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CONTENTS

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Foundry Propaganda

We have been re-examining the bulletins issued by the British Steel Founders' Association since July, 1946. The first approach—and it is fundamental—was to the designer, and in the first half-dozen or so the designer had placed before him the basic principles to be observed in the drawing office. A later bulletin, No. 7, informed him of the steps taken by the steelfounders to ensure that the conditions imposed would be met by rigid control. Then a delicate subject—that is, the repair of blemishes in castings by welding—is ventilated, and here by the reproduction of a British standards specification in the original format as issued by the Institution the whole subject acquires the respectability which it well merits. That is excellent publicity. The education of the designer is then taken a step further by detailing the potentialities of patterns and coreboxes. The course finishes with information on actual moulding; core making and mould closing; steelmaking and fettling. Logically the next one should be machining.

There has been during this period one other publication of outstanding interest—that is the report of Association's team which visited America. Being the first of the series, it was of exceptional interest. It must have been a "best seller," for we saw goggle-eyed students from the London School of Economics and other persons constituting London's *hoi polloi* with the report tucked underneath their arms. Speed of action and publication combined to achieve for this section of the industry the maximum daily Press publicity.

What form should future publicity take? Now there is a book published by a firm in the rolled steel industry which details all the sections available, together with a mass of other information which is to be found—if he can obtain a copy—on every designer's book-shelf. It should be the aim of the foundry industry—possibly by co-operative action—to provide every drawing office with a companion volume to the one cited, dealing as far as possible in a similar way with castings. This, of course, represents a long-term policy, and is difficult to attain, as foundry work is a dynamic industry, and unfortunately such a book would need constant revision. One but five years old would not contain information as to the properties of nodular iron. The British Steel Founders' Association has undoubtedly made an excellent start, and now that it possesses its own research organisation, will be capable of augmenting additional information, the scope for publicity is considerably widened. Moreover, there should be a steady stream of technical Papers which will give to the industry the approbation of their fellow workers in other fields of scientific and technological endeavour.

Coleman Wallwork Company, Limited

With the formation of the Coleman Wallwork Company, two well-known manufacturers of foundry equipment—Stone-Wallwork, Limited, and the Coleman Foundry Equipment Company, Limited—become integrated and thereby of much greater potential service to the foundry industry. The new concern, which is within the J. Stone group of companies, will operate from Windsor Works, Stotfold, Bedfordshire, with area offices at 157, Victoria Street, London, S.W.1, and 12, Bulldale Street, Glasgow, W.4. Here, also, are located the workshops and technical and research departments. The Coleman Foundry Equipment Company, Limited, was founded in 1928 by an American, Mr. Charles W. Coleman, who was resident in this country for many years. He was amongst the pioneers of the moulding machine business and his earliest efforts did not always receive the complete approbation of the men, but his sense of humour soon turned hostility into friendship and admiration for his achievements. Many of his old friends still recall with mixed feelings record runs at record speeds in his supercharged cars, for Coleman was rated amongst the fastest drivers in the country. The company he operated developed interesting lines of moulding machines, core blowers, sand-preparing machines and high-speed abrasive cutting-off machines. The works, surrounded by a garden, have a pleasing modern aspect and are well equipped for the production of foundry plant.

Stone-Wallwork, Limited, since their inception, have made notable progress and were responsible for the creation of the "Automold"—the first push-button automatic moulding machine produced. They have undertaken the mechanisation of foundries both at home and abroad, and have helped to convert the United Kingdom from a foundry-equipment importing country into one now exporting these commodities to a value of over half a million pounds a year.

We wish the new company every success in their endeavour to give to the foundry industry services of the highest order—a level which its recent achievements well merit.

AN INTERNATIONAL WELDING CONGRESS, after a reception at Lancaster House, London, on Saturday, opens up its technical sessions next Monday at Oxford. The congress closes with a banquet at the Savoy Hotel on Saturday week.

Conference Paper Author

MR. W. A. BLOOR

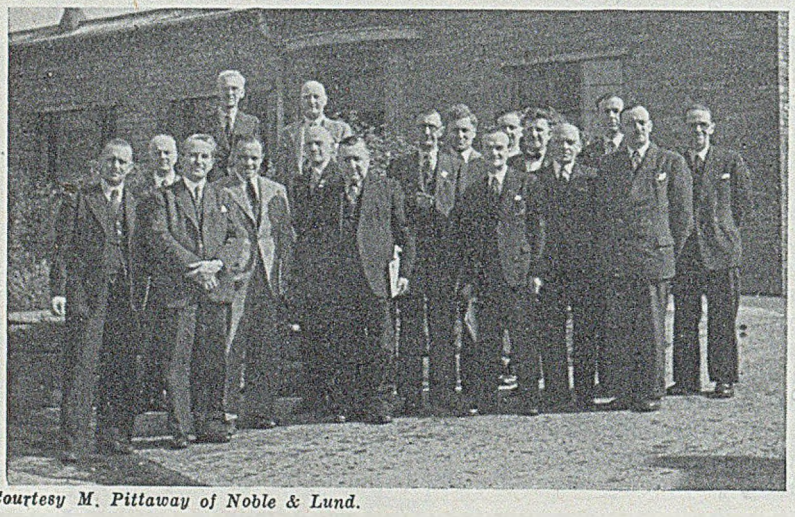
W. A. BLOOR, Author of the Paper on "The Reduction of Dust in Steelfoundry Operations" (printed on the opposite page) received his technical education at the North Staffs Technical College and took a post in the testing department there in 1935. In the following year he was awarded a research scholarship by the British Pottery Manufacturers' Federation to carry out an investigation of the dust problem in the ceramic industry. Five years later he joined the research staff of General Refractories, Limited, and was later placed in charge of this company's production control staff. In 1947 he joined the British Iron and Steel Research Association and for a time was stationed in the refractories department of the University of Sheffield. He is now senior scientific officer in charge of the foundry hygiene project of the steel castings division of the Association.

Still Available

The secretaries of the Foundry Trades Equipment and Supplies Association—Peat, Marwick, Mitchell & Company, 94-98, Petty France, London, S.W.1, inform us that they still have a few founders' Buyers' Guides left in stock. These were originally only available for overseas distribution, but now the permission of the Board of Trade has been given for despatch to home foundries also. The publication is a very useful booklet to be placed in the hands of foundry executives —especially the purchasing officer.

Centigrade or Fahrenheit?

At a meeting of the Council of the Foundry Trades Equipment and Supplies Association, general approbation was given for the use of the Centigrade scale in connection with the control and recording of mould and core-drying stoves. Thus, in the future, the FOUNDRY TRADE JOURNAL will exclusively use degrees Centigrade when dealing with these subjects.



Courtesy M. Pittaway of Noble & Lund.

Group of Foundrymen during the Works Visit to Noble & Lund Limited, Felling-on-Tyne, arranged in connection with the Newcastle Conference of the Institute of British Foundrymen. Easily recognisable among the assembly are the president, Mr. Colin Gresty and the junior vice-president Mr. E. Longden.

Reduction of Dust in Steelfoundry Operations*

By W. A. Bloor

The Author has recorded the extensive research work in hand by the British Iron and Steel Research Association for improving the dust conditions in steel foundries. Methods have been developed for measuring and continuously recording dust concentrations, and these methods have been used in foundries to explore the source, composition and cencentration of dust. The dust concentrations have been shown to be very variable from foundry to foundry, and from operation to operation, and the importance of isolating dusty operations and removing the dust at its source have been clearly demonstrated. Some details have been also given of more fundamental work, sponsored by B.I.S.R.A. and conducted in university departments, into the specific effect of foundry dust upon animal systems.

Introduction

During recent years, considerable attention has been given to conditions in foundries and particularly to the means for removing the risks of pneumoconiosis or silicosis. The medical surveys[1,2] have indicated those operations which give rise to the highest incidence and have led to regulations and recommendations designed to reduce the possible hazard to workers in these particular processes. The suspended matter in foundry atmospheres is largely made up of mixtures of smokes, fumes, metallic dusts and mineral dusts produced in the foundry, together with the general atmospheric pollution associated with the area in which the foundry is situated.

The effect on the lungs of inhaling such material is not fully understood, but it has been well established that the chief risk is silicosis, arising from the inhalation of uncombined silica, usually referred to as "free" silica. There is some evidence[3] that other constituents are not merely dilutents, but may influence the action of the free silica on the lung tissue. In addition, there is obviously a limit to the amount of dust which can be disposed of by normal defence and elimination mechanisms of the respiratory system, and accumulations in the lung tissue may lead to pathological changes facilitating the onset of coincident infections.

Research Programme

In view of these considerations and as it is impracticable to selectively remove the "free" silica from the normal foundry air-borne dusts, any work undertaken with the intention of improving general working conditions should reduce the occurrence of all kinds of dust. The British Iron and Steel Research Association, through its Foundry Hygiene project, has conducted work on this matter in conjunction with the work of the Factory Department and the Medical Research Council so that the total amount of effort now devoted to this end is deservedly very great.

The urgency of the problem is such that most effort has been directed towards an immediate improvement in conditions by modifying foundry operations, equipment, or materials used. For this reason extensive surveys have been made in many foundries to measure the dust concentration and to advise on immediate steps which might be taken. New sampling and analytical techniques have been developed to extend this work more rapidly.

Since it is known that much dust arises from the fettling of castings upon which sand is adhering, a study has been made of the mechanism of metal penetration and the burning-on of sand. The more fundamental aspects such as the specific toxicity of various dusts, and the means of reducing that toxicity are studied in University Departments.

Dust Control

The elimination of dust and fumes from foundry atmosphere, although the ultimate objective, presents great practical difficulties. The adoption of measures designed to control or suppress the dispersion of dust into the atmosphere is the obvious alternative.

The most widely practised of these methods are those of local exhaust ventilation at the dust source, and the complete enclosure of dust producing processes with provision of exhaust ventilation. The efficiency of these methods is a function of their design and maintenance, but from the health point of view, their value is not necessarily related to their apparent performance on visual dust clouds. The degree to which such installations affect those particles which are of respirable size is a matter which is being investigated. Efficiency tests on new and established plant have been undertaken in collaboration with the designers and makers. From the experience so gained it is suggested that such tests in the development stages, as well as after installation, are essential to ensure the removal of minute dust particles.

The application of local exhaust ventilation is not of great benefit, however, if the dust concentration in the general atmosphere is allowed to build up an account of other uncontrolled dust

* This Paper, a communication from the Steel Castings Division of B.I.S.R.A., was presented to the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen.

sources. Where local control is impracticable, isolation or segregation of dusty operations is desirable. In some of these operations, methods of dust suppression, as distinct from control are feasible. Investigations into methods of application to dry materials of water with or without the addition of wetting agents are in hand. It is known already that if moisture to the extent of only one per cent. can be introduced into such materials, the dust produced during handling is greatly suppressed.

The question of the provision of adequate general ventilation to dilute and help to clear away the dust and fume which does escape into the general atmosphere is one which is intimately tied up with the maintenance of a reasonable air temperature. Uncontrolled ventilation so often leads to the lighting of open fires which in turn pollute the general atmosphere.

The convection currents set up by the heat generated in furnace areas are a further factor affecting natural ventilation. Whilst these air currents usually result in removal of some dust and fume through roof openings, it also means that any otherwise uncontrolled dust generated at bench or floor level will be taken up into the worker's breathing zone.

The standard of tidiness and house-keeping maintained in the different foundries has some influence on the dust concentration present in the general atmosphere. The state of floors varies from almost scrupulous cleanliness associated with frequent wetting of gangways to those whose floors are simply an accumulation of dry sand. Some of the latter is constantly being broken down and dispersed into the atmosphere by the workers' movements.

Surface Finish of Steel Castings

The adequate control of the dust produced by the stripping and fettling of castings by pneumatic tools presents a difficult problem. Those castings which are small enough to be handled on a bench can conceivably be dealt with in a well-designed fixed exhaust system, but the directional velocity imparted to the dust produced by these tools and the interference with air-flow by the tool exhaust itself are complicating factors. With large castings the fixed exhaust method is quite impracticable and the alternative of movable hoods placed near the fettling position is not sufficiently flexible to allow the different angles and positions at which this type of casting requires treatment. The application of water will reduce the amount of dust produced from the removal of loosely adhering materials but will do little to suppress the dust raised by the fettling of " burnt-on " areas. As it is well established that in fettling such areas, large quantities of respirable-size particles of the moulding material are produced, it is obvious that any practicable measures which will reduce the amount of " burning-on " will lead to a diminished dust concentration.

The Association has sponsored research work on the relationship between sand adherence and metal pentration, on the physical and chemical reactions at the mould face and on the factors influencing surface finish. This work[4] has indicated that, under the test conditions, the metal penetration was the immediate cause of sand adherence and that the former occurred independently of the mould face reactions. Casting temperature, in conjunction with composition as affecting the fluidity of the steel, was the major criterion in determining penetration, and it was shown that suitable mould coatings can inhibit penetration at temperatures considerably above the penetration limits for uncoated moulds. Numerous substances were shown to be suitable for use as constituents for these coatings, there being a number of adequate alternatives to silica as bases.

To minimise metal penetration it appeared desirable to employ moulding materials of as fine a grain size as possible consistent with the maintenance of adequate resistance to general sintering, and that casting temperatures should be maintained at as low a level as possible consistent with other requirements.

Sampling Instruments

From a casual study of the various foundry operations it is obvious that the concentration of dust in the immediate vicinity of some of them varies considerably with time. In some instances, *e.g.* fettling operations, heavy concentrations are produced but these are usually of short duration.

The question arises as to whether it is the total amount of dust breathed over a long period which is of pathogenic importance, or if very heavy concentrations for short periods constitute a greater hazard. It might well be that temporary overwhelming of the natural defences of the lungs by high dust concentrations is of some importance in the rate at which the damage occurs.[5, 6].

Whilst it is possible to obtain a measure of the variations in dust concentration with time, by taking samples with a normal instrument at fixed intervals, or at times when visual differences are discernable, there has been a need for some type of continuous sampling instrument which will give a record of both short and long time dust variations. Such an instrument has been developed by the Association's Physics Department which is capable of giving valuable information in this respect. It has been fully described elsewhere[7] and depends on the measurement of the light which is reflected and scattered by dust particles.

Briefly, the dusty air is continuously drawn into a tube along the length of which is sent a concentrated beam of light. A group of photocells placed around windows in the circumference of the tube measure the intensity of the " Tyndall beam " of light scattered by the particles suspended in the tube. The small current produced in the photo-cells is electronically amplified to give readings on a continuous recorder. Provision is made in the electronic system to enable a very wide range of concentrations to be covered, and also to vary the sensitivity over this range to suit different conditions.

For dust clouds with a reasonably constant size distribution, the readings given by this instrument

show a high degree of correlation[8] with both the particle counts as determined by the thermal precipitator and with gravimetric samples obtained with naphthalene filters. Thus, where only slight variations in size exist, the recorder readings themselves may be used as relative measures of dust concentration. Where the size distribution and concentration are both changing, however, readings are not so easy to interpret. In this connection, it is worthy of note that, for particles above about 0.5 micron, the intensity of the Tyndall beam varies directly with the surface-area of the particles for unit volume of air, and that the surface area of inhaled particles may be an important characteristic from a physiological standpoint. With this instrument any significant change in dust conditions is seen immediately, and its extent, duration and time of occurrence are automatically recorded. This facilitates subsequent and more detailed examinations of the factors producing the changed conditions.

For the more detailed examinations, the Thermal Precipitator[9,10] apparatus has been extensively used. It was developed principally for use in mines and for this reason it was essential that it should be particularly robust and also "safe" from the point of view of use in areas likely to contain inflammable gas. For use in foundries, however, the accessories are rather more bulky and heavy than is necessary. A modified and more compact version of this apparatus is under development by the Association with a view to making it of such a bulk that the whole of the apparatus can be attached to a worker. This will enable him to carry out his normal duties without restriction of movement, whilst samples can be extracted from the apparatus at convenient intervals.

Animal Experiments

In addition to the knowledge of respiratory diseases obtained by the examination of workers affected by the inhalation of dust, animal experiments can provide useful information in this respect. In these experiments it is possible to test under controlled conditions the effects of such factors as dust concentration, particle size and composition, and to judge the relative hazards involved in the inhalation of the different components of a mixed industrial dust. Further information may be obtained by injection of dust into various animal tissues since many of the tissues give similar reactions to that of the tissue of the lungs. Research work on this aspect of the silicosis problem at Reading University is being supported by B.I.S.R.A. The work includes dust inhalation experiments on rats and mice, an investigation of the physiological importance of silicon, and a study of the fate of siliceous dusts in the body. Holt has shown[8] that the inhalation apparatus used is capable of giving a wide range of concentrations of dust of a very consistent size distribution with a medium particle size of about 2 microns. It is intended to study the effect on these animals of a variety of materials which will include pure silica as well as normal foundry materials. It should also be possible to study the effect of additions of other substances to dangerous dusts with a view to reducing their toxic action.

