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Fewer and Bigger

In a Paper* which Mr. V. C. Faulkner presented to an international foundry congress held in Poland in 1938, he included a map showing the number of iron, steel, brass and light-alloy foundries in each of the countries of England, Scotland and Wales. Because we were asked for permission to use this map by a lecturer in foundry practice, we deemed it desirable to examine the current (1950) figures to see whether they were still applicable. The statistics used in both cases were taken from Ryland's Directory. We presume that such lists repeat the name of a firm three times if it makes iron, steel and brass castings, but at least they would be comparable. The grand total at 4,429 is 41 fewer than in 1938, but when detailed, shows that iron foundries at 2,233 are fewer by 24, steel at 155 have gained 13, brass and bronze at 1,573 have lost 91, whilst light-alloy at 432 have gained 61.

Examining the various counties, we find London (no doubt through bombing and concentration during the war) has lost no fewer than 73 foundries. Lancashire has gained three iron foundries, nine light-alloy, as well as 27 brass and one steel foundry. Scotland has remained static so far as iron foundries are concerned, has gained one steel foundry, lost six brass foundries and gained two light-alloy. The Black Country shows gains in each section totalling 25, including a gain of 13 brass foundries. Yorkshire has lost 80 copper-base foundries and 13 light-alloy, but has gained ten iron foundries. The East Midlands have remained virtually static. Because the output of iron foundries has increased to record figures, the lesson of these statistics is that the average size of the works covering this class of work is now much larger than in pre-war days. Arithmetic based on coke deliveries would indicate that the production of iron castings was of the order of 2,500,000 tons per annum in 1938, whereas now it is running close to 3¼ million tons. The former figure is probably low, because coke was then of better quality, whilst the output of heavy castings such as tunnel segments was much greater. Production statistics, of course, only became available during and since the war.

The loss of 80 brass foundries in Yorkshire, 27 in Lancashire and 26 in London, calls for some comment. It may be that they experienced difficulty in getting raw materials and in financing them at the new high levels, the imposition of more stringent specifications by the buyers, or a changeover to, or to a concentration upon, the making of iron castings, for which the demand has been exceptionally pressing. However, it is not a cause for headaches, unless local industries find difficulty in getting adequate breakdown service—which is generally furnished by the small jobbing shops. The one industry for which figures are available is that of steelfounding, where the 1938 output figure was 140,400 tons, whilst during the last few years it has been about 240,000 tons. The light-alloy foundries have increased both in number and output, as would be expected from the growth of the aeroplane industries; yet this is not all the story, as more than half the output of the aluminium foundries is despatched in the form of die-castings. By and large, we think the major factor in the trend towards fewer foundries is the current belief that the larger ones can produce more economically under better working conditions.

* FOUNDRY TRADE JOURNAL, October 6, 1938, p. 249.

British Standards Institution

Cast Iron Smooth-tube Economisers with Pressed Socket Joints

This new British Standard (B.S. 1713:1951) covers cast-iron smooth-tube economisers with pressed socket joints having a maximum water design pressure up to and including 325 lb. per sq. in. (gauge) where the socket joints are not reinforced, and a corresponding maximum pressure of 475 lb. per sq. in. (gauge) where the socket joints are reinforced in accordance with the requirements of this standard.

In the section dealing with construction, formulæ are included for determining the design pressure for economiser sections with pressed socket joints: minimum thickness of headers, tubes, and manifold pipes. Formulæ for determining flange dimensions and the number of bolts and studs to be used are also given. The minimum sizes of studs required for certain pressures are laid down and also the minimum lengths for the tapped holes. Installation requirements and details of the mountings are specified. Inspection during construction is also stipulated, together with details of hydraulic tests. Copies of this standard may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 2s. post free.

Latest Foundry Statistics

According to the Bulletin of the British Iron and Steel Federation for June, employment in ironfounding on May 5 has risen by 162, of whom only 27 were males, as against the April figures. The total reached 151,543 as against 146,978 a year ago. The position in the steel foundries was reversed, and in this section of the industry there were 44 fewer employed. Of these there were 65 fewer males and a gain of 21 females—the total being 19,081, as against 19,139 a year ago. The average weekly production of liquid steel for castings was also lower in May. It was 9,200 tons as against 9,800 in April. The average weekly production of finished castings was 4,800 tons.

An Easy Solution

The Scottish Press has carried a story about objections being raised by housewives to the newer forms of cooking stoves, which having no chimney, allow the aroma from kippers, and the like, to vitiate the atmosphere of the kitchen. It is said that these objections are having a deleterious effect on the market providing the more aromatic foods. It should be remembered, however, that there are on the market really effective "compounds" which completely eradicate odours at their source of production.

Papers on Malleable Iron

Birlec, Limited, of Erdington, Birmingham 24, have issued two Papers in handy form—"Metallurgical Considerations of the Gaseous Annealing of Whiteheart Malleable," by Dr. F. Schulte, and "Gaseous Annealing of Malleable Castings," by P. F. Hancock, B.A. They are reprints from the Journal of the British Cast Iron Research Association and were originally presented at a symposium on malleable cast iron organised by the Association. They are available to our readers on writing to Birlec, Limited.

Conference Paper Authors

A. P. Fenn, A.M.I.Mech.E., is the Author of the Paper on "D.T.D. 424—The Versatile Alloy" (printed on the opposite page). Mr. Fenn served his apprenticeship with the B.S.A. Company. He then entered the employ of the Hillman Motor Company, Coventry, as a designer. After three and a half years in this capacity he joined the Birmingham Aluminium Casting (1903) Company, Limited, in the early part of 1914 in charge of the die design drawing office. In 1929 he opened and managed a new department of the company for the production of light-alloy pistons, being subsequently appointed chief technical and development engineer to the company, a position in which he still serves.

MR. A. P. FENN

R. F. Ottignon, who is development and foundry director of K. & L. Steel Founders & Engineers Limited, is joint Author with Mr. W. B. Lawrie of the Paper entitled "Observation and Control of Dust in Foundry Dressing Operations." (Part I of which is printed on page 99 of this issue.) Born in 1909, Mr. Ottignon was educated at King Edward's Grammar School, Birmingham, and served his apprenticeship at the B.S.A. Company's works. He was then employed for six or seven years on time study and methods at Joseph Lucas, Limited, Birmingham. Subsequently he became works superintendent at the Penistone iron, steel and bronze foundries of David Brown & Sons, Limited, a post which he held for six years. In 1943 he joined his present company and was made a director in 1947. He is also a director of Metalclad Limited of Leeds.

MR. R. F. OTTIGNON

Scottish Industrial Estates

The fourteenth birthday of Scottish Industrial Estates, Limited, on July 18 heralded the start of a new phase in the second "industrial Revolution" which is bringing cleaner, brighter factories and greater economic security to Scotland. Mr. W. C. Kirkwood, general manager of the Estates, said there was a total factory space of more than 12,811,000 sq. ft. In addition, approved applications for new factories totalled 1,024,000 sq. ft. In the last six months 121 applications had been received for new factories or extensions to existing premises. A total of 52,000 people—more than 30,000 of them men—are now employed at Industrial Estate factories and employment will again be increased in the near future when new factories are completed at Port Glasgow, Greenock, Clydebank, Dundee, East Kilbride, and Vale of Leven.

D.T.D. 424—The Versatile Light Alloy*

By A. P. Fenn, A.M.I.Mech.E.

The Paper is intended to show that the aluminium/copper/silicon alloy under consideration, while having in general been used since 1939 in the as-cast condition as a general-purpose material for castings which are only lightly stressed, is actually capable of giving much greater service in the engineering field. After a brief survey of the development of the alloy, it is shown that by various heat-treatments a considerable range of mechanical properties can be obtained, thereby enabling it to be used for a greater variety of applications. The Paper also points out that the alloy is equally suitable for the main three processes used for the production of light-alloy castings to-day, namely, sand casting, gravity die-casting and pressure die-casting, and finally, a brief description is given of the methods used in the manufacture of one of the largest light-alloy sand castings ever produced, in which this alloy played an important part.

Introduction

It is customary in many Papers presented to learned societies and the like for the skill and artistry of man to be the main theme, and in the science of metallurgy and foundry engineering, the skilful handling of high purity, difficult alloys is often used to illustrate the point, that with careful study of all the peculiar characteristics these materials can be handled satisfactorily and good results obtained. This is very important as it is only by the application of the skill of the craftsman in combination with the knowledge of the technician that progress can be made. At the same time, it must be emphasised that, under certain circumstances, much greater progress can sometimes be made by applying some of the skill and knowledge to more-commonly-known materials which may have been used for a considerable time for limited applications only. One aluminium alloy which is possibly among the best known to-day, and which is used by practically every light-alloy foundry in this country, is an example worthy of consideration—namely D.T.D.424. This alloy can be classified as "the maid of all work," for all types of casting where a good all-round casting is desired, but no special qualities are required. At the same time, it is one of the most versatile of light alloys being used to-day.

The alloy was developed at a time when the wrought light-alloy industry was using nothing but virgin ingot and alloying metals in the production of their sheets and extrusions, and the only scrap used was that produced within the mill, such as sheet cuttings and bar ends. At that time, a considerable amount of scrap Duralumin was coming on the market from the many aircraft and engineering works all over the country. There was at that time no quick sale of this material and stocks of wrought scrap were tending to pile up. The late Percy Pritchard very soon visualised that the foundry might be a very useful outlet for this Duralumin "scrap" if it could be adjusted in composition to suit the foundry requirements. He therefore immediately put the necessary machinery in motion to develop an alloy which might be useful in the gravity-die foundries, and in a reasonably short time an alloy was developed which gave very promising results, both as to castability and mechanical properties. The composition of the alloy was:—Cu, 2 to 4; Si, 4 to 6; Mn, 0.3 to 0.7; Mg, 0.15 (max.); Fe, 0.8 per cent. (max.), and Al, remainder.

A provisional patent application was filed on May 5, 1939, covering the alloy, and the complete specification was accepted on May 10, 1940, under No. 521089. In this specification, the preferred alloy within the range was given as having the following composition:—Cu (approximately), 3; Si (approximately), 5; Mn (approximately), 0.7; impurities—not exceeding 1.3 per cent., and Al the remainder.

Shortly after the outbreak of the 1939 war, the Ministry of Aircraft Production expressed a desire that a specification should be drawn up for a secondary alloy which could be used for many aircraft-engine and air-frame castings which were subject to moderate stresses only, thereby saving much valuable virgin ingot, and the newly-formed technical committee of the Light Metal Founders' Association were given the task of putting forward recommendations for such an alloy. Mr. Pritchard, who had taken up the duties of Casting Controller (Light Alloys), offered his alloy, which by that time had been well tested, at the same time waiving all patent rights for the duration of the war. The offer was immediately accepted by the technical committee, a draft specification was drawn up and submitted to M.A.P., and specification D.T.D.424 was issued, which calls for a composition as follows:—Cu, not less than 2 nor more than 4 per cent.; Si, not less than 4 nor more than 6 per cent.; Mn, not less than 0.3 nor more than 0.7 per cent.; Fe, not more than 0.8 per cent.; Mg, not more than 0.15 per cent.; Ni, not more than 0.35 per cent.; Zn, not more than 0.20 per cent., and Al the remainder.

The material was to be supplied in the as-cast condition, and the tensile-test requirements from a standard D.T.D. sand-cast specimen were:—Ultimate tensile strength, not less than 9 tons per sq. in., and elongation, not less than 2 per cent.

In the original D.T.D. specification the manganese content was given as not more than 0.7 per cent. As this permitted the alloy to be manganese free, it was subsequently altered to that given above with a

* Presented at the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen and sponsored by the Aluminium Development Association.

D.T.D. 424—The Versatile Light Alloy

proviso that manganese plus iron should be not more than 1.3 per cent.

Mechanical Properties

The D.T.D. specification calls for the material to be supplied in the as-cast condition only, in view of the fact that no special properties, either mechanical or physical, were required for the duties for which the alloy was intended. During the war period, many thousands of tons of castings were produced in this alloy and nearly all of them were supplied to specification conditions, namely, in the as-cast condition. With all the experience gained with this large production programme, it naturally followed that the alloy should retain its popularity in the foundries and engineering shops when changing over to peace-time products. In this sphere it has again proved its worth for many and varied applications, these parts being usually supplied in the as-cast condition.

The alloy is, however, very responsive to heat-treatment, and its field of usefulness can be considerably increased, and its mechanical properties greatly enhanced, by subjecting the castings to heat-treatment of a suitable nature. A solution treatment, by soaking the castings at 520 deg. C. for a period of 6 hrs. and quenching in hot water or oil will improve the 0.1 per cent. proof stress, ultimate tensile strength and elongation values, and at the same time increase the Brinell hardness of the metal A full solution and precipitation treatment can be given by following the quoted treatment with a low-temperature treatment at 165 deg. C. for 12 hrs. and cooling finally in still air. This full heat-treatment will further increase the proof stress, ultimate tensile strength and Brinell hardness, but reduces the elongation considerably. This loss of elongation would not be detrimental in a large number of applications; it may even be beneficial in some, but should always be avoided where shock loading is anticipated; in such cases the castings in the solution-heat-treated condition would be preferred. The figures in Table I, which are the averages of a large number of tests, illustrate the improvement in mechanical properties that can be obtained.

It is evident from these mechanical test figures that the material is of a very versatile nature and can be so treated to give a very extensive range of properties to suit numerous applications. It is therefore to be expected that the alloy will become even more popular for all types of castings. At this stage reference must be made to the permitted inclusion of magnesium as an impurity. The specification gives this as 0.15 per cent. maximum, but it is advisable to keep the magnesium content below 0.10 per cent. if optimum results are to be obtained. Where it is higher than this latter figure, the elongation suffers, and the alloy is prone to appreciable age hardening. Laboratory tests have shown that in specimens with a magnesium content of 0.12 per cent. that have been subject to ageing at room temperature in the as-cast condition, many changes in mechanical properties have taken place.

In a series of tests of this nature it has been found that the changes have been of the following order:—0.1 per cent. proof stress increased by from 35 to 40 per cent.; ultimate tensile stress increased by from 4 to 9 per cent.; Brinell hardness increased by from 10 to 15 per cent., and elongation decreased by from 40 to 45 per cent.

