refining of aluminium alloy scrap is mainly confined to the purification of the metal by the removal of all the forms of foreign matter, non-metallic and gaseous impurities, and uncombined metals. Only certain alloying elements are reduced by refining, and of these only one is reduced in most alloys as routine production practice. The specified compositions of casting alloys are obtained by the skilful blending of materials of different compositions and by the addition of alloying elements. It may appear that there are severe limitations to the alloys which can be produced in this way, since the compositions must to some extent be related to those of the aluminium scrap, a large part of which is from wrought alloys. In the past the restriction imposed by the composition of the wrought alloy scrap has not, in fact, resulted in unsuitable casting alloys. On the contrary, it is probably true to say that, if all alloys could be made in future from the direct alloying of pure aluminium, the founders would continue to demand most of the alloys they use to-day.

Not all the "secondary" casting alloys are, of course, made by blending alloy scrap; some are produced by the addition of alloying elements to scrap from unalloyed aluminium.

Although the greater part of the scrap, which forms the raw materials of the refiners, is of wrought origin, the output of the refineries is mainly casting alloys. One of the reasons for this is that in many cases the alloying content of casting alloys and the number of alloying elements is greater than in wrought alloys. As it is not always possible to ensure the complete alloy segregation of scrap, it is easier to find a casting alloy in which both the "foreign" and the main alloying elements are major constituents than to find a wrought alloy in which both can be tolerated. Furthermore, the

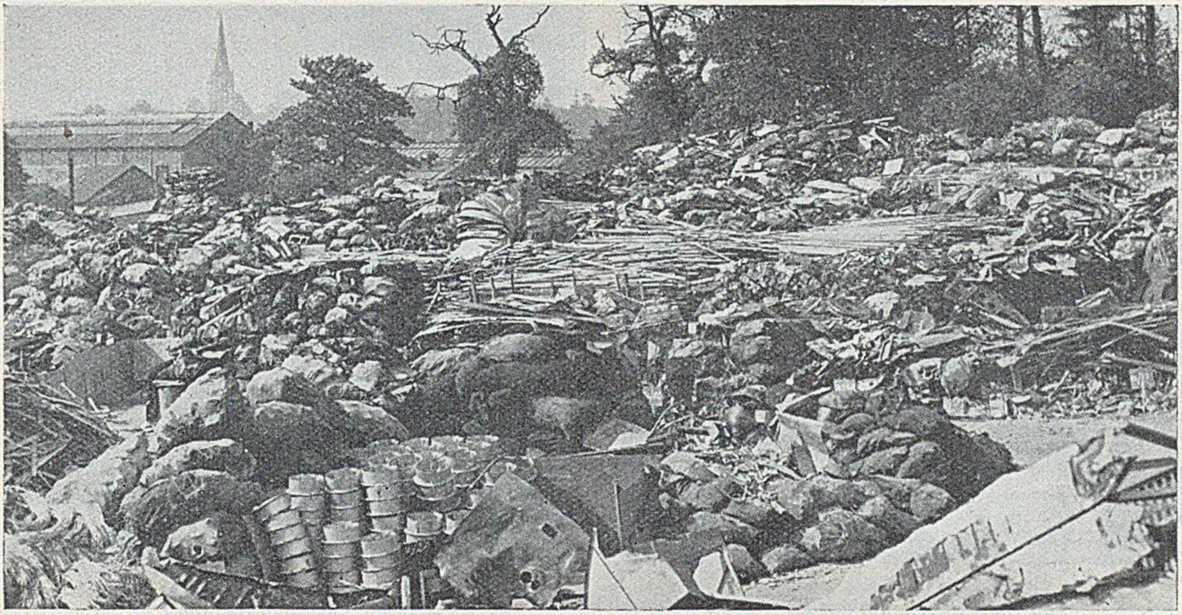


FIG. 4.—*View showing Part of a Scrap-yard for Aluminium and its Alloys.*

working properties of wrought alloys are often adversely affected by the addition of other elements whereas the casting characteristics of the casting alloys do not suffer in this way and in fact may be improved by the addition of other elements.

Raw Materials

The forms in which pure aluminium and aluminium alloys are received by the refiners are almost without number, but they can be classified into the following main categories:—

(*a*) Wrought process scrap formed in the fabrication of finished or semi-finished products, *e.g.*, residue from sheet from which circles or other shapes have been blanked;

(*b*) wrought products either new (redundant, obsolete or defective) or old (*e.g.*, forgings and extrusions from aircraft, tubing and machined bar from industrial equipment and sheeting from road passenger vehicles);

(*c*) castings *e.g.*, from obsolete motor vehicles, marine engines, industrial machinery;

(*d*) turnings, borings, etc., from the machining of wrought and cast aluminium components;

(*e*) foil and foil products;

(*f*) cable and wire;

(*g*) grindings and sawings;

(*h*) foundry spillings; and

(*i*) drosses.

Although nearly every type of scrap can be classified according to one or other of these nine groups, in practice there may be a considerable degree of mixing in any consignment of scrap, depending on its source. Furthermore, the scrap may contain other metals, for example, magnesium and zinc-base castings among the aluminium castings, and lead foil with the aluminium foil. Engine castings may contain steel bolts and bronze bushes, sheets may be joined with steel rivets, and assemblies may be soldered with lead-tin alloys. Non-metallic contaminants, such as paint, grease, oil and dirt must be expected with most forms of old scrap, and all of these factors must be taken into account in the recovery treatment. Views of different types of scrap are shown in Figs. 4 to 8.

Sorting and Identification

The first stage of the process is to sort and identify according to composition or composition groups. During the war, a segregation scheme for

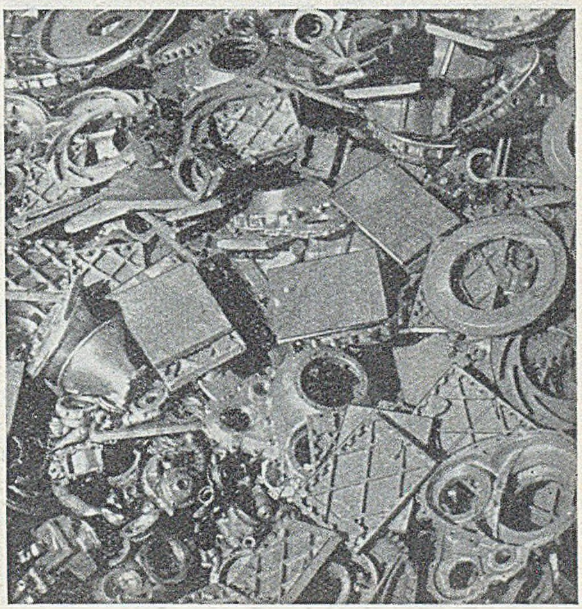


FIG. 5.—*Assortment of Redundant Aluminium Castings.*

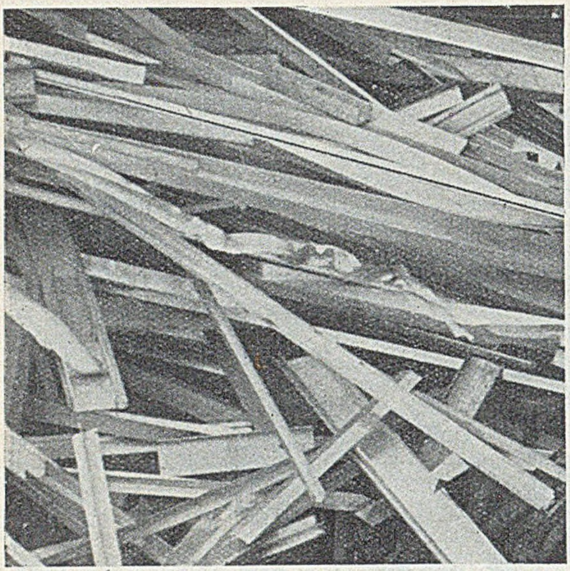


FIG. 6.—*Scrap Ends of Aluminium Extruded Sections.*

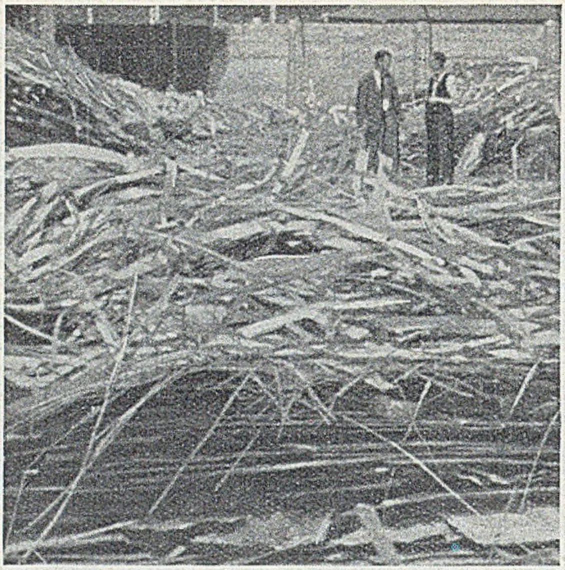


FIG. 8.—*Scrap Sheet-aluminium Cuttings.*

aluminium scrap was operated in factories engaged on Government contracts and was extremely effective in reducing waste and minimising the down-grading which may result from the mixing of alloys of different compositions. Unfortunately, since it is no longer enforced, the scheme is less widely used now, and both the country and the industry are consequently the poorer. This segregation schedule is used in most refineries in the country, and incoming consignments of scrap are sorted according to nine composition groups within the schedule.

In a Paper such as this, it is only possible to indicate on general lines the way in which the composition of the various forms of scrap are identified and, where possible, sorted. In mixed batches, scrap which is large enough to justify the individual handling of each part, is sorted by hand, usually on a conveyor belt. The alloy type of many components is often known to the skilled sorter from experience, or may be deduced from simple tests of mechanical properties (*e.g.*, bending) and from the appearance of the fracture surface. The skill of the sorter is further supplemented by tests often carried out under the supervision of a member of the laboratory staff. These include chemical spot tests, thermo-electric and electrolytic-potential measurements and density and hardness determinations. Where the quantities of a single component or part are large enough to justify such a course, a rough analysis may be made in the chemical or spectrographic laboratory.

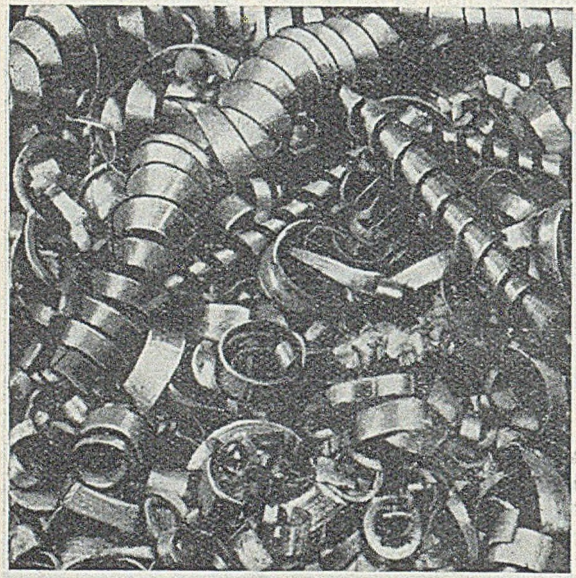


FIG. 7.—*Aluminium Turnings Scrap.*

Sampling

In some types of scrap assemblies it is not economically practicable to separate the components into individual alloy groups and with small material such as turnings and grindings it is physically impossible to do so completely. Where sorting is not possible, the average composition of a batch of scrap must be determined on a representative sample. The sampling of small forms of scrap presents little difficulty but is probably most accurately done while the material is on a conveyor belt at some stage of processing. The sampling of mixed batches of scrap containing pieces of many different shapes and sizes is an operation requiring very considerable skill and experience. Representative samples are melted in small furnaces kept for this purpose either in a part of the melting shop or in an experimental foundry. The composition of the sample is determined from a standard chill cast plate poured from the liquid melt, and on the basis of the samples, scrap is segregated in batches

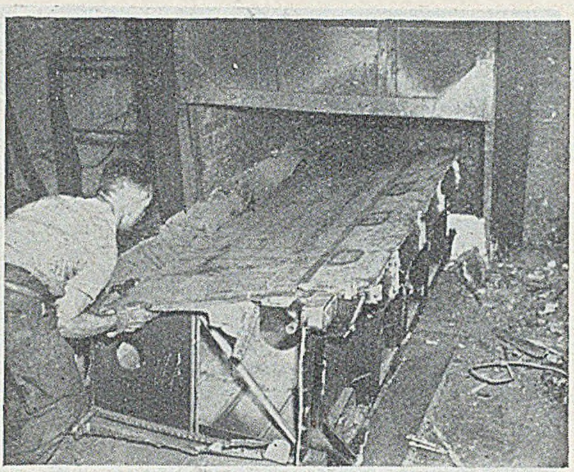


FIG. 9.—*Charging a Piece of Aircraft Fusilage into a Stack Furnace.*

according to composition. After appropriate treatment these batches will become the constituent parts of furnace charges in proportions to give the desired composition in the final alloy.

Scrap aircraft and other large assemblies are dealt with in quite a different way and are referred to later. The recovery of aluminium from obsolete aircraft has been described by Gittins[5] and is the subject of a number of B.I.O.S. reports.[6]

Preparation

It is not intended, in this Paper, to describe the dismantling of multimetal structures for remelting. Whether such assemblies are completely stripped by hand or whether they are only broken down to a size convenient for transporting and melting is largely a matter of economics. Aircraft scrap, for example, may be broken down to pieces of the size shown in Fig. 9 for treatment in the liquation type of furnace which separates the aluminium from other metals.