The work on the form and extent of the secretion of silicon in tissues has shown that no very marked accumulation of silicon occurs in the animal system and in order to estimate the amount in animal body organs it became necessary to develop modified micro methods of analysis. The theory that tissue damage in silicosis is due to silicic acid produced by the solvent action of tissue fluid on inhaled dust particles is widely accepted. There are, however, a number of materials of low solubility which are, nevertheless, toxic, and some with high solubilities which are apparently harmless.

Holt[11] has studied the solubilities of various materials *in vivo* by the injection of dust suspensions into animals intraperitoneally. These include cement, silicon carbide, quartz and moulding sand. From the results obtained it would seem that cement is another exception to the general rule that the more soluble dusts are the more toxic and that for this dust solution is a normal mechanism for its removal from the body. It appears probable that if the tissue-damaging property of the silicic acid is a main factor in the production of silicosis, other factors which reduce this action must be active in the case of some dusts.

Foundry Surveys

The aim of these surveys was to obtain information on the existing dust conditions in steel foundries with a view to assessing the relative importance of the different processes as sources of dust, to select the best conditions found for each process and then to suggest where and how improvements may be made.

Of the available apparatus for particle concentration determinations, the Thermal Precipitator, the Owens jet dust counter, and the British Konimeter were all tried out under foundry conditions. It soon became apparent, however, that the Thermal Precipitator, although recognised as the most efficient apparatus, was not sufficiently portable and quick in operation to be really suitable for a rapid survey of the industry. The Owen's and the Konimeter on the other hand had the advantages of both portability and ease of operation, but the latter was shown to give such low results on dense clouds of fine particles, as to impair its usefulness in foundry atmospheres.

The disadvantage of these two instruments is that they both take "snap" samples and as dust concentrations may vary widely from moment to moment, a "snap" sample may not give an indication of the average amount of dust being breathed by a worker. The Thermal Precipitator, which gives a so-called "long-time" sample is sometimes preferred on this account. It is worth consideration, however, that a series of consecutive "snap" samples might be more informative than a "long-time" sample because the latter only gives an average, and does not indicate at what time or by what process the dust in the average sample is deposited. In the

heavy dust clouds found with certain foundry processes, it proved necessary to so reduce the sampling time of the Thermal Precipitator to obtain deposits which could be assessed, that it too virtually became a "snap" sampler.

On the whole, therefore, it was concluded that the Owen's jet instrument with its ease and speed of sampling combined with a reasonable efficiency, were advantages which carried considerable weight for this particular work. In this apparatus the sample of dust is obtained from 50 ccs. of air, or multiples of this, and is deposited by impingement on a thin ¼ in. dia. glass circle in a form of a ribbon with clubbed ends approximately 1 cm. long and 0.030 cm. wide (Fig. 1).

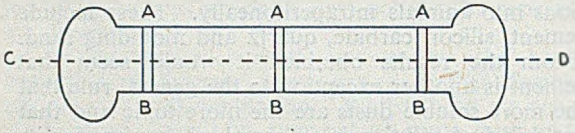


FIG. 1.—*Owen's Dust Deposit.*

Sampling for Analysis

For the collection of samples of air-borne dust in sufficient quantity for chemical and mineralogical analysis the salicylic acid filter[12] was used. This employs a pad of crystalline salicylic acid supported by a 120 mesh stainless steel gauge contained in the mouth of a metal funnel. Suction through the filter is provided in the foundry with the aid of an ejector connected to the compressed air mains. The ejector itself is fitted with a critical pressure orifice to give a constant flow of around 2 cub. ft. per min. with a wide range of mains pressure.

The salicylic acid is subsequently dissolved in alcohol and the dust reclaimed by centrifuging.

Concentration Estimations

The accurate assessment of a large number of samples by accepted methods of visual counting is very laborious and extremely slow. Moreover, in industries where such "accurate" figures have been obtained it has been shown[13] that, in any case, only a very broad relationship exists between dustiness and the health of the workers. The physiological factors which enter into this relationship appear to be such as to preclude the possibility of presenting it in a more exact manner. Drinker and Hatch[13] have stated that, in order to classify processes according to their respective health hazards, it is not necessary to arrange dust concentrations in groups closer than 100 per cent. It is suggested, therefore, that an "estimation" of the Owen's deposits as distinct from an accurate count may still give as good an indication as can at present be obtained of the health risk involved in working in a particular dust cloud.

Lawrie[14] in 1948 described a method of estimating such dust samples by visual comparison of photomicrographs of the deposits at a magnification of 1,000 diameters against a standard scale. This method appeared to be sufficiently sensitive to record differences in concentration of the required order and it was likely to be much quicker than visual counting. The application of the method is dependent, to some extent, on the degree of uniformity of the dust deposits, and in this connection Kagan and Broumstein[15] have shown that there is no significant variation in the number of particles along the length (CD, Fig. 1) of the ribbon of dust obtained by the Owen's jet counter. They did, however, observe a definite order in the transverse distribution (AB) of the particles, with the greater number in the centre and a fairly regular decrease in density towards the edges. In order to allow for this transverse variation, it is desirable that the photomicrographs to be used for comparison with standards should include nearly the whole width of the deposit, but that, if the clubbed ends are disregarded, it will not matter which position in the length of the deposit is chosen for the estimate.

At a magnification of 1,000 diameters, the longer side of a half-plate negative covers about two-thirds of the width of the Owen's deposit. This gives a print of convenient viewing size and the magnification is high enough to give sufficient separation of particle images. The Vickers Projection microscope fitted with a 4 mm. apochromatic objective and 6 X compensating eyepiece and used with the standardised photomicrographic technique suggested by Lawrie[14] gives prints of good quality which are easily reproducible.

Photographic Scales

A preliminary study of photomicrographs of a variety of deposits obtained in foundry atmospheres showed that the upper concentration limit for the print comparison method was in the region of 6,000 particles per cc. and that the lower limit was around 200 particles per cc Two scales of photomicrographs of suitable Owen's deposits were constructed to cover this range[18] (Figs. 2 and 3). The scale groups are numbered and for 50 cc. samples are equivalent to the particle concentrations given below:—

Group No.	1	2	3	4	5	6
Particles per cc.	200	400	800	1600	3200	6400

The scale with the smaller particle size range is called the A scale (Fig. 1) and the other showing mixtures of large and small particles the B scale (Fig. 2). The reason for having two scales is that there is some divergence in the size of particles produced by different processes. It will be seen that the scale group is a geometric progression, each group having a dust concentration double that of the next lower group, so that the dust concentration (P) is expressed by $P = 100 \times 2$, where N is the group number. It is against the original half-plate prints, from which these scales were prepared, that the photomicrographs of samples are assessed and placed in one of the six categories.

Samples, may, of course, fall on either side of a particular group, and it was originally decided to estimate each sample to the nearest print in the scale. This meant that a sample falling just below that concentration which is mid-way between two groups

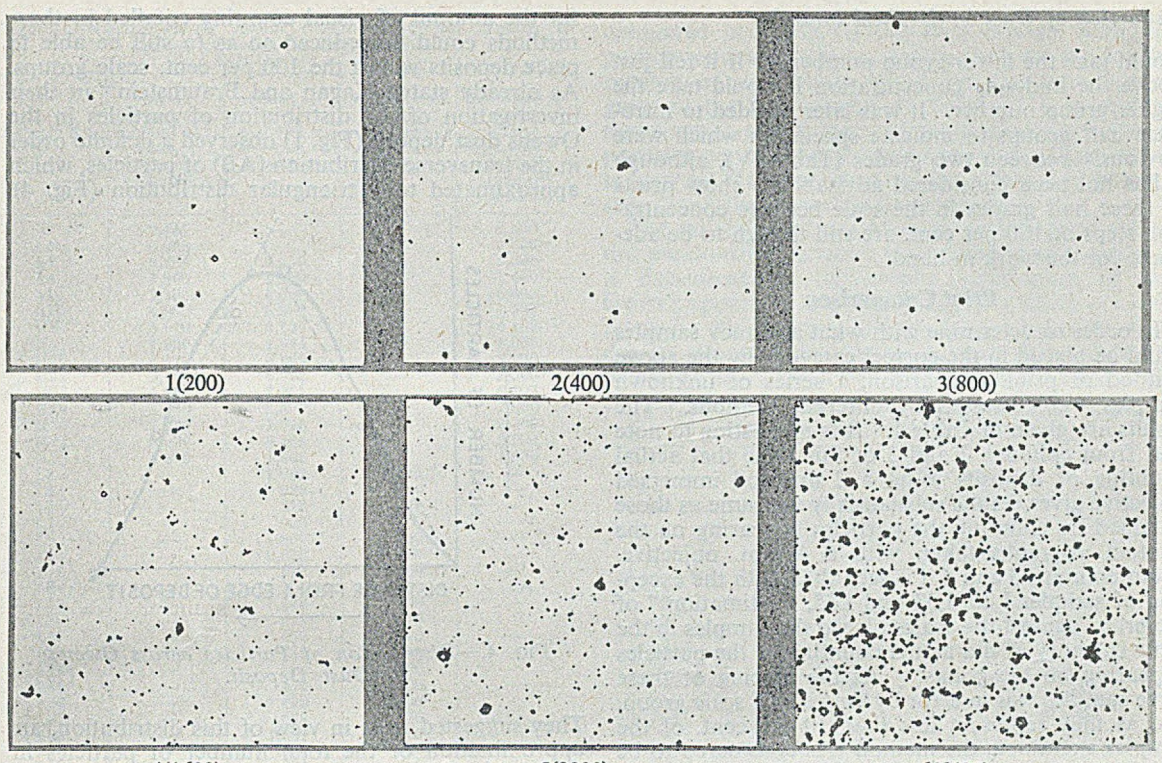


FIG. 2.—*Photomicrographic Comparison Scale A (Reduced Linearly to Half during Reproduction).*

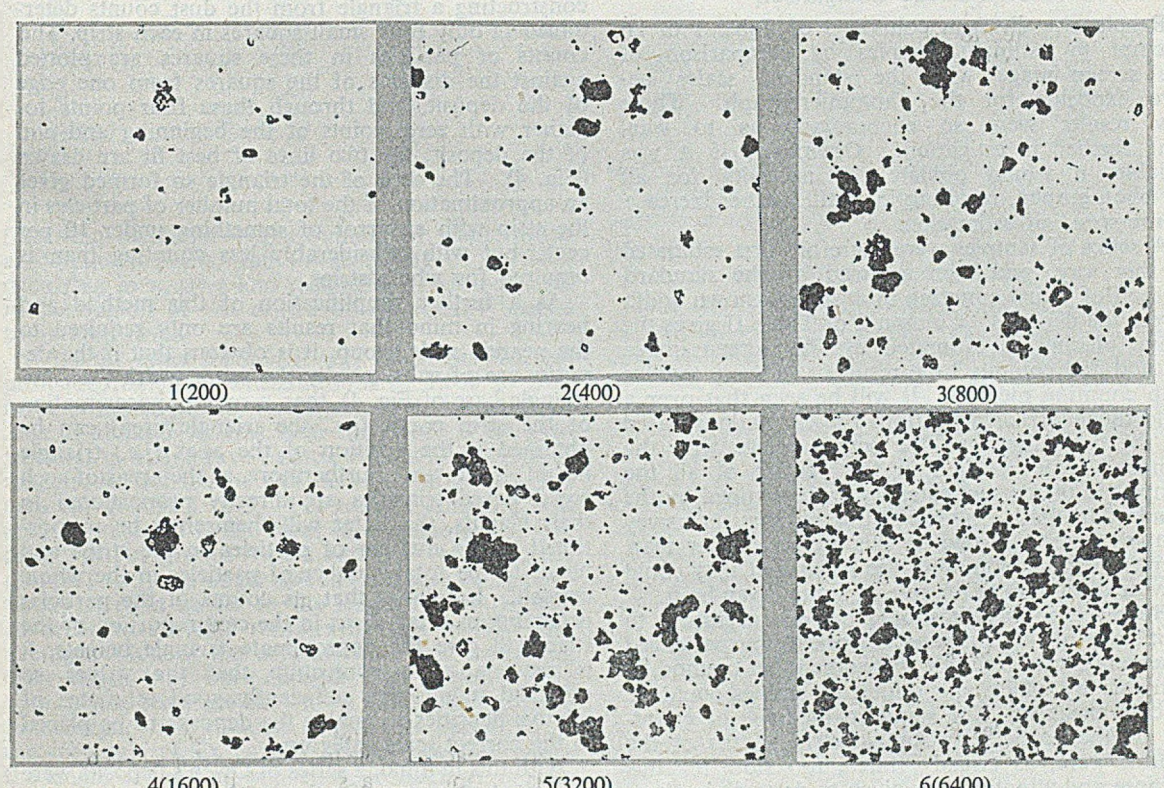


FIG. 3.—*Photomicrographic Comparison Scale B (Reduced Linearly to Half during Reproduction).*

would take the lower-group number, or if it fell just above the mid-way concentration it would take the higher-group number. It was later decided to introduce half groups to indicate specimens which were obviously between two grades (Table IV), although it has not been considered advisable to show prints of these half grades in the scale because concentration steps of 100 per cent. are still though to be adequate for the work in hand.

Print Comparison

In order to determine with what accuracy samples could be placed in the correct category by the above method of print comparison, a series of unknown samples were assessed by different methods. The results are given in Table 1. It is interesting to note that from columns 2 and 3 of this table that actual counting of deposits using a 2 mm. oil immersed objective gives results substantially the same as those obtained by counting the particles appearing on the photomicrographs taken with a 4 mm. objective. From columns 3 and 4 it is seen that, with the exception of samples L26, L33 and L35, " estimation " of the prints against the scales placed the samples in the same category as did actual counting of the particles appearing on the prints. As the placing of these three samples was in error by only a half scale group, and as they represent less than 10 per cent. of the samples examined, the method was considered to be satisfactory.

Screen Image Comparison

Results are given in column 5 of Table 1 of an attempt to estimate samples by comparison of the screen image with the standard scales before exposing for the photomicrograph. These few results were so encouraging as to warrant further investigation. Obviously, if it was reliable, it would obviate the necessity for all the photography, resulting in a still further increase in the speed of estimation.

A series of samples were therefore first estimated in this way, and then assessed by the standard method of visual counting of strips of known width across the deposits. Column 2 of Table II gives the group placing as estimated by this screen image method and column 3 the result of the very tedious strip counting method. It will be seen that over a wide range of concentrations the estimations based on the comparison of the screen image with the standard scale resulted in the placing of all the samples in the correct category as determined by the standard method. In view of this, subsequent survey samples were estimated by this method rather than by print comparison, with the result that they could now be dealt with at the rate of about 30 an hour.

However, in case it should become necessary to allot some of the comparison work to inexperienced observers it was desirable that some other method be available by which any doubtful samples could be quickly checked. The standard methods of counting of the particles in known strip widths of the deposit were, as already stated, too slow for this purpose and attention was given to determining how far the amount of visual counting entailed in these methods could be reduced so as to still be able to place deposits within the 100 per cent. scale groups. As already stated Kagan and Braumstein[15] in their investigation of the distribution of particles in the Owens dust deposit (Fig. 1) observed a definite order in the transverse distribution (AB) of particles, which approximated to a triangular distribution (Fig. 4).

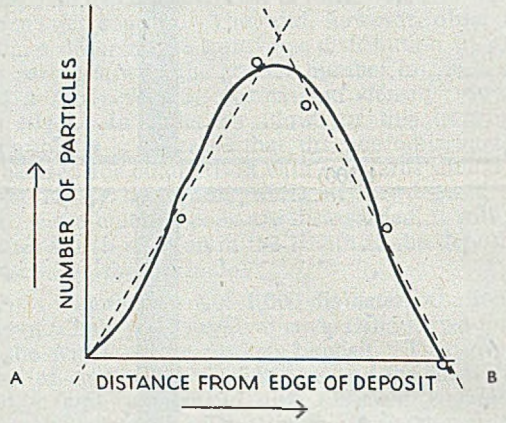


FIG. 4.—*Distribution of Particles across Owen's Dust Deposit.*

They suggested that, in view of this distribution, an approximation of the total number of particles in strips across the deposit and consequently the total number in the whole deposit could be obtained by constructing a triangle from the dust counts determined in only four small squares in each strip. The counts of particles in these squares are plotted against the distance of the squares from one edge of the deposit, and through these four points together with zero points at the beginning and end of the deposit, the two lines of best fit are drawn (Fig. 4). The area of the triangle so formed gives an approximation of the total number of particles in the strip with an error of something under 10 per cent., but with considerably less counting than is required for whole strips.