Solution-heat-treated material of the same composition, subject to the same ageing treatment, at the same time and under the same conditions as the as-cast specimens, gave the following changes:—0.1 per cent. proof stress increased by from 3 to 8 per cent.; ultimate tensile stress increased by from 5 to 7 per cent.; Brinell hardness increased by from 12 to 14 per cent., and elongation decreased by from 5 to 20 per cent. From this information it will be realised that the magnesium content will have some effect on the age-hardening properties of this alloy, even if kept below the recommended figure of 0.10 per cent. Where the material is free from magnesium, such as the alloy produced from virgin ingots, it will be found to possess much superior elongation properties, usually well over 50 per cent. higher than the alloy which contains magnesium.

Stability

It would perhaps be natural to assume from the last paragraph that the alloy is of a somewhat unstable nature if magnesium be present. This is not a true statement of facts, for while age-hardening does take place to a greater or lesser degree, according to the percentage of magnesium that may be present, it is subsequently very stable both in mechanical properties and dimensionally. In cases where it is very necessary to obtain dimensional stability of a high order, for instance in the production of parts for scientific instruments and the like, a special stabilising treatment can be given. It consists of a soak at 250 deg. C. for from 2 to 4 hrs., according to the size and thickness of the casting, and a slow cool in still air. This treatment causes a moderate hardening of the alloy, but all mechanical properties remain stable subsequently. The treatment also relieves casting stresses, thus obviating any liability of distortion after final machining.

The stabilising has been of possibly greater benefit where castings have been produced and used in the

TABLE I.—*Improvement in Mechanical Properties secured by Heat-treatment*

	Sand cast.				Gravity die-cast.			
	0.1 per cent. Proof stress	U.T.S.	Elongation per cent.	Brinell.	0.1 per cent. Proof stress	U.T.S.	Elongation per cent.	Brinell.
As-cast	4.0	9.5	2	60	4.5	11.5	3	70
Solution heat-treated	5.5	12.0	3	70	6.0	15.5	6	75
Fully heat-treated	16	17.5	—	100	18	21	1	110

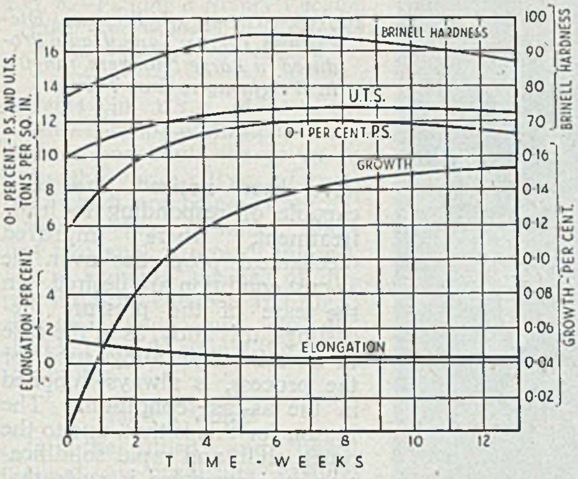


FIG. 1.—*Effect of Ageing on D.T.D. 424 Material in the As-cast Condition; samples held at* 150 *deg. C. for* 8 *hrs. per day.*

as-cast condition as engine parts, which are subject to continuous rise and fall in temperature, varying during every 24 hrs. between normal atmospheric temperature and 150 deg. C. and sometimes higher. Under working conditions, a certain growth appeared to take place and to check up on this tests were put in hand, using 6-in. test-pieces accurately machined to length. A certain number of these were checked at room temperature over a 13-week period and no variation could be measured. The remainder were heated up to 150 deg. C. for 8 hrs. each day and allowed to cool slowly. They were carefully measured every week and three specimens were taken at random each week for mechanical testing. At the same time, a similar number of specimens were prepared and treated in the same way after stabilising.

The benefits to be derived from so simple and inexpensive a treatment, both for mechanical and dimensional stability, are graphically shown in Figs. 1 and 2, the former showing the results obtained on material in the " as-cast " condition, and Fig. 2 the same material after stabilising.

Corrosion Resistance

From the viewpoint of practical applications of an alloy, a further important aspect for consideration is the corrosion resistance of the material under normal exposure conditions. Aluminium alloys as a general class offer very good resistance to normal atmospheric corrosion, therefore any reference to " 424 " under this heading would create comparisons which are unjustified, and which may be detrimental to other alloys. On the other hand, when the conditions are somewhat abnormal, such as in heavily-polluted industrial atmospheres, tests have shown that the alloy under consideration stands very well in the top group of light alloys. Again, the same can be said where the alloy is exposed to road wash, as in automobile construction. One well-known automobile manufacturer, after careful testing, wrote:—

From further contacts and experience we do not now feel that there is any tangible hazard in using this alloy in positions exposed to the contact of anti-freeze agents which are used on winter roads.

Laboratory tests carried out under controlled conditions in a salt-spray cabinet, which is a very severe type of test, has shown that the D.T.D.424 alloy is only slightly inferior to the " Alpax " alloy 2.L.33, which, for a long time, has been much used by Admiralty engineers.

Other Applications

In the consideration of the value of any material or alloy, a clear indication can usually be obtained by investigation of the ultimate use to which the castings are put, and the service that is obtained from them. The alloy under consideration eventually finds its way into a greater variety of applications than any other light alloys. It has proved its value in many parts of automobile assemblies, including water-cooled cylinder heads, which operate under stress at elevated temperature, clutch parts and gear boxes, differential axle casings, brake shoes, and a multiplicity of small and less-important components. In the building industry it is used for many applications, among the foremost being, possibly, cast guttering and rainwater fittings, in the production of which some thousands of tons have been used, as well as all types of domestic and office fittings and fixtures. Examples could be given in a similar manner for electrical engineering, mechanical-tool production, precision instruments, heavy engineering, agriculture and the like. The foregoing should, however, be sufficient to establish the fact that there is scarcely any industry which uses light alloys, where D.T.D.424 material does not play some very useful part.

Production

In the light-alloy foundry industry there are three well-known methods of producing castings,

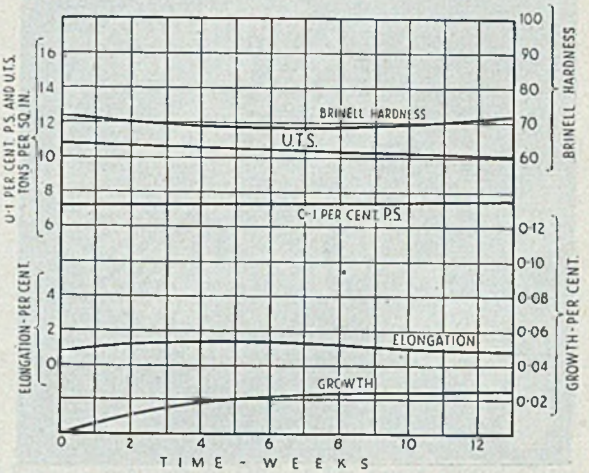


FIG. 2.—*Effect of Ageing on Stabilised D.T.D.* 424 *Material; samples held at* 150 *deg. C. for* 8 *hrs. per day.*

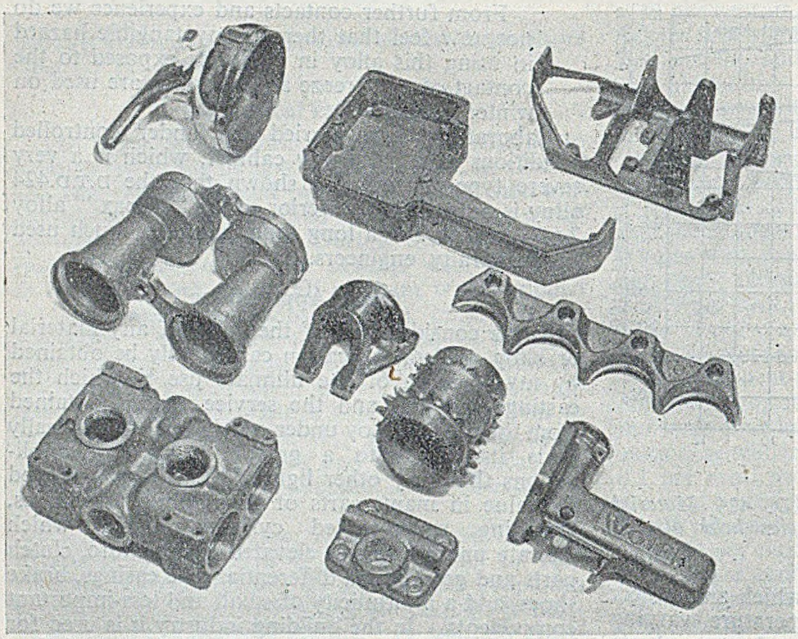


FIG. 3.—*Group of Pressure Die-castings of the Type Daily Produced in Large Numbers, ranging in Weight up to 6 or 7 lb.*

namely, by the use of (*a*) sand moulds, (*b*) gravity dies, or, as is termed in America, permanent moulds, and (*c*) the pressure die-casting process. These processes are so well known throughout the foundry industry as to make it quite unnecessary to elaborate on them or to attempt to describe the processes in detail. It is sufficient to state that they are each entirely different processes, requiring in many respects different characteristics in the alloy used. Such, however, is the versatility of D.T.D.424 material that the alloy is really "at home" in all three methods of production. Sand castings and gravity die-castings, as will already have been noticed, are both capable of responding to heat-treatment, where improved mechanical properties over the as-cast condition are desired. In the case of the pressure die-castings, this alloy, as in the case of all other light alloys used for the process, is always supplied in the as-cast condition. The reason for this is that, due to the quick chill, and rapid solidification, the structure is such that little or no improvement of mechanical properties can be obtained by any subsequent treatment.

In the pressure die-casting field, castings of all types and sizes can be produced by the cold-chamber process, using D.T.D. 424 alloy covering, as has already been mentioned, practically all industries as well as domestic uses. Fig. 3 illustrates a few of the types of pressure die-castings that are daily being produced in very large numbers. Castings produced by this process range in weight from fractions of an ounce to between 6 and 7 lb.

Gravity die-castings in this alloy are also employed for a multiplicity of applications, and it would take up too much space to deal with these in any detail. It is sufficient to say that practically every mechanically-propelled vehicle on the road to-day carries a number of die-cast com-

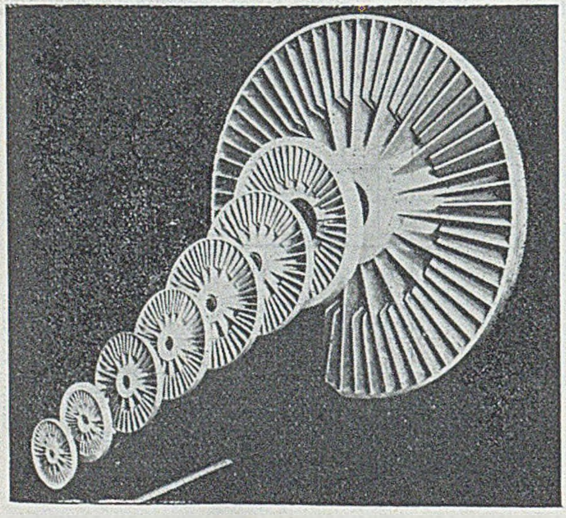


FIG. 4.—*Range of Sizes of Fluid Drive Wheels, Gravity Die-cast in D.T.D. 424 Alloy.*

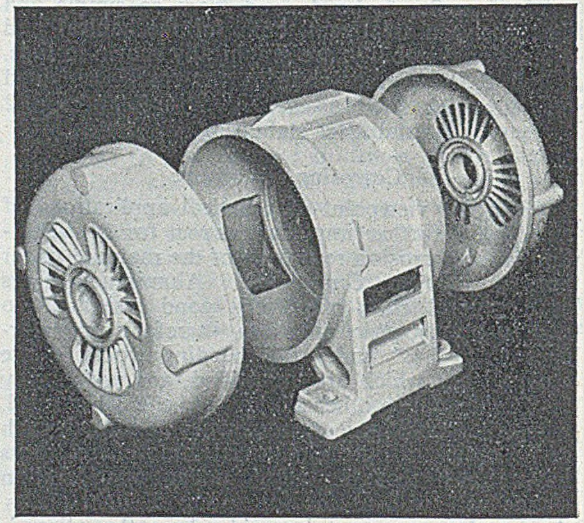


FIG. 5.—*Gravity Die-cast Body and End Shields for a Fractional-h.p. Electric Motor.*

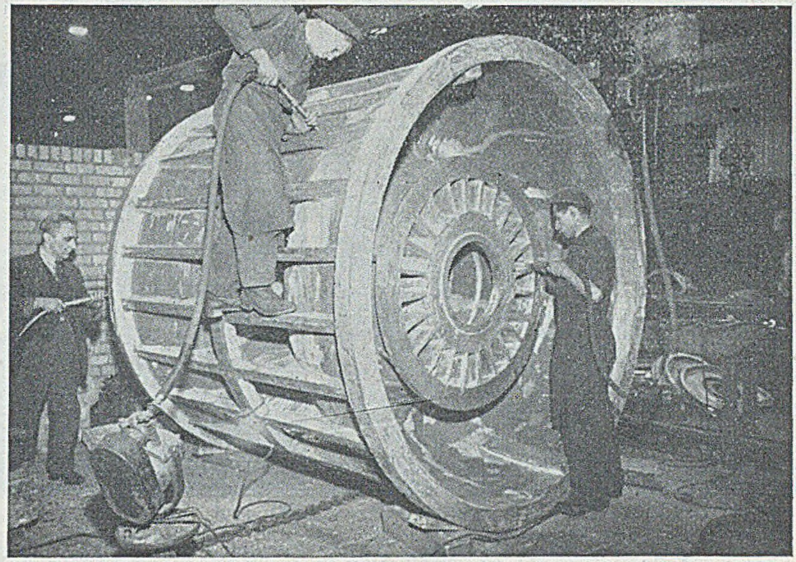


FIG. 6.—*Fettling a Rotary Vacuum Filter Casing made in D.T.D.424 Alloy; As-cast Weight, 10,800 lb.*

ponents in D.T.D. 424 alloy. Again, if space permitted, many illustrations could be given to show the various types of castings which are being produced; however, Figs. 4 and 5 show just two applications of interest, Fig. 4 showing a range of die-cast fluid-drive wheels and Fig. 5 the main body and two end shields of a fractional-h.p. electric motor.