Baling

Fig. 9 illustrates the very bulky nature of this kind of scrap, and it is easy to visualise the atten-

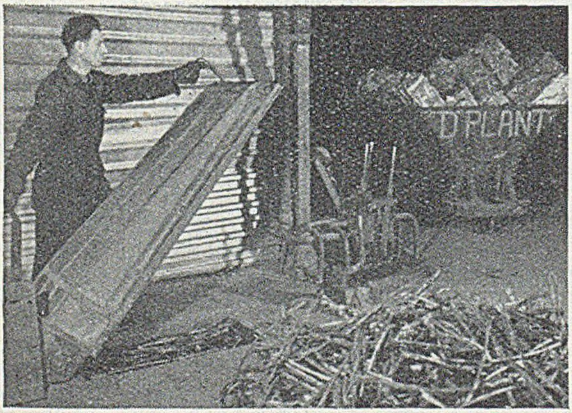


FIG. 10.—*Baling Press for Sheet-aluminium Cuttings.*

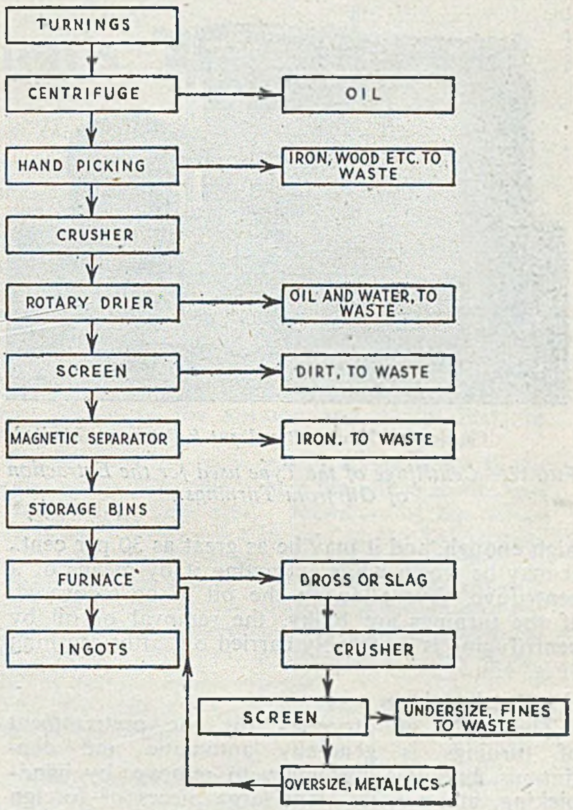


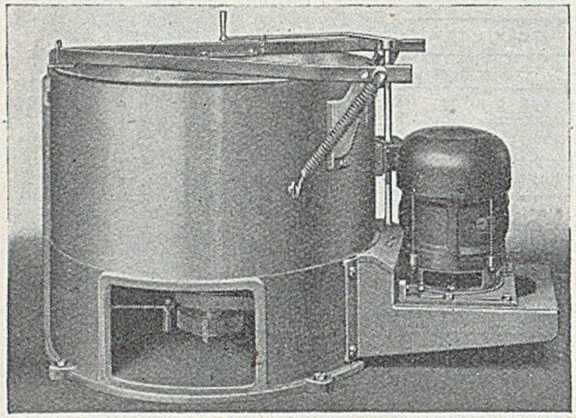
FIG. 11.—*Flow-sheet for Operations in the Treatment of Turnings.*

dant storing and handling problems. Most of the refiners' raw materials have a low bulk density—turnings, for example, may occupy ten times the volume of the equivalent weight of ingots. The density may be increased with some forms of material by compression. Such treatment not only facilitates handling and storing but is also a great advantage in subsequent melting. Sheet metal cuttings (see Fig. 8) are compressed into small compact bales by means of hydraulic presses such as the one illustrated in Fig. 10, in which a truck of baled cuttings can be seen on the right. Similar machines may be used to produce briquettes from grindings and fine turnings. These baling processes can be applied only to clean scrap which does not require any further preparation before melting. Most forms of scrap require a great deal of treatment before they can be safely and efficiently melted, and the treatments vary with the different kinds of scrap. It would take much space to describe the pretreatment of each class of material, but the flow-sheet for turnings (Fig. 11) may be considered as an example.

Pre-treatment of Turnings

(*a*) *Centrifuging*

Turnings, as received by the refiner, are almost always contaminated with water and oil or other cutting compounds. These contaminants must be removed before melting, and if the oil content is



[Courtesy of Thomas Broadbent & Company, Limited

FIG. 12.—*Centrifuge of the Type used for the Extraction of Oil from Turnings.*

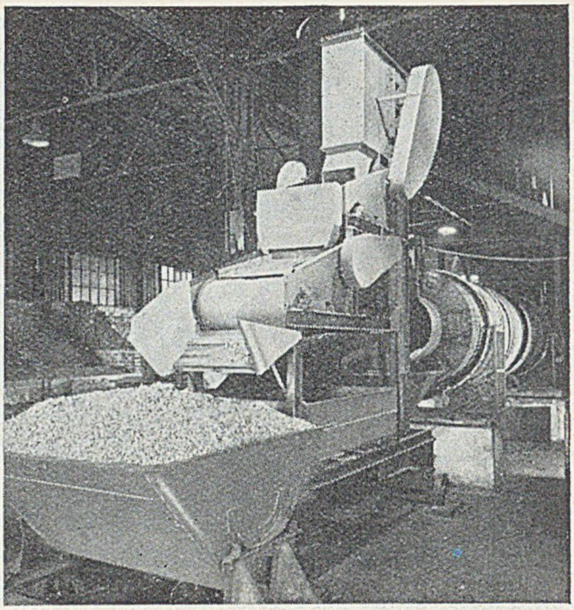


FIG. 13.—*Magnetic Separator and Rotary Drier for Treating Crushed Turnings.*

high enough, and it may be as great as 30 per cent., it may be worth while extracting it by means of a centrifuge, thus allowing the oil to be recovered. If the turnings are bulky, the removal of oil by centrifuging is preferably carried out after crushing (Fig. 12).

(*b*) *Hand Picking*

The train of processes for the pretreatment of turnings is generally automatic and continuous, but it is customary to remove, by hand-picking, at an early stage large pieces of foreign matter such as iron, wood, paper, and rag; this may be done on the conveyor belt while the turnings are being transferred to the crusher.

(*c*) *Crushing and Drying*

Crushing is a very important operation as the success of subsequent treatment depends upon the turnings being broken down to the desired size and the solid foreign matter being detached.

The crushed turnings are fed into the rotary drier which removes oil, water, and any organic matter which may be present. The rotary drier consists of a tube or drum, 30 ft. or more in length and 3 or 4 ft. in diameter, which rotates slowly at a small angle to the horizontal whilst being heated internally, usually by means of an oil flame. The turnings travel slowly down the drier with a tumbling motion imparted by the rotating drum, and the speed, temperature and atmosphere are so controlled that oil and organic matter are driven off or burnt without the turnings being either carburised or on the other hand oxidised.

(*d*) *Screening*

The turnings, which are lustrous in appearance as they emerge from the drier, are conveyed to a series of vibrating screens through which dirt and other non-metallic dust is extracted. By choosing the appropriate sizes of mesh it is possible to effect a measure of separation of alloys by screening as the size of turnings and other machinings, both as received and after crushing, depends to a large degree on the mechanical properties of the alloys. Separation of contaminating metals may also be produced in this way. Table II illustrates the result of sieving a quantity of crushed Duralumin-type turnings containing brass machinings.

The zinc content (0.55 per cent.) of the mixed turnings would preclude their use of an alloy such as LM-4, but after screening nearly three-quarters of the turnings with a zinc content of only 0.08 per cent. could be used for this alloy.

(*e*) *Magnetting*

Aluminium alloy turnings are seldom completely free from iron and are therefore passed, after screening, over electromagnetic separators, which remove any iron or steel particles which may be present. Many forms of magnetic extractors are used; Fig. 13 shows crushed turnings passing over a roller type extractor; a small rotary drier can be seen in the background.

(*f*) *Batching*

The completely treated turnings are finally conveyed to storage bins, where they are identified

(*Continued on page* 450)

TABLE II.—*Results from Sieving Crushed Duralumin-type Turnings.*[7]

Per cent. of sample.	Mesh No.	Analysis of melt.							
		Cu.	Mg.	Si.	Fe.	Mn.	Ni.	Zn.	Pb.
72.5	10	3.82	0.54	0.51	0.58	0.61	Tr	0.08	Tr
27.5	30	6.27	0.54	0.60	0.66	0.60	0.08	1.82	0.04
Total		4.48	0.54	0.54	0.60	0.61	0.02	0.55	0.01

German Foundrymen's Association

Annual Meeting at Dusseldorf

As in recent years, Düsseldorf was again the venue for the German foundry technicians' annual meeting, held from September 27 to 29. The extensive programme arranged, with its carefully-selected Papers for presentation, gave an interesting survey of the high standard of foundry practice achieved, as well as outlining the work of the *Verein Deutscher Giessereifachleute* during the past year. This was recognised by the large attendance from foreign associations which sent delegations to the meeting. The meeting included the following items:—

1. An American film: "New Methods in Sand-treatment."

2. "Working with Synthetic Moulding Sand," by chief engineer H. Herschenz, Frankfurt/M.-Höchst.

3. "Recent Results with the Cement Moulding Process," by Dr.-Ing. M. Beilhack, Rosenheim.

4. "Sand-treatment for the Cement Moulding Process," by Dr. H. Gries, Brunswick.

5. "The Rated Fatigue Limit of Malleable Cast Iron," by Dipl.-Ing. Ernst Mickel, Stuttgart-Bad Cannstadt.

6. "The Importance of Spectrum Analysis in Foundry Practice," by Dr.-Ing. O. Werner, Berlin.

7. "Application of the Wire-resistance Strain Gauge for Cast Components," by Dr.rer.nat. K. Fink, Düsseldorf.

8. An American film: "Fundamentals of the Technique of Pouring Gates," with an introduction by Dipl.-Ing. Ph. Schneider, Hamburg.

9. "Modern Core-drying Methods," by Dr.sc. nat. W. Magers, Düsseldorf.

10. "The Practice of Wax Extraction in a Molten Condition," by Dipl.-Ing. H. Heimann, Kaiserlautern.

11. "Heat-developing Gates," by Dr.-Ing. E. Lanzendörfer, Mülheim-Ruhr.

12. "Pre-Christian Moulding and Pouring Practice," by Prof.Dr.-Ing. E. Piwowarsky, Aachen.

An address by the ministerial director, Dipl.-Ing. L. Brandt, Düsseldorf, on "Tasks of the German Engineer in the Near Future" was an outstanding feature of the meeting.

German foundrymen considered the meeting an appreciation of the economic importance of their industry, and, moreover, a good example of the co-operation between the government and the technical societies for the general good of industry. The work accomplished at Düsseldorf would illustrate clearly how technical societies and especially the V.D.G. contributed to the rationalisation of German industry.

As a social relaxation from the general meeting there was a gathering in the rooms of the Rheinterrasse on September 28. It was anticipated that foreign guests would take the opportunity of initiating a friendly exchange of ideas, renewing old acquaintances, or making new friendships. Heinz Bonn-Walden as compère provided real variety and created the right mood through excellent performances and shows. Gian Mangone with two bands played for dancing. A special point of interest was the fashion-show for the ladies in the rooms of the Melodie, Bahnstrasse, on September 28, where the latest models of the autumn and winter fashions were presented.

The foundrymen have created a new home in the capital of the Rhineland since the offices in the east of Berlin were destroyed. Members of the V.D.G. have in the "Haus der Giesser" in the Sohnstrasse an ideal meeting-place and a comfortable home. It is expected that the house will be in occupation during the course of this year. It is hoped that the foundrymen will be able to carry on with advantage their activities which are of the utmost value to the common welfare of the country.

The following are brief abstracts from the technical contributions:—

American Film: "New Methods in Sand-treatment"

The plant shown uses horizontally and eccentrically supported, freely-moving discs of light construction, lined with rubber bonded to metal. The interior circumference of the casing is lined with rubber sheets. The lumps of sand are disintegrated under the centrifugal force; the grading of the sand is, however, not altered. A suitable air-conditioning system in the casing permits the hot moulding sand to cool down to approximately room temperature within 70 secs. The high speed of the discs separates the composite grains of sand so that they are coated with a film of oil or with a thin layer of a binding agent. The moulding sand leaves the plant in a state ready for use.

"Working with Synthetic Moulding Sand"

Long years of research and practical experiments have resulted in being able to match natural moulding sands through the help of quartzite grains and a highly-swelling bonding-clay of enhanced quality. About 300 tons per month of new moulding sand have to be transported to and from a foundry with a monthly output of 1,000 tons, whereas only 30 to 50 tons of quartz sand are required when moulding with synthetic sand so that the saving in transport costs alone is considerable. Furthermore, synthetic sand permits of conveyor-line operation. The German chemical industry has had to treat German sands by chemical methods in order to obtain the quality of the natural American bentonite, which is found in America in a state that needs no further treatment.

German Foundrymen's Association

" Recent Results with the Cement-sand Moulding Process "

The programme of the Committee for the study of the cement-sand moulding process in the *Verein Deutscher Giessereifachleute* covered researches as to the types of cement, the sands, the amount of water and binding agents added, the shape of the mould, the facing varnish, reduction in the time required for drying, and the recovery and treatment of used cement sands.

Some time ago, practical experience acquired in the field of cement-moulding and core-making showed that long periods for drying, low strength of the "green " mould, inferior shrinking properties and prolonged time for dressing because of the high hardness of the cement after casting, required large amounts of cement and bonding agents, and slow setting which acted adversely upon the economy of the process. In the course of the last few years, the Committee has, however, succeeded in overcoming the above disadvantages of the process.

" Sand-treatment for the Cement-sand Moulding Process "

With the development of cement-sand moulding, problems as to the economy of the process have to be solved. Basic materials for the sand mixture are quartz sand which must be free from clay, special cement and water, which, if added quickly, requires considerable amounts of quartz sand. The question of recovery of the waste sand is raised, the sand being available in lumps in a subhydrated state.

To this end, some foundries have developed several methods such as disintegration of the cement lumps by pan grinders; classification in an arrangement of vibrating meshes and sifting the sand by sweeping with air; crushing in a hammer mill, subsequent sweeping with air the cement dust for recovery of the waste sand, crushing and pneumatic transport of the waste sand from a crusher or hammer mill through a classifier. This arrangement is used for dust collection and for the transport of the new sand at the same time. The essential points in technical and economic respects are in all cases the disintegration of the waste sand, a highly efficient dust collection, and return of the quartz sand to the process. In a normal case, it is possible to retain 50 to 85 per cent. of the waste sand in continuous circulation.

" Rated Fatigue Limit of Malleable Cast Iron "

The rated fatigue limit of malleable cast iron lies between steel and grey cast iron. The endurance tests show fatigue limits betwen 9.5 and 10.8 tons per sq. in. for malleable cast iron, the notch sensitivity being moderate. A perfect surface of the casting does not decrease the fatigue limit as compared with the polished test bar. An unobjectionable surface of the casting depends, however, on the skill, the experience, and the knowledge of the foundryman. Smaller surface imperfections decrease the fatigue limit to a considerable extent, in some cases. In order to make full use of the possibilities of the fatigue limit of malleable cast iron, it is necessary to develop moulding methods which invariably provide a perfect surface on the casting.

" Importance of Spectrum Analysis for Pouring Practice "

The use of spectrum analysis in German foundry laboratories is not commensurate with the knowledge available in this field. The advantage of the spectrum analysis is the simultaneous detection of all important alloying elements present. The analysis of carbon, sulphur, and phosphorus is still difficult. Initially, silicon and manganese can be determined in plain cast iron by spectrum analysis. The quick, accurate, and simultaneous determination of both elements has definite advantages. The accuracy of the analyses is about 0.1 per cent. When cast iron or steel are alloyed, the same picture shows simultaneously copper, nickel, chromium, molybdenum, titanium, vanadium and if necessary further alloys together with silicon and manganese. The larger the number of the simultaneous elements, the greater is the speed of the analysis and hence the economic advantage. Recently ductile cast iron has come to the fore where the quick determination of magnesium by the wet method is superior to all chemical analyses.

" Application of the Resistance-wire Strain-gauge for Cast Components "

About a decade ago, the resistance-wire strain-gauge was developed into a new unit for measuring longitudinal stresses for the static and dynamic strains which has found a wide field of application. Whilst the analysis of the stresses in steel parts is comparatively simple because of the linear relation betwen stress and strain (Hooke's Law), the evaluation of stresses measured with cast-iron parts is difficult, as the influence of the modulus of elasticity as a function of the stress and of the positive and negative sign of the tension of compression shows a disturbing effect with normal grey castings. Recent research on the behaviour of cast iron has succeeded in improving the elastic properties of cast iron so that it is now similar to normal steel, whence the way is free to the analysis of stresses in cast components with a view to lighter methods of construction.