As a further simplification of this method and bearing in mind that results are only required to the nearest scale group, it is obvious that if the deposits are of substantially the same width (*i.e.*, the triangle base of Fig. 4), then a rough approximation of the strip count (*i.e.*, the triangle area) can be obtained if the position of the apex (*i.e.*, triangle height) is known. Furthermore, as the areas of such equal based triangles are directly proportional to their heights, the latter will themselves be proportional to the number of particles in the strips and hence to the total number of particles in the whole deposit. It follows that, as counts of the particles occurring in small areas in the centre portion of the strip will give the approximate triangle heights, it is reasonable to conjecture that the values so obtained might give sufficiently good estimates of relative densities to enable the deposits to be placed in the correct scale category.

With this in mind, a series of Owen's deposits were evaluated at a magnification of 1,000 diams. by the

TABLE I.—*Comparison of Results Given by Different Methods of Evaluating Owen's Jet Dust Deposits.*

Sample No.	Direct microscope count at 1,800 × (2 mm. objective). Particles per c.c.	Count of print at 1,000 × (4 mm. objective). Particles per c.c.	Estimate of print against standard scale. Particles per c.c.	Estimate of screen image at 1,000 × against standard scale. Particles per c.c.
A1	2,457	—	—	2,300
A3	2,068	—	—	2,300
A4	3,384	2,950	—	3,200
A5	1,805	1,730	—	1,600
A10	7,500	6,600	—	6,400
A12	4,960	5,200	—	4,500
H3	5,910	6,105	—	6,400
H11	1,820	1,944	—	1,600
H16	4,170	3,969	—	3,200
H22	5,180	4,998	—	4,500
H25	5,920	7,371	—	6,400
H29	1,480	2,307	—	1,600
H30	2,220	1,746	—	2,300
H32	3,030	3,438	—	3,200
H33	1,580	1,695	—	1,600
L3	—	1,082	1,100	—
L4	—	939	800	—
L5	—	213	200	—
L7	—	900	800	—
L9	—	1,800	1,600	—
L10	—	2,913	3,200	—
L12	—	213	200	—
L14	—	1,701	1,600	—
L15	—	1,548	1,600	—
L16	—	678	570	—
L17	—	2,550	2,300	—
L24	—	759	800	—
L24a	—	1,500	1,600	—
L25	—	474	400	—
L26	—	1,629	1,100	—
L27	—	675	570	—
L28	—	1,557	1,600	—
L29	—	885	800	—
L30	—	924	800	—
L31	—	3,270	3,200	—
L32	—	1,650	1,600	—
L33	—	4,371	3,200	—
L34	—	2,700	2,300	—
L35	—	2,817	2,300	—
L36	—	3,087	3,200	—
L37	—	5,928	6,400	—
L38	—	3,700	3,200	—
L39	—	3,600	3,200	—
L41	—	864	800	—
L42	—	1,650	1,600	—
L43	—	1,539	1,600	—
L44	—	2,280	2,300	—
L45	—	1,053	800	—

following methods:—(*a*) Counting of whole strips across the deposits, and (*b*) Counting of particles occurring in squares and rectangles of various sizes in the region of the centre of six equally spaced transverse strips.

With the latter method it was found that for deposits representing concentrations of 1,600 to over 6,400 particles per cc. (scale groups 4, 5, and 6) an area of about 5 sq. cms. near the centre of the projected strip image gave particle counts of convenient magnitude, but that it was desirable to double this area for groups 1 to 3. For ease of counting, this area is preferred in the form of a rectangle, of side ratio 3:1 for groups 4 to 6 and side ratio 3:2 for groups 1 to 3, the longer side in each case being positioned at right angles to the length of the deposit. In order to evaluate samples by this method, the average widths of the deposits were first measured, after which they were centred with respect to the appropriate rectangle drawn on the Vickers projection screen. The number of particles appearing in the rectangle at six equally spaced positions along the length of the central portion of the deposits were then counted. The average of these six counts is compared in Table III for each deposit, with the particle concentration as determined by the longer method of strip counting. From the ratio figures given in the last column of Table III it is evident that there is a sufficiently close relationship between particles per cc. and average central rectangle count to warrant the later being used as a means of placing samples in the correct scale category.

The reliability of this method, and to some extent the previously described scale comparison method, is dependent on the proper functioning of the Owen's apparatus to produce deposits which are uniform in width and without serious variations in density along their length. Apart from deposits whose density is well above that of the highest scale

TABLE II.—*Comparison of Results Given by Different Methods of Evaluating Owen's Jet Dust Deposits.*

Sample No.	Particles per cc. Direct microscope count at 1,000 × (4 mm. objective).	Particles per cc. Estimate of screen image at 1,000 × against standard scale (4 mm. objective).
F1	1,515	1,600
F2	1,650	1,600
F3	1,440	1,600
F4	1,129	1,100
F5	1,485	1,600
F6	1,185	1,100
F10	925	800
F11	2,280	2,400
F18	4,065	4,500
D101	540	400
D102	5,175	4,800
D103	6,750	6,400
D104	6,585	6,400
D105	6,330	6,400
D111	4,800	4,500
D112	3,930	3,200
D120	3,375	3,200
D121	375	400
D122	660	570
D126	885	800
D127	945	800
D128	1,350	1,100

step, any serious variation in the width or the character of the transverse particle distribution is usually associated with a fault in the sampling technique or apparatus.

Free Silica Determinations

With the development of the quick screen image comparison method of dust estimation, it became desirable to speed up both the collection and determination of analytical samples. It was obvious that a micro- or semi-micro method of analysis involving the collection of smaller samples would be a distinct advantage in this respect. Of the available chemical methods for the determination of "free" silica that of Trostel and Wynne[16] appeared to be the one most suitable for adaptation to a micro-scale.

Briefly, this consists of a fusion with potassium pyrosulphate, followed by a digestion with caustic soda solution to dissolve the silicic acid liberated from decomposed silicates. The R_2O_3 precipitate is subsequently dissolved in hydrochloric acid leaving the "free" silica as a residue. The main objection to this method is that the felspars in particular are very resistant to attack by the pyrosulphate fusion, a point which renders the method rather limited with regard to general application. However, due to the nature of the materials in common use in steel

Reduction of Dust in the Steel Foundry

TABLE III.—*Comparison of Results Given by Different Methods of Evaluating Owen's Jet Dust Deposits.*

Sample No.	Average width of deposit in mm.	Screen image magnification × 1,000. Particles per c.c. calculated from average number of particles per strip (13.3 mm. wide).	Average number of particles per central rectangle (40 × 13.3 mm.).	Ratio Particles per c.c. / Particles per rectangle.
F1	0.26	1,515	16.1	94
F2	0.28	1,650	15.7	105
F3	0.28	1,440	15.8	91
F4	0.27	1,129	11.2	101
F5	0.29	1,485	13.8	108
F6	0.28	1,185	10.8	110
F10	0.28	925	9.0	103
F11	0.26	2,280	21.7	105
F18	0.30	4,065	43.7	93
D101	0.27	540	5.6	96
D102	0.28	5,175	44.7	116
D103	0.28	6,750	54.0	125
D104	0.30	6,585	65.4	101
D105	0.32	6,330	68.2	93
D111	0.28	4,800	48.8	98
D112	0.29	3,930	38.7	102
D120	0.27	3,375	36.2	93
D121	0.26	375	3.9	96
D122	0.27	660	7.0	94
D126	0.27	885	9.1	97
D127	0.28	945	8.9	106
D128	0.29	1,350	12.9	105

foundries, only a small amount of this mineral group is likely to be present in the air-borne dust. One of its many advantages, which is possessed by few other chemical methods, is that the results are not affected by the presence of corundum (crystalline alumina) or silicon carbide which have been shown to exist in appreciable quantities in some foundry atmospheres.

To make the method suitable for the analysis of air-borne foundry dust, it has been necessary to make two major modifications:—

(*a*) The treatment by the caustic soda solution, whilst satisfactory for the materials containing only relatively large quartz grains, was shown to have an appreciable solvent action on particles of respirable size, leading to low results for the "free" silica determinations. This difficulty has been largely overcome by the use of a concentrated Lunge's solution to replace the caustic soda.

(*b*) The presence of large quantities of metal and metallic oxide particles (chiefly iron) in foundry dusts gave such large R_2O_3 precipitates as to make the subsequent filtration tedious and slow. With samples which contain more than about 10 per cent. of iron, it is desirable to remove as much of this as possible by a prior digestion with dilute hydrochloric acid.

One of the essentials of a method which utilises only small quantities of sample is that the number of transferences of filtrates and residues should be reduced to a minimum so as to avoid serious losses. A semi-micro technique has been developed[17] in which all the operations of fusion, solution and filtration take place in the same vessel. The method is applicable to samples weighing 50 mgms. or so, which can easily be obtained by the use of the salicylic acid filter previously described. The accuracy and reproducibility of the technique have been determined by the use of synthetic mixtures of foundry materials and by the use of a quantitative X-ray diffraction method on unknown samples.

Survey Procedure

Using the Owen's Jet apparatus and salicylic acid filter with the methods of estimation described, surveys of existing conditions in steel foundries were undertaken in full collaboration with Mr. W. B. Lawrie, of the Factory Department, and with the support of the Moulding Materials Committee of B.I.S.R.A. and the Dust in Steel Foundries Committee of the Factory Department.[18] For dust concentration determinations the actual number of samples taken in a particular foundry was in general related to its size and output, but the average number of samples taken for each foundry was in the region of 100. The samples were spread over all the foundry processes, but with particular attention to those which had the reputation of being sources of dust. In addition, samples were obtained of the dust in the general atmosphere of the foundry shops (as distinct from samples taken adjacent to particular processes) together with samples taken in the open air to give an indication of the atmospheric pollution associated with the area in which the foundry was situated.

Sampling positions with results and relevant data were then inserted on a block plan of the foundry concerned for subsequent analysis of the information and for future reference. Normally, four samples for chemical analysis were taken in each foundry, the actual sampling positions being varied to suit conditions and to cover different processes.

Survey Results

The results of 2150 Owen's Jet samples collected in 24 foundries have been statistically analysed.[19] To simplify this statistical study, all samples specified as greater than group 6 have been assumed to be of a concentration equal to group $6\frac{1}{2}$. For convenience, the particles per c.c. equivalents of the scale groups are given in Table IV and are used in the subsequent tables.

TABLE IV.—*Particles per c.c. Evaluated with Group Numbers.*

Group No.	Particles per c.c.
$6\frac{1}{2}$ (> 6)	9,000
6	6,400
$5\frac{1}{2}$	4,500
5	3,200
$4\frac{1}{2}$	2,300
4	1,600
$3\frac{1}{2}$	1,100
3	800
$2\frac{1}{2}$	570
2	400
$1\frac{1}{2}$	280
1	200
$\frac{1}{2}$ (< 1)	140

It has also been assumed that the boundary between two adjacent scale groups is halfway between their group centres, *e.g.*, the boundary between groups $4\frac{1}{2}$ and 5 is taken as 4.75, which on the exponential photographic comparison scale is equivalent to 2,690 particles per c.c.

Table V gives the dust concentration averages for all the samples taken in each foundry. In Table VI the results have been further analysed to give similar data for the different shops and processes whilst the results of the "free" silica analyses on the samples collected by the salicylic acid filters are given in histogram form in Fig. 5.

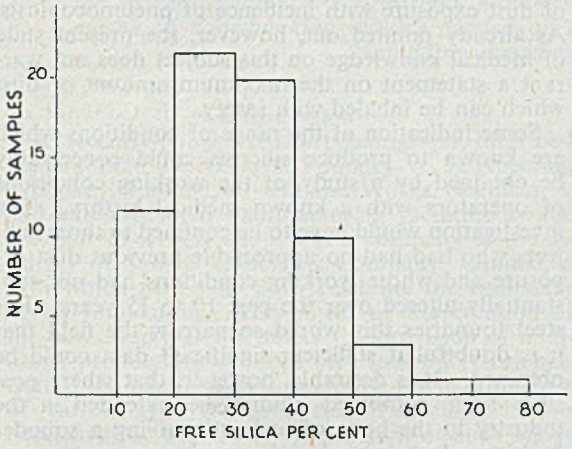


FIG. 5.—*Histogram showing Number of Samples in each "Free Silica" Range.*

Discussion of Results

From the concentration figures for each foundry given in column 2 of Table V, it is seen that a wide divergence of conditions exists in the industry, varying from an average of 900 to 4,100 particles per c.c. Using the values given in Table V, it is possible to place the foundries in order of relative dustiness, but this does not necessarily mean that the best foundries are the ones which are exercising the best dust control or suppression methods. The existing conditions are greatly influenced by many variables, one of which is the effect of the general atmospheric pollution associated with the areas in which the foundries are situated. From a comparison of such pollution data with these results, it becomes evident that the proximity of other works which are emitting dust has a noticeable effect on the dust concentration found inside the foundries.

TABLE V.—*Concentration Averages of Samples Taken in 24 Foundries.*[18]

Foundry No.	Particles per c.c.			
	Average.	10 per cent. of samples below.	50 per cent. of samples below.	90 per cent. of samples below.
A	3,400	1,250	2,900	6,500
B	4,100	1,240	3,600	(8,600)
C	2,600	1,270	2,100	4,500
D	3,400	1,080	2,900	6,500
E	4,000	2,220	3,700	6,300
F	2,000	770	1,500	3,800
I	2,900	370	2,300	6,400
J	1,700	370	1,200	2,300
K	1,700	770	1,300	2,700
L	900	560	830	1,300
M	2,400	960	1,700	5,100
N	3,200	980	2,400	6,900
O	3,300	1,070	3,000	5,800
Q	2,100	740	1,300	4,400
R	1,000	440	1,600	2,600
T	3,900	1,050	3,000	(8,900)
U	3,400	640	3,000	8,000
V	2,200	760	1,900	3,800
Y	3,300	1,560	3,000	5,700
Z	2,200	650	1,300	4,700
AA	1,600	280	1,200	3,300
AB	3,800	1,390	3,600	6,800
AC	1,500	580	1,200	2,300
AD	3,300	1,130	2,800	6,400

TABLE VI.—*Samples Taken in 24 Foundries arranged as to Process.*[18]

Location.	Particles per c.c.			
	Average.	10 per cent. of samples below.	50 per cent. of samples below.	90 per cent. of samples below (*i.e.*, 10 per cent. above).
All samples	2,800	810	2,100	5,800
Dressing	2,200	900	2,200	6,300
Moulding	2,900	770	1,800	4,600
Sand plant	2,400	380	1,500	4,900
Furnace	3,500	940	2,600	7,700
Knock-out	3,800	930	3,400	7,300
All core shops	2,100	700	1,500	4,300
Separate core shops	1,300	360	970	3,000
Combined core shops	2,300	850	1,700	4,500
Pneumatic chisels	2,900	900	2,100	6,300
Swing frame grinders	2,900	980	2,500	5,700
Floor stand grinders	2,700	870	2,400	4,900
Portable grinders	3,700	1,500	3,100	7,000
Burners and welders	3,800	920	3,000	(8,200)
Shot blast, wheelabrators	3,100	1,100	2,300	6,400

From a consideration of the figures presented in Table VI, an indication of the order of dustiness of the different processes and operations can be obtained. Of the processes, "knocking-out" appears to give rise to the greatest amount of uncontrolled dust, whilst sand preparation and core-making cause the least dust. The rather higher results for the combined core shops and those for mould making are, no doubt, due to contamination of the atmosphere by adjacent processes. In the case of the core shops, this point is well illustrated by the much lower results obtained for core shops which are housed in a separate building. The high values for furnace processes is due to the large amount of fume associated with their operation, which fume in most cases finds its way into the surrounding area.

The worst fettling operations are those associated with the dust produced by portable grinding wheels and the fume from burning and welding. Somewhat less dusty in operation are pneumatic fettling and floor stand grinding. As the latter operation is done under local exhaust ventilation, a much smaller figure might have been expected, but it should be remembered that the lower limit of concentration which can be attained is, of course, that of the general atmosphere in the vicinity of the operation. On the other hand, the results may suggest that the velocity of the exhaust was in some cases insufficient to capture the extremely fine particles produced. The results outside shot-blast cabinets and wheelabrators probably reflect the state of maintenance of this equipment.

Only a few of the swing frame grinding machines were fitted with local exhaust ventilation and, as in each case adjacent machines were working without it, it is not possible to show the effect of the applied exhaust. As to results obtained on individual foundries, one of the most interesting is that associated with the segregation of processes. The best dressing shop results were obtained in a building which was

separate from the foundry, the best moulding shop was completely separate from the dressing shop, and as already stated, the best core-shops were those occupying separate buildings.

Some degree of correlation of dust concentrations with such factors as the intensity of production and the number of castings handled might be expected and in the dressing of castings, the large difference in the size of castings produced by different foundries, which in turn involves the treatment of vastly different surface areas, should conceivably be related in a general way to the amount of dust produced. Relative figures for the surface areas per unit weight of casting are difficult to obtain, but scatter diagrams of the median dust concentrations against the average weight of casting and against the floor area per worker indicate that the dust concentration decreases with increasing floor area and with increased average weight of castings produced.