Sand Castings

Of the third and oldest method of producing castings from sand moulds, the alloy has been, and is being, used in considerable quantities for all types of castings of various designs and in all sizes and weights varying from a few ounces to many hundreds of pounds. In fact, two of the largest aluminium-alloy castings ever made in this country were recently produced in D.T.D. 424 alloy. They were rotary vacuum filter casings for use in ammonia-scrubbing plants, the size of which can be judged from Fig. 6, which shows one of the castings being fettled. The outside diameter of the casting is 7 ft. 9 in., height 7 ft., the net weight of the finished casting, as delivered from the foundry, being 7,207 lb. The production of these castings in the alloy under consideration is a further point illustrating the versatility of the alloy. At the same time, it is felt that from the foundry angle alone this casting is of sufficient interest to warrant a few details being given of the methods of production.

Rotary Vacuum Filter Casing

The pattern for the filter casing was fully segmented and complete in itself so that no strickles were employed. Full advantage was taken of existing patternmaking machinery for producing the pattern in 12 sections, which were bolted together into four units for ease of transport and handling. Nearly four standards of timber were used in the production of pattern and coreboxes.

The moulding box was made in four sections, three comprising the drag and one the cope. Owing to the height of the casting, the mould was rammed-up in a pit of such depth that when pouring the casting the top of the mould was at a convenient height from the foundry floor. The bottom section of the drag had four steel channel sections bolted on to form a base on which securely to fasten the cores. This section was carefully levelled and the pattern bedded therein with great care to ensure that it was vertical, this being essential for ease and accuracy of assembly of cores and mould. The remainder of the mould was then rammed up.

Mould and Core Assembly.—In assembling the mould and cores after the pattern had been withdrawn and the mould surface finished and dried, the first main body core, which was approximately $3\frac{1}{2}$ tons in weight, was located and set in the base of the mould. The setting of this core was of extreme importance, since in its construction 24 metal cups had been accurately positioned to form the internal location for the radial cores which produced the ports. These radial cores, which were made in sea-sand, were each located by means of a metal dowel in the 24 cups in the main core, with an additional location at the outside periphery, at the top and bottom of the mould respectively. Fig. 7 shows the assembly of these cores. Four additional main body

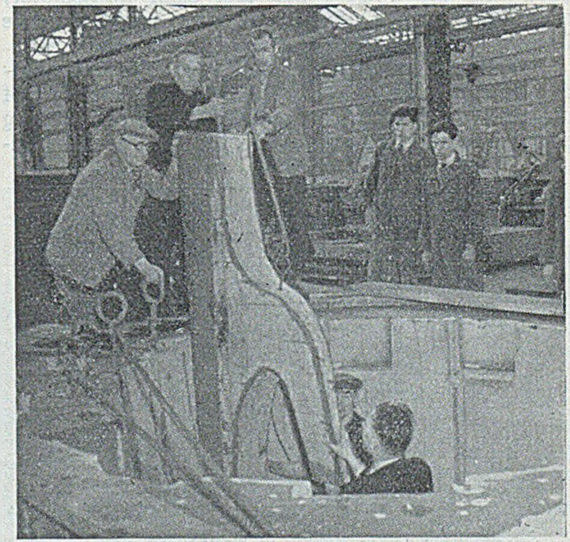
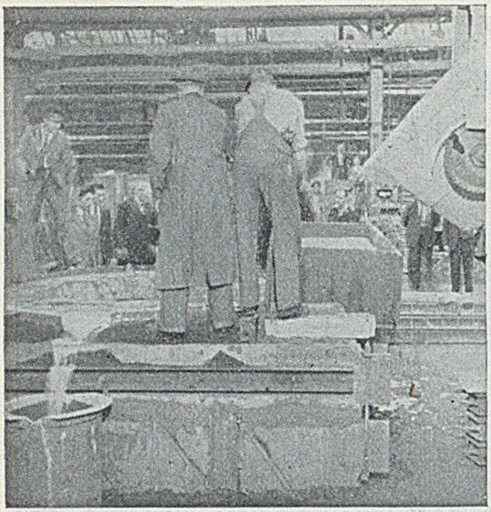
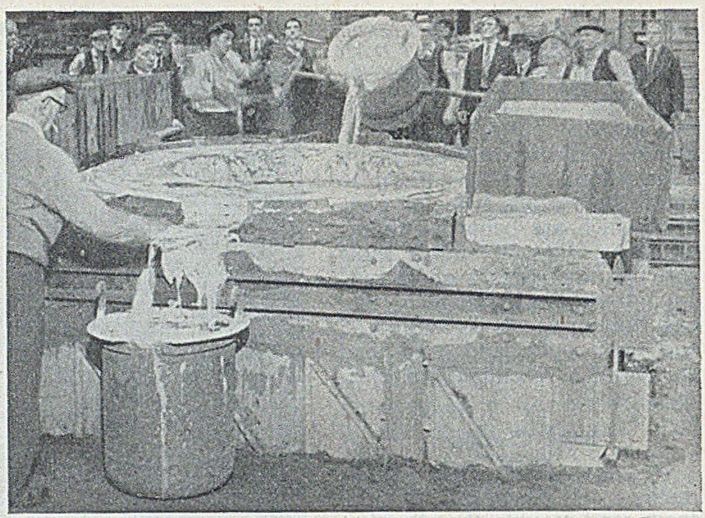


FIG. 7.—*Insertion of One of the Large Radial Cores during Mould Assembly for the Vacuum Filter Casing.*





FIGS. 8 AND 9.—*Casting the Mould for the Vacuum Filter Casing. Note the Use of a Run-off Pot (shown in the foreground). The second illustration shows Pouring Completed and Topping-up from a Smaller Ladle in Progress. The job took 2 min. to Cast.*

cores, all produced in natural-bonded sand, were assembled to form the centre profile, and these were eventually held down by four long bolts, which passed through the base core to the steel channels referred to earlier. This was considered essential to avoid a possibility of lift or movement during the pouring.

Closing.—The top moulding box was next placed in position, and two large git boxes were placed in position on opposite ends of the mould, each covering two down gates, the two boxes having a total capacity of 12,000 lb., which was actually sufficient to run the casting. In the base of these boxes metal cups and plugs were inserted, each immediately above one of the down-gates, thus preventing the flow of any metal into the mould until desired.

Pouring.—Not the last of the problems in producing a casting of this type and size was that of maintaining a sufficient head of metal for feeding purposes and a careful control of the metal temperature. The metal was melted in a 6-ton reverberatory furnace and was tapped into two geared ladles simultaneously. From these, the two git boxes, or bushes, were filled, the stops preventing any metal from reaching the moulds. The large ladles were then replaced by two smaller ones carrying a reserve of metal in case of necessity, and also to provide an adequate supply of feed metal for the open ring-riser on the top of the casting.

When the metal in the runner boxes was at the correct temperature, the four stops were withdrawn and the casting was run. Fig. 8 shows the mould at the time of casting, and Fig. 9 the topping-up of the ring-riser after casting. The actual time taken to fill the mould was 2 min., the metal temperature at the time of casting being 700 deg. C. As one would expect, extensive chilling was applied where rapid changes in metal sections occurred. The total weight of the job cast was 10,800 lb. and weight of the finished casting 7,207 lb., the weight of the sand used in the production of the mould, cores, etc., being approximately 51½ tons. Fig. 10 shows the finished casting loaded ready for despatch.

Acknowledgement

In conclusion, the Author wishes to express his thanks to the directors of the Birmingham Aluminium Casting (1903) Company, Limited, for permission to publish this Paper, and to his colleagues for their ready assistance in the preparation of the illustrations and graphs.

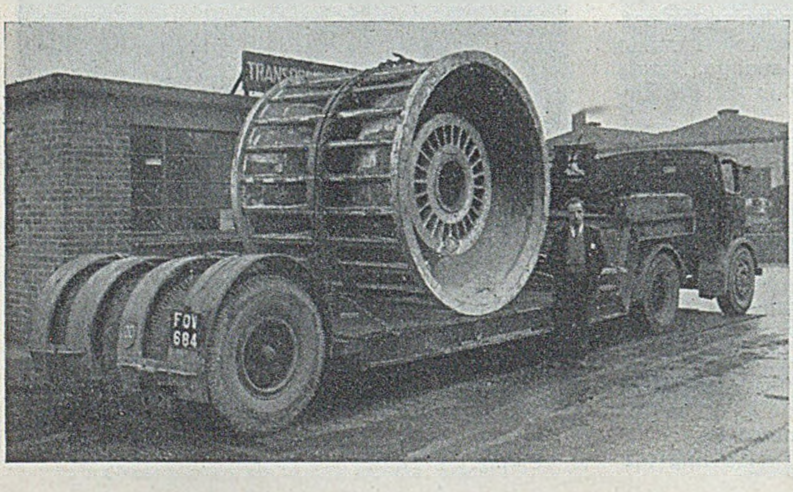


FIG. 10.—*Vacuum Filter Casting (Finished Weight 7,207 lb.) loaded for Despatch by Road.*

Steel Company of Wales Limited

As briefly announced in last week's JOURNAL, *on July 17 the Chancellor of the Exchequer formally opened the great integrated works of the Steel Company of Wales Limited. Given suitable raw materials, the plant will produce 30,000 tons of steel ingots per week, from which will be rolled approximately 3,500 tons of rails and railway material and 22,800 tons of sheet and plate.*

Immediately after the war the Iron and Steel Federation presented to the Minister of Supply plans for the reconstruction projects under consideration throughout the steel industry of the country. The board recommended that projects to the extent of £240,000,000 should be approved and that of this sum £60,000,000 should be for the reconstruction project in the South Wales sheet, steel and tinplate industry. Under the chairmanship of Mr. E. H. Lever, the four founder companies, Guest Keen Baldwins Iron & Steel Company, Limited, Richard Thomas and Baldwins Limited, John Lysaght Limited, and the Llanelly Associated Tinplate Companies, Limited, pooled certain of their resources calculated at a value of more than ten million pounds, including a steelworks at Port Talbot and Margam, 18 tinplate works in West Wales, and a sheet works at Newport.

The plan was to reconstruct and enlarge the blast furnaces, coke ovens and coal- and ore-handling plant at the Margam steelworks, in order to produce the greater tonnage of pig-iron required, and to erect adjacent to the Margam works, a new 80 in. continuous strip mill, together with a melting shop and ancillary plant, making one integrated works which would, when completed, extend for 4½ miles, and the estimated steel production of which would be 1½ million tons of ingots per year. As an essential part of the scheme there were to be two cold-reduction mills and a modern tinplate plant. One of these cold mills was placed alongside the continuous mill at Margam, while the other, together with the tinplate plant, was located at Trostre, near Llanelly.

Works in Operation

Blast Furnaces.—The blast furnaces have been considerably enlarged in order to provide sufficient pig-iron to feed the Abbey melting shop in addition to the shops at Port Talbot and Margam works. No 1. Furnace (hearth diameter 21 ft. 6 in.) was blown-in in 1946 and has a capacity of 700 tons per day. No. 2 (formerly 16ft. dia.) was completely dismantled and a new 25-ft. 9-in. furnace erected in its place, the new furnace being blown-in on November 7, 1950. The day after No. 2 furnace came into operation, dismantling commenced on No. 3 furnace (also 16 ft.) and now the old furnace has been completely removed and the foundations completed for a new 25-ft. 9-in. furnace. Nos. 2 and 3 furnaces each have a capacity of 1,000 tons per day using foreign ore. Fig. 1 shows the new No. 2 furnace. A new Lodge-Cottrell gas-cleaning plant and an additional pig-casting plant have also been installed.

Coal and Coke.—To provide sufficient coke for the blast furnaces, it has been necessary to build a further 90 coke ovens in addition to the 54 already in operation. These ovens will produce about 15,000 tons a week of coke from about 22,000 tons of coking coal from Garw, Llynfi, Ogmore, Afan, Duffryn and Rhondda valleys, as well as a certain amount from Monmouthshire. Of the 90 new ovens, 60 have been in operation since March 1 this year, and a newly-completed by-product plant is in operation.

Home ore from Oxfordshire and limestone from the company's own quarry at Cornelly (about 6 miles away) is supplemented by foreign ore. To unload the foreign ore required for the blast furnaces, three new transporter unloaders are being installed.

Steel Shops.—In the old melting shops at Port Talbot and Margam works, the open-hearth

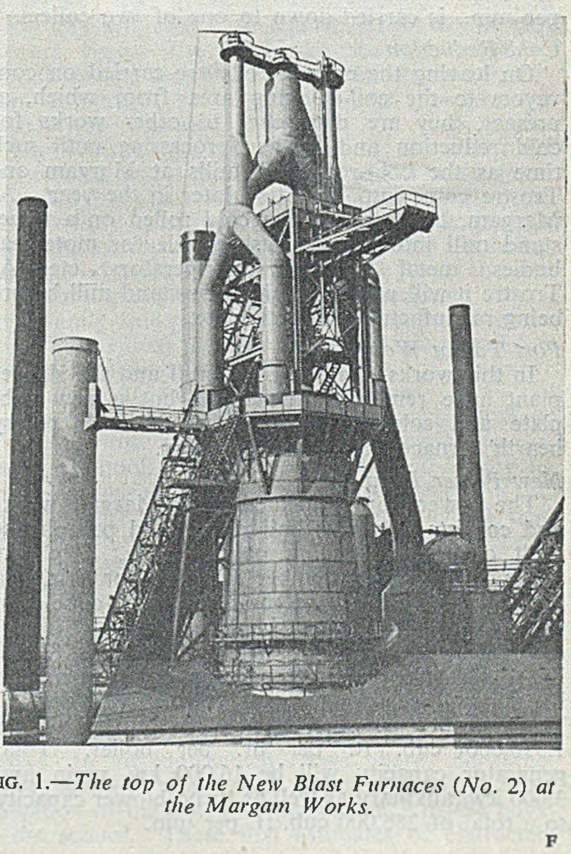


FIG. 1.—*The top of the New Blast Furnaces (No. 2) at the Margam Works.*

Steel Company of Wales Limited

furnaces are being reconstructed one at a time as 80-ton fixed furnaces. Each of these shops has six furnaces. So far four furnaces have been re-built in the Port Talbot shop and five in the Margam shop. At Abbey works melting shop. the hot metal from the blast furnaces is, on arrival, poured into one of two 800-ton mixers. In this shop there will be eight 200-ton fixed, oil-fired furnaces of which four are in operation.