American Film : " Fundamental Technique of Pouring Gates "

American foundrymen have done much work in the field of pouring gates during the last years. The results of these important researches have been publicised by several films. By courtesy of the American Foundrymen's Society it was possible to show the first of these films to the meeting. The tests the film illustrates were executed with transparent models for the gates (Plexiglas). Aluminium flakes in an emulsion in water and Wood's metal were used as test liquid. The tests give hints as to the arrangement and design of gate openings, sprues, and runners. Special attention was given to the gate opening. Cylindrical divergent, and tapering sprues were tested. Tapering gates showed the best results. Cylindrical and divergent gates entrain some air, which causes swirls. The American researches give evidence to the theoretical considerations of P. Nielsen who read his Paper before the 1949 meeting.

"Modern Core-drying Methods"

Important research work on core drying has been carried out, especially abroad. A study of American methods shows new ways which may be followed advantageously under certain circumstances. Thus short descriptions of the high-frequency capacity-heating of non-metals and of the high-frequency core-drying installations in the United States were given. Some figures as to the economy of the process would no doubt induce foundrymen to carry on further work in this field. The preliminary tests in Germany had shown the possibilities for use by German foundries.

"Practice of Wax Extraction in a Molten Condition"

After the termination of the last war, the process of wax extraction (lost-wax process) was used for the production of various parts in nearly all civilised countries, the items produced weighing from 1 gm. to about 10 lb. The production of tools and even the manufacture of high-speed cutting tools was especially interesting. The mould is made to very accurate dimensions so that the tool requires nothing but subsequent hardening and grinding. The saving of material is especially important for expensive steels. Even small dies are cast to-day. A new application of special importance for foundries is the manufacture of models for pattern-plates which repeat the same model several times on one pattern-plate. The economy does not so much depend on the number of castings as on the number of machining operations and the required accuracy, which has already reached in some cases tolerances of 0.05 mm. Cast-steel parts show an especially small distortion after hardening. The future development cannot be exactly foreseen. Steel castings with high melting points and parts with a higher weight per piece are required, automatic procedure being desirable.

"Heat-development Gates"

Casting practice generally employs runners and risers to avoid shrink-holes which result in additional steel requirements and involve considerable costs during the dressing of the casting. In the course of the efforts to decrease the costs, a number of heat-developing means known on the market as thermal powders, has been produced.

A method, developed in England, inserts annular cores into the gates, these cores consisting of a mass which, after having been ignited by the molten steel, liberates considerable quantities of heat which not only heat the steel but insulate it so well that the cooling-down of the steel is considerably delayed. Tests which are not yet included have shown quite surprising results: the mass of the runners and risers of steel castings can be reduced to less than one-third of their original weight without increasing the number of wasters, the gates being kept substantially smaller. With a given steel capacity, the output can be increased by using the heat-developing gates, and higher yields for the castings proper are possible. The more valuable a steel, the more economical is the application of heat-developing gates.

"Pre-Christian Moulding and Pouring Practice"

The first metals used at the end of the Neolithic period were gold and copper. The Chinese knew the art of making ingenious vases and plastic art of bronze and cast iron since 1,000 B.C., at least (probably, however, since 3,000 to 5,000 B.C.). Some of these castings had sizes up to the dimensions of the Munich "Bavaria."* The conditions in Asia Minor and in the Egyptian area were, however, unambiguous. Wonderful embossing work from the early Sumerian period (3,000 to 3,500 B.C.) shows the high standard of the art. At about 2,500 B.C., copper castings come to the fore. Soon afterwards, they are, however, replaced by bronze castings utilised at first for solid castings for simpler objects of everyday life (amulets, signets, weights, statuettes, etc.), and later on, from about 1,800 B.C., in increasing amounts for military weapons (bucklers, helmets, parts for war-chariots, etc.). Iron was known to the men of the different ages and highly appreciated as valuable metal at least since 3,000 B.C. and stored in the royal treasuries. For commercial and war purposes it appears only since 1,500 B.C. In their coloured paintings, the old Egyptians showed copper with red, bronze with green and iron with blue colour. The development of the poleaxes is interesting from the viewpoint of the pouring practice ranging from the Neolithic flint poleaxe to the simple bronze poleaxe of the Near East (and, since about 1,800 B.C. also of the British) area, and from here to the nicely-shaped Persian and to the efficacious Roman poleaxes. The bronze and steel helmets have developed in a similar way. Hollow castings made by the lost-wax method have been manufactured in the Near East since about 2,200 B.C. Hollow iron castings are found at the time of the Greeks (after 800 B.C.) producing unforeseen perfection in the casting of tall monuments. Castings in two-part or multiple moulds and ingot moulds have undoubtedly been made since about 1,600 B.C. in the Assyrian as well as in the Mycenæan area. Safe centring devices for moulding boxes as well as the mass production of small castings on permanent mould plates were known. Our arrogance in putting the beginning of the technical era only two hundred years ago is refuted by history. Actually the technical era of mankind begins with the end of the Neolithic Stone Age, this transitional stage lying between 6,000 and 8,000 B.C.

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* The "Bavaria" statue is symbolic of the heroism displayed by the Bavarians during the war of 1870. It was designed by Schwenthler and cast in the foundries of Von Müller. It stands about 65 ft. high and to reach the top 150 steps have to be mounted. There is room for 10 people inside the head and using the eyes as windows an excellent panoramic view of Munich can be obtained.—EDITOR.

Carborundum Company, Limited

New Cinema and Films

Films have aways played an important part in publicising the products of the Carborundum Company, and in instructing operatives and others in their correct use. Nowadays all their films are entirely the work of their own film production unit. A new cinema was opened at the Trafford Park, Manchester, works of the Company on October 2, the opening programme consisting of a preview of two new films. The longer of the two, "The Super Refractories," is a beautiful and impressive colour film dealing with the manufacture and use of silicon-carbide refractories, including "Carbofrax" and "Alfrax." The Company has recently opened a new factory at Rainford, Lancashire exclusively for the manufacture of refractories and the first part of the film contained a number of shots at this factory. The remainder showed manufacturing processes in the metallurgical and ceramic industries in which the company's refractories find an application. Of particular interest to foundrymen were some excellent views of work at the enamelling muffles of Bennett's Ironfoundry Company, Limited, Stockport, British Bath Company, Limited, Greenford, and Belling & Company, Limited, Enfield. The metal-melting applications of refractories were shown in the ramming of furnace linings and in the use of Carborundum crucibles. This section of the film included shots from the works of Enfield Rolling Mills, T. & J. Priestman and the Royal Mint, the last named being particularly impressive.

The other film which had its preview was "The Grinding of a 98-in. Telescope Mirror." The film was made in association with Sir Howard Grubb, of Parsons & Company. Whilst not of metallurgical interest it is of interest to the members of the Institute of British Foundrymen, as many of them saw this mirror being ground during their visit to C. A. Parsons & Company, on the occasion of the recent Newcastle Conference.

The Carborundum Company's new cinema accommodates about 200 people and is equipped with modern projection and sound apparatus. The building has been adapted from other uses and good acoustics are ensured by the provision of sound-absorbing wall panels and baffles suspended from the roof. The building will also be used in connection with the entertainment of visitors, engineering societies, for the Company's own internal conferences and in the planning of exhibition work.

Iron and Steel Values

A further list of five iron and steel securities for which values have been agreed with stockholders' representatives was published on October 8 by the Ministry of Supply.

Out of 146 securities, the number now agreed is 140, of which 55 are quoted and 85 unquoted; the remaining securities are all unquoted. The total compensation value of the agreed securities is approximately £235,350,000. The compensation value of the present batch of five securities is approximately £1,850,000.

PREFERENCE STOCKS AND SHARES (£1)

John Baker & Bessemer 6 per cent. cumulative (free of tax up to 6s. in £1) 34s.

ORDINARY STOCKS AND SHARES

John Baker & Bessemer £1, 60s.
Sheffield Forge & Rolling Mills Company 6s. 8d., 22s. 6d.
Skinningrove Iron Company £1, 20s.

LIAISON DEFERRED SHARES

Stewarts and Lloyds £1, 57s. 4d.

Book Review

Proceedings of the Brussels International Congress. Published by the *Association Technique de Fonderie de Belgique*, 21, rue des Drapiers, Brussels, and obtainable through the Penton Publishing Company, Limited, 2, Caxton Street, Westminster, London, S.W.1. Price £3 12s., post free.

From the abstracts which have already been published in the JOURNAL, readers will already have a fairly complete knowledge of the contents of this nicely-bound book. To criticise in detail the 50 Papers contained within 500 odd pages would be to express views on the current technical thoughts on world foundry technique. It should be recalled that the book is Anglo-French, that is to say, each Paper is printed in one of these two languages, with an abstract in the other. Actually, 16 are in English. Though its cost seems high, there is a new book on a limited section of foundry practice for review, which costs 75s., so one feels justified in recommending the purchase of the former even at its elevated price. However, this needs qualification, because an analysis shows that there is only one Paper on steel castings, three on heavy non-ferrous, one on light-alloys, and two on malleable. By way of balance, there are eighteen Papers which have been tabulated as "general"—that is, that they are of equal interest to all types of foundry technologists.

V. C. F.

Associated Engineering's Offer

Treasury consent having been obtained, the directors of Associated Engineering Holdings, Limited, propose to issue further ordinary capital to produce approximately £650,000. Subject to the creation of 2,603,323 5s. ordinary shares at an extra-ordinary meeting on October 24 and to favourable market conditions, 1,301,335 of the 5s. ordinary will be offered at 10s. each in the ratio of one for every five 5s. units held on October 12.

The directors state that in their opinion it will not be possible to meet the whole of the expansion programme of the company from existing resources and that it would be unwise to resort to short-term borrowing.

Production and Properties of Aluminium Casting Alloys

(*Continued from page 446*)

by a batch card which shows their chemical composition. Later the turnings will be mixed with turnings from other batches, together with any necessary metal additions, in the proportions required to give a furnace charge of the composition of the alloy to be made. Other forms of scrap are treated in different ways but on the same principle, and in each case the final product is a batch of metal free from harmful contaminating material and fully identified as to composition. Large assemblies such as aircraft which are not completely broken down cannot, of course, be chemically identified as accurately as, for example, can turnings, but the approximate "average" composition will be known from experience. The treatment of assemblies is, however, quite different and compositions are determined while the metal is in the furnace.

(*To be continued*)

Heating Ventilation and Lighting of Foundries

B.C.I.R.A. Conference at Ashorne Hill

THAT the choice of out-of-the-ordinary subjects—heating, ventilation, and lighting—at the foundry conference at Ashorne Hill, near Leamington Spa, held from September 26 to 28—was an indication of the way in which the British Cast Iron Research Association was extending its activities, provided the theme with which Dr. J. E. Hurst, president of the Association, welcomed the 170 delegates when he opened the Conference on the Wednesday afternoon. Thereafter, before the assembly broke up on the Friday evening, members participated in no fewer than 13 papers, together with discussions, as well as a film and a demonstration of equipment. The country-club atmosphere at Ashorne Hill helped the free-and-easy exchange in public and private sessions, and enthusiasm for some of the subjects was such that on one occasion it led to a sitting late into the night. For Mr. Colin Gresty, president of the Institute of British Foundrymen, and chairman of most of the sessions, the subjects were obviously close to his heart. It would be difficult to find a better combination of exponent of improving working conditions and the practical resourcefulness to carry them through economically.

The following are brief accounts of the main points developed in the Papers and discussions; it is understood that at some future date the whole of the proceedings will be published, possibly in book form.

Improvement in Working Conditions

The first technical contribution was purposely of a provocative nature—"Improvement of Working Conditions in Foundries: Survey of Problems Involved," by Mr. W. B. Lawrie (Factory Department, Ministry of Labour and National Service). The Author enumerated the committees whose purpose was concerned with the betterment of foundry working conditions, and acknowledged help these had already received. It was, he said, his rôle in this Paper to pose questions, and not provide the answers. He continued in this manner to give in general fashion the problems besetting the industry, many of which were a legacy of the past, reinforced by lack of fundamental knowledge of the sciences of heating, ventilation and good housekeeping. It was apparent that no simple expedient would give the kind of foundry all wanted; development work even in a restricted sphere was a small step forward, but as a result of much work in many apparently unconnected spheres there had emerged some logical methods of approach. Three avenues appeared to him worthwhile in the dust-control field for exploration; in order of value, these were: (*a*) preventive measures; (*b*) use of alternative materials, and (*c*) preventing the inhaling of dust by operatives. More particularly, he urged that open fires in foundries should be banned; the carbon monoxide risk should be reduced along with the banishment of uncontrolled mould and ladle drying; castings should be formed not by extensive fettling, but by good foundry practice; cores should produce no harmful fumes; leakage from drying stoves ought to be controlled; a knock-out should, and could, be totally enclosed, and very large ones were feasible. There was, he concluded, shortly to be issued another report on dust in steel foundries which would contain data obtained on substitutes for silica mould dressings as well as much food for thought on the conditions at present existing, and the means in hand to overcome the dust problems in foundries generally. Wet-treatment of cast moulds, vibrating knock-out grids, the powder-jet burner and wet-rumblers were among other items mentioned by Mr. Lawrie as being possible means of amelioration. Finally, the Author dealt with general ventilation problems, indicating that extraction of concentrated dust in small air volumes was to be aimed at. The inculcation of an open but inquiring mind was perhaps the best objective which he could put before the conference.

Dust Control in Planning

The second contribution of the afternoon was by Mr. J. Hunter, of the Association's staff, on the "Incorporation of Dust Control in Foundry Planning." On this subject the speaker prefaced his remarks by indicating how the deterioration in the supply of skilled moulders and the need for more and more mechanisation had aggravated the dust hazard in foundries in recent years, particularly at the knock-out and in intensive fettling operations. Methods of tackling these problems, treating the subject from the theoretical design angle, were next outlined, and general solutions indicated. The application of methods to existing buildings was said to pose very considerable difficulties, and individual rather than general schemes were probably all that could be recommended to suit individual cases. Localised segregation of dust-producing operations into clearly-defined areas served by exhaust systems was advantageous.

Lamps and Lighting

The next two Papers on electric lamps and industrial lighting respectively, both by Mr. F. Jamieson, of the Lighting Service Bureau, were complementary, the first dealing with history and the second with applications. The outlining of the development of electric lighting provided interesting hearing and placed each light-source into perspective, so that eventually the virtues and limitations of tungsten-

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filament, mercury-arc, sodium and other discharge lamps could properly be appreciated. The designs available for industrial use and details of their efficiency and life were next described in detail. It was disclosed that the mercury-vapour discharge lamp properly mixed with tungsten-filament lamps so as to provide a colour balance, appeared to offer a satisfactory combination of all-round properties for foundry lighting. Electrically speaking, the sodium lamp was said to be the most efficient to date; discharge lamps were held to be less susceptible than filament types to voltage drops. In this connection, one foundry lighting engineer was heard in discussion to say that it was his practice to buy discharge lamps for a voltage below his nominal supply (*e.g.*, 230 v. units were purchased for a 250-v. supply); he suggested that the life of the lamps was little impaired by the overload when voltage was normal, and when a " power-cut " was in progress, his standard of lighting was not affected. Other discussion stressed the need for side lighting or side-reflecting surfaces to supplement overhead lighting in lofty foundries, so as to provide illumination for vertical as well as horizontal surfaces. Glare should be avoided, it being a clause in the Factory Act that a filament must never be visible.