The results of 69 determinations of " free " silica in the samples collected from different positions in the foundries give a range of 11 to 73 per cent. and an average of 35 per cent. (Fig. 5). There does not appear to be any close relationship between the " free " silica content of the air-borne dust and the kind of shop in which the sample was taken. For example, the figures for dressing shops vary from 12 to 73 per cent., for moulding shops 16 to 65 per cent., and for core shops from 23 to 60 per cent. It is presumed that these large variations are due to a combination of factors such as sand practice, casting temperature, contamination of one shop's atmosphere by the dust produced in another, etc.

Conclusions from the Survey Results

(1) Dust concentrations in steel foundries vary from under 200 particles per c.c. to over 6,400 per c.c. as determined by the particular method used, and average concentrations for each of 24 foundries vary from 900 particles per c.c. to 4,100 per c.c.

(2) The " free " silica contents of the air-borne dusts vary from 11 to 73 per cent., with an average of about 35 per cent.

(3) The results are to some extent dependent on the amount of general atmospheric pollution associated with the area in which the foundry is situated.

(4) A relative order of dustiness is given for the different processes and operations. This is based on a consideration of the mean and median concentrations found in 24 foundries.

(5) Many processes are showing high concentrations due to contamination of the atmosphere by adjacent dusty processes.

(6) No single factor can account for either the low or high concentrations seen in certain processes and more results are needed in these cases before attempts can be made to determine the relative importance of the different factors involved.

(7) Dust concentrations appear to decrease with both increasing floor area per worker and with average weight of casting produced.

Threshold Dust Limits

Standards of dustiness for foundries have been proposed by various overseas investigators.[20] [21] [22]

The problem of the determination of such permissible standards is a very difficult one. For them to be of any real value they should be deduced from the results of investigations involving the correlation of dust exposure with incidence of pneumoconiosis. As already pointed out, however, the present state of medical knowledge on this subject does not warrant a statement on the maximum amount of dust which can be inhaled with safety.

Some indication of the range of conditions which are known to produce silicosis could conceivably be obtained by a study of the working conditions of operators with a known medical history. The investigation would have to be confined to those subjects who had had no appreciable previous dust exposure and whose working conditions had not substantially altered over the past 10 to 15 years. For steel foundries this would so narrow the field that it is doubtful if sufficient significant data could be obtained. It is desirable, however, that where possible such combined studies be extended in the industry in the hope of at least deriving a sounder basis for dust control and suppression measures.

In the meantime, it might be useful to adopt some measure of what is considered good practice in the industry as a tentative standard. This would give a concentration which existing foundries should try to obtain and which could be used as a basis in the design and planning new foundries. A few examples of reasonably satisfactory dust control for different shops and processes already exist in the industry, and from the results of the foregoing surveys it would appear that the best general conditions are showing less than 1,600 particles per c.c. as determined by the methods described.

Acknowledgments

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(*References concluded on page* 46)

Osborn's Steelfoundry Extension

By J. Preston (with an introduction by V. C. Faulkner)

This account deals mainly with the addition of a fully-integrated sand plant and the mechanisation of a new light jobbing section of an old-established steel foundry by means of floor-banking moulds carried on roller conveyors, the latter served directly from moulding machines of several types.

Introduction

A recently-published short paragraph informed readers that the Osborn Foundry & Engineering Company, Limited, of Rutland Works, Sheffield, 3, had extended their manufacturing facilities by the erection of a new shop. The company is a subsidiary of Samuel Osborn & Company, Limited, a firm which next year is to celebrate the centenary of its foundation. The object of the creation of the new shop was not solely the provision of additional production, but part of a general re-orientation of the plant, so as to segregate the manufacture of various types of products. Especially is this necessary for the orderly production of such alloys as stainless steel.

A perhaps over-simplified description of the plant is that there is a large shop for the heavy castings, the new shop for repetition castings, and a third for the alloyed type. It is interesting to note that the new mechanised shop was erected on a roadway running parallel with the heavy foundry, and that apart from the steelwork and roofing, the whole of the construction has been designed and carried out by the firm's own staff. It is this new mechanised shop which Mr. Preston describes.

This young man is an Australian from Sydney, New South Wales, where he was on the staff of Hadfields Australia, Limited. For more than a year now, he has been assisting Mr. R. F. Horton, Osborn works director, but the shocking weather of last winter has influenced his decision to return home in a few months' time. One contribution he has made during his stay at Osborn's is to design and put into commission a gas-fired furnace for preheating the charges for a "low" high-frequency melting furnace. This increased production and lowered melting costs.

Melting is also carried out both by the arc-type electric furnace and the converter process. The plant for this latter process, of course, includes cupola melting and the desulphurisation of the liquid iron. A good deal of fume is created, yet the shop is kept clear by the natural draught created by a 83-ft. high chimney, which, unlike most, is rectangular in section—actually 6 ft. by 18 in. Another interesting feature is the provision, for the purpose of cleaning, of a hinged section on the canopy into which the converter blows; by raising this section with the crane-hook several times, and allowing it to fall with a good bang, all adhesions are cleared, and the proper functioning of the canopy is maintained.

The workpeople at Osborn's are indeed fortunate in the amenities provided for them. Not only is there a well-organised and adequately-equipped canteen, but also excellent changing, washing and bathing facilities. Before clocking in, a man is given a key to his clothes locker, which is heated and ventilated. He changes, places his outdoor clothes in a second locker, housed in a room located beyond the bathing and washing room, and gives the key to the attendant. On finishing his shift, the operation is reversed, except, of course, there is the stage of washing or bathing.

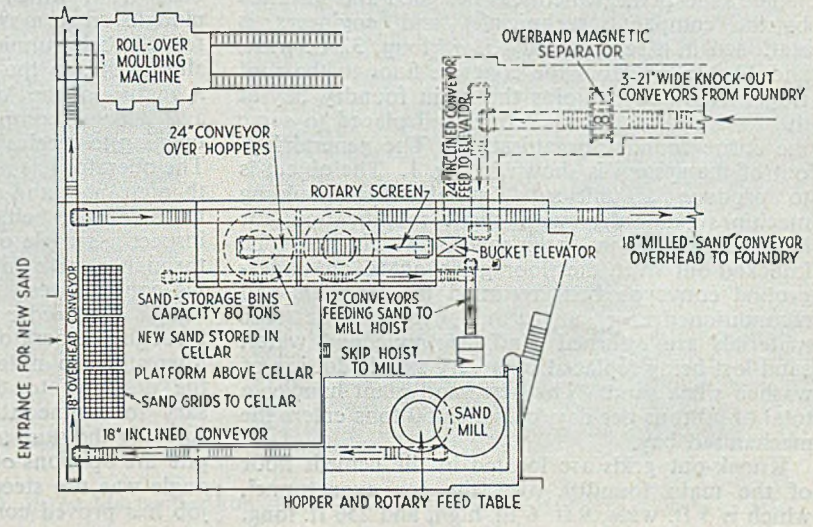


FIG. 1.—*Plan View of the Plant at the New Osborn Foundry Sand-preparation Section. This was Designed and Installed by the Company's Own Engineers.*

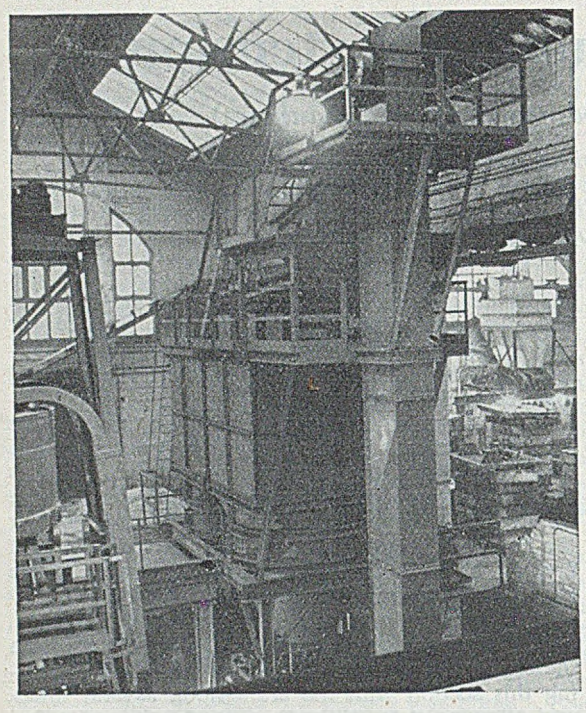


FIG. 2.—*Vertical Elevator, Rotating Grid and Storage Hoppers of the Sand-treatment System.*

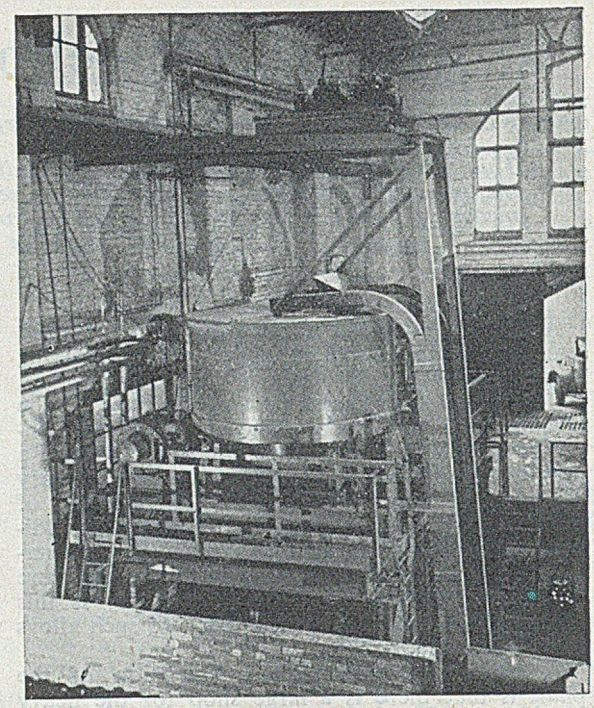


FIG. 3.—*Sand Mill, showing the Top almost completely Enclosed.*

Sand Plant

Following the conclusion of the war, during which the whole of the company's resources had been engaged in the national effort, a programme of mechanisation and further development has been vigorously pursued, and, in fact, the policy is one of continuous development. Two installations of outstanding importance to this foundry have been the new mechanised moulding plant, and the integrated mechanised sand system which supplies this plant in addition to other sections.

The sand plant, which was designed and installed by the company's technicians and engineers, is stationed in a separate bay 53 ft. long, 32 ft. wide, and 48 ft. 6 in. from the concrete floor to the roof ridge. This bay adjoins the main foundry bay at the road end, and is therefore well placed to serve the entire foundry organisation. The general lay-out of the system is shown in Fig. 1. The object is to produce a unit sand, suitable for moulding machines (and also with slight modification for hand moulding in green-sand), which can be knocked-out over the floor grids on to an underground conveyor belt, returned to the mills and reconditioned for a further cycle. The base materials are returned sand, bentonite and water, sand lost being replaced by a very small addition of washed silica sand. The new sand plant handles a total of 70 tons per day, of which 50 tons enters the mechanised bay.

Knock-out grids are located in the cement floor of the main foundry, over the conveyor tunnel, which is 5 ft. wide, 8 ft. 6 in. high, and 256 ft. long. This tunnel is well lighted, and gives free access to the belt gear, enabling maintenance and cleanliness to be matters of routine. The belt is 21 in. wide and moves at 190 ft. per min. After passing a magnetic separator to remove tramp iron, it discharges the sand into the boot of the vertical elevator, which carries it through a cylindrical rotating grid and thence into the two storage hoppers (Fig. 2). The ¾-in. mesh grid removes non-magnetic material and delivers a well-broken-up sand. The hoppers are discharged by means of a rotating disc at their base from which sand is diverted by adjustable ploughs on to a swiftly-moving belt, which in turn, feeds a belt running at 440 ft. per min.; the latter almost throws the sand into the mill charging skip. A feature of the August's mill is the small dust leakage, it being completely covered except for a chute opening to receive the contents of the skip (Fig. 3). The operator has no manual work to perform, other than cleaning and adding a few shovels of new sand to the feeder belt. From floor level he is able to inspect a sample of the mill contents which trickle through a hole in the side, and down a chute to his control area. From the mill, sand discharges into a disc feeder which controls the rate of feed through the aerator on to the conveyor belt. It is interesting to note that in order to keep clear of the doorway to the road outside, it was necessary to incline at an angle of 26 deg., the belt carrying the sand to the main distributor line. Despite the opinions of many expert observers that the angle was too steep for efficient sand carrying, the job has proved completely satisfactory.

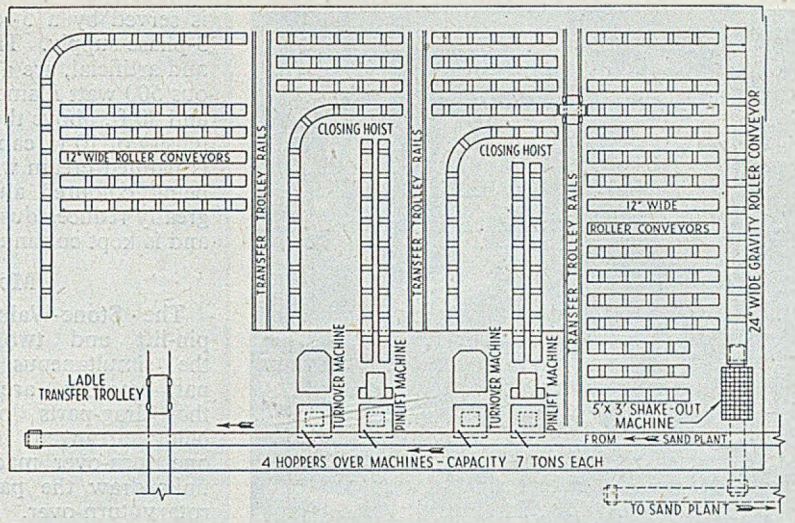
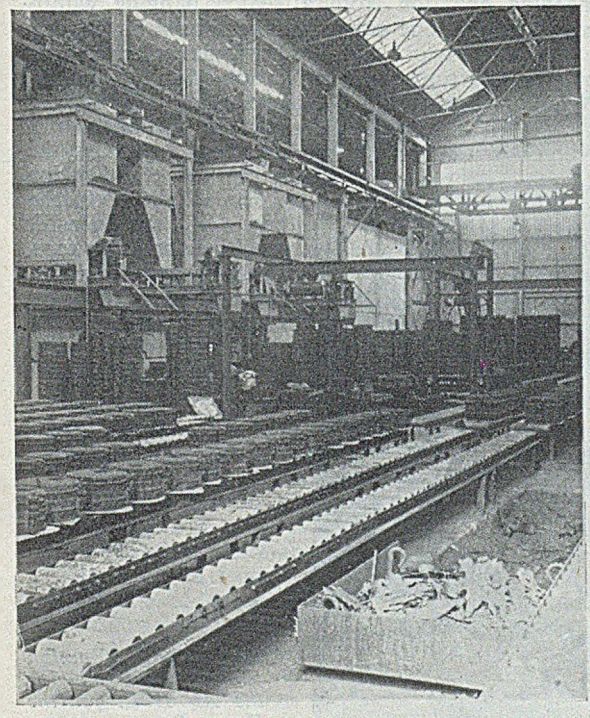


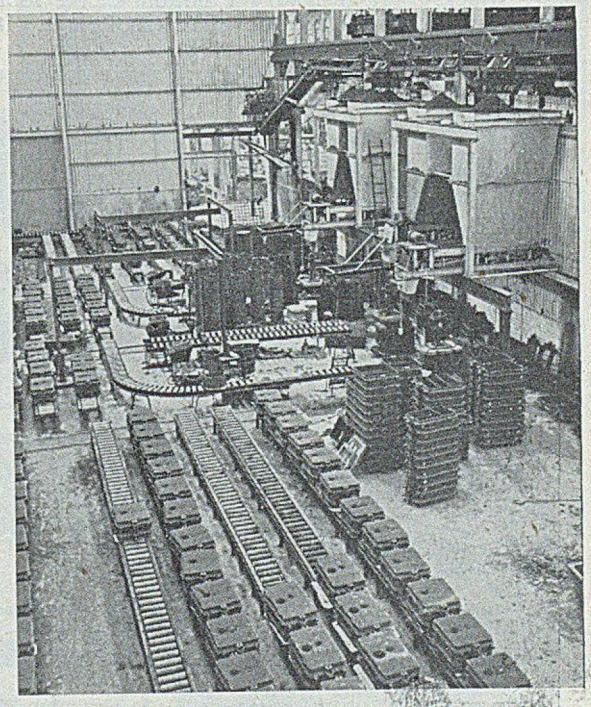
FIG. 4.—*Ground Plan of Osborn's New Mechanised Foundry. The Roller Conveyor Banks and Transfer Arrangements are shown in Relation to the Moulding Machines and the Shake-out.*

New sand is delivered by road on to the grating shown in Fig. 1, through which it falls to the storage area below street level. Sand from this plant feeds a heavy table-type jolt-roll-over machine, is diverted at three points into bins for shop use and also feeds two high-output small jobbing machines—the sand passing off the belt down a chute and through a Royer. Finally, this conveyor supplies all sand required in the new mechanised section.