When teeming, all the ingot moulds stand on bogies and the largest ingot cast will be 20 tons. Cleaning and preparation of moulds is carried out in a separate building.

Ancillary sections re-built or re-equipped include an ingot stripper bay and soaking pits; slabbing mill; vertical edger and shears; slab yards; and reheating furnaces.

80-in. Continuous Strip Mill

On emerging from the reheating furnace, a slab is carried on rollers to the hot strip mill. This broadside mill can accommodate the slab sideways if it is required to increase the width up to 72 in. There are 54-in. back-up rolls and 42-in. work rolls with 130-in. barrels.

After passing through a crop shear there are six finishing stands with pinch rolls feeding into each, the back-up rolls being 54 in. and the work rolls 27 in. On emerging from the last finishing stand, the strip, travelling at a speed of up to 2,000 ft. per min., is carried down to one of two coilers.

Cold Reduction

On leaving the coilers, coils are carried on conveyors to the coil-stocking area from which, at present, they are dispatched to other works for cold reduction and further processing until such time as the cold-reduction mills at Margam and Trostre come into operation later in the year. At Margam, the strip will be cold rolled on a three-stand mill into wide sheets suitable for motor-car bodies, metal furniture, refrigerators, etc. At Trostre it will pass through a five-stand mill before being manufactured into tinplate.

Port Talbot Works

In this works, the 32-in. bar mill and the sleeper plant have remained unchanged but a new fish-plate and soleplate plant equipped with rotary hearth furnaces have been installed.

New Power Plant

The power plant is located in the Margam works and consists of a new boilerhouse and pumphouse built on to the existing power house. The new boilers are four in number designed for firing on blast-furnace gas as the main fuel and coke-oven gas and oil fuel when blast-furnace gas is not available. The capacity of each boiler is 87,500 lb. of steam per hour at a gauge pressure of 625 lb. per sq. in. and a temperature of 820 deg. F. The quantity of blast-furnace gas burnt will be 1,350,000 cub. ft. per hr. per boiler. Total generator capacity will be 16,000 kw. main and 3,600 kw. auxiliary as well as turbo-blower capacity to a total of 266,000 cub. ft. per min.

C. A. Parsons Director Honoured

On November 23, the foundation day of the University of London, a well-known industrialist will receive an honorary degree. He is SIR CLAUDE DIXON GIBB, chairman and managing director of C. A. Parsons & Company, Limited, Newcastle-upon-Tyne, since 1945, and he will receive the D.Sc. Eng. Sir Claude is also chairman of A. Reyrolle & Company, Limited, metal-clad switch-gear manufacturers, etc., of Hebburn. Born in Adelaide, Australia, he joined the Pilot Australian Flying Corps in 1917 after completing his education at the South Australian School of Mines, University of Adelaide; he returned there in 1920 as senior research assistant in the university's engineering laboratory. He came to Newcastle-upon-Tyne in 1924 to join C. A. Parsons as chief engineer and a director. In 1940, he became engineering assistant to the Director-General, Munitions Production, subsequently becoming deputy to the Director-General.

Sir Claude is the author of several papers to the Institution of Mechanical Engineers.

George Kent Board Changes

One of two new directors appointed to the board of George Kent, Limited, the Luton engineers and meter manufacturers, is MR. WALTER A. H. MAY, who is a great-grandson of the founder of the firm. He joined the firm in August, 1938, as personnel manager and returned, after nearly seven years in the Royal Engineers during the war, in 1946. Mr. May is now administration manager.

The other new director, MR. L. A. C. BARTLETT, has been with George Kent, Limited, for 25 years, entering the firm as an apprentice. After service in most of the departments of the firm he was, in 1939, placed in charge of research on automatic control systems. During the war he was responsible for the handling of Admiralty contracts and was appointed sales manager at Luton in 1945. Several months ago he was made commercial manager.

Promotion on Return

Last year MR. A. J. BEELEY, a director of Plowright Bros., Limited, engineers, iron and brass founders, etc., of Chesterfield, was granted temporary leave from the company to assist the Paul Weir Company, of Chicago, with a portion of its assignments as consultants to the Turkish Government. Now, on his return to this country, he has been appointed managing director of the company.

THE RETIREMENT OF MR. D. N. TURNER from his pasition as chairman and from the board of the Staveley Coal & Iron Company, Limited, came into effect at the end of last month, when he also vacated the chairmanship of the Staveley Iron & Chemical Company, Limited.

Apprentice Training

Details of "Allied" Scheme in Scotland.

The following gives an outline of the measures adopted in one particular organisation—the "Allied" group of foundries—to tackle one limited aspect of the question of providing a supply of effectively-trained moulders. These measures are believed to be a realistic attempt to meet the problem at least in part and to counter the present trend of drift away from the moulding trades.

Object of the Scheme

In general terms, the object of the scheme is to provide a balanced supply of moulders for the years ahead and, at the same time, to encourage apprentices to develop along lines of conduct which will assist them to take a worthwhile place in the team of which they will eventually be a part.

The approach to the problem was made by considering three closely-related aspects; recruitment, training and placement. It was agreed that the training proper was the pivot round which the scheme as a whole would revolve, but it was recognised that without adequate measures being taken to encourage a reasonable flow of recruits in the initial stages and without a realistic follow-up, the success of the scheme would be prejudiced.

A review of the recruitment of moulding apprentices into the works of Allied Ironfounders Limited in Falkirk during the three years prior to the introduction of the scheme revealed an unsatisfactory situation. Not only were there insufficient numbers coming into the trade but too many of those who did embark on moulding apprenticeships left before their apprenticeships were completed. This situation was of course not peculiar to the "Allied" concern who were in no worse a position than other employers in the district in this respect.

Encouraging Recruitment

Early experience revealed that aspects secondary to the question of training would have to be given greater weight than was first believed necessary. The existence of good working conditions and amenities and of reasonable prospect of permanent and remunerative employment had to be proved before any further approach could be made. A great deal of publicity has had to be directed to the parents of potential apprentices and particularly if those themselves had experience in founding, in an effort to prove that a serious attempt was being made to improve the standard of working conditions and to provide amenities in the various foundries. At the same time it was necessary to present an outline of the proposed training programme and to underline its advantages over previous methods.

Among persons most interested in the programme, whose comments were sought, were the working moulders employed in the shops, the trade union concerned and the foremen into whose shops the boys would go. It was considered essential that those persons were made aware of what was being done and that they were assured that the training would be better than it had been in past years. Visits to the training centre and a series of discussions with the programme planners served to provide information and to remove doubts.

Prospects

The question of prospects for the future was one which concerned principally the parents of potential apprentices and to a lesser extent, the boys themselves. Allied Ironfounders Limited were able to say in all honesty that they believed there would be a job for each apprentice at the end of his training, and for many years to come this situation would continue. It was pointed out that, rather more important than that, the scheme would ensure that the jobs offered to the boys were those most suited to their capabilities. A fully explanatory brochure was produced and distributed to schools and employment exchanges, outlining what was proposed. A representative of the employers visited the local schools and spoke to school-leavers, and the co-operation of the education authorities through the youth employment service was requested and given.

The scheme was advertised fully in the local papers and works and shop delegates were given an opportunity to visit the school and to have the scheme fully explained. At a later date, parents and friends were given an opportunity of seeing the type of work carried out by the boys and the conditions under which they were working. Every opportunity was granted for suggestions and questions. Individual parents were interviewed and the scheme explained in detail.

Acceptance of Apprentices

As a result of all these measures, a steady flow of applications was received for admission to the training school. Despite the previous difficulty in obtaining apprentices and the apparent swing in the opposite direction, admission to the school was restricted to those boys who would best benefit from the type of training which was being made available. Certain standards were laid down regarding the qualities which, it was felt, were essential both as regards school performance, general suitability of the boy, and the likelihood of his fitting into the scheme. A comprehensive interview was carried out with each boy, supported by intelligence and aptitude tests, enabling the employer to decide which boys were desirable apprentices and which were not, and giving a good indication of the potential performance of the boys at the school. These first estimates of character

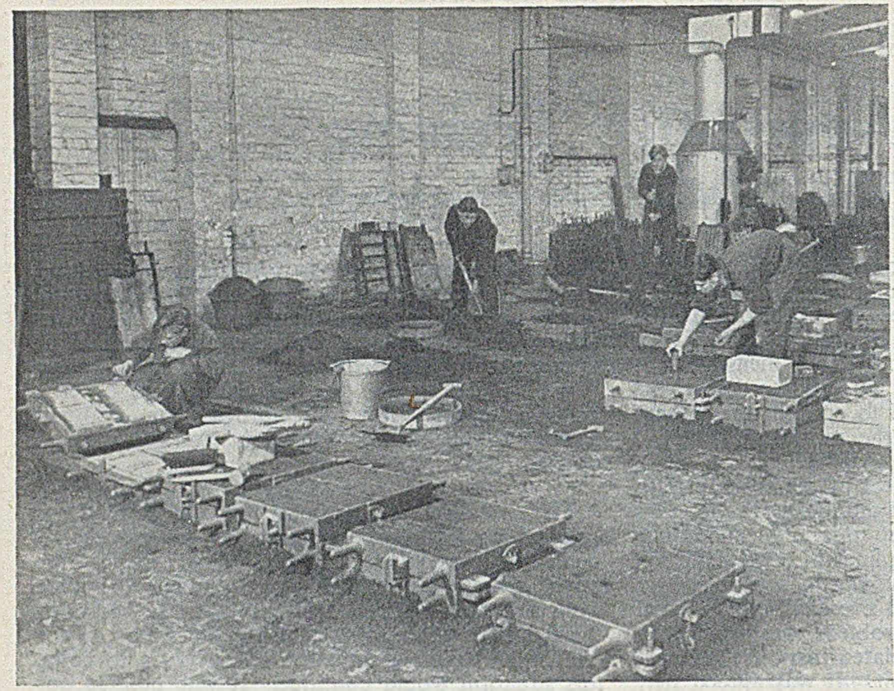


FIG. 1.—*Boys at work in a Section of one of the Shops of the "Allied" Apprentice School at Falkirk.*

and ability have since proved to be very accurate.

The over-all requirements of the foundry in respect of various grades of tradesmen had been established early in the planning stage. It was therefore possible to control to some extent the intake to make these requirements. Boys are accepted initially into the school on a month's probation at the end of which they are free to leave if they are so minded. The employer can also take advantage of this opportunity to dispense with services of an unsatisfactory apprentice. In only very few instances has advantage been taken of this opportunity on either side. At this stage, too, an indenture form is completed, binding both employer and apprentice for five years. Only one case has arisen of a boy wishing to break this agreement

New Outlook on Training

In planning the scheme, the responsible persons had kept before them the idea that each boy should be given an opportunity to make the greatest use of his natural gifts. He should be encouraged to find his own level of ability and be offered employment finally in the job which is most likely to make use of his talents and give him the greatest job satisfaction.

The first impact of the acceptance of this maxim has been the recognition of the need for a break-away from what has been, in this district at least, the traditional method of training apprentice moulders. This break-away has taken several forms, the most important of which is the establishment of a school external to the production departments of the various works, staffed by full-time training supervisors, selected, not only for their knowledge of the craft and their wide experience, but for their ability to instruct and make friends with groups of young men.

Emphasis on Quality

The second change of outlook which has had to be accepted is the subordination of production considerations to the demands of training. The attitude which has very properly been adopted is that the school has been established to produce trained craftsmen and not as an additional production department. This has not meant that the work on which the boys are engaged is unrelated to the type of work on which they will eventually be employed. Patterns and plates are supplied from the shops of the local works and the castings produced by the boys find their way into finished goods sold to the public in the normal way. What it has meant is that in the early stages, no pressure is exerted on the boys to lay down specific numbers of boxes simply for the sake of boosting production. The emphasis is rather on the quality of casting produced. The speed of assimilation of instruction is also closely studied and progress controlled accordingly. Fig. 1 shows some boys at work in a section of one of the shops.

Theoretical Instruction

A further influence of the maxim accepted is the introduction of formal theoretical instruction designed to amplify and explain what has been taught on the shop floor. The syllabus of the City and Guilds of London Institute has provided a standard on which the lecture courses have been based, and while it is not considered that all the apprentices will achieve a standard high enough to enable them to qualify for a City and Guilds certificate, the value of a course of lectures set at a somewhat lower standard has in this case been fully established. Those boys whose ability and interest suggests that they can go further in their theoretical training receive more advanced instruction from suitably-qualified people.

Two further changes in what has been previously accepted standard apprentice-training practice are worth commenting upon. A close watch is kept on the health of the boys and the staff of the school conduct a physical-training programme designed to assist the development of the apprentice to meet increasing physical demands. In addition, the size of boxes, etc., being handled at each stage of the training is carefully controlled with a view to eliminating some of the causes of muscular strain. These steps are closely linked with efforts to provide a high standard of general working conditions.

Value of "Belonging"

Subject matter of interest to employees of the particular concern and of purely educational value has been included in the training programme, for two main reasons: First, it is felt that one must encourage in the apprentices a feeling of "belonging," and to this end a lecture programme has been devised, among which are presented the story of the "Allied" organisation, Allied Ironfounders, its history and products, a general picture of the industry and the place of the group in it, and so on. Also included are outlines of some of the industrial problems which, it is felt, should be presented in a simple form to the boys.