This discussion concluded the afternoon session. In the evening, a non-technical film, " The Perfect Woman," was shown by way of relaxation. This, of course, depicted a mechanical robot.

Fans and their Characteristics

The opening Paper of the Thursday morning was a résumé of the important characteristics of fans and the factors governing their selection for foundry use. It was delivered by Mr. R. A. Young, who is attached to the National College for Heating, Ventilating, Refrigeration and Fan Engineering in London. The whole field was well covered and adequately documented by tabular matter, the three types—centrifugal, axial flow and propeller—each being dealt with in turn, and working formulæ being quoted. The Author concluded by stressing that fan designs and characteristics were specialist matters and foundrymen with specific problems should refer them to trained fan engineers, rather than attempt to use a " stock " item of plant that happened to be conveniently on hand, but which might really be quite unsuited to the purpose, wasteful of power, and disappointing in service.

Ventilation in Swedish Foundries

The Paper on the above subject by Mr. K. Nilsson, of A.B. Svenska Fläktfabriken, Stockholm, showed that Swedish fan engineers appeared to have gone deeper into dust-removal and overall ventilation problems than was the case in this country. It is postulated, however, that this is probably due to the special conditions created by Sweden's geographical position, where, for a large proportion of the year, hot air is extremely precious and cold air cannot be allowed to enter indiscriminately, while at the same time vitiated air and process dust must be exhausted. Such circumstances have led to the elaborate schemes detailed by the visiting engineer. In particular, designs for swing- and stand-grinder exhaust systems, extraction hoods for knock-outs and oxy-cutting booths, and the like, were described and illustrated by slides, as well as general systems for shop-ventilation, all of the forced- or induced-draft types. A fettling booth had extraction on two sides and from below. An important point in using such equipment was the segregation of operations at points where dust-extraction could be arranged conveniently. When plant was boxed-in, as, for example, could be applied to melting furnaces even of the electric-arc type, a reduced volume of exhaust was necessary, and dust could be taken away at high concentration; this simplified its ultimate collection. Also, under these circumstances, a smaller withdrawal was made from the general shop atmosphere, with the consequence that a reduced input of fresh air then required heating to shop temperature to replace that taken out.

This conservation of heat, along with efficient, concentrated extraction, was perhaps the most important lesson demonstrated at the conference. Yet, sealed foundry buildings, with roofs as low as can be tolerated are extremes which are unlikely to be adopted in this country, with its more equable outside and inside temperatures.

The discussion which followed this Paper was lively and to the point, and showed that the delegates intended to profit by the theory only as applied in relation to home conditions. Such points as cost of the elaborate Swedish schemes, possibilities of recuperation of sensible heat losses in extracted air, use of radiant heating, wet dust-collection, as well as dust-arresting methods, were adequately dealt with. It appeared that of different sorts of dust-arresters, the electrostatic type was the best, but most expensive, multi-cell cyclones came second, and high-efficiency cyclones third. Wet-collection was little favoured in Sweden—once more, simply as a result of freezing hazards. It was disappointing to learn that little of advantage could be put forward by the Swedish engineer in the way of ventilation schemes for existing foundry buildings, lofty and sometimes old-fashioned in design. Either a scheme had to be planned along with the building, or it was, in the Author's view, almost useless attempting anything at all. Movable shutters also were frowned upon—on the principle that equipment left to optional adjustment by operators seldom received proper attention.

Natural Ventilation

The Paper " Natural Ventilation " by Mr. L. G. Davies (Colt Ventilation, Limited) was by way of providing a " foil " for the Swedish contribution. Much that was condemned in Sweden, at least for general-ventilation purposes, was described as of advantage where use was made of natural air-currents, as distinct from forced. Into this category came high buildings, large total areas for roof and side-wall ventilators, and the designing of systems to take into account prevailing winds. The new proposals seemed to be more in keeping with climatic conditions in this country. Various designs of shutters, louvres and flow directors were illustrated, it being clear that multiple openings were preferable. The effect of adjacent high buildings was demonstrated, almost total enclosure being favourable to natural ventilation. Low first-cost, no running cost and negligible maintenance were put forward as worthwhile features, as well as the psychological effect of a worker being able to see sky and feel incoming fresh air. The scientific placing of equipment, depending on thermal and wind currents was advocated, and suitable measuring instruments for air conditions were detailed. A fact disclosed, which may be but little made use of, is that the British Meteorological Office can supply, on request, recorded data as to prevailing and seasonal winds for any part of the country.

Observation of Dust

After the luncheon break, Mr. W. B. Lawrie showed his film " Observation of Dust in Foundry Dressing Operations " which many of the audience were seeing for the first time, and which was much commended. Introducing the film and outlining the work which led up to the general investigation, Mr. Lawrie described a few of the limiting factors of dust investigations and particularly of sampling practice, mentioning medical notes on toxic inhaled dust, particularly of the less-than-5μ size (thereafter, this invisible " pentamicron " became the gremlin of the Conference, always eluding capture by trapping, drowning, netting or spraying). Nevertheless, Mr. Lawrie, working on the theory from an engineering point of view, that if any dust could be removed an improvement in some degree was inevitable, explained the details of available apparatus and his experiments with the object of measuring dust and estimating its size range. Progress made with the exhausting of the effluent from fettling and grinding tools and work places was also dealt with.

Such disturbing facets as the comparative value of very short exposure tests against a life-time working in an atmosphere; the wide divergence of dust counts—from 1,000 to 10,000 particles per ml.—in individual locations and over short periods; from two to five time as much dust at crane level as compared with the foundry floor; atmospheric pollution at only ½ that of a " clean " foundry; and more dust left in mechanised foundries after extraction than in a jobbing foundry with no extraction—all these were used as pointers to the need for more and more research and greater scatter of observations and workers, as it was obvious that only the fringe of the main problems had been touched. A new figure, Mr. Lawrie thought, might be desirable in the future from ventilating engineers when quoting for equipment — not what could be abstracted, but what was *left* after the apparatus had done its best.

Dust Conveying and Collection

In the late afternoon, the assembly listened to a Paper " Methods of Dust Conveying and Dust Collection " by Mr. G. C. McKeown (Controlled Heat & Air, Limited). This began by outlining the human respiratory system, the sources of silica in various atmospheres, and Jones's theory on cerusitic particles. Every year 3.68 tons of air are inhaled by each workman. Next, dust-collection plant was detailed. Suction collection, it appeared, always proved a difficult matter because from the open end of an extraction duct there was negligible velocity at ×1 dia. distance. Even when the air and dust had been extracted, a major problem was their efficient separation. Electrostatic methods had the highest efficiency, but were expensive to apply; progress had been made recently with cyclone design, and nowadays the multi-cell cyclone was very suitable. Separation by bag filters was next reviewed, narrow bags on wire-mesh thimbles being recommended as to-day's best in this line. Then were detailed constructional features of wet separators—which plant was particularly advantageous for hot, dust-laden gases, although corrosive constituents gave trouble; another convenient feature was the easy disposal of the final sludge. Discussion of this Paper centred around collection and disposal of small particles of dust; combinations of cyclone and bag filters; cyclone corrosion and the cost of various types of plant .

Knock-out Fume and Dust Extraction

The final Paper of the evening was by Mr. L. W. Bolton (Morris Motors, Limited, Wellingborough) on " Fume and Dust Extraction at the Knock-out." This was extremely terse and factual and disclosed graphic experiences of installations at the foundries in charge of the Author, the groundwork being as described in a previously published work.* Of the three possible means of knock-out extraction—from below, from above and from the side—the first two were out of favour on account of blocking and loss of sand in the first case, and extraction past the operators' faces and difficulty with hoists in the second. The third, side ventilation, proved satisfactory both on theoretical and practical approaches. Extraction of large air volumes was necessary; a grid 3 ft. square required a fan capacity of 25,000 cub. ft. per min. and an inlet velocity of 2,500 ft. per min. (equivalent to a 30-m.p.h. wind) requiring a 7½-h.p. drive. At a distance of 4 ft. from the duct, velocity was down to 3 m.p.h. For high efficiency the diameter of the duct should be large enough to limit the velocity to 4,000 ft. per min. at ½ to 1 in. water gauge.

In his own foundry, the operators preferred the side hood and its best position was for its lower edge to be one moulding-box height above the knock-out. A high-efficiency fan was recommended and protection for the inlet could be provided by ½-in. dia. vertical bars at 1½-in. pitch, expanded metal having proved too fragile. Mr. Bolton illustrated his plant and applications by lantern slides and said there was no difficulty now in his foundry in getting men to work at the knock-out, although all castings were stripped at 700 deg. C. and there was much core fume. In the discussion, it transpired

* " Modernising an Iron Foundry " by L. W. Bolton, A.M.I.Mech.E., printed in the JOURNAL, May 25, 1950.

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that side-hoods parallel with conveyor working could be arranged.

In the late evening, an open discussion on methods of local and general ventilation was resumed and prolonged well into the night. Generally speaking, the same points as had arisen during the day sessions were re-examined in greater detail and speakers gave individual experiences in dealing with the problems arising.

Foundry Heating

Specialist topics were considered when the conference resumed on the Friday morning, the first being a Paper by Mr. W. D. Bamford (B.C.I.R.A.) on "Methods of Foundry Heating." This treated the subject mainly from a theoretical standpoint, the difficulty of specific recommendation being that no two existing foundries presented a common heating problem. An objective was "comfortable working temperature," varying with the job being done, but a minimum requirement, according to the Garrett report, was 50 deg. F. within 1 hr. of starting work. The Author stated that a number of successful radiant-heating systems had been designed to maintain a globe-thermometer temperature of 57 deg. F. For heat losses due to building construction, corrugated iron was worst and corrugated asbestos lined with ½-in. fibre-board, leaving an air space was much better. Rapid and frequent air changes were cited as expensive luxuries, for the heating of air contained in a building 200 by 100 by 16 ft. mean height, by 20 deg. F., through 20 changes per hr., required a capacity of over 2½ million B.T.U. per hr. This indicated the need to control heat and dust at the source and over small volumes. Cost of installations could be based on the following average figures:—

Fuel.	B.T.U. per 1d.
Coal (boiler)	17,400
Coke (boiler)	13,600
Electricity	3,412
Town's gas	6,000
Fuel oil	12,600

Automatic control was recommended for planned heating installations and various types were detailed. Finally, Mr. Bamford showed a number of slides illustrating various systems of heating and outlined the pros and cons of each.

Wet-process Cleaning

"Core Removal and Cleaning of Castings by the Wet Process," a Paper by Mr. W. Russell (Pneulec, Limited), was the next contribution. Initially, the theory, history and development of "Hydroblast" systems were dealt with. Points arising later were the potential saving through non-destruction of core-grids and the recovery of sand in a fine, washed condition; the high efficiency of 1,700 to 2,000 lb. per sq. in. cleaning jets; the marketing of a small utility plant for small foundries, which used a 25 gall. per min. gun and was without sand recovery, and a reported nozzle life of 200 to 300 hrs. A very worthwhile feature was said to be the cleanliness not only of the treated castings, but the whole atmosphere of the shop where "Hydroblasting" was being carried on.

Much additional information was derived from the discussion of this Paper. It was reported that there was no difficulty in de-coring small holes in castings, even when these were formed by loam sand; that water-heating was optional; that comparative cleaning times, wet and dry, for identical jobs was in three-to-one ratio in favour of the wet process; and that sufficient space for the plant could often be provided from areas previously occupied by castings awaiting cleaning. The capacity of a one-gun plant was said to be 50 tons per week of steel castings, such as anvils and other fairly simple shapes, a two-gun installation was dealing with 63 tons per week of large complicated iron castings, such as turbine casings and yet another plant of this type was cleaning 30 tons per day of simple-shaped iron castings.

Cupola Dust Arresters

The last Paper of the morning (and, as it turned out, of the conference, since an expected contribution on dust suppression in the fettling shop was unavailable at the last minute) was delivered in a very droll manner by Mr. W. Y. Buchanan on "Some Experiences with Cupola Spark- and Dust-arresters." Outsiders were, the Author said, beginning to take an interest in cupola effluent, but, quite apart from that, it was much in the foundryman's own interest financially and æsthetically to preserve his roofs and glazing from cupola dust, as well as to guard against fire hazard. Types and varieties of cupola dust were legion; strangely enough, charging by electro-magnet increased the outflow from the stack! Early installations (including American models) and a description of their shortcomings led Mr. Buchanan to a description of his own initial and final design. In its simplest form, this now comprised a cone suspended by tie-rods over the stack which was enlarged at this point. Mains water (recovery not favoured) was pumped up and splashed over the cone and between the cone and the stack, the collected water, ash, dust, etc., after catching in an annular ring outside the stack, was led to ground-floor level by a cast-iron pipe. Maintenance over several years had been reduced to negligible proportions.

Exhibition of Plant

In the early Friday afternoon, instead of the Paper scheduled, a visit was paid by the conference delegates to a small exhibition of ventilating plant and dust-estimating and removal equipment arranged in rooms adjacent to the conference hall. Here, the actual equipment for and *modus operandi* of the Owen's Jet and Thermal Precipitator methods of dust estimation were demonstrated and explained by Mr. W. B. Lawrie. Other items on show included working models of Hill's ventilating roof-shutter; various types of Colt ventilators and louvres; a representative assembly of literature appertaining to the subjects on hand; velometers by Metrovick, as well as numerous catalogues and pictures of plant and typical foundry installations.

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Progress in Steelfounding Productivity

The Report, of which this is a summary, is based on information gathered by the productivity committee of the British Steel Founders' Association from the members. It constitutes a review of progress in steelfounding productivity since 1948 *and examines the effects on productivity of the report of the steelfounding productivity team which visited the United States in* 1949.

Over half the Association's members, representing well over half the industry's total tonnage, have contributed to this report. The summary is divided up under six headings: sales, design, layout, equipment, methods and research, and personal relations.

Sales Policy

In the appendix to the productivity report, reference was made to an address to the team by Mr. S. Holme, of the General Electric Company of America. He emphasised that, in a successful business, the three activities—engineering, production and selling — must keep in step. Several firms — although not a sufficient number to justify a broad generalisation being made—have shown that they realise how important an influence sales policy can exert in the interests of productive efficiency. Those firms which report along these lines are using sales policy to employ machines in place of unobtainable skilled workers, to reduce the variety of steel compositions, and to obtain long production runs.

Design

Replies on the question of design show that this is linked with sales activities, and emphasise how important it is that founder and customer should understand each other's ideas and difficulties, close co-operation between the two often leading to changes in design. Good design will cut subsequent costs, and it is stressed that with increasing specialisation, the machining allowances formerly thought necessary can safely be reduced.