Construction of the Shop

The new shop, of which the Company is justly proud, was in operation three months after work began on the site. Fig. 4 is a ground plan, and Figs. 5 and 6 show general views from each end of the building. Completion was not achieved without difficulties, and proved another triumph for the dynamic managerial policies in operation. Constructed of corrugated fibro-cement sheeting on a





FIGS. 5 AND 6.—*General Views of the Mechanised Foundry—Photographed from Opposite Ends.*

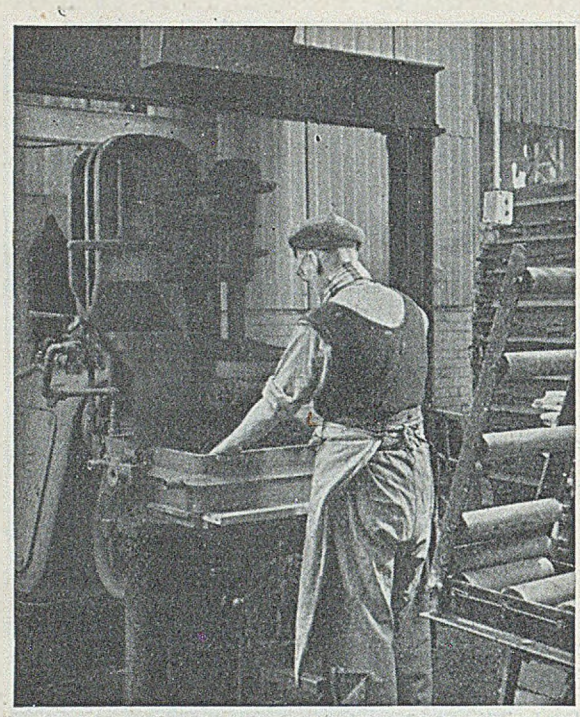


FIG. 7.—*Close-up of one of the Moulding Machines during Sand Delivery and Jolting.*

steel framework, it is 50 ft. wide, 150 ft. long, and has a height of 26 ft. from the concrete floor to the crane-track, 37 ft. 6 in. to the bottom of the roof trusses, and 55 ft. to the top of the roof ridge. It is served by a 5-ton crane operating on 400v a.c. 3-phase supply. The lighting facilities, both natural and artificial, are a feature of the building. Numerous 500 watt filament lamps are spaced 25 ft. apart, and 30 ft. above the floor, giving an approximate intensity of 10 ft. candles. The interior of the building is painted cream with blue reliefs, the sand hoppers being coloured aluminium. The concrete floor greatly reduces dust and assists good house-keeping, and is kept continuously clean.

Moulding Machines

The Stone-Wallwork moulding units are two pin-lift and two turn-over machines, all of the simultaneous jolt-squeeze type. The top-part moulds are made by the former and the drag-parts on the latter, the machines being arranged in pairs of one pin-lift, and one turn-over machine adjacent. The turnover units draw the pattern out of the box after the rotary turn-over. Each pair of these machines is handling boxes up to 24 in. square by 8 in. deep, at a rate up to 700 moulds per 8-hour day. Over each machine is a steel hopper holding about 7 tons of sand. These hoppers are rectangular in section and have three vertical sides, the fourth tapering. Sand is diverted from the main overhead supply belt, which is situated beside the crane-tracks, by means of adjustable ploughs. Owing to the careful design of the hoppers, no trouble has been experienced because of sand packing and ceasing to flow through them. Each hopper tapers on to a feeder belt 20-in. wide, which runs at 2½ ft. per sec.

The motor driving this belt is controlled by the machine operator from a switch hanging within easy reach. The sand falls vertically on to the boxes in an ideal condition for moulding, and the machine is started jolting whilst the box is filling, the usual jolt time being 7 sec. (Fig. 7). In the case of the pin-lift machines making tops, small boxes are lifted by hand on to the roller conveyor lines, but there is a carrier suspended from a track

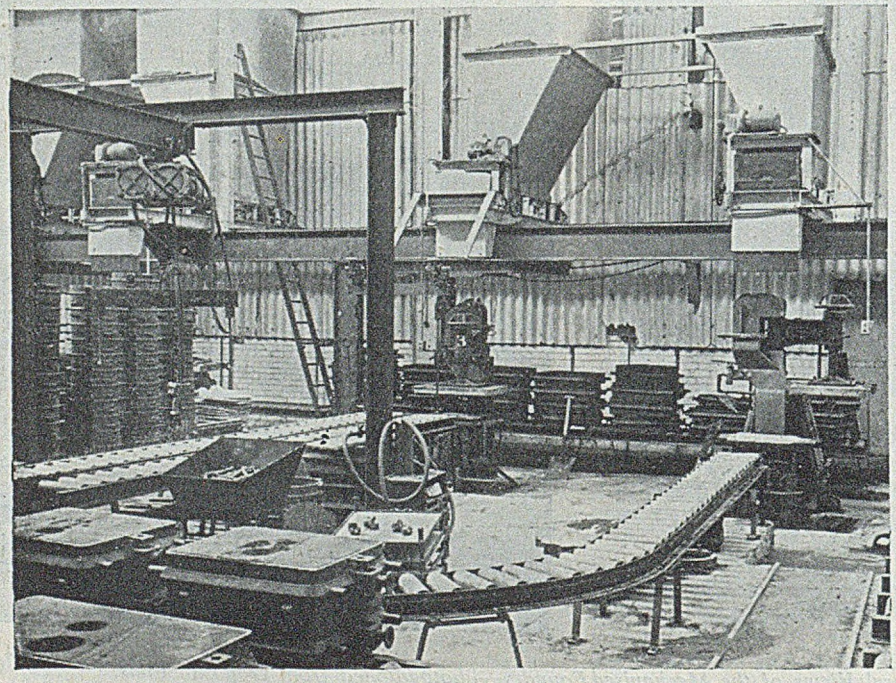


FIG. 8.—*Closing Station for Moulds, showing the Air Hoist for the Heavy Boxes.*

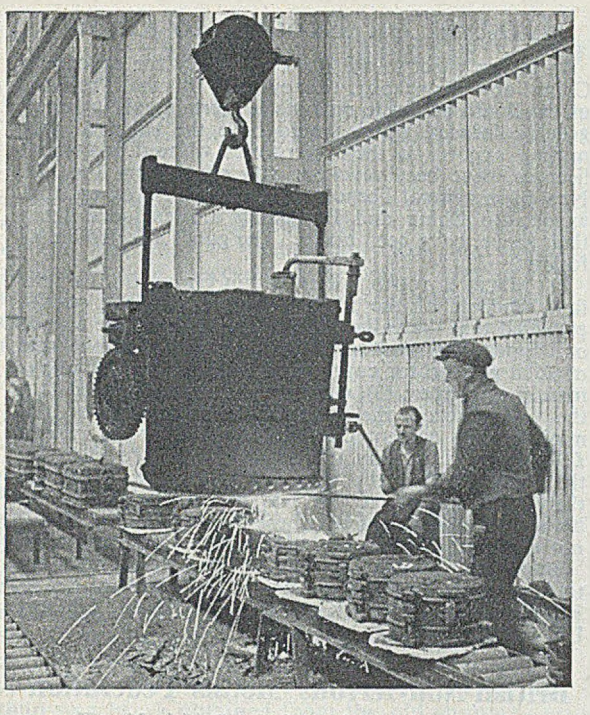


FIG. 9.—*Bottom Pouring of Moulds from a 2-ton Capacity Ladle.*

above the machines to facilitate lifting the heavier boxes on to the rollers. This can be seen in Fig. 6. After moulds on the turn-over machines have been drawn, a hinged section of the roller line (which is quickly detached) is moved through a vertical radius, the free end coming to rest on two seats provided on the pattern board. This roller section can be seen in Fig. 7. A stainless-steel plate which is mounted on the top board of the machine, and on which the box is then sitting, enables it to slide easily on to the roller-conveyor line. Boxes are then moved away from the machines to the closing station, situated below the air-hoists, one of which can be clearly seen in Fig. 8. Smaller boxes are closed by hand, the larger moulds using the fine-adjustment air-hoist .

Coremaking

Cores are made in a separate department, using both a horizontal and a vertical-type core-blower, and are supplied to the mould-closing station on trays. Cores are inserted, the tops put on, and the moulds then moved along to the pouring station.

Castings are now being produced in this shop in both carbon and manganese steels, and are usually bottom-poured from a 2-ton ladle (Fig. 9). A $\frac{7}{8}$-in. nozzle is used for manganese steels and a 1-in. nozzle for the carbon ranges. Up to 237 boxes have been poured from a single ladle in a total pouring time of 35 min. Boxes are shaken out on a vibrating floor-grid a few minutes after pouring, the sand dropping on to a conveyor belt which takes it to the main return conveyor. Castings pass out of the shop immediately, being thrown into pans placed adjacent to the grid. These pans are lifted on to small electric or petrol-driven motorised runabout trucks and delivered, still hot, to the fettling department. The box-parts return to the machines on a roller conveyor running direct from the shake-out to the rear of the machines. Fig. 10 shows typical examples of moulds now in production.

The new extension, which has been rather aptly christened " Festival Hall," contains 850 ft. of roller conveyor, the bulk of which is constructed of 4 by 2-in. channels and angles carrying rolls 3 in. dia. and 12 in. long, pitched at 6-in. centres. Boxes are transferred from one parallel line to another, where necessary, by means of rail-borne trolleys carrying roller tops. There is a total of 20 men in the new foundry, which number covers men engaged on moulding, pouring and general labouring, the crane driver and a man driving the runabout truck. The output naturally varies with the type of casting, but is averaging 1 cwt. per man/hour at present.

The Osborn Company believe that this new department fully answers those critics who, taking an easy course, sit back, accepting what they think is the inevitable position that a jobbing foundry can never be mechanised for high productivity. The writer feels that this example of mechanisation fits ideally into the precincts of the jobbing foundry and is able to accommodate all the domestic problems always current in a foundry accustomed to jobbing work. It has been established that its output can favourably compare with the specialised mass-repetition shops both here and overseas.

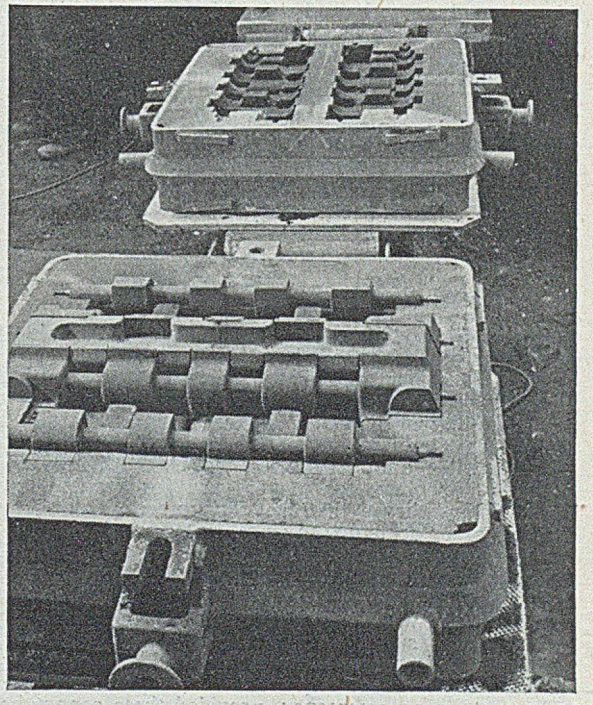


FIG. 10.—*Examples of Typical Moulds on a Conveyor Line before and after Coring-up.*

Simon Engineering's Research Buildings

Among the 300 guests representing the senior levels of the industrial and scientific world and Government departments who were at Cheadle Heath, Stockport, on July 3 for the opening of the new research and development buildings of the Simon Engineering Group, was Sir Charles Ellis, F.R.S., a member of the National Coal Board. At a luncheon, Sir Henry Tizard, F.R.S., chairman of the Advisory Council on Scientific Policy, formally opened the new buildings, which were erected at a cost of £250,000.

Proposing the toast "The Guests," Lord Simon of Wythenshawe, governing director of the group, referred to plans now being made to meet the grave sulphuric acid shortage and announced that Simon-Carves, Limited, had been appointed main contractors for the newly formed United Sulphuric Acid Corporation's £3,500,000 plant at Widnes and I.C.I.'s £1,500,000 plant at Billingham, which will both produce sulphuric acid from anhydrite.

Since the war the Simon companies had achieved about £25,000,000 of exports to some 40 countries, including the North American dollar markets. Their present £50,000,000 order-book, Lord Simon continued, included a large coke-oven battery in the United States, a £2,000,000 grain elevator contract for the Argentine Government, a £2,000,000 coal-washery contract in Turkey, and power-station contracts in Australia and the Middle East amounting to about £6,000,000. At home the companies had a heavy programme, including power stations for the British Electricity Authority, and coal-cleaning plants for the National Coal Board.

Speaking of the interdependence of the home and export markets, Lord Simon said: "It is our national duty to export to the utmost, and exports demand two things—good research, and a good home market where we can readily and effectively study our own plants at work. If large nationalised concerns like the B.E.A. and the N.C.B. set up their own contracting departments to design and build their own plants, they will deprive British private enterprise of much of the home market on which it relies as the foundation of its export business. I hope the nationalised concerns will not take this step, but will continue to place their orders with engineering contractors like ourselves, and thus give practical aid to British engineering exports."

Metal Stockpiling by Pakistan

A programme of stockpiling of certain metals—mostly iron and steel—has been embarked upon by the Government of Pakistan. For that purpose the purchasing mission to France was instructed to explore the possibility of purchases in that country, Belgium, and western Germany. Inquiries have also been received for a possible allotment from the United Kingdom, and also for plans for a stockyard for keeping the steel. It is believed that the Government is thinking in terms of a stock equal to an estimated requirement of the country for six months. Pakistan's annual consumption of iron and steel is now estimated at 350,000 tons in round figures.

The imports will be on Government account and will be located at suitable centres both in west and east Pakistan. Releases against the stocks will be made for essential Government requirements, and for trade requirements in an emergency, provided these cannot be made from normal trade channels. A sum of Rs. 12 crores is mentioned as having been allotted for the purchase of strategic metals.

Control on Exports to China

In giving effect to the licensing policy for exports to China and Hongkong, announced by the President of the Board of Trade on June 19, certain existing open general licences, which would have the effect of permitting exports to these territories without individual licences, have been revoked, with effect from June 25. New open general licences, similar to these except that exports to China and Hongkong are excluded from their scope, have been made. The goods affected are as follow:—

(1) MACHINE TOOLS falling within Group 6 (5) of the first schedule of the main Order; (2) COPPER GOODS, provided that the value exceeds the value of the copper or copper alloy content therein, calculated at the rate of £500 per ton for copper and £400 per ton for alloys mainly of copper; (3) ALUMINIUM GOODS, provided that the value exceeds the value of the aluminium or aluminium alloy content therein, calculated at the rate of £180 per ton; (4) IRON AND STEEL GOODS, provided that the value exceeds the value of iron or steel content therein, calculated at the rate of £30 per ton. For items 2, 3, and 4, above, where the respective value is not exceeded, licences are, of course, already necessary.

Inquiries from any exporters affected should be made to the Export Licensing Branch of the Board of Trade, Regis House, 43/46, King William Street, London, E.C.4 (tel: AVEnue 3111).

British Non-ferrous Metals Federation

At the annual meeting of the British Non-Ferrous Metals Federation held in Birmingham last Thursday, the following officers were appointed for the year 1951-52: As *president*, Mr. W. J. Terry; *past-presidents*, Dr. H. W. Clarke, D.Sc. and Mr. W. H. Henman; as *vice-presidents*, Mr. H. E. Jackson, Mr. H. C. Gibbins, B.A., and Mr. W. F. Brazener, J.P.; as *treasurer*, Mr. A. L. Johnson, M.A., and as *chairman of the Executive Committee*, Mr. W. J. Terry. In his valedictory address, Mr. Henon reviewed the trading conditions of the industry during the last year and reported the steps being taken by the Federation to mitigate as far as possible the banal effects of the current shortages of raw materials.

Reduction of Dust in Steelfoundry Operations

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New Foundry of Gibbons Bros.

The following is a brief description of the new installations of the Lenches Bridge works of Gibbons Bros., Limited, the well-known refractory and furnace manufacturers, and includes a short description of ancillary sections.