Current Affairs

Secondly, it is believed that any scheme which serves to awaken the interest of the boys in what is going on about them will serve a useful purpose. Monthly lectures on current affairs have therefore been included in the programme. The subject is chosen by the boys, and both they and the lecturer prepare some notes and meet at a later date to discuss the matter. A short "quiz" is then held so that points of interest which have arisen can be elaborated. It might be said that if for no other reason than that it relieves the tenor of the practical and theoretical instruction, the introduction of this type of lecture is worthwhile.

Individual Treatment

The length of time spent at the Training School varies with the ability of individual boys, but in general the training period will be two years. During that time, graduated and progressive practical instruction is given to the boys, the rate of progress being controlled entirely by the ability shown.

Each boy is given separate consideration, and at the end of the first year's training his position is reviewed and his future training decided on the basis of his record. At this stage the apprentices are classified into one of two grades, each of which subsequently follows a separate course of training wherein the rate of progress is again controlled by individual performance.

Practical instruction covers simple and general plate moulding; snap-flask moulding; simple and advanced loose-pattern work, rain-water and soil-pipe connections, bends and branches, gutters, furnace pans, engineering castings (plain and cored), cupola operation and maintenance. Theoretical instruction (in the form of lectures, films, film strips, etc.) includes sand-preparation and testing, casting defects, furnace control and operation, coremaking, foundry pig-irons, coke, elementary metallurgy, engineering drawing and calculations. Illustrating a method of instruction, Fig. 2 shows the use of wall charts to demonstrate the production of raw materials.

The final two months of the training period are planned to give the boys experience in the dressing shop and fitting shop, after which the first class of boys spend one year in the foundry and pattern-shops of some of the local works and the two final years in the shop of their choice. The second class of boys spend their third year in each of four

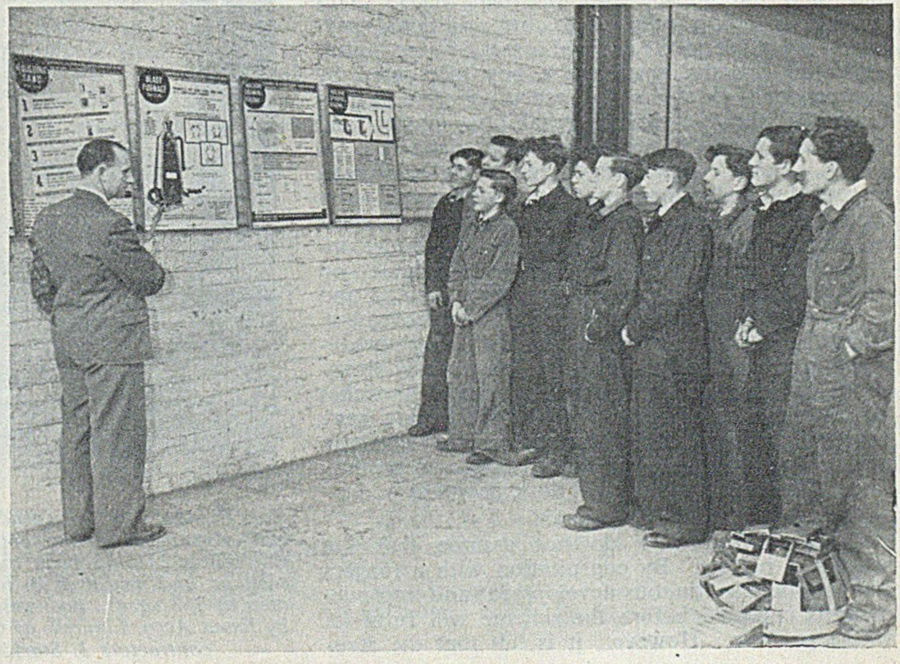


FIG. 2.—*Instructor using Wall Charts to demonstrate the Production of Raw Materials to a Group of Boys at the School.*

Apprentice Training

production shops working on piecework and their final two years in the shop of their choice. Final allocations to particular foundries at the end of the five years are decided according to existing requirements and the boy's own preference. A full report of his performance will accompany each boy to his new job. During the first two years, too, very close contact is maintained with the parents of apprentices, efforts in this direction being rewarded by a very much greater interest on the part of the parents than is found to be usual.

Realism

Everything is done to achieve realism in instruction. The purpose of each aspect of the programme is made clear and its relation to the whole explained. Nothing which does not add to the boy's experience is included in the programme.

A fair measure of control is obtained by setting standards of performance which it is considered should be reached by any apprentice who is going to make a success of his job. The patterns used for instance, are graded according to degree of difficulty. In addition to making it easier to graduate the practical instruction, this step allows the instructor to stipulate the volume of work expected of an apprentice who has reached a particular stage of his training. These standards are designed to ensure that the speed of work is increased toward the end of the first two years to an extent sufficient to enable the apprentice to compete favourably under piecework conditions. The control is applied through the medium of practical and theoretical examinations and tests and by keeping an accurate record of each boy's production.

Method of Payment

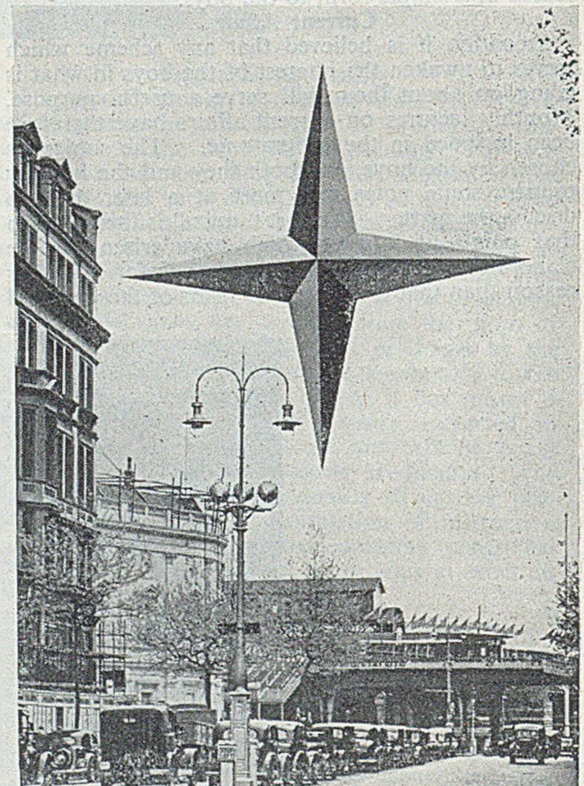
The boys are paid, and this is important, on a flat time rate during the first two years. This practice is rigidly adhered to, but additional payments are made in the form of a merit-rating bonus. After six months' service, the boys are rated by independent observers in respect of five factors (industry, skill developed, reliability, loyalty and initiative), each of which has been defined. A bonus, calculated as a percentage of the basic rate, is paid during the three months following each new rating and amounts, on the average, to an increase of about one-fifth over the basic rate—more information about this scheme is available on application. The boys are told their ratings and at what points there is scope for improvement. There has been, as a result, not only an improvement in the degree to which the boys apply themselves to their work but the incidence of breaches of discipline or of spells of bad timekeeping have practically disappeared. It is stressed that this payment is not related directly to volume of production. That is, it is not piecework payment.

Future

Allied Ironfounders do not assume that the scheme is perfect. By consultation with managers and foremen, continuous development and improvement is expected before the scheme will fulfil its whole purpose. However, it is felt that the standard of apprentice employed in the training school is gratifyingly high and although there has not yet been reached the desirable position of having more applicants for apprenticeships than required, there are at present three times as many apprentice moulders at the school than the total number recruited in the three years prior to the introduction of the scheme. In the course of time, it is fully expected that the numbers will increase to the desired level.

The standard of work being produced and the spirit of harmony and co-operation which exists among the boys is proof that the effort and expense involved is justified. While many problems remain to be solved, there are few doubts that the men who enter the moulding shops after having received the training offered do so backed by experience which can only be to the advantage of both employee and employer.

THE MINISTER OF LABOUR told Mr. Boyd-Carpenter that approximately 2,305,000 days' work were lost as the result of industrial disputes during the period January 1, 1950, to May 31, 1951.



This Festival Star is suspended 50 ft. above Northumberland Avenue near one entrance to the South Bank Exhibition. It has been made by welding magnesium sections, and measures 40 ft. from tip to tip, a surface area of 763 sq. ft., and weighs 1,790 lb. It was made by Essex Aero, Limited, of Gravesend, for the principal contractors J. Starkie Gardner, Limited.

Observation and Control of Dust in Foundry Dressing Operations

Part I. Control of Dust—By R. F. Ottignon

Part II. Observation of Dust—By W. B. Lawrie, M.Sc., F.R.M.S.

New methods have been developed to observe and control the dust cloud generated during certain fettling operations because it was considered that the existing methods of applying local exhaust ventilation might be improved, that further processes might be put under local exhaust ventilation, and that it was desirable to have some method of observing the path of moving dust clouds. The two aspects of the problem were therefore (a) a new approach to methods of local exhaust ventilation which would give both greater production and lower capital and running costs than the more conventional methods in use, and (b) the provision of some means of observing progress.

The work dealt with the application of local exhaust ventilation to the dressing of small and medium size castings and two dressing benches were constructed. One was fitted with local exhaust ventilation only, whilst the other, more successful bench, was provided with local exhaust ventilation assisted by an air jet which imparted to the dust a movement in the required direction.

Existing methods of dust estimation indicate the amount of dust present at a particular time and a specified point in space. It was clear that valuable information would accrue if the actual movement of the dust could be seen or recorded. This was done by a macroscopic observation of the dust cloud under conditions which are similar to those used in the application of the Tyndall phenomenon to the ultra microscope. Cinematograph films have been taken to show the clouds observed at different processes both with and without local exhaust ventilation.

Results indicate that increased efficiency in the application of local exhaust ventilation may well be attained by using an air jet to control the direction in which a dust cloud flows. It also appears that further aerodynamic studies are essential to effective local exhaust ventilation.

Part I. CONTROL OF DUST

FOR MANY YEARS, an increasing amount of attention and comment has been directed at the health risks which exist in foundries. One of the problems which is always in mind when these risks are under consideration, is the possibility of a worker developing lung troubles when he is exposed to dusty conditions over a number of years.

One of the worst risks in the steel foundry is that of the steel dresser, and a review of general fettling shop conditions suggested that a practical method of dust extraction for this operation would be easier if—

(*a*) bench, fan and filter could be self-contained, and

(*b*) exhaust air from the filter could be discharged direct to shop atmosphere so that ducting would be unnecessary and heat losses from the shop avoided.

An experimental bench was built and it was found that by directing a small percentage of the filtered air back over the working position as an air curtain, it was possible to get up to 90 per cent. of the dust generated away from the operator, with an expenditure of about 0.4 h.p. per bench.

These results were considered sufficiently attractive to justify going ahead with equipping one fettling shop with some 24 similar benches so that full-scale dust counts could be taken to show conditions in a medium-size shop both with and without this type of dust control. It is hoped that this installation will be completed by April 1951 and that the information on dust counts will be available by June 1951.

Before going on to deal with the mechanical problems in more detail it will be of interest to consider some aspects of the dusts concerned. It will be agreed by most people that while dust in the atmosphere is always unpleasant, there is a very wide difference in the danger to health which is presented by different types of dust.

At one end of the scale are materials such as cement and iron oxide dusts which can apparently be inhaled in large quantities for many years without any harmful effects being apparent, and at the other end the much more dangerous silica and asbestos dusts. The dust met with in foundry atmospheres is, of course, largely composed of silica in various forms. The character and composition of these silica dusts vary very widely even inside any one foundry, and two employees working in different jobs at different positions may be subjected to entirely different health risks even though the dust particle size and dust concentration in which they are working is roughly the same in each position, and both dusts are largely of siliceous origin.

Experience over the past years has shown that the steel dresser working with a pneumatic chisel ex-

* Paper presented at the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen. The Authors are respectively Development and Foundry Director, K. & L. Steelfounders & Engineers, Limited, Letchworth, and H.M. Engineering Inspector of Factories, Factory Department, Ministry of Labour and National Service.

Dust in Foundry Dressing Operations

perience more health risk from dust than a labourer, slinger, crane driver, etc., who is working within a few feet of him. A variety of explanations for this have been put forward by research workers, it is doubtful whether any of these reasons is unanimously accepted or capable of being stated as incontrovertible fact. The following points, however, emerge as strong probabilities:—

(1) That a large percentage of the dust particles below 5 microns in size must consist of free silica;

(2) the dust particles causing damage to lung tissues are those below 5 microns in size (*i.e.* 5/25,000 in);

(3) freshly-fractured particles are more toxic in their effect than are older dusts; and

(4) flooding of the lung defences by exposure to heavy concentrations for short periods may be more dangerous than exposure to a similar amount of dust more evenly distributed over a long period.

The first three factors referred to, *i.e.*, composition, size and freshness of fracture, are likely to be met with in dressing shops for many years. There is no satisfactory substitute for silica sand in sight at the present time, and while there is considerable research going on in both universities and foundries all over the world to try and improve the stripping of steel castings, it appears likely to be many years before radical changes become so general that there is no burnt-on sand on the castings when they reach the fettling shop. It is as well to emphasise here that the burnt-on sand referred to, which is the cause of most of the dust danger in fettling shops, is that sand which is still adhering to castings after they have been shot-blasted and annealed.

A consideration of these factors does, then, indicate that the only practical way of providing safer working conditions for the fettler is to provide some means of preventing him from breathing the dust which is generated at this operation, rather than waiting hopefully for a rather problematical date in the future when the "strip" will be so good that no dust will be generated.

Three approaches appear practicable:—(1) The wearing of respirators; (2) general ventilation to keep down dust counts, and (3) local exhaust. Dealing with these in turn:—

Respirators

A suitable respirator, if worn continuously, may provide complete protection against the dusts concerned. Its main drawback is that if it is an efficient filter then some restriction to ease of breathing occurs, with the result that normally it is only worn part of the time so that full protection is not obtained. It appears to be easier in the U.S.A. to persuade men to wear respirators than it is in this country, possibly due to the fact that, as the most popular respirator over there is not regarded as satisfactory by our Factory Department, it may offer less restriction to breathing than our more efficient respirators.