Standardisation is being increasingly emphasised, and some sections of the B.S.F.A. have succeeded in standardising certain castings, while one founder, by offering good deliveries for standard patterns but poor deliveries for fancy or frivolous modifications, has succeeded in having standardised designs accepted. Finally, one foundry "tied" to an engineering works has established one section working full-time on problems of standardisation.

Layout

A large number of important changes have taken place in layout, ranging from one or two firms which have installed a new melting shop or new bays, to a general emphasis on better-mechanised moulding, whether by moulding machines or by Sandslingers, and on improved efficiency and conditions in fettling shops. One typical example is that of a jobbing founder who has modernised the layout of his casting areas—this will speed-up the turn-round of boxes and reduce sand movement. Other foundries have saved much loss of time by reorganising their pattern-shops and improving their production control, and one has cut down the movement of castings by centralising heat-treatment, burning-off, and shot-blasting processes. It is clear that greater attention than before is being paid to those layout principles which have been long known, and which the Productivity Report was by no means the first to emphasise.

Equipment

Nearly all founders mention the installation of new equipment or the better use of existing plant over the last three years, despite the fact that many had already carried out extensive schemes of improvement and modernisation. The reports provide evidence that where equipment was already satisfactory, improvements in productivity have still been possible. One founder reports that he has improved productivity (measured in man/hours per ton) by 14 per cent. on his Sandslinger, 47 per cent. on machine-moulding, and 50 per cent. on fettling. Many tell of a wide range of new equipment: one member has turned from open-hearth melting to electric-arc furnaces, others have put in new machine-moulding installations or new Sandslingers with better servicing—as by the use of swing-jib cranes, roller conveyors, and individual sand-rammers—and one speaks of his practice of supplying lifters in large quantities, sorted by sizes, and insists on the importance of straightening-machines for lifters. Several reports show large increases in productivity in moulding and fettling shops, and one founder has doubled production since he introduced machine moulding.

In the coreshops, more core-blowers are in successful use, new core-stoves are reported, and the use of light alloys for core-plates and carrying boxes. Several reports from B.S.F.A. members mention mechanical knock-outs, flame-cutting machines, airless shotblasting plants, and the use of crane magnets, and real efforts are being made to tackle the dust problem. One founder has brought in an excavator to dig out his pits, and others have installed new sand-mixing equipment. A mechanical loader for handling bulk materials is described, and the prominent featuring of materials-handling equipment shows that its advantages are now realised throughout the industry.

It is interesting to read that even a foundry engaged mostly on jobbing work has standardised moulding-box sizes. Major re-equipment of pattern-shops is also taking place in several other foundries. Of all the steelfounding processes, steel melting has been the least affected by the prevalent

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re-equipment trends. This may be due to the shortages of electric power, which makes the installation of electric-arc furnaces impracticable. Also, the scarcity of scrap has prevented a general conversion from basic to acid melting, though two foundries report that they have done so, and one has installed a transformer giving high power/tonnage rating for the melting units.

Methods and Research

Only a general impression of trends in methods and research can be given, for they are perhaps the most intimate parts of a foundry's activity. Methods to speed operations which have been reported include the use of acid arc melting combined with Carbometer testing and oxygen blowing, and this has reduced melting time by about 40 per cent. from tap to tap. Pattern changes have been speeded-up to enable short-runs to be produced from machines, and even for hand-moulding, split and mounted patterns are coming into greater use. Many reports show that knock-off cores for the rapid removal of heads are being extensively used. More care is being taken to keep skilled men in skilled work and to service them efficiently.

One of the ways to produce better steel and cut down waste is by a reduction of refractory costs—one foundry has lowered these by 50 per cent.—through better inspection, which often includes gamma-ray and magnetic crack detection, and by the closest control of methods, sometimes even through special new-methods departments and developing sections. One founder has reduced his grinding costs by 40 per cent. through close study of grinding-wheel usage. Increasing attention is also being directed to sand formulation to obtain better stripping and consequent fettling economy. Green-sand work is increasing, with introduction of unit-type sand, and several foundries are reaping benefits from the use of sands of finer-grain. Economics are being sought in the use of exothermic feeding powders with short feeder heads, as was described in the Productivity Report.

Several members have sent technicians to the United States, and one is using an American foundryman as a consultant for a specific job. It is certain that many others have benefitted from the visit to their works of American foundrymen. There is no doubt that at this time, when members are being asked to make castings for machines which formerly came from the United States, more and more attention is being paid to improving the breed of the products.

Personal Relations

It is a good thing to hear of improved working conditions and increased amenities throughout the industry, of schemes for apprentices, older entrants, and supervisory staff, and publicity on the shop floor through the distribution of productivity statistics and shop achievements, yet none of these, incentive schemes, payment-by-results, or any other device, is enough if there is not the knowledge throughout the foundry that all in it have one interest in common—the success of the firm. No member would claim to have the confidence of all his workpeople, and one or two wrongly blame their workers or their workers' Trade Union leaders for their failure to obtain it. But blaming the other side will not help—good leadership is the only way to inculcate a good spirit throughout a concern.

This report covers progress made in the last three years. There is little evidence that the Trade Unions or that some of the employers' organisations are acting on the productivity team's suggestions, but the British Steel Founders' Association is now represented on the Foundry Committee of the Engineering and Allied Employers' Federation, and it is hoped thereby that action along the lines set out will be encouraged.

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Concluding Remarks

For the final session of the conference, which was a general discussion on conclusions and implications to be drawn from the deliberations of the delegates, the members returned to the conference hall. Although, by this time there was some " wastage " in the numbers attending, enthusiasm among those present was still high and considerable useful comment was made both on policy to be followed in future and detail points from the Papers. It was stated from the rostrum that as many founders as could be interested would be encouraged to procure and use the Owen's jet instrument and submit results to the central body. Several members indicated their support on those lines. Ladle driers were discussed, again, from the chair it was disclosed that a recently-publicised request for information* had resulted in gratifying response and Mr. Lawrie's committee would shortly have some information for dissemination on this subject. There was a general reiteration that local exhausting should be so designed as to abstract the minimum of clean air along with the undesirable fumes—screens and baffles could be used with good effect in individual cases. About jack-roof ventilation, there appeared to be some divergence of opinion as to its efficacy when there were high winds, but the addition, described by one member, of external directive curved sheets on the roof was warmly commended.

In conclusion, the chairman, Mr. Colin Gresty, summed up, very briefly, the main points and lessons to be learned from the exchange of views which had taken place. Ideas for further work would, however, be warmly received from any quarter by the co-operating bodies on dust and ventilation problems. Finally, the proceedings were terminated upon a vote of thanks being cordially granted the organisers, the chairman, the Authors of Papers, and other contributors, as well as the Association's staff.

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* See JOURNAL, August 2, 1951.

More Art Foundry Practice

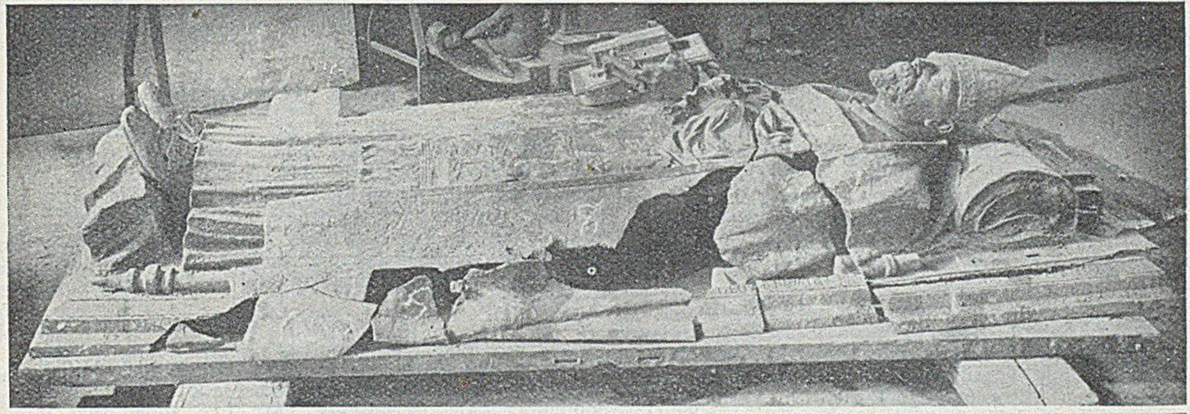
Recently, our representative re-visited the well-known art foundry of Morris-Singer, Limited, of 123, Dorset Road, London, S.W.8. He was pleased to note that there has now been an intake of three apprentices. The principal job on hand at the moment is a larger-than-life statue of King George V to be erected at Canberra the capital of the Australian Commonwealth. The model has been executed by Mr. J. E. Moorfield, an Australian sculptor, and shows His Late Majesty in his coronation robes. The mould for the head, which was made by the lost-wax process, was just ready for stoving. The plaster model of the torso, to guard against breakage during its long trip from Australia was reinforced internally by tubular-steel scaffolding. In general, the processes used for making this statue will closely follow those used for the making of the Roosevelt memorial which were detailed in a Paper* by Mr. Wizard.

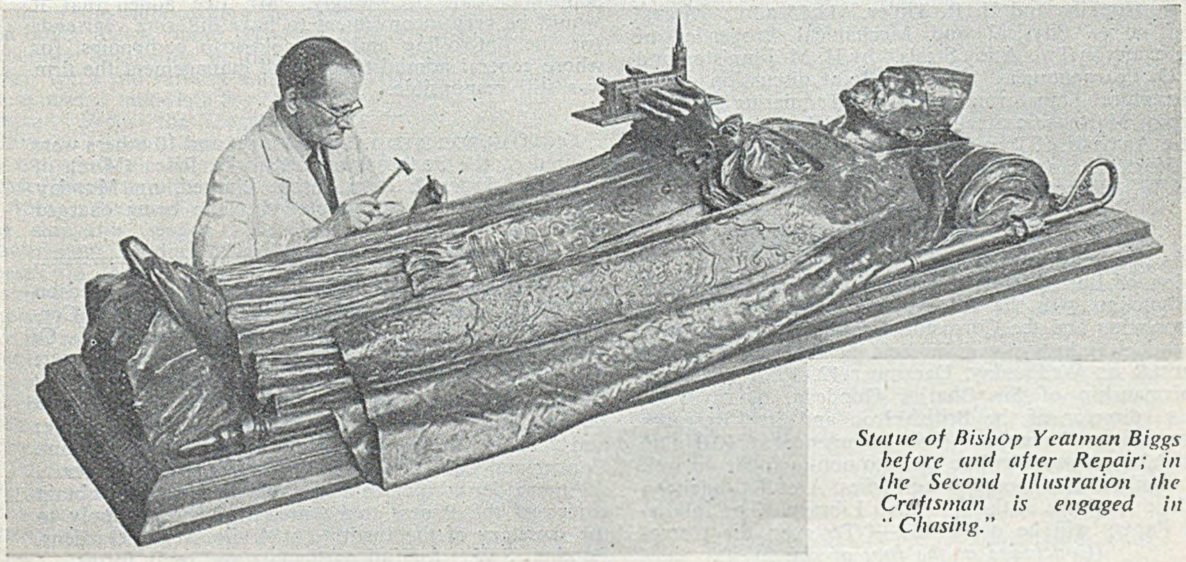
The statue is to be mounted on a stone plinth which will carry nine circular plaques. Several of these have already been cast and as finished they do real credit to both sculptor and founder. The whole of the work is being supervised by Sir William Reid Dick, K.C.V.O., R.A., the sculptor of the Roosevelt statue. About ready for delivery was a particularly charming group showing St. Nicholas with three children.

Because of the depredations done by bombing, art foundries are now being called on to repair damaged statues and the like. One which is illustrated is of Bishop Yeatman Biggs, the first Bishop of Coventry, the work of Sir Hamo Thornycroft, R.A., which reposed in Coventry Cathedral. It was originally cast in the Morris-Singer foundry in 1924. The repairs were effected by strapping-in the broken pieces, working from the inside of the statue, and then peening also from inside to close the cracks. Finally, where necessary the surface was "chased" and the second picture shows the craftsman engaged on this delicate task. Mr. Parrott, the manager of the foundry, seemed to be more proud of this repair—and probably rightly so—than he was of the complete making of a new work.

The last job we saw going through was a pair of beautiful medallions designed by Mr. A. J. Young, the one bearing the arms of the Worshipful Company of Founders and the other a ladle symbolising the antiquity of the craft of founding. The artist, by the way, is a past Master of the "Company."

* "Art Foundry Practice" published in the JOURNAL, April 28, 1949.





Statue of Bishop Yeatman Biggs before and after Repair; in the Second Illustration the Craftsman is engaged in "Chasing."

Iron and Steel Institute

The Autumn General Meeting of the Iron and Steel Institute will be held on November 21 and 22, at the offices of the Institute, 4, Grosvenor Gardens, London, S.W.1. The president, Mr. Richard Mather, will be in the chair. A buffet luncheon (price 6s. per person) will be arranged in the Institute's Library on the Wednesday. There will also be an interval during the mornings on both days for light refreshments (no charge). Members intending to join in the discussion on the Papers and/or to attend the buffet luncheon are requested to complete the appropriate parts of a reply form. This is particularly necessary in the case of members intending to take refreshments, in order that adequate provision may be made.

Programme

Wednesday.

10.0 a.m.: Formal business. 10.15 a.m.: Joint discussion on:—"Crystal Structure of Graphite in Cast Irons," by W. S. Owen and B. G. Street, and "Carbide Phase in Iron/Carbon/Silicon Alloys," by W. S. Owen. 11.45 a.m.: Joint discussion on "Metallography of Carbon in Silicon/Iron Alloys containing 4 per cent. Silicon," by E. D. Harry, and "Variation in Electrical Properties of Silicon/Iron Transformer Sheet," by S. Rushton and D. R. G. Davies.

1.0 p.m.: Buffet luncheon in the Library.

2.30 to 5.0 p.m.: Joint discussion on: Symposium on Stresses in Moulds: "Mechanical Properties of Ingot-mould Irons," by J. W. Grant; "Poisson's Ratio for Cast Iron used for Ingot Moulds," by J. Woolman; "Growth Characteristics of Some Cast Irons used for Ingot Moulds," by W. C. Heselwood and F. B. Pickering; "Note on Relaxation Tests on Cast Iron," by J. Woolman, and "Determination of Surface Stresses in Ingot Moulds," by M. W. Buttler and W. H. Glaisher; "Ingot Heat Conservation: Ingot-mould Temperature Measurements," by R. T. Fowler and J. Stringer, and "Ten-ton Ingot Moulds: Comparison of Design and Conditions of Use," by A. Jackson.

Thursday.

10.0 a.m.: Joint discussion on:—"Production of High-purity Iron and Iron Alloys on a 25-lb. Scale," by B. E. Hopkins, G. C. H. Jenkins, H. E. N. Stone and H. G. Short, and "Tensile and Impact Properties of Iron and Some Iron Alloys of High Purity," by W. P. Rees, B. E. Hopkins and H. R. Tipler. 11.15 a.m.: Discussion on:—"Physical and Mechanical Properties of Segregates in Two Alloy Steels," by H. M. Finniston and T. D. Fearnehough. 12 noon: Joint discussion on:—"Structural Transformations in the Tempering of High-carbon Martensitic Steels," by K. H. Jack, and "Magnetic Analysis of Iron/Carbon Alloys: The Tempering of Martensite and Retained Austenite," by J. Crangle and W. Sucksmith.