GIBBONS BROS., LIMITED, of Dudley, have long operated their own foundry, but with the growth of the business, it became apparent that better facilities were needed. Just before the war a shop was built, but later was taken over for other duties. This was at Lenches Bridge, four miles from Dudley, and the foundry just completed runs parallel to it. The main bay is a really tall building, a factor which goes far in eliminating a dusty atmosphere, and around the inside is a concreted area leaving the centre available for moulding on a sand floor. The main considerations of the management at this early stage have been to instal an excellent melting plant, a modern sand-preparing plant and good mould and core-drying facilities, plus (and this is important) really good sand control. Except for a pair of Adaptable machines, all moulding is by hand from loose patterns. Herein are all the essentials for the making of good serviceable castings, and already the machine-shops are convinced that they are receiving a better article than was being obtained from the old shop.

Patternshop

The patternshop is a light, airy building, covering an area 100 by 50 ft., and is well-equipped with lathes, planers, sanders, and the like. It is heated by low-pressure steam heaters with fan impellors. A dust-extraction plant is in course of installation. The fine dust from the sanders is being used together with purchased wood-flour for mixing with the moulding sand to replace coal-dust. Good results are being reported.

The pattern-stores is a building of the same size as the patternshop, and is carried on two floors. The ground floor is for the storage of the heavier patterns which are handled by a small crane. The lighter ones are housed on the first floor, access to which is provided by a hand-operated lift. There are no windows, artificial lighting by electricity being used. The building is fireproof, and was designed according to information appearing in an article printed in the JOURNAL.* Concrete roadways connect the pattern-stores and patternshop with the foundry.

Melting Plant

There are two cupolas available, one of 3 tons, and the other of 30 cwt. per hr. Charging is by means of circular skip which is charged (whilst resting on a dial-type weighing machine) according to a schedule set by the works metallurgist. When full, it is hoisted to cupola level, racked-in, and lowered on to a wish-bone structure which allows the bottom doors to open and deposit the contents in a hinged chute, which can be swivelled so as to serve either cupola. All the movements are push-button controlled. The raw-material storage bins have been constructed of brickwork, and so far no damage to these walls has occurred. However, a coping of iron castings is usually desirable.

Sand Preparation

A decision was taken that for the type of work being undertaken using skilled labour, both backing and facing sand should be readily available, and two plants have been installed for this purpose. Knock-outs are located along the foundry floor, served by an underground conveyor, which carries the sand to the reconditioning plant. The prepared sand is then distributed by a belt conveyor to fill hoppers with swinging outlets so as to serve either the heavy or light bay. There is available a very modern automatically-fired mould drying stove, core drying being undertaken by an Acme continuous plant. The control is centred in a well-equipped and intelligently-operated laboratory.

The original concept, which has been detailed, was successfully carried through, and the design is such that, as and when it is deemed desirable, mould-making and handling plant can be installed without detracting from the initial plan.

Machine Shops

The constructional plating shops are situated on the southern aspect and are the largest single block in the works, comprising three bays each of 50 ft.

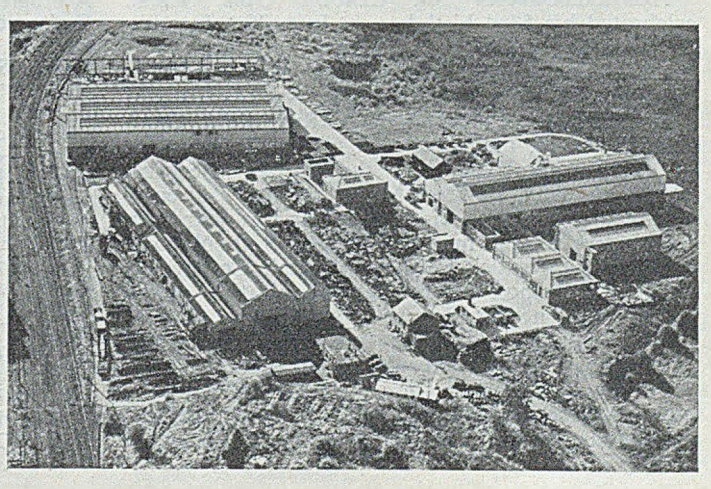

FIG. 1.—*Aerial View of Gibbon's New Works.*

* "Fire Hazards in Pattern Stores," by W. H. Tuckey, O.B.E., appearing February 24, 1949.

New Foundry of Gibbons Bros.

span by 250 ft. long, these being serviced by two steel stockyards, one being 70 ft. span by 250 ft. and one 60 ft. span by 250 ft. A private railway siding branching from the main line which runs adjacent to the works runs directly into the stockyards with a double line, one for incoming traffic, and the other, running through the steel shops for outgoing materials. Railway wagons can therefore be easily loaded by means of the overhead electric cranes that service the three bays. At the other end of the shop a modern concrete road joins up to the stockyards, with a large doorway leading into the fabricating shops, allowing road transport easy access for loading and unloading.

The machine and fitting shops are on the east side and occupy a building 336 ft. long by 120 ft. wide, comprising a main centre bay, with a 50 ft. span and flanked on either side by a smaller bay 35 ft. wide. The machine shop is equipped with a large and varied selection of machine tools, the largest being a centre lathe capable of turning a diameter of 8 ft. in a 3-ft. gap. The production in this shop comprises the mechanical gearing, etc., for the tunnel kilns, mechanical furnaces, retort mouthpieces, pushers both mechanical and hydraulic, and special charging machines. As in the other departments production varies from chain parts that weigh but a few ounces to the largest charging machine the company have so far built which weighed 56 tons unloaded, with a load handling capacity of 25 tons, giving a complete load of 81 tons.

The whole of the works are connected by a series of roads radiating from a central yard, and inter-departmental transport is provided by two mobile cranes, one of 6 tons capacity and the other of 3 tons.

The welfare and ablution facilities provided are in a central block, containing washing fountains, heated cloakrooms, shower and foot baths, together with a small but well-equipped ambulance room.

Helping the Festival

AUSTRALIAN-BORN SIR CLAUDE GIBB, F.R.S., celebrated his 53rd birthday on June 29. In addition to his widespread business commitments—he is chairman and managing director of C. A. Parsons & Company, Limited, the Newcastle-upon-Tyne engineers, chairman of A. Reyrolle & Company, Limited, manufacturing electrical engineers, of Hebburn-on-Tyne, and the Parolle Electrical Plant Company, Limited, Newcastle, and a director of other companies—Sir Claude has this year been very active as chairman of the industrial sub-committee of Newcastle's Festival of Britain Committee, which was responsible for the organisation of the successful Tyneside Industrial Exhibition.

Early this year, too, he was appointed by the Minister of Fuel and Power to the Scientific Advisory Council and for some time he has been closely connected with the production of tanks and armoured fighting vehicles for the Ministry of Supply.

International Foundry Congress

Final list of Papers to be presented at the Brussels International Foundry Congress is as follows:—

SECTION I

"On the Formation of Nodular Graphite in Cast Iron," by Dr. A. Wittmoser (German Exchange Paper); "The Possibilities of the Combined Ca-Mg Treatment in the Field of Nodular Cast Irons," by Prof. A. De Sy; "The Annealing and Heat-treatment of Nodular Cast Irons," by J. E. Rheder (Department of Mines, Ottawa, Canada); "Quantity Production of Spheroidal Cast Iron," by N. Croft (British Exchange Paper); "Study of Some Properties of Irons Allied to Self-quenching Spheroidal Graphitic Cast Irons," by Dr. Ballay, R. Chavy, and J. Grilliat; "The Elimination of Sulphur in the Cupola and in the Electric Furnace," by Dr. E. Pfannenschmidt; "Nodule Genesis and Growth in Magnesium-treated Hypoeutectic Irons," by W. S. Pellini (Naval Research Laboratory, Washington, D.C.).

SECTION II

"An Effort to Define and Classify Foundry Defects as Related to Their Practical Identification," by Guy Henon (French Exchange Paper); "A Novel Method for Solidification Studies," by Dr. V. Paschkis; "Application of Ultrasonic Tests for the Detection of Castings Defects: Possibilities and Causes of Errors," by Dr. P. Bastien.

SECTION III

"Productivity in the Brassfoundry: The Economic Utilisation of Raw Materials," by Frank Hudson, F.I.M.; "Gases in Bronze," by Dr. W. T. Pell-Walpole; "Adjustment of Complex Brasses in Relation to the Obtaining of the Specified Mechanical Properties," by Gustave Hublet; "Utilisation of the Metallurgical Microscope in Heavy Non-ferrous Foundrywork," by G. Mathy.

SECTION IV

A Belgian Contribution to the Study of a Code of Good Practice for the Preparation of Foundry Patterns, by a Sub-committee of the A.T.F.B.; "Nickel Cast Irons and Spheroidal Graphite Cast Irons in Engineering," by J. V. Bairiot and J. Berthellier; "Co-operation between Foundry and Machine Shop," by B. J. Helders (Philips, Eindhoven); "Surface-treating Grey Iron to Meet Specific Industrial Application," by C. O. Burgess (Director, Gray Iron Founders' Society); "Important Attributes of Malleable Iron," by J. H. Lansing (Director, Malleable Founders' Society).

SECTION V

"Dimensioning Risers and Feeding Heads," by J. S. Abcouver (Werkspoor); "Risering Castings, Part II: A Progress Report, 1948-51," by J. B. Caine (American Exchange Paper); "A Study of the Design and Performance of Moulds and Core-drying Stoves," by E. O. Lissell, S. Forslund and S. Ryden (Swedish Exchange Paper); "Study of Steel Casting for a Turbine Engine," by Jose Jamar (Cockerill); "Economic Conditions for the Use of Core-blowers," by G. Lambion; "The Effect of Burn-out on Melting Conditions with Special Reference to the Water-cooled Cupola," by G. L. Jones (Meehanite) and Fr. W. Bergen (Globe Iron & Steel Foundry, Holland); "Considerations in the Mechanisation of Foundries," by W. A. Morley (Foundry Superintendent, Link-Belt Company); "Some Recent Danish Experiments with the C-Process," by Ove Hoff (Copenhagen); "Experimental Study of Insulation Efficiency on a Foundry Stove in Brickwork," by G. Ulmer (*Centre Technique*).

SECTION VI

"The Use in the Foundry of Machine-cast Pig: Tests of Remelted Iron Made with Hematite and Cast in Sand and in Chills," by W. De Micheli, M. Drufaca, and A. Palazzi A. Scortecci (Italian Exchange Paper).

News in Brief

A. C. WICKMAN, LIMITED, Coventry, has changed its name to Wickman, Limited.

THE REGISTERED OFFICE of Lancashire Dynamo Holdings, Limited, is now 94, Petty France, London, S.W.1.

THE ASSOCIATION OF BRONZE AND BRASS FOUNDERS has issued to its members a confidential report on Metal Losses in the Foundry.

MEMBERS of the Foundry Equipment and Supplies Association contributed £154 to the Institute of British Foundrymen's Newcastle Conference Fund.

AN ORDER worth about £1,250,000 has been placed with Alexander Stephen & Sons, Limited, Glasgow, for two 6,800-ton cargo vessels for Det Bergenske Dampskibsselskap, of Bergen.

A SCOTTISH CONFERENCE is being arranged by the Scottish Branches of Incorporated Plant Engineers at Dunblane Hotel Hydro, Perthshire, from Friday afternoon, October 5, to Sunday, October 7.

NEARLY 43 PER CENT. of employees in the iron, steel, and metals industries are now members of savings groups. Other figures are:—Engineering, 34 per cent.; collieries, nearly 30 per cent.; chemicals, nearly 25 per cent.

IN CELEBRATION of the 50th anniversary of the foundation of Smith & Davis, Limited, brassfounders, of Birmingham, employees were taken on a trip to Blackpool on June 29. During the day, long-service awards were made to the oldest employees.

A NEW BRANCH OFFICE has been opened by Gent & Company, Limited, manufacturing electrical engineers, of Leicester, at Winchester House, Victoria Square, Birmingham (telephone: Midland 6443). Mr. J. P. Devlin is in charge of the new office.

A BORING MACHINE, 27 ft. high, capable of boring or turning on work up to 8 ft. deep and 20 ft. in diameter, has been installed at the works of George Fletcher & Company, Limited, colliery and general engineers and ironfounders, of Derby.

APPROVAL has been given by the Treasury for the establishment in Greenock of a new factory for an American firm. This will be situated in the Kip Valley and will be erected by Scottish Industrial Estates for International Business Machines, a firm manufacturing electric typewriters, calculating machines, and other types of business machinery. It is hoped eventually to employ about 5,000 persons.

HENRY BALFOUR & COMPANY, LIMITED, Durie Foundry, Leven, Fifeshire, have recently acquired the manufacturing rights for the Meader pump, a new pump which promises to revolutionise the handling of unwieldy and filthy materials such as thick mud, clays, thickened sewage, and residues from many manufacturing processes. At a demonstration held recently at the company's works, visitors saw a quantity of bauxite residues of only 30 to 40 per cent. water content pumped easily through 200 ft. of piping. Lime sludge from a sugar-beet works was passed equally well.

MR. W. M. ODDIE, managing director of Spencer & Halstead Limited, Bridge Works, Ossett, Yorks., has recently completed a tour of inspection of "Spenstead" shot-blast equipment installed in several foundries and engineering works in the Union of South Africa. All the equipment inspected, which includes a number of bath cleaning installations and general purpose shot-blast plant in jobbing foundries, was working very satisfactorily, and several repeat orders were obtained. Spencer & Halstead, Limited, are represented in South Africa by Koppel Engineering (Pty), Limited, 51, Commissioner Street, Johannesburg.

Personal

MR. RALPH E. PERRING, a past-master of the Tin Plate Workers' Company, was unanimously elected president of the City Livery Club for the ensuing year at Guildhall on June 28.

MR. R. S. LEIGH has been awarded a Beit Fellowship value £500 a year, tenable at the Imperial College of Science and Technology, London, for research on the elastic properties of metals and alloys.

MR. JULIAN S. TRITTON, a partner in Rendel, Palmer & Tritton, consulting and designing chartered civil engineers, of London, has been elected president of the Institution of Locomotive Engineers for 1951-2.

IN THE UNITED STATES AND CANADA on a three weeks' business trip is MR. J. M. BAZIN, a director of Durham Chemicals, Limited, Birtley (Co. Durham), and managing director of White's Marine Engineering Company, Limited, Hebburn.

SIR JOHN W. F. BEAUMONT, last year's Senior Warden, has been elected Master of the Worshipful Company of Cutlers for the ensuing year. MR. R. McV. WESTON has been elected Senior Warden, and MR. K. P. STROHMENGER Junior Warden.

MR. C. L. OLD, principal of Rotherham College of Technology since 1948, has been appointed principal of the Wolverhampton and Staffordshire Technical College. Aged 42, he was formerly vice-principal of the technical college at the Royal Aircraft Establishment, Farnborough.

MR. F. D. LEY, managing director of Ley's Malleable Castings Company, Limited, and Ewart's Chainbelt Company, Limited, Derby, opened an extension to the works institute on June 29. The building has been redecorated and modernised, and a new billiard room added, also a television set.

MR. J. L. HARRISON has joined the British Oxygen Company, Limited, in an advisory and consultative capacity to clients in connection with the use of oxygen in steelmaking processes. During recent years he has taken a considerable interest in this sphere. He was responsible for the development of the use of oxygen in the side-blown converter while serving with Catton & Company, Limited, Leeds.

Following the appointment of MR. P. D. F. VARRALL as secretary of Johnson, Matthey & Company, Limited, precious metal smelters, refiners, and engineers, of Hatton Garden, London, E.C.1, MR. L. C. MONTAGUE, who has been secretary of the company since 1934, will now give the whole of his time to his work as a joint managing director, which position he has held in conjunction with the secretaryship since 1946.

At the end of September SIR CHARLES LILLICRAP will retire from the position of Director of Naval Construction, which he has occupied since 1944. He was appointed Assistant Director of Naval Construction in 1936 and Deputy Director in 1941, and since 1937 has been a member of the council of the Institution of Naval Architects. Succeeding Sir Charles is MR. V. C. SHEPHEARD, who was appointed Assistant Director of Naval Construction in 1942, and Deputy Director in 1947.

DR. LILLIAN M. GILBRETH has been elected the first Honorary Fellow of the British Institute of Management. Dr. Gilbreth and her husband were the originators of the technical development of motion study and two of the pioneers of scientific management. Dr. Gilbreth, who is 73, is the president of Gilbreth Incorporated, and a member of the board of the American Management Council of the U.S.A. From 1935 to 1948 she was professor of management at Purdue University.

Iron and Steel Shipments to the Far East

A notice to shippers issued by the Far Eastern Freight Conference, the Japan Outward Freight Conference, and the Philippines/Europe Conference points out that difficulties in delivery to consignees are continually arising at ports of discharge due to the absence of permanent and distinct shipping marks on all types of iron and steel shipped loose or in bundles, and owing to the insecure fastening of bundles.

In consequence, the Conference Lines give notice that from August 1 next Bills of Lading for such shipments will be claused as follows:—Vessel not responsible for correct delivery, and all expenses incurred at port of discharge consequent upon insufficient securing or marking will be payable by consignee unless:—(*a*) every piece is distinctly and permanently marked with oil paint; (*b*) every bundle is securely fastened, distinctly and permanently marked with oil paint and metal tagged, so that each piece or bundle can be distinguished at port of discharge.