It may be of general interest to point out here that the Industrial Health Committee of the British Steel Founders' Association, in conjunction with Siebe Gorman Limited, have recently developed a respirator which gives the greatest degree of protection that can be obtained at present with the minimum restriction to ease of breathing. In general, the Factory Department do not regard the wearing of respirators as other than a short-term solution to be used while better methods are being developed.

General Ventilation to Keep Down Dust Counts

Where it has been difficult to provide an efficient local exhaust system to a dust- or fume-producing operation, it has usually been left to methods of general ventilation to provide a reasonable working atmosphere. These methods, consisting of extraction fans, jack roofs or roof ventilators, etc., although they make an important contribution to general working conditions, do nothing to protect those employees who, while working at a dust-producing operation, have ample opportunity to inhale the dust before it reaches the higher levels where it is extracted from the shop.

An increasing amount of investigation is taking place in measuring dust counts in foundry atmospheres, and in the course of the next year or so it is probable that ranges of counts for various types of workshop will be set which will give a good indication as to whether satisfactory dust control measures are, in fact, operating.

The main source of dust in fettling shops which general ventilation is usually relied upon to deal with, is that produced by fettling chisels and portable grinders. Experience over the past years has shown that this is not good enough to protect the health of the operator, and the film which has been produced indicates very clearly the dust plume rising from the chisel and shows that, however good the general ventilation of the fettling shop may be, this particular dust is in the vicinity of the operator's head long enough for him to breathe a considerable amount of dust. The founder, therefore, appears left with local dust extraction as being the only practical measure capable of being applied at the present time as a safeguard to this operation.

Considerations affecting Application of Local Exhaust to Fettling Operations

(*a*) *Size and Shape of Casting.*—For the Author's foundry it was decided that different equipment would need to be provided for the following range of sizes:—

(1) Castings up to 112 lb. in weight which could be handled on a fixed-top bench.

(2) Castings from 1 to 7 or 8 cwt. which could be dealt with on a similar but slightly larger bench incorporating a turntable to facilitate handling.

(3) Castings weighing up to 3 or 4 tons which would have to be dealt with on the floor.

As castings under 7 or 8 cwt. represent about half the output, it was decided to concentrate on applying extraction to two sizes of benches, leaving the larger floor work to be tackled as experience was gained.

(*b*) *Amount of Dust to be Handled.*—As all castings are annealed and shot-blasted at 100 lb. per sq. in. before being passed to the fettlers, it is clear that only very small amounts of burnt-on sand are left on the casting. When this sand is removed by the impact of the chisel or grinding wheel, some of it is broken down to particles of the dangerous sizes, some remains in particles too large to be easily air-borne and falls to the floor, while the remainder, although becoming an air-borne dust, is in particle sizes above 5 microns, and is not considered very harmful.

It is thus found that, although this is probably the most dangerous dust in the foundry, the actual amount to be handled is very small indeed. A weight of 3 or 4 lb. of sand per day being the maximum which a fettler is removing from the castings, and of this amount only a portion is broken down to dust. This point influenced very strongly the next consideration.

(*c*) *Type of Filter Unit.*—The fact that only a very small quantity of dust has to be dealt with, is a very different condition from most foundry dust-extraction problems, and opened up the possibility of using a high-efficiency throw-away filter if required. If large quantities of sand or dust had to be extracted, it would have forced any decision along conventional lines with one large fan and filter unit situated outside the building and connected by a long and complicated system of trunking to the benches. In view of the small amount of dust to be handled, a cotton-wool filter of the type used to filter incoming air in many ventilating and air-conditioning systems was considered worth a trial at the same time arranging the extraction system so that as little heavy dust as possible was passed on to the filter pads, in order that the useful life was not shortened by their being unnecessarily overloaded.

Possible advantages from using this type of filter appeared to be:—

(1) A self-contained bench was possible with no extra floor space required either inside or outside the shop to house the filter unit and fan.

(2) No exhaust ducting would be required. Personal experience with long runs of ducting in the foundry has caused the Author to dislike ducting because of its high cost, vulnerability to damage with consequent maintenance costs or loss of efficiency, difficulty in arranging installation in older shops already having much plant located on walls or inside annexes, and general unsightliness. Some of these objections have been overcome in one shop by putting all exhaust ducting underground, but the initial cost was very high.

(3) As the fettling shop is heated, any air taken from the shop in winter has to be replaced by warm air. The present heating system was put in to deal with four to five air changes per hour, if all fettlers were supplied with extraction at about 2,000 cub. ft. per min., the number of air changes would go up to about 18 per hr., which would require heavy additions to heating plant and put running costs up to three or four times their present figure. If, on the other hand, the filtered and heated air could remain in the shops at least as a wintertime measure, no additional heating problems would arise. It was felt that this would be possible with the cotton-wool type filter.

(4) With the absence of ducting, the fan horse-power required per bench would be lower due to the absence of resistance in the ducts.

(5) The extraction rate at each bench would be consistent without any need for balancing each take-off point as would occur in a larger system.

(6) Complete flexibility would obtain, only those benches in use being switched on, additional benches being added to a shop or alterations in layout being done more readily than with one main system of trunking.

(*d*) *Volume and Speed of Extraction Air.*—With a booth front, a minimum air speed of 100 ft. per. min. flowing into the booth is required to comply with American Foundrymen's Society[1] recommendations, but on checking a swing-grinder installation it was found that even 150 ft. per min. did not give 100 per cent. dust extraction under all conditions. The opening of the booth front in this case was approximately 18 in. behind the point of dust origin, and on occasions light dust was seen to be blown outside the range of the exhaust air by stray cross-draughts. The opening of the booth was 6 ft. by 4 ft., and some 3,500 cub. ft. per min. was being extracted through ducting to an outside arrestor with approximately 3.75 h.p. being used for each exhaust station.

Due to the need for the fettler to be over the work, it was felt that any bench provided could only be hooded at the back and sides, so that incoming air could flow into the exhaust system either down from the top of the screening or in from the front opening. The minimum combined area of these openings on the smallest bench was about 12 sq. ft. which, with an average flow of 150 ft. per min., gave a required extraction rate of 1,800 cub. ft. per min.

It was then decided that if a flat thin air curtain were provided across the top of the bench, two important advantages would be obtained:—

(1) The inlet area through which exhaust air could flow would be restricted to the front of the bench only, in the same way as if a solid sheet were added to the top of the bench, converting it to an open-fronted booth. This would reduce the amount of exhaust air required to maintain the desired flow of 150 ft. per min. by 50 per cent. to, say, 1,000 cub. ft. per min. with a corresponding reduction in fan size and power cost.

(2) The provision of an air curtain starting from a slot, say, 17 in. by $\frac{3}{16}$ in. requires only 50 cub. ft. per min. to give a velocity of 2,000 ft. per min. to the air stream. As it was proposed to extract about 1,000 cub. ft. per min., it was decided to recirculate about 5 per cent. of this air after it had been through the filters, to provide the air curtain. With this thin stream of air travelling at between 2,000 and 3,000 ft. per min., it seemed very unlikely that any light dust would penetrate the air stream without being caught up by it and blown into the exhaust suction inlet to which it

Dust in Foundry Dressing Operations

was directed. Air velocities of this order at a distance of 3 ft. from the exhaust point would be impracticable by suction alone as an extremely large volume of air would have to be handled.

(*e*) *Type of Fan.*—Once it was decided that the bench was to be self-contained, it became apparent that the total resistance of the built-in air passages and filters would be less than ½ in. w.g. and would accordingly come in the range which could be handled by an axial-flow type fan. This would again reduce the power consumption somewhat and add considerably to the possibilities of reducing the cost and simplifying the design of the exhaust system.

These points, then, were to be accommodated as the prototype bench was designed, but additional to them it was desired to try and make the bench a useful piece of equipment from the production viewpoint, and also to provide the man who was going to use it with all possible facilities which would help him in any way. The following details were, therefore, also accommodated in the prototype bench.

(*f*) *Work holding.*—The working surface consisted of hardwood timbers about 3 in. square arranged in such a manner that they could easily be turned so as to present a fresh working face as wear took place on the original surface, also so as to present a serrated working surface which would give the maximum assistance in preventing work from sliding about on the bench. This form of surface would make it easy to drop additional wood blocks on to the table to form a simple jig to assist further in holding castings which were particularly likely to move about because of their shape. This surface was also sloped so as to be higher on the left-hand side of the bench. This, again, was to assist in holding the casting against the blow of the pneumatic hammer. These points can be seen in Fig. 1.

(*g*) *Noise.*—The question of noise was the next point to consider, and in this connection it was felt that, while the wooden working surface was satisfactory, the sheet-metal screen round the bench would act as a sounding board and make worse what was already an extremely noisy operation. It was, therefore, decided to line this sheet-metal screen with a sound-absorbent blanket which would, at any rate, stop any reverberation and prevent some of the noise being passed on through the sheet. The sound-absorbent blanket was protected in turn by a perforated metal screen.

(*h*) *Lighting.*—As the intensity of light diminishes as the square of any increase in distance from the light source, and as a power supply has to be brought to the bench to operate the fan, it seemed economically worthwhile to provide a high standard of lighting from a local fitting built into the bench. Local lighting was accordingly arranged to give an intensity of 15 ft.-candles in the working plane. For safety reasons the lighting was arranged to operate at 50 v. from a transformer built into the bench. Power consumption for this intensity is 50 watts plus, say, a further 50 watts for general lighting from roof fittings, giving a total consumption per bench of 100 watts for lighting, compared with a figure of 300 watts which would be needed if the lighting fitting had been arranged at the normal shop roof level of about 20 ft.

(*k*) *Tool Rest and Tool Connections.*—Each fettler is provided with a pneumatic hammer and a portable Hi-cycle grinder. It is normal foundry practice to feed these machines with long flexible leads running from connections on the foundry wall. These leads are subject to frequent damage and in the case of the air hose, a repaired portion is often inclined to leak, with consequent waste of compressed air. The bench was accordingly arranged so that compressed air and Hi-cycle power supply were permanently connected to the bench with outlets for flexible connections provided at the right-hand side, so that flexible leads should be very rare, and it is thought that a worth-while saving in the cost of maintaining these will be obtained.

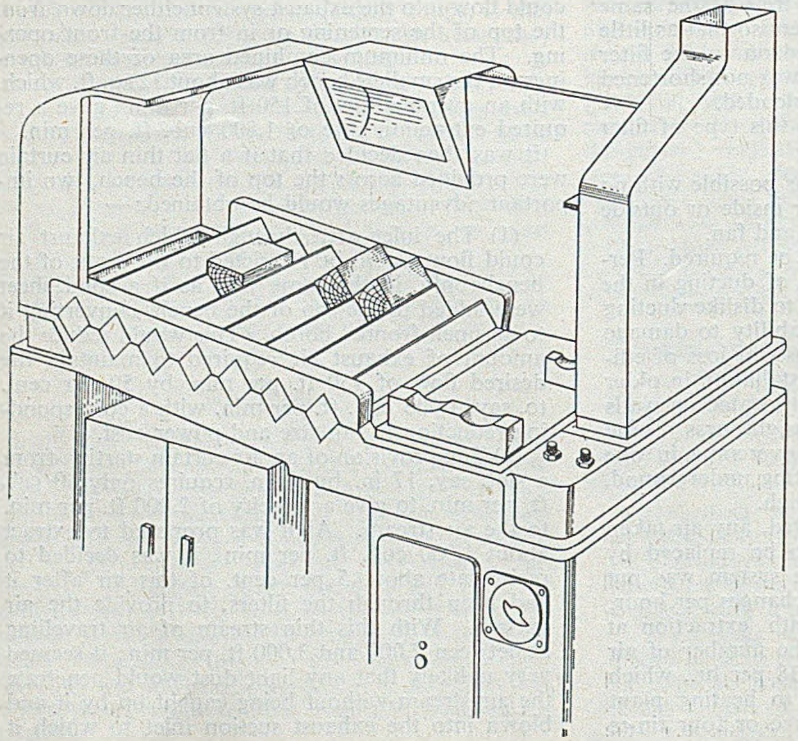


Fig. 1.—*Fettling Bench utilising Timber Bearers approx. 3 in. sq. for Work Holding and incorporating Special Ventilation Features and Unit Control of Fan, Tool, and Lighting Arrangements.*

(l) Cupboard for Tools and Personal Belongings.—As a further stage in tidying up the shop, it seemed worthwhile providing a cupboard so that goggles, tools, spare chisels, etc., together with the usual personal belongings, could be stored under lock and key.

Working to the specification covered in paragraphs (*a*) to (*l*), a prototype bench was detailed

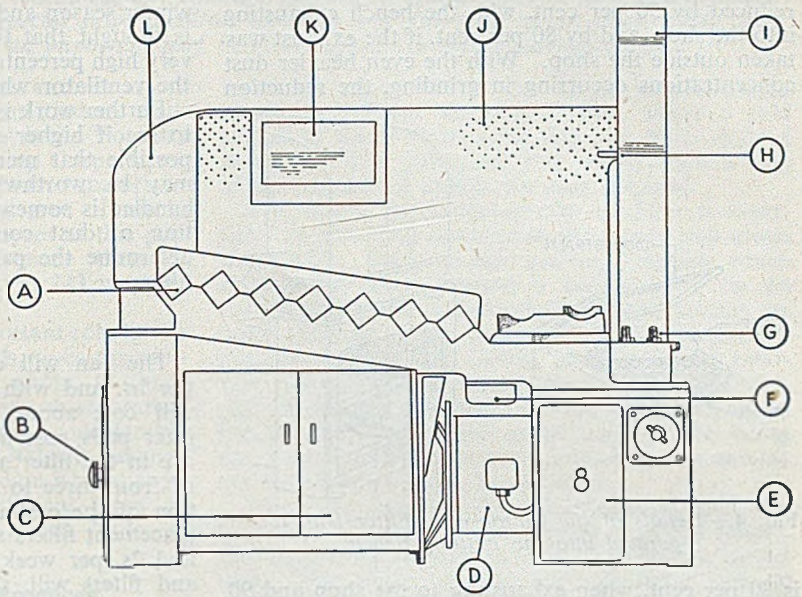


FIG. 2.—*General Front Elevation of the Fettling Bench shown in Fig. 1.*

A.—Wooden bearers forming the working surface.
B.—Door to the filter unit.
C.—Cupboard for operator's belongings.
D.—Fan housing.
E.—Access door to starter and lighting transformer.
F.—Chip tray.
G.—Chisel and grinder connections.
H.—Outlet for air curtain.
I.—Exhaust stack.
J.—Sound-absorbent curtain.
K.—Local lighting.
L.—Exhaust suction catch-box.

and built. Fig. 2 shows the general appearance of the bench from the front, with the following features indicated by the lettering.