CORROSION OF BURIED METALS

As previously announced, a Symposium on the Corrosion of Buried Metals, organised by the Institute in conjunction with the British Iron and Steel Research Association and the Corrosion Group of the Society of Chemical Industry, will be held at the offices of the Institute on Wednesday, December 12, 1951, under the chairmanship of Sir Charles Goodeve, O.B.E., D.SC., F.R.S., director of the British Iron and Steel Research Association; the sessions will commence at 10.0 a.m. and 2.30 p.m., and will be open to non-members as well as members of the organising bodies. A buffet luncheon will be available in the Institute's Library. The following Papers will be discussed:—"Tests on the Corrosion of Buried Iron and Steel Pipes," by J. C. Hudson and G. P. Acock; "Investigations on Underground Corrosion," by K. R. Butlin, W. H. J. Vernon and L. C. Whiskin; "Cathodic Protection," by K. A. Spencer; "Cathodic Protection of Buried Metal Structures," by R. de Brouwer; "Corrosion of Buried Copper and Ferrous Strip in Natural and Salted Soils," by G. Mole; and "Tests on the Corrosion of Buried Aluminium, Copper and Lead," by P. T. Gilbert and F. C. Porter.

(*Concluded at the foot of col. 2*)

Any reader wishing to attend this meeting or to obtain copies of the Papers to be presented should apply to the secretary of the Institute at 4, Grosvenor Gardens, London, S.W.1, for full particulars and reply forms.

Inspection Team for U.S.

A team of eight specialists on inspection methods sailed for the United States on October 9 to study methods of inspection in practice in American plants, including those applicable to raw materials, semi-raw materials, and finished articles. Organised under the auspices of the Anglo-American Council on Productivity, the attention of the tour will be focused primarily on the function exercised by inspection in the organisation of industry at large. Matters such as the status of inspection departments in relation to other departments, the bearing of inspection on testing, the application of automatic jigs and fixtures, and the development of electronic tests will also be investigated.

Leading the team is Mr. LEONARD SOLLIS, managing director of Highfield Gear & Engineering Company, Limited, Huddersfield, the other members of the team being Mr. ALEXANDER HEWARD, chief inspector of W. & T. Avery, Limited, Birmingham, Mr. C. H. JOHNSON, chief inspector of Hoover, Limited, Perivale (Middx), Mr. S. W. NIXON, chief inspector of the Rover Company, Limited, Birmingham, Mr. F. J. MILLS, chief inspector of James Booth & Company, Limited, Birmingham, and Mr. P. R. SNADDEN, inspector, the British-Thomson Houston Company, Limited, Rugby.

The joint secretaries of the team are Dr. JOHN BARNETT, technical manager and chief inspector of Thorn Electrical Industries, Limited, Enfield (Middx), and Mr. E. D. VAN REST, principal scientific officer, the National Physical Laboratory, Teddington (Middx).

State Steel Accounting

Instructions for the use of one accounting date for all nationalised iron and steel concerns have been issued by the Iron and Steel Corporation in accordance with the statute requiring it to present consolidated accounts for the whole nationalised industry. In practice all iron and steel businesses which came under State control last February must change their accounting years to end on the last Saturday of September.

In a notice to the company's stockholders, Mr. G. Wilton Lee (chairman of Arthur Lee & Sons, Limited, points out that Arthur Lee & Sons (Hot Rolling Mills), Limited, a former subsidiary, must adopt the end of September date accordingly. Mr. Lee added that it would be very inconvenient to have differing year-ends for the hot-rolling and the cold-strip companies, for whose general administration and management the firm was still responsible.

ONE MAN RECEIVED FATAL INJURIES and 10 others were injured at the Pontymister steelworks, Risca (Mon), of Partridge, Jones & John Paton, Limited, on Monday night, when a furnace exploded while being charged with steel.

Bulk Exports Licences Recalled

An instruction, issued by the Board of Trade, dated October 3, which became operative on October 5, has the effect of restricting steel exports to certain markets, and the licensing branch of the Board of Trade recalled a number of bulk licences from makers and re-rollers so that the necessary alterations could be made. Scottish makers and re-rollers duly sent back their bulk licences as ordered. The restriction has no doubt been rendered necessary by considerations of international finance, but the chief alteration would appear to be a cessation of steel exports to the United States and a more generous allocation to Commonwealth markets.

Export allocations of sheets for Period IV have been announced rather belatedly, and are understood to involve some alterations in distribution, but no increase in the total tonnage permitted to be exported.

Consumers' demands on Scottish steelmakers and re-rollers continue to be heavy, and the full effects of the reduced outputs of steel in Scotland are now beginning to be apparent. Stock reserves of finished steel have now largely disappeared, and anxiety as to the future continuance of operations is frequently expressed, but makers are doing their best to ensure an equitable distribution of the limited tonnages available. The Defence Order (D.O.) and Preferential Treatment (P.T.) symbols have been increasingly in evidence, showing clearly that the rearmament programme is well under way. Naval demands appear to be mainly for lighter types of vessel, but materials for arms and equipment are in substantial request.

Pig-iron Output Improves

Pig-iron outputs are apparently improving, a feature all the more gratifying as steel melting scrap is still inadequate to the requirements of the steel furnaces, and steel ingot outputs remain at about 20 per cent. below capacity as a result. Steelmakers are doing their utmost to satisfy the demands of re-rollers for billets, slabs, and sheet bars, and the re-rollers themselves are endeavouring to secure supplies of re-rolling materials to make up for any deficiencies in raw material deliveries.

Unfortunately, a usually fruitful source of supply is at present most disappointing, because of the almost entire absence of ships for breaking-up. From the yards of the shipbreakers such re-rollable materials as old boiler plates, boiler stay-bars, and ships' davits are generally obtainable in fair quantities, and from the scrap yards old railway wagon axles and rails, but all these useful materials for re-rolling purposes are very scarce. From the Continent there are occasional deliveries of semis, but not nearly enough in proportion to the needs of the re-rollers and the quantities purchased many months ago from Belgium and Luxemburg.

Among the steel consumers clamouring for supplies the shipyards, wagon and locomotive builders, and power-plant producers are the most prominent, but there are many other users who have a strong claim for prior consideration because of the earning capacity of their finished products abroad. Noteworthy are the makers of agricultural machinery, sugar-refining plants, and many articles of domestic equipment such as electric and gas cookers, washing and wringing machines, and refrigerating machinery. One Scottish factory is turning out 175 combine harvesters a week, of which about 50 per cent. are for export.

Pig-iron production during September was at an annual rate of 9,854,000 tons, compared with 9,409,000 tons for August and 9,712,000 tons a year ago. The annual rate for the first half of the year was 9,506,000 tons.

Iron and Steel in Pakistan

Resources Inadequate for Pig-iron Production in the Country

The position of iron and steel in Pakistan is discussed by Walter Godfrey in a recent report on economic conditions in that country. The report, which is dated May, 1950, recalls that the steel industry of Pakistan after partition comprised two electric steel re-melting furnaces of five tons capacity, each with its own rolling-mill, and 32 re-rolling-mills, most of which, however, were small establishments not producing sections of proper quality and dimensions. Altogether, the annual capacity of the industry was about 12,000 tons of re-melted products, and 80,000 tons of re-rolled products, but it was only producing at the rate of 7,000 and 18,000 tons respectively. There was no smelting industry. The Government's development plan envisages the erection of a smelting plant of 1,250,000 tons annual capacity, eight new re-melting plants of 56,000 tons annual capacity, and two new re-rolling mills of 20,000 tons annual capacity. This was a provisional estimate, and at the invitation of the Government a United States Steel Mission visited the country in November and December, 1949, to advise on the development of the industry in Pakistan. Their report, when these notes were compiled, had not been made public but they were believed to have advised against the setting up of a smelting plant in view of the expected high cost of local production. Pakistan possesses only negligible resources of coking coal, and such of her deposits of iron ore as are known are comparatively low grade.

Technical Recommendations

It is believed, however, that besides a number of technical recommendations the Mission advised the setting up of bar mills, a basic open-hearth cold-metal steel plant and sheet-producing facilities in Karachi and a bar mill and a structural steel fabrication plant in East Pakistan. They are reported to have estimated Pakistan's steel requirements at 260,000 tons per year during the period 1950-1953 rising to about 400,000 tons per year during the period 1954-1970, of which local production is to provide 60,000 tons per year during 1950-1953 rising to 228,000 tons per year during the period 1954-1970.

Pakistan has about 150 small and medium-size grey-iron foundries, mostly situated in the Punjab. Their annual productive capacity is about 30,000 tons. It is estimated that this capacity is almost adequate for the country's requirements, but production in September, 1949, was estimated at little more than one-tenth of capacity. Castings produced by these foundries are said to be of poor quality as they use only ordinary types of cupolas, and their foundry technique is simple compared with modern foundries using mechanised equipment. It is planned to modernise the existing foundries and to bring their production up to the proper standard by the provision of technical assistance. The target for development also covers the installation of six new foundries, including two for the production of heavy castings for ship-building and heavy engineering industries. No malleable iron foundries exist in Pakistan and in view of the heavy demand for malleable iron castings for the railways and other industries, it is proposed to set up three foundries with a total annual capacity of 1,000 tons.

Copies of the report may be obtained from H.M. Stationery Office (price 5s.).

Personal

MR. T. L. DICKIE, of Stockport, has retired after 25 years as north-western organiser of the Association of Engineering and Shipbuilding Draughtsmen.

MR. WILLIAM MANSON has been appointed managing director of Barr, Thomson & Company, Limited, engineers, Kilmarnock. He joined the company in April, 1948, as general manager.

MR. T. P. D. SPENS has been appointed chief buyer of Stewarts and Lloyds, Limited, in succession to MR. JOHN CRAIG, who is retiring after nearly 40 years' service with the company.

MR. A. R. WRIGHT has been elected to the Board of directors of Lansing Bagnall Limited, Kingsclere Road, Basingstoke. Mr. Wright has been associated with the company for 10 years.

THE METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, announce that on September 1, 1951, Mr. S. A. Ghalib was appointed assistant chief engineer, in their electronic-control department.

MR. WILLIAM ALLSOP, a foreman, was presented with a gold wristlet watch to mark his 50 years' service with the Sheffield Smelting Company, Limited. The presentation was made by Mr. R. E. Wilson, a director.

MR. H. A. MACCOLL, head of the department of metallurgy at the County Technical College, Wednesbury (Staffs), has been appointed principal of the college to succeed MR. T. G. BAMFORD, who retires at the end of the year.

MR. E. J. WILSON, until recently the assistant engineer to the Port of London Authority, has been appointed London office manager of Richard Sutcliffe, Limited, manufacturers of conveyors and mechanical handling plant, of Horbury (York's).

LORD KNOLLYS, Minister at the British Embassy in Washington in charge of raw materials, has been elected chairman of the central group of the International Materials Conference following the resignation of the American representative, MR. EDWIN GIBSON.

MR. J. MORGAN who, since August has been at Foundry Services Limited of Birmingham familiarising himself with products and organisation, sailed on October 6 in the Queen Elizabeth to Canada, to take up his duties as chief metallurgist at Foundry Services (Canada) Limited, Guelph, Ontario.

MR. C. M. BUCKLAND, deputy works manager, of Aiton and Company, Limited, pipe engineers, Derby, is the new president of the Derby Society of Engineers, and he gave an interesting address on how Aitons developed their new works at Southwick, Sunderland, when they decided to take over the site in 1949.

MR. JOHN MCKAY, melting shop manager of the Lanarkshire Steel Company, Limited, Motherwell, has retired after 32 years' service with the company. At a presentation ceremony last week tribute to his work was paid by Sir John Craig and Sir Andrew McCance. Mr. McKay is being retained as a consultant by the company.

MR. W. N. COLLINS, sales and service director of F. Perkins, Limited, Diesel-engine manufacturers, of Peterborough, and MR. H. STANLEY PEARCE, the company's export consultant, have left for a six weeks' visit to the Belgian Congo, where Diesel engines are exposed to particularly severe working conditions.

At the recent conference at Llandudno of the Purchasing Officers' Association, MR. A. ELLIOTT (Churchill Machine Tool Company, Limited), MR. J. C. THOMPSON (Edgar Allen & Company, Limited), and MR. D. WRAGG (Thos. Firth & John Brown, Limited) were elected vice-presidents of the association for 1951-52. MR. R. J. MITCHELL (Morgan Crucible Company, Limited), was elected honorary treasurer.

Obituary

THE DEATH has occurred after a long illness of DR. ALBERT JAMES GILBERTSON, a former chairman of John Crown & Sons, Limited, the Sunderland shipbuilders and repairers. He was 70.

THE DEATH occurred suddenly on October 4 of MR. J. L. KERRY. Chairman of British Ropes Western (Sales), Limited, Cardiff, he had been in control of the company's activities in that area for the past 4½ years.

SIR JOSEPH SHARP, who retired 16 years ago from the post of superintendent engineer with the Eagle Oil Shipping Company, Limited, has died at the age of 83. He started his career with Palmers' Shipbuilding & Iron Company, Limited, Jarrow.

DR. ANTON FREDERIK PHILIPS, president of the board of directors of Philips Electrical Industries at Eindhoven, Holland, died on October 7. He was 77. The giant Philips factories in Eindhoven were founded in 1891 when Dr. Philips' brother, Gerard, started a small electric-lamp factory. It was not successful until Dr. Anton Philips took charge of the commercial side of the firm.

WE REGRET to announce the death of MR. GEORGE E. ROBERTS, J.P., chairman of Coventry Malleable and Aluminium Limited. Mr. Roberts was for many years a very active member of the Institute of British Foundrymen which he joined in 1919. He presided over the Coventry branch and for a number of years took a prominent part in the affairs of the General Council. He was 77 years old, and maintained his interest in technology to the end.

Increases of Capital

The following companies are among those which have recently announced details of capital increases:—

GEORGE OXLEY & SONS, LIMITED, engineers, ironfounders, etc., of Sheffield, increased by £30,000, in £1 ordinary shares, beyond the registered capital of £20,000.

SALWAY MORGAN & COMPANY, LIMITED, ironmasters, etc., of Poole (Dorset), increased by £20,000, in £1 ordinary shares, beyond the registered capital of £30,000.

JOHN DALE, LIMITED, manufacturers of non-ferrous collapsible tubes, etc., of London, N., increased by £100,000, in 5s. ordinary shares, beyond the registered capital of £500,000.

GLACIER METAL COMPANY, LIMITED, Wembley (Middx), increased by £750,000, in 300,000 preference shares of £1 each, and 1,800,000 ordinary shares of 5s. each, beyond the registered capital of £500,000.

RANSOMES, SIMS & JEFFERIES, LIMITED, engineers, ironfounders, manufacturers of agricultural machinery, etc., of Ipswich, increased by £1,000,000, in £1 ordinary shares, beyond the registered capital of £1,250,000.