Foundry Workers' Claim

At Margate on June 18, the conference of the Amalgamated Union of Foundry Workers passed a resolution calling on the national executive council to support the Confederation of Shipbuilding and Engineering Unions, the National Light Castings Trade Union Joint Committee, and other joint bodies in measures for a substantial increase in wages to all workers, comparable with the rise in the cost of living and in profits.

Mr. Garvin Martin, general secretary of the confederation, addressing the conference, declared: "We must say in clear unmistakable terms that we are not satisfied with the proportion in which the proceeds of engineering production are divided between the employer on the one hand and the workpeople on the other."

SIXTY-ONE PER CENT. of employees of the Steel Company of Wales, Limited, are now members of works' National Savings groups.

FOLLOWING AN ACCIDENT in which a workman had most of his clothing torn from him, Cochranes (Middlesbro') Foundry, Limited, was fined £15 at the local police court for running a crane without fencing round the driving shaft.

Anglo-Italian Patents Agreement

The Governments of the United Kingdom and Italy have agreed to entertain applications in their respective territories for the expansion of the term of patents owned by nationals of the other country to compensate for losses incurred as a result of the war. In assessing the amount of extension to be granted, no account will be taken of any losses incurred from June 10, 1940, to September 3, 1943. All applications for extension of the term of patents in Italy owned by U.K. nationals must be filed within a period of four months of the date (June 16) of signature of the agreement. Applications for extension of the term of Italian-owned patents in the U.K. which have expired must also be filed within that period.

A copy of the agreement is available for inspection in the Patent Office Library, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

Industrial Accidents

On an average more than 800,000 insured workers were absent from work on any given day in the year because of illness or injury, said Mr. Alfred Robens, Minister of Labour, when he opened a "People at Work" conference at Keble College, Oxford, on July 1. The number of reported accidents in factories in the last year for which figures were available had been a little under 200,000. The less serious accidents represented the equivalent of a loss of more than 25,000 workers a year.

Mr. Robens said that much had been done already to combat the dangers of industrial diseases and accidents, but there was still more that could be done. Largely, the problem was one of educating both managements and workers in safe practices.

Brazilian Steel Plant

The Volta Redonda (Brazil) steel plant produced 330,000 metric tons of pig-iron and 287,000 metric tons of rolled steel products in 1950. The figures for 1949 were 193,000 and 227,000 tons, respectively.

Building Machinery Exhibition

The Ministry of Works, in association with the building industry, is organising a "Machines for the Modern Builder" exhibition at Middlesbrough from July 13 to 21, inclusive. Lord Morrison, Parliamentary Secretary to the Ministry of Works, will open the exhibition.

Our illustration shows the exterior of the latest extension to the foundry of the Dover Engineering Works, Limited. The decorative treatment it has received is both noteworthy and pleasing.

Pig-iron and Steel Production

Statistical Summary of April Returns

The following particulars of pig-iron and steel produced in Great Britain have been extracted from the Statistical Bulletin for May, issued by the British Iron and Steel Federation. Table I summarises activities during the previous six months; Table II gives the production of steel ingots and castings in April; Table III gives deliveries of finished steel, and Table IV the production of pig-iron and ferro-alloys in April. All figures in thousands of tons.

(References applicable to the Tables are given at the foot of col. 2.)

TABLE I.—*General Summary of Pig-iron and Steel Production. (Weekly Average.)*

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy). Imports. [3]	Output of ingots and castings.	Deliveries of finished steel.	Stocks.[2]
1949	258	169	199	183	188	17	299	233	1,071
1950	249	174	197	185	197	9	313	239	997
1950—November[1] ..	260	179	200	193	206	6	336	261	1,060
December ..	249	171	198	188	175	5	296	234	997
1951—January[1]	258	163	200	183	183	7	306	236	920
February	262	164	202	186	193	7	326	252	875
March	267	167	204	184	187	6	318	253	848
April	279	149	201	179	195	6	323	260	800

TABLE II.—*Weekly Average Production of Steel Ingots and Castings by District.*

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby, Leics., Notts., Northants and Essex ..	—	3·2	11.5 (basic)	1.3	0.3	15.6	0.7	16.3
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Cheshire	0.9	22.2	—	1.8	0.5	24.4	1.0	25.4
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	30.0	—	—	0.1	29.9	0.2	30.1
North-East Coast	1.4	62.6	—	1.0	0.5	63.8	1.7	65.5
Scotland	4.2	39.1	—	2.0	0.8	44.2	1.9	46.1
Staffs., Shrops., Worcs. and Warwick	—	16.2	—	0.9	0.7	16.3	1.5	17.8
S. Wales and Monmouthshire	10.9	51.5	5.1 (basic)	0.9	0.1	68.0	0.5	68.5
Sheffield (incl. small quantity in Manchester) ..	9.8	25.3	—	8.7	0.6	42.3	2.1	44.4
North-West Coast	0.6	2.5	4.8 (acid)	0.4	0.1	8.2	0.2	8.4
Total	27.8	252.6	21.4	17.0	3.7	312.7	9.8	322.5
March, 1951	26.2	253.0	20.6	15.2	3.2	309.4	8.8	318.2
April, 1950	24.2	262.0	20.8	13.3	3.2	315.5	8.0	323.5

TABLE III.—*Weekly Average Deliveries of Finished Steel.*

Product.	1949.	1950.	1950. April.	1951. March.	1951. April.
Non-alloy steel:					
Ingots, blooms, billets and slabs[4]	4.5	3.6	3.4	4.0	4.4
Rails, sleepers, etc.	9.8	11.3	11.3	11.4	10.4
Plates ⅛ in. ..	39.2	40.0	41.2	43.9	43.8
Other heavy prod.	37.5	40.2	40.2	41.5	43.4
Light rolled prod.	46.4	47.6	45.8	52.3	51.6
Hot-rolled strip ..	17.1	19.4	19.3	21.1	20.3
Wire rods	15.4	16.3	15.3	17.5	19.0
Cold-rolled strip ..	4.9	5.5	4.7	5.6	6.0
Bright steel bars ..	5.6	6.2	5.3	7.2	7.7
Sheets, coated and uncoated ..	27.6	30.5	30.5	31.2	35.3
Tin, terne and blackplate ..	13.7	14.3	13.4	16.0	14.4
Tubes, pipes and fittings	18.5	20.0	19.3	21.2	24.0
Mild wire	12.0	12.6	11.5	12.5	12.8
Hard wire ..	3.2	3.5	3.2	4.1	4.2
Tyres, wheels and axles	4.1	3.5	3.9	3.0	4.1
Forgings (excl. drop)	2.4	2.2	2.5	2.3	2.5
Steel castings ..	3.6	3.5	3.4	3.5	3.6
Total	265.5	280.2	274.2	298.3	307.5
Alloy steel	10.4	10.6	10.1	12.3	12.6
Total deliveries from U.K. prod.[5] ..	275.9	290.8	283.3	310.6	320.1
Add imported finished steel	9.5	3.8	3.9	3.6	4.2
	285.4	294.6	288.2	314.2	324.3
Deduct intra-industry conversion[6] ..	52.8	55.6	54.9	61.1	64.3
Total deliveries ..	232.6	239.0	233.3[7]	253.1[7]	260.0

TABLE IV.—*Weekly Average Production of Pig-iron and Ferro-alloys*

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	24	2.1	16.3	20.0	1.9	—	40.3
Lancs. (excl. N.E. Coast), Denbigh, Flints. and Cheshire ..	6	—	8.2	—	—	0.9	9.1
Yorkshire (incl. Sheffield, excl. N.E. Coast) ..							
Lincolnshire ..	13	—	24.1	—	—	—	24.1
North-East Coast	23	7.1	33.1	0.2	—	1.4	41.8
Scotland	9	0.8	10.4	2.6	—	—	13.8
Staffs., Shrops., Worcs. and Warwick ..	9	—	9.6	1.0	—	—	11.2
S. Wales and Monmouthshire	7	3.3	21.0	—	—	—	24.3
North-West Coast	8	12.6	—	0.2	—	1.1	13.9
Total ..	99	25.9	122.7	24.6	1.9	3.4	178.5[8]
March, 1951 ..	99	25.9	127.0	26.2	1.3	3.7	184.1
April, 1950 ..	98	26.4	124.6	27.8	1.1	2.5	182.5

[1] Five weeks
[2] Stocks at the end of the years and months shown.
[3] Weekly average of calendar month.
[4] Other than for conversion into any form of finished steel listed above.
[5] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[6] Material for conversion into other products also listed in this table
[7] Revised.
[8] Including 100 tons of direct castings.

Raw Material Markets

Iron and Steel

The pig-iron position becomes increasingly difficult: in some cases it is almost desperate. Moderate tonnages—chiefly of refined iron—are still being shipped abroad under licence, but bigger quantities of other grades are being imported and fantastic prices have been paid.

In one instance as much as £35 per ton is reported to have been paid for Belgian iron. The output of basic iron is fairly well maintained, but all the foundries are now on short commons and it is hinted that some establishments will soon be working a four-day week unless the supply of pig-iron improves.

Sufficient quantities of foundry iron are coming forward to meet current requirements, while ganister, limestone, and firebricks are also available to cover users' needs.

Deliveries of steel semis from Belgium and Luxemburg have been on a slightly better scale, and re-rollers are still preponderantly dependent upon home steelmakers for their supplies of billets, sheet bars, slabs, etc.

These under existing conditions cannot be increased and re-rollers are glad to accept defective billets and bars to eke out their supplies of primes. There is also a vigorous demand for railway axles and any description of scrap suitable for use in the mills.

Non-ferrous Metals

Last week saw a slightly easier trend in commodity prices, and although the decline in non-ferrous metal values was by no means spectacular, it was definitely in a downward direction. Tin led the way with a fall of some £40 in the cash position, while forward metal declined by £25. In New York the quotation remained at $1.06 per lb., but there is a fairly general belief that we shall see this price down to $1.03 before long.

The fall in tin has certainly been spectacular, and it has, of course, occurred very largely because of the tactics adopted in the United States, where the tonnage of tin metal and concentrates, etc., is such that a holiday from buying does not endanger the situation. The London market is evidently still short of supplies, for the backwardation persists and, indeed, is wider now than it was some months ago.

Official tin prices on the London Metal Exchange were as follow:—

Cash—Thursday, £890 to £900; Friday, £880 to £890; Monday, £869 to £871; Tuesday, £875 to £880; Wednesday, £880 to £885.

Three Months—Thursday, £835 to £837 10s.; Friday, £824 to £825; Monday, £827 10s. to £830; Tuesday, £827 10s. to £829; Wednesday, £837 10s. to £840.

On the Continental "grey" market, values have been somewhat easier in copper, lead, and zinc, due probably to the inflence of the changing outlook in Korea. This movement is not, however, expected to go very far. In fact, the popular expectation today is more in the direction of a levelling-up process. On the American domestic market the present level of 24½ cents for copper may very well give way to 27½ cents before long, thus ironing out the difference created by the 3 cents premium demanded for Chilean brands.

In regard to the U.K. price, this could be affected by the higher prices which, it is believed, the Ministry of Supply has paid for modest sized parcels of copper from time to time.

The situation in scrap shows little change, and the institution of licensing has not so far brought any repercussions. Scrap merchants were made a little uneasy at the end of last week by the report that copper futures in New York were cheaper to the extent of 4.25 cents. There was no apparent reason for the fall and the adjustment (for it seems to be little more than that) came at a time when, as already mentioned, a somewhat easier tendency was apparent on the Continent.

From Washington last week came news that the National Production Authority had announced that it intends to take over the allocation of slab zinc in the United States as from August 1. After that date no-one will be allowed to take delivery of slab zinc unless authority has been given.

London Aluminium Management

At the recent annual meeting of the London Aluminium Company, Limited, at Birmingham, a committee of five shareholders was appointed to confer with Mr. Arthur H. Johnson, a former chairman who has accepted nomination for reappointment to this post, on the question of arranging a new management for the company. This step was suggested by Peat, Marwick, Mitchell & Company, appointed last March to investigate the company's affairs, in a circular accompanying the 1950 report and accounts. The circular disclosed that the company had incurred a debit of £188,995.

Mr. Duncan Campbell, chairman and joint managing director, whose resignation, along with those of the remainder of the board, has been placed with Mr. Johnson, in a personal statement at the end of the meeting, said: "I am confident that at the present moment we are operating at a profit and, I think you will find, a very satisfactory profit." There were "colossal" orders on hand, he said.

The company is passing the dividend on the 5½ per cent. cumulative preference shares in respect of the half-year ending June 30, 1951.

Chainmakers' Wage Increase

Workers in the chain industry are to get an all-round wage increase of 10 per cent. This has been agreed to in negotiations between the manufacturers and the Chainmakers' and Strikers' Association, and took effect from Monday last. Mr. A. Head, secretary of the association, said that in the first place the workers applied for a 25 per cent. increase, which the employers refused. The demand was then reduced to 15 per cent., to which the employers replied with an offer of 7½ per cent. Finally the two sides agreed on 10 per cent.

"There has been no need to arbitrate and the agreement confirms the happy relationship between manufacturers and employees," added Mr. Head.

April Output

The index number of United Kingdom industrial production (1946=100) during April, prepared by the Central Statistical Office, is estimated provisionally at 151, compared with a revised figure of 140 for the previous month. Figures for the corresponding months last year were 135 for April and 144 for March. The figures for March, 1951, and April, 1950, were affected by the Easter holidays.

On the basis of information so far received the index for May, 1951, is expected to be 146-147.

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

(Delivered, unless otherwise stated)

July 11, 1951

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £10 17s. 9d.; Birmingham, £10 13s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £12 9s., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 16s. 6d.; South Zone, £12 19s.

Scotch Iron.—No. 3 foundry, £12 7s. 9d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 7s. 6d.; South Zone, £13 10s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 17s. 6d.; South Zone, £14.

Cold Blast.—South Staffs, £16 10s. 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 7s. 6d.; Scotland, £12 14s.; Sheffield, £13 2s. 6d.; Birmingham, £13 9s.; Wales (Welsh iron), £12 7s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 3s.

Basic Pig-iron.—£10 19s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £37 15s., basis 45% Si, scale 14s. per unit; 70/84 per cent., £52, basis 75% Si, scale 14s. 6d. per unit.

Silicon Briquettes (5-ton lots and over).—2lb. Si, £44 2s.; 1lb. Si, £45 2s.

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. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 35s. 6d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent C, £66, basis 60% Cr, scale 22s. per unit; 6/8 per cent. C, £61, basis 60% Cr, scale 21s. per unit; max. 2 per cent. C, 1s. 6¾d. per lb. Cr; max. 1 per cent. C, 1s. 7¼d. per lb. Cr; max. 0.15 per cent. C 1s. 8d. per lb. Cr.; max. 0.10 per cent. C, 1s. 8¼d. per lb. Cr.

Chromium Briquettes (5-ton lots and over).—1lb. Cr, £69 4s.

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., £37 19s. 10d.

Manganese Briquettes (5-ton lots and over).—2lb. Mn, £46 18s.

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

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £17 4s.; tested, up to 0.25 per cent. C (100-ton lots), £17 9s.; hard (0.42 to 0.60 per cent. C), £19 4s.; silico-manganese, £24 6s. 6d.; free-cutting, £20 9s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £22 11s. 6d.; case-hardening, £23 9s.; silico-manganese, £26 14s.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £20 4s.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 9s.; acid, up to 0.25 per cent. C, £23 9s.

Sheet and Tinplate Bars.—£17 6s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £21 3s.; boiler plates (N.-E. Coast), £22 10s. 6d.; chequer plates (N.-E. Coast), £23 8s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £20 1s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 15s.; flats, 5 in. wide and under, £22 15s.; hoop and strip, £23 10s.; black sheets, 17/20 g., £29 13s.; galvanised corrugated sheets, 17/20 g., £43 6s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £37 19s. 3d.; nickel-chrome, £56 6s.; nickel-chrome-molybdenum, £63 1s.

Tinplates.—48s. 3½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £234; high-grade fire-refined, £233 10s.; fire-refined of not less than 99.7 per cent., £233; ditto, 99.2 per cent., £232 10s.; black hot-rolled wire rods, £243 12s. 6d.

Tin.—Cash, £880 to £885; three months, £837 10s. to £840; settlement, £880.

Zinc.—G.O.B. (foreign) (duty paid), £160; ditto (domestic), £160; "Prime Western," £160; electrolytic, £164; not less than 99.99 per cent., £166.

Lead.—Good soft pig-lead (foreign) (duty paid), £160; ditto (Empire and domestic), £160; "English," £161 10s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £180; rolled zinc (boiler plates), all English destinations, £178; zinc oxide (Red Seal), d/d buyers' premises, £178.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £390; quicksilver, ex warehouse, £73 10s. to £74; nickel, £454.