The section through the bench, which is shown in Fig. 3, illustrates the flow of air from the filter and the exhaust unit together with the returned air being passed over the top as an air curtain. Fig. 4 gives more detail of the filter unit, showing how the renewable cotton-wool filter pads are held in position.

Testing

When the bench was completed, it was found that the exhaust system was only extracting just over 600 cub. ft. per min. instead of the 1,000 cub. ft. per min. which was originally specified. This reduction was due to the resistance in the built-in air passages being higher than anticipated, a probable loss in fan efficiency due to rapid change of direction of air flow and additional restriction at the outlet duct which had been provided to assist in getting the high velocity for the air curtain. Adjustment to the baffle in the outlet stack was made until the air curtain was delivering approximately 50 cub. ft. per min. at a velocity of 2,000 ft. per min.; this setting was chosen as a result of tests with a smoke generator which showed that velocities higher than this tended to be deflected away from the curved sheet at the suction end of the bench, instead of being guided into the suction intake.

During the time the bench was being built, Mr. W. B. Lawrie, of the Factory Department, had offered to try and film the dust-flow which occurs in fettling operations, while Mr. W. A. Bloor, of the British Iron and Steel Research Association, together with Mr. Lawrie, offered to collaborate by taking dust counts. The results of the work done in dust counting have been separately published in the Dust in Steel Foundries[2] second report.

Both the fettling and grinding tests were done on castings specially provided for the purpose; those for fettling had been cast in soft rammed moulds and had not been shot-blasted, so that there was plenty of burnt-on sand adhering to the castings. Those for grinding were very rusty and had been outside in the weather for a year or two. The dust conditions shown in the film and the dust counts, therefore, bear no relation whatsoever to normal work-

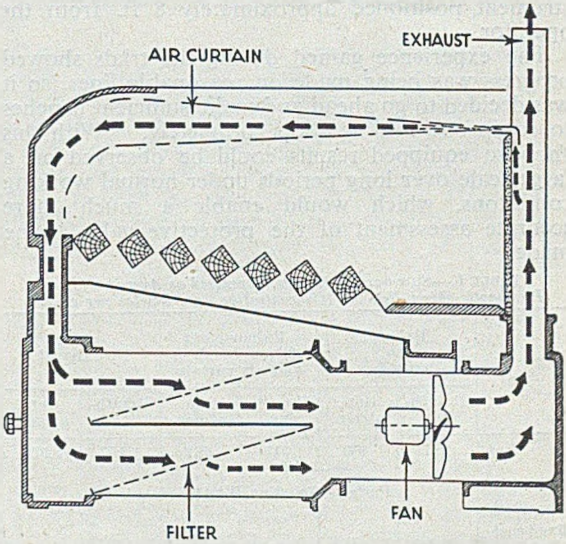


FIG. 3.—*Section through the Fettling Bench showing the Fan and Filters as well as the Paths of the Exhausting System.*

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ing conditions, but are used to indicate trends only. Mr. Lawrie's Paper and the film cover the visual results of the test. A summary of the dust counts made by Mr. Bloor showed that under the heavy dust overload conditions of the tests, dust counts in the vicinity of the operator's mouth were reduced by 50 per cent. with the bench exhausting into the shop, and by 80 per cent. if the exhaust was taken outside the shop. With the even heavier dust concentrations occurring in grinding, the reduction

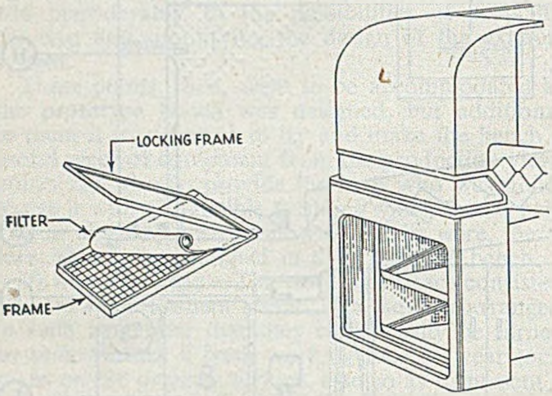

FIG. 4.—*Details of the Cotton-wool Filter Unit incorporated into the Fettling Bench.*

is 80 per cent. when exhausting to the shop and 90 per cent. when the exhaust is taken outside.

The dust estimations were made using two thermal precipitators, one head being attached to the operator's chest; the counts from this position are shown in the following summary under the column headed "Breathing." The heading "General Atmosphere" gives the count from the second instrument positioned approximately 8 ft. from the operator.

The experience gained during the trials showed progress was being made on reasonable lines, so it was decided to go ahead and make sufficient benches to equip one fettling shop completely. With this shop so equipped results could be observed on a large scale over long periods under normal working conditions, which would enable a much more accurate assessment of the protective value to be made.

TABLE I.—*Summary of Results Expressed as Averages for Pneumatic-chisel Fettling (Concentration in particles per c.c.).*

	Exhaust to outside.		Exhaust *via* filters to shop and air curtain.		No exhaust.	
	Breathing.	Gen. atmos.	Breathing.	Gen. atmos.	Breathing.	Gen. atmos.
	287	300	749	637	1,557	1,551
			Portable Grinding Wheel.			
Mixed castings ..	3,410	1,700	5,862	1,825	—	—
Flat castings ..	12,360	5,908	9,559	1,318	About 40,000	21,750
High castings ..	10,277	2,930	10,456	2,933	—	—

The outlet velocity of the exhaust air is approximately 5,000 ft. per min. when measured at the exhaust outlet. At 20 ft. from ground level a velocity of 750 ft. per min. is still measurable. When the benches are installed they will be so arranged that there is a roof ventilator over the exhaust from each bench. This ventilator will have a control flap which can be closed in the winter season and open for the rest of the year. It is thought that the exhaust velocity is such that a very high percentage of exhaust air will pass through the ventilator when it is open.

Further work is still to be done on filter materials to see if higher efficiency can be obtained. It is possible that merely increasing the filter thickness may be worthwhile even if the amount of air handled is somewhat reduced. Additional examination of dust counts must also be undertaken to determine the particle sizes which are passing the filters.

Running Costs

The fan will consume approximately 0.3 units per hr. and with power at one penny a unit this will cost about 1s. 3d. per 44-hr. week. The filter pads cost approximately 6d. each, two pads are in the filter at one time, these will have a life of from three to six days, dependent on the condition of the castings being fettled. The cost of replacement filters should, therefore, run between 1s. and 2s. per week. Total running costs for power and filters will, therefore, be between 2s. 3d. and 3s. 3d. per week.

Conclusions on Dust-control Methods

(1) Where fettling operations can be carried out on a bench, it is possible to prevent 80 per cent. of the dust generated from reaching the operator's breathing area even when the filter unit is exhausted into the shop atmosphere.

(2) An air curtain blowing across the top of the bench and using only 50 cub. ft. per min. will materially assist in keeping the volume of exhaust air down to a low figure.

(3) If an air curtain is used, an exhaust volume of 600 cub. ft. per min. provides adequate protection for a bench with a working surface of 3 ft. by 2 ft.

(4) With an absence of ducting and using an axial-flow type of fan it is possible to provide adequate protection for a bench of this size with an expenditure of 0.4 h.p.

(5) In view of the small quantities of dust involved, the cotton-wool filter pad which is changed once or twice a week is quite economic and provides a good degree of protection even when the exhaust is into the shop atmosphere.

REFERENCES

The bench referred to in Part (I) of the Paper is covered by British Design Application No.'s 861058, 863555 and 863958, and British Patent Application No. 2814/50.

1 A.F.S. Recommendations. Code of Recommended Good Practices for Metal Cleaning Sanitation. American Foundrymen's Society. Industrial Hygiene Committee.

2 Dust in Steel Foundries Second Report. Appendix No. 9. Dust Estimations on two Exhausted Fettling Benches. H.M. Stationery Office, London.

(To be continued).

Mass Production of Castings

By William Czygan

Efficient handling and extensive mechanisation enable a permanent-mould foundry to produce a large number of grey-iron castings. Special skips facilitate carrying and dumping of lift-truck loads, and efficient storage plays an important part in handling the variety of castings made.

AN EXCELLENT example of how the ancient art of ironfounding can be brought up to modern standards of efficiency and productivity is the Foundry Division of the Eaton Manufacturing Corporation, Vassar, Mich. By combining improved materials-handling techniques with a high degree of mechanisation, approximately 550 employees at this permanent-mould foundry produced more than 70 million grey-iron castings last year in 243 working days.

Materials handling plays an important rôle in the impressive Eaton production records, since the castings must be moved and handled about 17 times after actual pouring. The problems of separation and transport around a plant are considerable enough when output approaches 300,000 castings per day; they become even more acute where, as in this case, something like 1,200 different types of castings are being produced with about 70 to 90 different parts daily.

Wide Variety of Castings Produced

Castings made at the Vassar foundry vary from ¼ to 15 lb. with an average of about 1 lb. per individual casting, and cover a broad range from the simplest shapes to fairly complex cored types. About 40 per cent. of the output goes to the motor-vehicle industry, about 30 per cent. is for air-conditioning and refrigeration components, and the remaining 30 per cent. for the appliance field such as washing machines, irons and other items. The plant has grown from a 40- by 80-ft. shop employing 27 workers in 1920 to the enviable position of the world's largest permanent-mould grey-iron foundry, employing almost one-fourth of the population of Vassar, Mich.

The improved procedures begin with raw materials received at the plant. Railway trucks are unloaded by a magnetic crane, which also lifts the scrap and pig-iron to the weigh hopper. The 4,000-lb. charge is then emptied into a skip bucket and charged into the cupola stack by way of mechanical charging apparatus.

By means of a pivoting arrangement, the charger can be swung to service the charging door of either of the three cupolas. Only one of the 54-in. cupolas is kept in operation at a time, melting about 275 tons of grey iron per 16-hr. operation. Another is kept on standby while the third cupola is being relined with a Bondactor lining gun.

Continuous-tapping System Used

A continuous tapping system runs the molten iron into a barrel-type receiving ladle. The iron is then transferred to 1,200-lb. bull ladles operating on an overhead monorail to the 18 permanent-mould machines. Front slagging is used, where a cold stream of water shatters the slag into finely divided particles. The pulverised slag washes into a skip at the rear of the cupola for easy disposal.

The Eaton permanent-mould machine is essentially an actuating mechanism that opens and closes the moulds. Each machine carries 12 moulds, which continually rotate around a central hub. As the machine revolves, cam-controlled valves actuate the arms attached to the inner half of the permanent moulds, opening and closing them at pre-set intervals. Two operators are required on each machine, one for pouring the metal and the other for removing the castings. When cored castings are being run, a third man sets the cores just before the moulds are closed preparatory to pouring.

When the iron moulds are fabricated, they are heated to 200 deg. C. and receive a special refractory coating in the casting cavity and on the mould face. This special coating prevents direct contact of the molten metal with the mould surface, which aids in greatly extending mould life and facilitates extracting the castings from the mould.

A ladle suspended from an overhead tramrail is used for pouring, after which the mould continues to rotate through a short solidification period. Near the end of the solidifying time, the mould automatically opens and the gate of castings is hooked out.

In the next stage of the cycle the open mould travels under a hood, where it receives a coating of soot from an acetylene flame. The purpose of this smoke coating is to minimise any tendency for the casting to stick to the mould. Finally, the inner head of the machine moves forward, closing the mould in readiness for another cycle. The complete cycle takes from 2 to 6 min. for proper solidification depending upon the mass of metal.

Skip Handling

As the castings are hooked out of the mould, they are thrown into skips for transport to a cooling slab outdoors. These skips are another innovation specially designed for greater ease of handling. The corrugated steel boxes, reinforced at the corners with angle irons, measure about 3 by 3 by 4 ft. and have a slanted front for controlled dumping.

Trunnions attached to each side of the skip fit into notches on the two arms of the fork lift trucks. The rear notches hold the box steady for carrying. For dumping, the skip is first placed on the corner of a hopper or on the floor, and the operator shifts

* The original article appeared in the *Iron Age* and carried the heading of "70-Million Castings in 243 Days."

Mass Production of Castings

it to the front set of notches. Then when the load is raised, the skip tilts forward and empties. Castings, after being cooled outdoors, are dumped in this manner into a continuous tumbling mill, which discharges on to a sorting belt. Sorters stationed along the moving belt segregate the castings from among the broken gates and risers, placing them into individual skips lined up in front of the belt. Lift trucks are again used to transport the skips to the annealing furnaces.

Annealing

All castings produced at the Vassar foundry are annealed to remove any possible casting strains, improve machinability and enhance the physical properties. The six oil- or gas-fired, tunnel-type pusher furnaces are held at temperatures of from 870 to 925 deg. C.; the entire annealing cycle takes about 3½ hrs. On the discharge end, the castings are dumped into skips for cooling and then delivered to the cleaning department. The skips are raised by the lift trucks and emptied into elevated hoppers in front of the shot-blasting units. Measured loads from the hopper drop into the machines for the cleaning operation, after which the castings again are discharged into skips by mechanical conveyor belts, which catch the castings as they are dumped out of the machine.

Charging into containers also plays an important part on the snagging line, where the small projections left from the gates and risers are ground off. Lift trucks empty the skips from the cleaning room into individual hoppers next to each grinder. The castings are delivered through a waist-level chute within easy reach of the operator, saving the time ordinarily required for stooping to pick the castings out of a tote box and greatly reducing operator fatigue. The castings are placed in skips after the snagging operation and then taken to the inspection benches.

In some cases, production jobs require special grinding operations. One casting produced in large numbers is a valve guide bushing for the motor-vehicle industry, measuring ½ in. dia. and about 2¾ in. in length. These are also first dumped into a hopper, after which an automatic positioning device feeds them into a special double-spindle disc grinder for end grinding to length. Discharge is again on to conveyor belts and into skips.