SOUTH WALES ALUMINIUM COMPANY, LIMITED, Resolven, Neath (Glam), increased by £749,500, in £1 "B" ordinary shares, beyond the registered capital of £1,750,500. Tube Investments, Limited, holds a majority of the issued shares.

WILLIAM H. CAPPER & COMPANY, LIMITED, engineers and pipe line specialists, etc., of Woolston, Warrington (Lancs), increased by £20,000, in 10,000 ordinary and 10,000 redeemable preference shares of £1, beyond the registered capital of £30,000.

DARLING & SELLERS, LIMITED, engineers, toolmakers, ironfounders, etc., of Keighley (Yorks), increased by £67,000, in £1 ordinary shares, beyond the registered capital of £8,000. The capital has been reorganised and is now £75,000 in £1 shares (37,500 "A" and 37,500 "B").

JAMES C. KAY & COMPANY, LIMITED, announce that, Mr. W. Perryman has resigned his position as managing director. Mr. Arthur Davies has been appointed general manager and will take up his duties on October 22, 1951.

News in Brief

A PLAN is under consideration by the Longbenton (Northumberland) Urban Council for the development of 31 acres of land as a trading estate.

THE ULSTER COMMENTARY announces that there are to be no power cuts in Northern Ireland this winter as the new extensions will take care of load imposed.

ORDERS FOR TWO CARGO MOTORSHIPS of 9,100 tons d.w. have been received by William Doxford & Sons, Limited, Sunderland, from the Reardon Smith Line, Cardiff.

PATENTS (numbered 658,003 and 646,371) have just been granted for a motorised, hydraulic, tube-bending machine to Chamberlain Industries Limited, Staffa Works, Leyton, London, E.10.

THE HEAD OFFICE of the Colonial Development Corporation is now at 33, Hill Street, London, W.1. The telephone number is Mayfair 8484 and the telegraphic address "Velop, Audley."

INDUSTRIAL DISTRIBUTORS (SALES) LIMITED call our attention to a lecture by P. Grodzinski on "Shaped Diamond Tools," at the South East London Technical College, Lewisham Way, S.E.4, at 7 p.m. on October 22.

THE REPORT of the Specialist Conference on Fuel Research, convened by the Standing Committee of the British Commonwealth Scientific Official Conference and held in London last year, has been published by H.M. Stationery Office, price 9d.

ANOTHER BLUE FUNNEL LINER is to be built by the Caledon Shipbuilding & Engineering Company, Limited, Dundee, similar to a 7,700-ton vessel delivered last year. Diesel engines will be supplied by J. G. Kincaid & Company, Limited, Greenock.

FINES of £100 each, with 10 guineas costs, were imposed on a mill manager and a millwright who admitted to stealing 3 cwt. of gunmetal bearings from the Yorkshire Rolling Mills, Limited. They asked for a further offence of stealing 5 tons of cast-iron scrap to be taken into consideration.

AT THE ANNUAL GENERAL MEETING of the Widnes Foundry & Engineering Company, Limited, held recently, Mr. Ralph Credland, assistant managing director of the company for the past four years, was appointed joint managing director. Widnes Foundry is one of the Thos. W. Ward group of companies.

THE DIRECTORS of Arthur Lee & Sons, Limited, producers of steel strip, wire rods, etc., of Sheffield, intend to issue £1,250,000 ordinary shares in units of 2s. 6d. by way of a bonus to existing ordinary stockholders on the basis of five 2s. 6d. units for every one existing ordinary 2s. 6d. stock unit held. The consent of the Treasury has been given.

BRITISH ALUMINIUM COMPANY, LIMITED, announce that Mr. S. M. Lawrence has been appointed assistant sales manager for unwrought and special products, in place of Mr. R. M. Warrington who will be relinquishing his appointment with the company on October 31, 1951; Mr. O. M. Bruce Payne has taken over responsibility for the technical service section of the development department in place of Mr. Lawrence.

LAST TUESDAY, October 16, a Productivity Team representative of British manufacturers of metal-working machine tools sailed for America in the "Queen Mary." This team is complementary to that concerned with wood-working machinery which sailed for the United States in August, and, like it, it is sponsored by the Engineering and Allied Employers' National Federation and the Machine Tool Trades Association.

THE GOVERNORS of the Heriot-Watt College, Edinburgh, were told at a meeting on October 12 that plans of the third and final stage of the extension scheme would probably appear before the Dean of Guild in November, and it was hoped that work would start in January. It was also stated that the College entrance examination was now recognised by the Engineering Joint Examination Board. Tribute was paid to Sir John Imrie, who has completed 28 years as hon. treasurer and who has now resigned.

SIR ANDREW MCCANCE, deputy chairman of Colvilles, Limited, delivering his presidential address on October 9 to the annual meeting in Glasgow, of the Institution of Engineers & Shipbuilders in Scotland, said that stimulated by the urgency of war demands, engineering progress had disclosed hitherto unsuspected behaviour of steel under conditions created by the increasing application of welding to shipbuilding. Problems connected with states of toughness or brittleness had been sharply defined, indicating clearly that they were not yet understood.

IN ORDER TO MELT additional scrap in a 28-ton acid-Bessemer converter over a period during which there was a shortage of hot metal, oxygen-enriched blast was employed by the National Tube Company, McKeesport, Pa., the results being reported by W. G. McDonough in a Paper presented to the Association of Iron and Steel Engineering. The experiment showed that under normal operating conditions, 4,000 to 5,000 lb. of additional steel scrap could be melted by the use of 4,000 to 6,000 cub. ft. of 99.5 per cent. pure oxygen per blow, with a reduction in blowing time of about 1 min.

SOME 50 REPRESENTATIVES attended a three-day conference held recently by Foundry Services Limited, at the Welcombe Hotel, Stratford-upon-Avon. Apart from the Company's senior executives and 18 home representatives, agents and representatives from most European countries and from as far away as Australia, India and Canada were present. Home and overseas matters were considered in two separate and one joint session. Social activities included a visit to the Stratford Memorial Theatre, a visit to Oxford and the Morris Motors' works for the overseas representatives and their wives, and a farewell dinner.

House Organs

Cracks and Crazes, Vol. 3, No. 1, Autumn, 1951. Issued by M. Cockburn & Company, Limited, Gowanbank Iron Works, Falkirk.

This issue has, in a prominent position, reprinted our review of their last issue and, moreover, the contributors have in general acted upon the advice tendered. As usual the issue gives an account of the social and sporting activities and a few short stories.

News Letter, Vol. 3, No. 3. Issued by the David Brown Group of Companies.

The Editor of this house organ has a more difficult task than most of those responsible for producing house organs, because of the geographical distribution of the works. He must accept the dictum that, unless something very special happens, the doings of the personnel of one branch do not in general interest the staff of the others yet by the exercise of good journalism, a magazine of real interest to all has been produced.

Nickel Bulletin, Vol. 24, No. 7.

Growing interest in the new spheroidal-graphite cast irons is shown by abstracts of articles on this material in this issue, taken from British, French and American sources. Other abstracts of interest deal with the creep of metals, the sub-zero properties of nickel-alloy steels and the use of nickel/chromium corrosion-resisting steels in the petroleum industry. Copies are available, free of charge, from The Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

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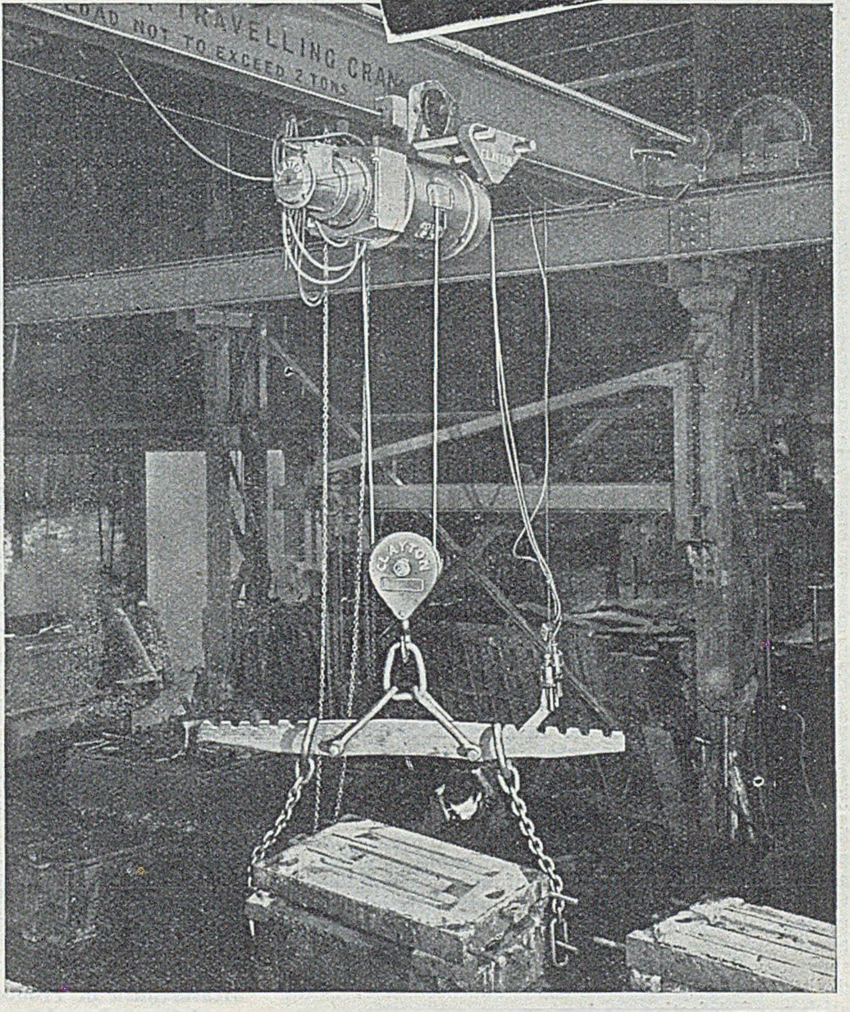

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Raw Material Markets

Iron and Steel

The improvement in deliveries of iron ore to the furnaces is welcome news to foundries generally, and in particular to the engineering, speciality, and textile foundries, as they now anticipate some improvement in deliveries of hematite and other grades which have for some time been curtailed. The provision of coke now appears to be the chief difficulty of the blast furnaces. The coke supply position is, unfortunately, very uncertain, and the output of pig-iron cannot be stepped up appreciably until more coke is forthcoming. Producers of the low- and medium-phosphorus irons are maintaining fairly even outputs, which are readily absorbed, as are the outputs of refined and Scotch foundry iron.

Production of high-phosphorus pig-iron for the light and jobbing foundries, together with the textile and some of the engineering foundries, is also inadequate. Apart from the reduction in outputs necessitated by the blowing-in of a furnace for relining, deliveries from the furnaces in blast are, for various reasons, not up to the maximum, and another unit will go out of blast early in November for six to eight weeks for repairs and relining. The foundries normally taking supplies from that source will have to seek fresh avenues of supply, but their chances of success are remote.

Suitable cupola grades of scrap in both cast iron and steel—and particularly the former—are very scarce. Foundry coke is coming to hand to cater for current needs, but many consumers would like to see larger stocks in their yard. Ganister, limestone, and firebricks are supplied to requirements, while the foundries in need of ferro-alloys are usually able to meet their needs.

The re-rollers' position shows little change; if anything, the demands tend to become even more insistent owing to their inability to fulfill orders on hand. There is very heavy pressure for all sizes of sections, bars, and strip, as well as sheets, demands for which are particularly strong. Present supplies of steel semis are but a fraction of requirements, and unless greatly increased supplies of imported steel are forthcoming, little improvement can be expected in the re-rollers' position, the tonnages from home sources being still meagre and with no prospect of improvement. Part-time working is the rule at many units. It is not surprising, therefore, that new business is very difficult to place, orders on hand being badly in arrears. The shortage of outputs at home steelworks not only reduces the tonnage of prime steel semis but also decreases the arisings of defectives and crops.

Non-ferrous Metals

Last week brought quite a marked appreciation in values on the tin market, although a setback on Friday afternoon caused the close to be below the best. Figures issued by the British Bureau of Non-ferrous Metal Statistics show that Government stocks of tin at August 31, apart from the stockpile, were 200 tons, while consumers held 1,816 tons. Consumption during August was 1,735 tons, compared with 1,867 tons in July.

In the United States discussions between the R.F.C. Administrator and the Bolivian producers have not yet resulted in an agreement between the two parties as to a basis for a long-term contract. Bolivia is reported to be asking for $1.50 as the price for tin, while the American negotiators think that this is much too high. They will probably concede, however, something in excess of the figure of $1.12 agreed upon for the 30 days contract.

Other figures published by the Bureau of Non-ferrous Metal Statistics show that copper stocks in the U.K. increased to 126,653 tons from the July figure of 120,336 tons. Consumption, however, declined from 24,010 tons in July to 21,764 tons in August. Stocks of lead rose sharply from 27,959 tons at the end of July to 43,959 tons at August 31, while consumption declined slightly from 26,136 tons to 25,778 tons.

In zinc the August usage, at 19,249 tons, compared with 22,605 tons in July. Stocks, however, increased from 34,506 tons at the end of July to 37,074 tons at August 31. Considering that August was a holiday month these figures must be regarded as satisfactory.

It now seems definite that the Ministry of Supply will shortly impose a ceiling price on secondary copper ingots, the figure mentioned being £225 10s. for the highest grade with discounts for the other qualities. In order to facilitate the manufacture of these ingots there is to be a reduction in the ceiling price of copper scrap, probably of £10, and at the same time secondary brass maximum prices will also be brought down.

London Metal Exchange official tin quotations were as follow:—

Cash—Thursday, £1,015 to £1,020; Friday, £1,025 to £1,030; Monday, £1,015 to £1,020; Tuesday, £1,000 to £1,005; Wednesday, £1,027 10s. to £1,030.

Three Months—Thursday, £947 10s. to £952 10s.; Friday, £965 to £967 10s.; Monday, £955 to £957 10s.; Tuesday, £945 to £950; Wednesday, £972 10s. to £975.

Publications Received

Directory and Handbook of the Scientific Instrument Manufacturers' Association (1951 Edition). Published by the Association, from 20, Queen Anne Street, London, W.1.

In addition to information on the history of the British scientific instrument industry, the principal features of the book are a directory of 104 British scientific instrument manufacturers who are members of the Association, and an index giving the sources in this country of some 2,500 instruments. This index is 20 per cent. larger than that of the previous 1947 edition, a measure of the increasing production of the British scientific instrument industry. Copies of the volume can be obtained by enquiry at the Association's headquarters at the address indicated above.

Measurement of Productivity—Applications and Limitations. Issued by the Joint Committee of the Institution of Cost and Works Accountants and the Institution of Production Engineers. Distributed by Gee & Company (Publishers), Limited, 27-28, Basinghall Street, London, E.C.2. Price 2s. post free.

The most important outcome of this report is couched in the following terms: "No rules can be laid down on how to measure the productivity of labour or of any of the other factors on production. The problems of individual firms differ widely and each firm must devise the index best suited to its needs. It seems highly improbable that any overall index will be devised to meet the requirements of all firms."