Brass.—Solid-drawn tubes, 24⅛d. per lb.; rods, drawn, 27d.; sheets to 10 w.g., 28⅞d.; wire, 30½d.; rolled metal, 27⅝d.

Copper Tubes, etc.—Solid-drawn tubes, 26⅞d. per lb.; wire, 26ls. 9d. per cwt. basis; 20 s.w.g., —s. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £277 to £281; BS. 1400—LG3—1 (86/7/5/2), £282 to £300; BS. 1400—G1—1 (88/10/2), £350 to £360; Admiralty GM (88/10/2), virgin quality, £350 per ton, delivered.

Phosphor-bronze Ingots.—P.B1, £360 to £390; L.P.B1, £309 to £322 per ton.

Phosphor Bronze.—Strip, 38½d. per lb.; sheets to 10 w.g., 40⅝d.; wire, 43¼d.; rods, 38½d.; tubes, 43½d.; chill cast bars: solids —, cored, —. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 6½d. per lb. (7%) to 3s. 6¾d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 0½d. (7%) to 4s. 0¾d. (30%); to 12 in. wide × .056, 3s. 0¾d. to 4s. 1d.; to 25 in. wide × .056, 3s. 2¾d. to 4s. 3d. Spoon and fork metal, unsheared, 2s. 9½d. to 3s. 9¾d. Wire, 10g., in coils, 3s. 6¼d. (10%) to 4s. 6½d. (30%). Special quality turning rod, 10%, 3s. 5¼d.; 15%, 3s. 10½d.; 18%, 4s. 2¾d. All prices are net.

Obituary

THE DEATH has occurred of MR. HERBERT MALLINDER, who for 49 years was in charge of the steel-moulding shops at the East Hecla works of Hadfields, Limited. Among the many castings for which he was responsible was that of the ship's bell for H.M.S. Sheffield.

THE AMERICAN PRESS reports the death of Dr. H. Ries, an eminent geologist and head of the department covering this science at Cornell University from 1914 to 1937. For a long period he devoted much time to the study of foundry sands and was awarded the A.F.S. Joseph S. Seaman Gold Medal in 1934 and honorary life membership in 1923. He was honoured by the Ceramic Society with honorary membership. He was 79 years old.

MR. FRANK O. EVERARD, for many years works executive director of Belliss & Morcom, Limited, engineers, of Birmingham, has died at the age of 81. Joining the company as an apprentice in 1886, he was appointed assistant works manager in 1897 and works manager in 1899. A civil as well as a mechanical engineer, he undertook the replanning and rebuilding of the company's head office shortly after being appointed works executive director in 1915. He retired in 1948.

AN EMINENT Midlands industrialist, MR. CHARLES THOMAS BARLOW, who in 1919 was a co-founder of Tube Investments, Limited, died on July 1. He began work at the age of 12 for 5s. a week and in 1899 founded the Accles Tube Syndicate, the forerunner of Accles & Pollock, Limited, occupying the post of general manager and joint managing director. He was a founder-director of Birchley Rolling Mills, Limited, from 1919 to 1923, and founder-chairman of British Stampings, Limited, 1923-1943.

Board Changes

ROBEY & COMPANY, LIMITED—Mr. G. W. R. Morley has been appointed a director.

ENGINEERING COMPONENTS, LIMITED—Mr. P. W. C. Griffith has been elected a director.

ASTON CONSTRUCTION COMPANY, LIMITED—Mr. F. Hodges has resigned from the board.

MATTHEW HALL & COMPANY, LIMITED—Mr. S. Kindler has been appointed a director.

MORGAN CRUCIBLE COMPANY, LIMITED—Mr. A. L. Stock has been appointed managing director in place of the late Mr. H. C. Mills.

C. LINDLEY & COMPANY, LIMITED—Mr. T. F. Nash, chairman, has been appointed also managing director, and Mr. R. W. Beken has been appointed a director.

W. H. ARNOTT, YOUNG & COMPANY, LIMITED—Because of pressure of consultant work, Mr. T. H. Gibson has retired from the board. He will, however, continue to be available to the company in his consultative capacity.

INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED—The Honourable Lewis W. Douglas, former American Ambassador to the Court of St. James, and Mr. I. C. Raymond Atkin, vice-president, director and member of the Executive Committee of J. P. Morgan & Company, Incorporated, have been elected to the board.

Sir John Cass College

The prospectus for 1951-52 details the courses provided for obtaining the B.Sc. (Engineering) (Metallurgy) degree of the University of London. For many years, it was the teaching centre for foundry practice, but this subject is now dealt with by other colleges.

CLASSIFIED ADVERTISEMENTS

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

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 VACANT

ASSISTANT FOREMAN wanted for jobbing foundry, Manchester district. Good opportunity for energetic young man; age about 30 years; good prospects. Canteen facilities; Pension Fund.—Write full details of experience.—Box 1096, FOUNDRY TRADE JOURNAL. L

VITREOUS ENAMELLING.—Experienced Man required to take charge of Mill-room. Knowledge of sheet and cast iron enamels, also colour matching.—Box 1065, 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.

TECHNICAL ASSISTANT to Works Manager, for Grey Iron Foundry in North West area, producing iron castings up to 15 cwts. Metallurgical and practical foundry knowledge essential. Good prospects. Pension fund. Replies stating age, experience and salary required to Box 1093, FOUNDRY TRADE JOURNAL.

PATTERNMAKERS required for wood and metal patterns, by highly mechanised foundry in Doncaster area, producing castings for agricultural, textile and mining machinery. Top rates of pay. Canteen facilities. Single men preferred owing to housing difficulty.—JOHN FOWLER & Co. (LEEDS), LTD., Sprotborough Works, Doncaster.

ASSISTANT FOUNDRY FOREMAN for Grey Iron Foundry in Black Country, 25-30 tons per week. Must have thorough floor and plate moulding experience and sound knowledge of pattern-making with ability to prepare plate patterns. Cupola mixtures and sand control essential. Write stating age and giving full particulars of experience and salary expected.—Box 1092, FOUNDRY TRADE JOURNAL.

FOREMAN for Mechanised Foundry in East Anglia, making a variety of castings in green sand 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 service operating. Give details of age, technical and practical training and operating experience to Box 1083, FOUNDRY TRADE JOURNAL.

INDIA.—Planning and Progress Engineer required for large Steel Foundry in Calcutta. Must be competent to introduce and operate an up-to-date system of Planning and Progress from Liquid Steel to finished and fully machined products. Experience in this class of work in a modern mechanised foundry essential. Salary according to qualifications and experience.—Box 1087, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

FLOOR MOULDERS required for Aluminium Foundry in the South Midlands area. For suitable applicants, accommodation could be arranged.—Box 1084, FOUNDRY TRADE JOURNAL.

ESTIMATOR required by Sales Department of Catton & Co., Ltd., Yorkshire Steel Foundry, Leeds, 10. Must have some knowledge of foundry production methods, etc., and ability to read drawings. Write, stating age, experience, and salary required.

WANTED

FOREMAN DRESSER for small Steel Foundry in the North. Output approx. 40 tons per week. Must be energetic young man, capable of running department. Salary start £450 per annum, plus production bonus. Superannuation scheme. Large flat available.—Apply Box 1085, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for Ceylon to take charge of Iron and Non-ferrous Foundry turning out general engineering castings. Must have thorough floor and machine-moulding experience and a sound knowledge of pattern making and preparation of plate patterns. Age not over 35 years. Salary equivalent to £1,300 a year is offered for a man with the desired qualifications. Terms include Provident Fund benefits and periodical furlough.—Write stating age and giving full particulars of experience, etc., to "JU/182," c/o 95, Bishopsgate, E.C.2.

FOUNDRY FOREMAN required for fully mechanised foundry, producing Iron and Steel Castings up to 10 cwts. Applicants must have previous experience of this class of work and be able to organise unskilled operators. The post is permanent, and a good salary will be paid to successful applicant. Single man preferred on account of accommodation difficulties.—Apply Box 1076, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT required for South Midlands. Must have thorough practical experience in electric melting of special steels and alloys to close specification; preferably also sand casting. Able to control labour. A.I.M. or equivalent. Permanent post with good prospects and pension scheme. Good salary, according to age and qualifications. —Write in confidence, Box 1078, FOUNDRY TRADE JOURNAL.

A WELL-KNOWN chemical firm in the Midlands require Technical Sales Representatives who can speak and write French, German or Spanish, to travel various countries abroad. Applicants should have metallurgical background and some knowledge of foundry work. Some sales experience is desirable. There is excellent scope for men who are adaptable, energetic and keen, and very good prospects in return for concentration and application to the work. Apply full particulars Box 1103, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

FOUNDRY ENGINEER, experienced in the design and installation of mechanised steel and iron foundries, required for responsible post with Consulting Engineers in Surrey.—Box 1082, FOUNDRY TRADE JOURNAL.

EXPERIENCED ASSISTANT WORKS MANAGER, with early prospects of promotion, required by Light Castings Foundry in Midlands, melting 200 to 250 tons per week on floor and mechanical plant. Must have technical and practical knowledge, with a progressive outlook and ability to take control.—Reply, stating age, full details of experience and salary required, to Box 1081, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN of proved experience required at once for modern Non-ferrous Foundry in East Lancs., engaged primarily in the production of aluminium sand and gravity die castings of high quality to A.I.D. requirements. Experience also in iron and brass castings would be useful, though not absolutely essential. Good salary with scope for advancement will be given and a suitable house is available. Please state age, detailed experience, and present position, which would be kept in strictest confidence. —Box 1094, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for small Light Castings Foundry in North-West Area. Applicant must be experienced and a qualified foundryman; good disciplinarian, and able to control labour efficiently. The post offers scope for a progressive man with ability to organise and capable of taking responsibility. Replies will be treated as strictly confidential. State age, full details of practical and technical training, positions held, and present salary.—Box 1098, FOUNDRY TRADE JOURNAL.

METALLURGISTS are required at the Research Laboratories of the General Electric Co., Ltd., East Lane, North Wembley, Middlesex, as follows:—(a) Scientific Staff for research and development work on high-temperature materials. Good degree in physics or metallurgy essential. (b) Experimental Staff to assist in the mechanical testing, including creep and fatigue, of high-temperature materials and also for work on metals used in lamps and valves. University degree desirable, but not essential. Applications in writing should be sent to the Staff Manager and should give details of age, qualifications and experience.

STEEL FOUNDRY FOREMAN.—Experience in Dry Sand, and Green Sand Moulding, Core Blowing, Floor Moulding, Sand Mixing and Testing as practised in a modern mechanised Steel Foundry essential. A good knowledge of patternmaking desirable. Candidates must have had at least 5 years in sole charge of a similar foundry. The foundry produces a large variety of castings, chiefly railway locomotive and rolling stock components, from a few lbs. to 5 tons in weight. Apply with full details of past experience and references to Box 1088, FOUNDRY TRADE JOURNAL.

PATENT

NOTICE is hereby given that Sidney Ernest Proctor and Austin Hoy & Company, Limited, seek leave to amend the Complete Specification of the Letters Patent No. 626980 for an invention entitled "Improvements in or relating to coal cutter chains."

Particulars of the proposed amendments were set forth in the Official Journal (Patents) No. 3253, dated 30th June, 1951.

Any person may give notice of opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25, Southampton Buildings, London, W.C.2, on or before 20th July, 1951.

J. L. BLAKE,
Comptroller-General.

PARTNERSHIP WANTED

SMALL Non-ferrous Foundry in the Birmingham area requires a Partner with about £1,000 as capital. Sleeping or active. 8 years' lease still to run. Very good contacts. All replies answered and treated confidentially.—Box 1095, FOUNDRY TRADE JOURNAL.

BUSINESS FOR SALE

FOR SALE AS A GOING CONCERN.—Iron Foundry in South of England. Premises 43,000 sq. ft. Mainly modern ferro concrete buildings, 17,500 sq. ft. Mechanised equipment with key personnel if required.—Box 1054, FOUNDRY TRADE JOURNAL.

FINANCIAL

OLD-ESTABLISHED Midland Firm, with extensive connections, interested in purchasing part Share Capital, with seat on Board, of Grey Iron Foundry. Can place long term contracts of upwards of 30 tons weekly, repetition and jobbing casting work. Small foundry desirous of expanding not objected to.—Box 1059, FOUNDRY TRADE JOURNAL.

AGENCY WANTED

ENGLISHMAN resident N.W. Germany seeks agency for British manufacturers of Foundry Equipment and Materials. Good knowledge of foundry practice and good connections with foundries in W. Germany and Scandinavia.—Box 1097, FOUNDRY TRADE JOURNAL.

MATERIALS WANTED

WANTED—New or secondhand Steel Bars, 1 3/16 in. and 1⅜ in. diameter, 10 to 16 ft. long. Birmingham area.—Box 1099, FOUNDRY TRADE JOURNAL.

REQUIRED—Aluminium Ribbed Pallet Boards (or equivalent) suitable for use on Conveyor Track; 300 off 22 in. x 22 in., 100 off 24 in. x 24 in. State price and delivery.—Box 1104, FOUNDRY TRADE JOURNAL.

MATERIALS FOR SALE

LARGE and Small Rollers. Solid and Laminated Woods. Also turnery in all hardwoods, including Lignum.—MUSTILL, Clifton Road East, Liverpool, 6.

ONE Gravity Roller Conveyor (unused), complete with supporting Trestles. Roller 24 in. long, 2⅜ in. dia. Total length 54 ft. with two left-hand bends. Price £50, ex our works. Full details on application to Box 1090, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

WANTED—Electric Arc Furnace, tilting type, for handling basic material, suitable for 3-phase, 50 cycles supply, and with a charge capacity of between 8 and 15 tons.—Box 1091, FOUNDRY TRADE JOURNAL.

15-20 TON E.O.H. Travelling Crane. Approx. 50 ft. span, 22 ft. lift, cab-controlled.—EIFFEL FOUNDRY CO., LTD., Moss Lane, Walkden.

WANTED

STEEL Rolling Mill complete, suitable for rolling angle sections, flats and rounds, medium capacity. Must be modern and self-contained; entire works premises, including rolling mills, would be considered. Full particulars, etc., to J. F., Box 1089, FOUNDRY TRADE JOURNAL.

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FOR SALE.—Two-ton geared Ladle in good condition. £60.—J. & H. MELLOR, LIMITED, Sefton Street, Hollinwood, Oldham.

TWO LUCAS HARDENING FURNACES, GAS FIRED, AS NEW.—SANDWELL CASTING COMPANY, WEST BROMWICH.

FOR SALE—One "Coleman" R2-type Core-blowing Machine; very little used and in excellent condition.—Box 1105, FOUNDRY TRADE JOURNAL.

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15,000-c.f.m. sheet metal encased Fan, by CHAPMAN ENGINEERING CO. 1¼ in. w.g., 585 r.p.m., 30 in. dia. inlet, vert. upwards discharge 22 in. by 28 in., multivane impeller, arranged to drive from 5-h.p. T.E. motor 400/3/50.

Seven 13,900-c.f.m. sheet metal encased Fans, by R. K. WEBSTER. 3 in. w.g., 802 r.p.m., 27 in. dia. inlet, top horiz. discharge 27 in. by 18 in., multivane impeller, arranged belt drive, will also give 6,000-c.f.m. 1 in. w.g., 434 r.p.m.

Eight 10,000-c.f.m. sheet metal encased type Fans, by MATTHEWS & YATES. 3 in. w.g., 980 r.p.m., inlet 22 in. dia., horiz. bottom discharge 23 in. by 16½ in., paddle blade impeller, arranged for belt drive, will also give 5,000-c.f.m. 1 in. w.g., 500 r.p.m.

Seven 10,000-c.f.m. casing type Fans, by KEITH BLACKMAN. 1½ in. w.g., two bottom inlets 15 in. by 29⅜ in., bottom discharge 24 in. by 26½ in. 4-h.p. at 645 r.p.m. required.

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SKLENAR FURNACE, 1-ton capacity, coke-fired. Tilted electrically. Installed new 1944 for war work. Very little used. Complete with brick canopy. Price £600.—Box 543, FOUNDRY TRADE JOURNAL.

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SUBSTANTIAL capacity available for grey-iron castings up to 2 tons each. Pattern making facilities if required.—JOHN JARDINE, LIMITED, Deering Street, Nottingham.

CAPACITY, substantial, available immediately, fully mechanised Foundry; high quality Grey Iron and Malleable Castings; boxes up to 28 in. by 16 in. by 5 in.; Patternmaking facilities if required.—E. J. WALLACE, 50, Wellington Street, Glasgow, C.2.

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MISCELLANEOUS

PAN MILLS, 4 ft. and 5 ft. dia. underdriven, stationary pans, self-discharging new, for delivery from stock.—W. & A. A. BREALEY (MACHINERY), LTD., Ecclesfield, Sheffield.

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