The reviewer can honestly state that he reached this conclusion coincidently with the advent of the notion that productivity as between firm and firm could be ascertained and recorded in such a way as to establish reliable comparison. The Report sets out clearly the attempts that have been made and stresses one based on a ratio as being the most promising.

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered, unless otherwise stated)

October 17, 1951

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £11 10s.; Birmingham, £11 4s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £13 0s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £13 12s. 3d.

Scotch Iron.—No. 3 foundry, £13 1s., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £15 7s.; South Zone, £15 9s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £15 17s.; South Zone, £15 19s. 6d.

Cold Blast.—South Staffs, £17 5s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 17s.; Scotland (Scotch iron), £13 3s. 6d.; Sheffield, £13 13s. 6d.; Birmingham, £14 0s. 6d.; Wales (Welsh iron), £13 3s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 15s. 9d.

Basic Pig-iron.—£11 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s., basis 45% Si, scale 15s. 6d. per unit; 70/84 per cent., £56 2s. 6d., basis 75% Si, scale 16s. per unit.

Silicon Briquettes (5-ton lots and over).—2lb. Si, £48 5s.; 1lb. Si, £49 5s.

Ferro-vanadium.—50/60 per cent., 15s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 9s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £175; ditto, copper-free, £190.

Ferro-tungsten.—80/85 per cent., 33s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 35s. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent C, £74, basis 60% Cr, scale 24s. 6d. per unit; 6/8 per cent. C, £70, basis 60% Cr, scale 23s. 3d. per unit; max. 2 per cent. C, 1s. 8¼d. per lb. Cr; max. 1 per cent. C, 1s. 8¾d. per lb. Cr; max. 0.15 per cent. C, 1s. 9½d. per lb. Cr.; max. 0.10 per cent. C, 1s. 9¾d. per lb. Cr.

Chromium Briquettes (5-ton lots and over).—1 lb. Cr, £78 9s.

Cobalt.—98/99 per cent., 17s. 6d. per lb.

Metallic Chromium.—98/99 per cent., 5s. 11d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £40 8s. 9d.

Manganese Briquettes (5-ton lots and over).—2lb. Mn, £50 6s. 6d.

Metallic Manganese.—96/98 per cent., carbon-free, £215 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £21 11s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £22 1s. 6d.; hard (0.42 to 0.60 per cent. C), £23 19s.; silico-manganese, £29 15s.; free-cutting, £24 15s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C. £27 16s.; case-hardening, £28 4s.; silico-manganese, £30 16s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £25 15s.; basic, hard, over 0.41 up to 0.60 per cent. C, £26 15s.; acid, up to 0.25 per cent. C, £28 4s.

Sheet and Tinplate Bars.—£21 16s.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £25 6s. 6d.; boiler plates (N.-E. Coast), £26 14s.; chequer plates (N.-E. Coast), £26 15s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £23 15s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £27 11s.; flats, 5 in. wide and under, £27 11s.; hoop and strip, £28 6s.; black sheets, 17/20 g., £35 15s. 6d.; galvanised corrugated sheets, 17/20 g., £49 18s. 6d.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £44 17s. 3d.; nickel-chrome, £65 2s. 9d.; nickel-chrome-molybdenum, £72 10s. 3d.

Tinplates.—52s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £227; high-grade fire-refined, £226 10s.; fire-refined of not less than 99.7 per cent., £226; ditto, 99.2 per cent., £225 10s.; black hot-rolled wire rods, £236 12s. 6d.

Tin.—Cash, £1,027 10s. to £1030; three months, £972 10s. to £975; settlement, £1,027 10s.

Zinc.—G.O.B. (foreign) (duty paid), £190; ditto (domestic), £190; "Prime Western," £190; electrolytic, £194; not less than 99.99 per cent., £196.

Lead.—Good soft pig-lead (foreign) (duty paid), £175; ditto (Empire and domestic), £175; "English," £176 10s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £210 10s.; rolled zinc (boiler plates), all English destinations, £208 10s.; zinc oxide (Red Seal), d/d buyers' premises, £205.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £390; quicksilver, ex warehouse, £73 5s. to £73 15s.; nickel, £454.

Brass.—Solid-drawn tubes, 25d. per lb.; rods, drawn, 32⅞d.; sheets to 10 w.g., 29⅜d.; wire, 31½d. rolled metal, 28⅜d.

Copper Tubes, etc.—Solid-drawn tubes, 26d. per lb.; wire, 254s. 9d. per cwt. basis; 20 s.w.g., 281s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £265 to £280; BS. 1400—LG3—1 (86/7/5/2), £275 to £300: BS. 1400—G1—1 (88/10/2), £330 to £360; Admiralty GM (88/10/2), virgin quality, £330 to £360 per ton, delivered.

Phosphor-bronze Ingots.—P.B1, £340 to £370; L.P.B1, £295 to £315 per ton.

Phosphor Bronze.—Strip, 38¼d. per lb.; sheets to 10 w.g., 40⅝d.; wire, 42¾d.; rods, 38d.; tubes, 36¼d.; chill cast bars: solids 4s., cored, 4s. 6d. (C. Clifford & Son, Limited)

Nickel Silver, etc.—Ingots for raising, 2s. 7d. per lb. (7%) to 3s. 6¾d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 1d. (7%) to 4s. 0¾d. (30%); to 12 in. wide × .056, 3s. 1¼d. to 4s. 1d.; to 25 in. wide × .056, 3s. 3¼d. to 4s. 3d. Spoon and fork metal, unsheared, 2s. 10d. to 3s. 9¾d. Wire, 10g., in coils, 3s. 6¾d. (10%) to 4s. 6¼d. (30%). Special quality turning rod, 10%, 3s. 5¼d.; 15%, 3s. 10½d.; 18%, 4s. 2¾d. All prices are net.

Forthcoming Events

OCTOBER 23

Institution of Production Engineers

Coventry section:—"Factory Layout," by R. Gore, 7 p.m., at the Geisha Café, Hertford Street, Coventry.

Institute of Metals

Sheffield local section:—Lecture by Dr. P. A. Taylor, 7 p.m., at the Grand Hotel, Sheffield. (Joint meeting with the Sheffield Metallurgical Association.)

Institute of Vitreous Enamellers

Southern section:—"Methods of Obtaining Major Production with Limited Floorspace," by R. Robinson, illustrated by a film, 7.15 p.m., at the Howard Hotel, Norfolk Street, Strand, London, W.C.2.

OCTOBER 24

Institute of Fuel

North-western section:—Works visit to John Summers & Sons, Limited, Hawarden Bridge Steel Works, Shotton. (Further details may be obtained from the secretary.)

Institute of British Foundrymen

North-east Scottish section:—"Precision Castings and Alloy Iron Castings," by R. R. Taylor (president of the branch), 7.15 p.m., at the University College, Dundee. (Joint meeting with the Dundee Institute of Engineers.)

Purchasing Officers' Association

Liverpool branch:—"Economic Situation"—discussion by members, 7.30 p.m., at the Exchange Hotel, Tithebarn Street, Liverpool.

OCTOBER 25

Incorporated Plant Engineers

South Yorkshire branch:—"Steelmaking from the Plant Engineer's Viewpoint," by F. Hinsley, 7.30 p.m., at the Grand Hotel, Sheffield.

Institution of Production Engineers

South Wales section:—"The Craftsmanship of Output as Applied to the Processing of American Brassfoundry Work," by F. E. Rattlidge, 6.45 p.m., in the South Wales Institute of Engineers, Park Place, Cardiff.

Royal Statistical Society

Sheffield group:—"Problems Occuring in the Iron and Steel Industry," by Dr. J. E. Andrew, 6.30 p.m., at the Cavendish Room, Grand Hotel, Sheffield.

Purchasing Officers Association

Yorkshire Branch:—"The Responsibility of the Buyer in Industry," 7 p.m., at the Great Northern Hotel, Leeds.

OCTOBER 26

Institute of British Foundrymen

Falkirk Section:—Film night—American film on "Gating," 7 p.m., at the Temperance Café, Lint Riggs, Falkirk.

Institution of Mechanical Engineers

Scottish branch:—"Methods of Stress Analysis," by Dr. R. M. Kenedi, 7.30 p.m., in Robert Gordon's College, Aberdeen.

OCTOBER 27

Institute of British Foundrymen

East Midlands branch:—Works visit to Sheepbridge Equipment, Limited, Chesterfield (details from the secretary).

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained.

SOUTHPORT, October 20—Manhole covers, special castings, smithy iron, rainwater goods, gutters, etc., lead piping, copper tubing, etc., bolts, nuts, etc., for the Borough Council. The Borough Engineer, Town Hall, Southport.

DONCASTER AND TICKHILL, October 20—Furnishing and laying of about 7,800 yds. of 4 in. cast-iron water mains, for the Joint Water Board. D. Balfour & Sons, consulting engineers, Caledonian Buildings, 145, Pilgrim Street, Newcastle-upon-Tyne, 1. (Deposit, £5.)

CLASSIFIED ADVERTISEMENTS

PREPAID RATES : Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Numbers. 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, 49, Wellington Street, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY MANAGER. — Energetic progressive Foundryman, fully competent with all aspects appertaining to foundry administration, desires post.—Box 1309, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (34), with drive and initiative, desires change. Wide and varied experience. Machine tool, jobbing, mechanised, sand and metal control. Ability to train labour.—Box 1316, FOUNDRY TRADE JOURNAL.

MANAGER (aged 45) desires change. Present position full control of heavy jobbing and repetition foundries. Practical training, fully experienced costing, estimating, and sales. Accustomed to complete control. Must be progressive post. —Box 1317, FOUNDRY TRADE JOURNAL.

METALLURGICAL CHEMIST (34), experienced in analysis, metallography, sand testing, pyrometry, furnaces, foundry work, etc., desires change, in Glasgow.—Box 1319, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

PROGRESSIVE Light Alloy Foundry requires competent DIE DESIGNER, to take control of die casting section, gravity and pressure dies. This is an excellent opportunity for capable and experienced man. Midlands area.—Box 1307, FOUNDRY TRADE JOURNAL.

A FULLY Mechanised Foundry in Doncaster producing a wide range of Iron and Steel Castings require a fully experienced time-served PATTERNMAKER, to assume full responsibility for pattern checking and marking off proof castings for machining. The position carries a good rate of pay, and applicants who have held similar positions are invited to apply to: MESSRS. JOHN FOWLER & CO. (LEEDS), LTD., Sprotborough Works, Sprotborough, Doncaster.

VITREOUS ENAMELLING.—Radiation, Ltd., have several vacancies for Technical Staff, preferably with some experience of the enamelling industry. Good salaries and ample scope for advancement for men of energy and initiative.—Full details to: FRIT FACTORY MANAGER, c/o J. A. Jordan & Sons, Ltd., Bilston, Staffs.

SITUATIONS VACANT—*Contd.*

FOUNDRY FOREMAN wanted for small Jobbing Foundry in Leigh area. Green sand and dry sand moulding. Piecework bonus system in operation. State experience and qualifications, etc. Permanent position.—Box 1306, FOUNDRY TRADE JOURNAL.

AN ASSISTANT CHEMIST required for a large Iron Foundry, west side of Birmingham. Knowledge of cast iron analysis and preferably accustomed to sand control, although not essential.—Please state experience and salary expected to Box 1312, FOUNDRY TRADE JOURNAL.

METALLURGIST required for Iron Foundry in Glasgow area. Must have practical experience of controlling Cupola and Mixtures for high duty cast irons. Fully equipped laboratory, with sole control of melting plant. State age, experience and salary required.—Box 1314, FOUNDRY TRADE JOURNAL.

CHEMIST required for Whiteheart Malleable Foundry. Able to control melting and annealing operations. Some grey iron experience an advantage.—Apply ALFRED H. MOULD & SONS, LTD., Stafford Street, Walsall.

METALLURGIST for Senior post in West Riding Engineering Firm, with own Cast Iron Foundries. Wide experience in chemical, physical and micro work, also in supervision. Excellent prospects. Give full career, age (about 35), and salary required.—Box 1313, FOUNDRY TRADE JOURNAL.

FOREMAN for Mechanised Foundry in East Suffolk, making Castings on various types of Moulding Machines. Experience of mass production, ability to maintain high production good quality work and discipline is essential. Superannuation Scheme operative, good canteen and transport facilities available.—Give details of age, technical and practical training, and operating experience to Box 1318, FOUNDRY TRADE JOURNAL.

STEEL FOUNDRY in Lancashire requires the services of METALLURGIST, age 21-28, for metal control work on their steel plant. Write stating age, training, experience and salary required to Box 1295, FOUNDRY TRADE JOURNAL.

SKILLED MOULDERS, PLATERS TURNERS, BORERS, etc., required by Distington Engineering Co., Ltd., Workington, Cumberland.—For further details apply to the LABOUR MANAGER.

SITUATIONS VACANT—*Contd.*

MOULDERS. — Jobbing Moulders required for Iron Foundry; rate 3s. 6d. per hour, plus £2 week bonus, plus merit bonus. Also, all classes of Foundry labour.—P.M.A., 136, Bramley Road, W.10. LAD. 3692.

KEEN young FOUNDRY METALLURGIST required with sound knowledge of Cupola Operation and Sand Control for Mechanised and Non-mechanised Grey Iron Foundries East Lancs. region. Write, stating age, qualifications, experience to Box 1298, FOUNDRY TRADE JOURNAL.

PATTERNMAKER.—Really first class man, able to make own Master Patterns, and supervise the completion of all types of metal patterns. Good flat available. Details of age, etc., to G. PERRY & SONS, LIMITED, Pattern Makers, Leicester.

YOUNG METALLURGIST required by large engineering company situated in the Eastern Counties, for metallography of ferrous and non-ferrous materials, special analysis, etc. Progressive position for successful applicant showing initiative and willingness to work with minimum supervision. Please state age, experience and qualification.—Box 1301, FOUNDRY TRADE JOURNAL.

OPPORTUNITY for fully qualified Foundry Manager to take complete control of small jobbing Iron Foundry in the Midlands. This is a genuine opening for a conscientious man to acquire a share in profits and a Directorship in firm—upon proved results. Fullest particulars of experience, etc., in the strictest confidence. —Box 1289, FOUNDRY TRADE JOURNAL.

FACTORY PREMISES WANTED

DISUSED FOUNDRY or Premises suitable for smelting required within 25 miles London, either Surrey or Sussex. Approx. 5-8,000 sq. ft.—Full details and price to Box 1106, FOUNDRY TRADE JOURNAL.

FINANCIAL

ENGINEERING OR ALLIED INDUSTRY.—Advertiser, with substantial financial resources, desires to acquire an interest in (or would purchase outright) an Established Concern with good profit-earning record. Continuity of management and personnel essential.—Address Box 1268, FOUNDRY TRADE JOURNAL.

AGENCIES

LONDON AREA.—Engineers' Agents, with good offices in Westminster, require AGENCY for Malleable or Steel Castings. If principals have established connections amongst users in the area, remuneration required would be correspondingly moderate.—Box 1061, FOUNDRY TRADE JOURNAL.