Castings requiring centreless grinding are automatically fed through tandem set-ups and are discharged into skips. Tolerances of plus or minus 0.002 in. are worked to on both length and diameter.

Despatch

After careful inspection from hoppers again, the finished castings are weighed, oiled if necessary to customers' specifications and then bagged for shipment. Here again, efficient handling and bagging systems pay dividends in creating a smooth flow of the finished product and reducing man-hours. The bags are wired shut and placed on flats, then loaded directly on to railway cars or road lorries by lift trucks.

The visitor to the Eaton foundry is impressed not only with this material-handling equipment and the high productivity of melting, pouring, and cleaning operations, but also with spacious lockers, showers, washrooms, canteens and facilities for the employees. A well-equipped first-aid dispensary for health protection is staffed by registered nurses. Dust from grinding and sorting is continually being exhausted by the most modern equipment. Departments are well lighted and painted in modern dynamic colour schemes. These steps taken by far-sighted management to create and maintain good working conditions cannot help but contribute to improved efficiency and a more profitable business.

Power-Gas Corporation

Although the Power-Gas Corporation was formed in 1901, and thus now celebrates its golden jubilee, the Parkfield Works, Stockton-on-Tees, from which it operates was founded by Ashmore, Benson, Pease & Company, in 1873. The Corporation was formed as a result of experiments and inventions by Dr. Ludwig Mond at the large alkali works in Winnington, Cheshire. There the process of manufacturing Mond gas or power-gas was developed and during the process sulphate of ammonia was recovered as a by-product. The sale of sulphate of ammonia, which is a valuable fertiliser, brought a good price and resulted in the cheap production of gas for industrial heating and power, although this gas was unsuitable for lighting.

In order to exploit the production of the plant for turning out cheap power, the Power-Gas Corporation, Limited, was formed in London on July 16, 1901, and one of its first acquisitions was the business of Ashmore, Benson, Pease & Company, at whose Parkfield Works there was a competent staff with valuable experience in gas-plant engineering practice. During the course of time, events changed because of the production of synthetic ammonia by a cheaper process, and changes had to be made in the organisation to meet the new circumstances. In 1908 the Corporation moved its head offices to Stockton and gradually a complete integration of the activities of the two companies took place.

Ashmore, Benson, Pease & Company had specialised in the construction of gasholders and such items of gas-works equipment as purifiers, condensers, etc., as well as iron castings. This trade has been gradually expanded in keeping with the growth of the organisation until to-day most types of gas-works equipment are manufactured in Parkfield Works. The foundries at Parkfield Works are engaged solely on the manufacture of Meehanite iron castings, many of which are built into the main manufactures. During the year 1950, however, five items extracted from the total output are as follows:—523,000 castings for the light and 374,000 castings for the heavy motor manufacturing industry; 65,000 castings for the use in furnaces; 40,000 castings for the agricultural industry, and 3,000 castings (principally rolls) for the printing industry.

A controlling interest has been acquired by the Corporation recently in the well-known firm of Rose, Downs & Thompson, Limited, Old Foundry, Hull.

AT A LUNCHEON celebrating the Corporation's golden jubilee, at which 5,000 employees were entertained, Mr. Beswick, chairman both of the Power-Gas Corporation and Ashmore, Benson, Pease & Company, announced his resignation after 50 years in the company's service.

Foundry Coke for Scotland

Since the setting up in February by the Scottish Board for Industry of a metallurgical coke advisory panel, the quality of coke has considerably improved and there is hope that this improvement will be maintained. The panel was formed for the purpose of finding a solution to complaints that had been forthcoming over a considerable period from the Scottish ironfounders and other bodies as to the quality of metallurgical coke supplied. Excellent *ad hoc* assistance had been given at the instance of sponsoring Ministries, but the Board appreciated that the problem had gone beyond one department and that the best means of dealing with it would be through a single co-ordinating body.

At the initial meeting of the Panel it was stressed by the ironfounders that the quality of coke was a matter of primary importance in the whole sequence of operations involved in the production of light castings. It affected not only the quality of the casting but also the cost of production and the efficient operation of the foundry as a whole. It was recognised by the ironfounders that the total quantity of coke being made available was relatively adequate, but the proportion of such supplies conforming to the specification of good-quality Durham or Welsh coke was entirely inadequate for maintaining the work of the foundries on an efficient basis. Emphasis was laid on the fact that the Scottish section of the light castings industry is representative of approximately one half of the total light iron castings production in Great Britain, and a large proportion of the light castings export trade emanates from Scotland. The industry is therefore an important Scottish economic unit.

A coke technical committee appointed by the Scottish light castings ironfounders had made specific statements regarding the technical points on which coke supplies were deficient and recommendations as to the minimum standards required. This committee stated that variations in quality made it impossible to establish routine cupola control, and that due to a large percentage of smalls and the soft nature of the Scottish cokes received there was increased resistance to the blast. This in turn necessitated introduction of high-pressure blast, which was not possible in the case of cupolas operating with fans. The breakdown of coke in the cupola, it was stated, gave an excessive amount of breeze which created a nuisance to the neighbourhood. Loss of coke as breeze and the increased consumption required under conditions where excessive slag was formed and where metal production rate and temperature was adversely affected, resulted in the excessive use of coke. In addition, high sulphur content made necessary an excessive use of manganese or expensive pig-iron. In general poor-quality cokes resulted in such defects as short-run and mechanically weak castings.

Accordingly, three minimum specifications were submitted which it was considered should be within the capacity of the coke producers to supply.

	Short-period melting, cupola diameter.		Continuous melting for 8 to 10 hrs.
	Up to 42 in.	Over 42 in.	
	Per cent.	Per cent.	Per cent.
Shatter index (2 in.)—			
Minimum	80	80	85
Average	85	85	90
Sulphur (max.)	1	1	0.8
Ash (max.)	10	10	8
Volatile (max.)	2	2	2
Moisture (max.)	5	5	5
Size	4 to 5 in.	8 in.	8 in.

Whilst the National Coal Board said they would endeavour to meet these specifications they could not guarantee a shatter index so high, and after discussion it was agreed the shatter index of itself was no true indication of the quality of the coke. The problem today, it was stated by the coke supplies officer, London, was not so much shortage of coke as increase in demand. Before the war, total deliveries to the foundry trade ran about 900,000 to 920,000 tons a year. In 1950 they touched 1,150,000 tons. Sources of supply had increased in Durham, Scotland and Wales, but as the contribution usually made by Wales to Scotland's requirements was very small, measured in hundreds, not thousands of tons, it was from Durham that Scottish supplies had to be found. Durham delivered pre-war 40,000 tons to Scotland and in the last few years around 50,000 tons. Sources of supply that had dried up had to be made in England from Durham and South Wales.

The opinion was expressed that what was required was a coke equal to the best Durham. The behaviour of the fuel when incandescent and its ability to maintain a level and constant melting zone, was the only true test. The National Coal Board promised closer liaison with the ironfounders' group and also promised to endeavour to meet the specification submitted by the founders. The closer liaison thus initiated between the foundry industry and the National Coal Board in regard to marketing and exchange of technical information will continue.

Fractures of Gland Irons

Safety Circular No. 189, published by the Ministry of Fuel and Power, points out that three accidents (one of them fatal) have been caused recently by the collapse of Scotch derrick cranes at quarries. Investigation of the accidents showed that the collapse had been caused in two cases by the failure of a cracked gland iron which had been repaired by welding, and in the third by the breakage of an iron which had been partially fractured for some time. Many Scotch derrick cranes are used at quarries, and the Minister thinks it is important that every such crane should be specially examined by a competent person to discover whether the gland iron is cracked or has been repaired by welding. Attention is directed to the following points in connection with the examination of gland irons:—(1) If the gland iron is not easily accessible a suitable platform should be provided for the purposes of inspection; (2) before the gland iron is examined, it should be scraped and washed with grease solvent until it is thoroughly clean; and (3) some special method should be used for detecting cracks. One way is to paint the clean iron with penetrating oil, wipe it dry and then coat the iron with whitewash. When the whitewash is dry, the crane jib is slewed both ways, raised and lowered. If a crack is present, oil will be forced out of it and the whitewash discoloured. If the gland iron of any crane is found to be cracked, or to have been repaired by welding, the crane should not be used again until a new gland iron has been fitted.

PLANS for several important extensions by Lanarkshire steel firms have been approved. The Lanarkshire Steel Company, Limited, Motherwell, are to erect buildings costing £31,000 in Craigneuk Street to house electrical plant and also offices costing £5,000. Plans by Colvilles, Limited, for an £11,500 bar-mill cooling-bay in Meadow Road, Motherwell, have also been approved. This firm is also to spend £10,000 in converting a building in Nelson Street for use as an effluent treatment centre.

Steel Industry's Raw Materials

SETTLEMENT OF DISPUTE ANNOUNCED

A temporary arrangement for the organisation of supplies of raw materials has been agreed upon by the Iron and Steel Corporation of Great Britain and the British Iron and Steel Federation. This was revealed in the following statement issued jointly on July 13.

"Representatives of the Iron and Steel Corporation of Great Britain and the British Iron and Steel Federation have had further discussions in regard to the arrangements to be made to enable the Corporation to assume and carry out its responsibilities in relation to the common services to the publicly-owned companies.

"Arising from these discussions an agreed memorandum has been prepared which clearly sets out the acceptance by the Federation of the Corporation's responsibilities in respect of these common services and, in particular, the Corporation's ultimate responsibility in respect of the publicly-owned companies for collective purchasing, distribution, and finance of raw materials, etc., now dealt with by the Federation's organisation known as British Iron & Steel Corporation, Limited, and its subsidiaries.

"It is, and will continue to be, the policy of the Corporation and the Federation that there shall be no duplication in organisation for the provision of these necessary and vital services, it being recognised that such unnecessary duplication would involve the expansion of staffs and an added financial burden on the industry.

"The Corporation has, therefore, declared its agreement that the comprehensive and integrated organisation which the Federation has developed to provide these common services for the industry, whether now publicly-owned or privately-owned, shall, pending the setting up of the long-term organisation, be continued in its entirety, and mutually-satisfactory arrangements have been made which will enable the Corporation to carry out its responsibilities. Discussions on the long-term organisation to be set up continue."

Until now the British Iron & Steel Corporation, Limited, a trading department of the Federation, has bought such raw materials as scrap, pig-iron, and semi-finished steel for privately-owned and publicly-owned steel firms.

A few weeks ago Mr. G. R. Strauss, Minister of Supply, accused the Federation "of using every device legal and otherwise, to frustrate the [Iron and Steel] Corporation, and to resist its efforts to bring in implementation by Parliament of the Act."

Glacier Metal's Dividend Policy

Criticisms of the company's dividend policy were taken up by the chairman (Mr. W. B. D. Brown) at the recent annual meeting of the Glacier Metal Company, Limited. He pointed out that throughout a period of expansion since 1940, the company had been fairly continuously short of capital for expenditure on fixed assets. That in itself, he said, had had a great deal to do with the dividend policy followed by the board.

Shareholders were aware, Mr. Brown added, that during the period the company had been engaged in a competitive business struggle with an extremely efficient American concern making bearings and with their licencees in this country. In the course of that contest the company had also had to engage in a legal struggle ever since 1938. Those two factors and costs of raw materials had caused a conservative policy to be followed.

Wholesale Prices Index Up

A further advance in British wholesale prices was recorded in June, when the Board of Trade index of all articles (1930 = 100) rose by one point over the revised May figure to another new peak of 320.7. Apart from the 0.9 point increase in May, this was the smallest increase since March, 1950, and was caused by a rise of 2 per cent. on the food and tobacco index which offset a slight fall in industrial materials and manufactures.

The rise in the index since devaluation in September, 1949, remains at about 38½ per cent., and the increase since the start of the Korean hostilities in June last year at 24.4 per cent.

Although there were further advances in June in the prices of some materials used by industry, including rises of about 10 per cent. in copper, nickel, and tungsten ore prices, these were more than offset by continued falls in the prices of wool, rubber, and tin. Declines were also experienced by other textile raw materials, namely cotton, silk, manila hemp, and coir. As a result, the new Board of Trade price index of basic materials (excluding fuel) used by non-food manufacturing industries (June 30, 1949 = 100) fell 8.7 points, or 4 per cent., to 193.1 from the revised May figure of 201.8. This was the third successive fall, bringing the index down by 14 per cent. from the March peak. At this level, however, it was still over 50 per cent. higher than in June last year.

Supplementary indices in the new series show that the continued firmness of non-ferrous metal prices was reflected in the price indices of materials used in the mechanical engineering and electrical machinery industries. The first hardened 0.3 of a point to 131.1, and the second 2.4 points to 152.0. Prices of building and civil engineering materials, as measured by the indices rose 0.9 point to 126.7, and the housebuilding materials index hardened 0.6 point to 125.3, although there was no increase in the price of imported softwood over the month.

Canada Produces More Steel

Canadian production of steel ingots in May was 302,900 tons, compared with 301,800 tons in April and 283,800 tons in May, 1950. Output totalled 1,479,600 tons in the first five months of this year, against 1,380,200 tons in the corresponding period a year ago.

On a daily basis the average output in May was 9,772 tons, compared with 10,059 tons in April and 9,155 tons in May, 1950.

High Nickel Output

The rate of production planned for the end of this year by the International Nickel Company of Canada, Limited, has already been reached. Announcing this, the Mond Nickel Company, Limited, states that the current production level is 21,000,000 lb. of nickel a month, which is a new record rate for peacetime. This is an increase of 1,000,000 lb. a month on the previous rate, resulting from the installation of emergency production facilities.

THE DIRECTORS of the National Gas & Oil Engine Company, Limited, have received an offer to purchase 226,950 ordinary shares in the company at 32s. a share from the Brush Electrical Engineering Company, Limited, which already holds the remaining 373,050 ordinary shares in the company.

House Organs

Broomwade News Bulletin Vol. 14, No. 3. Published by Broom & Wade, Limited, High Wycombe.

As usual, this Bulletin concentrates not on the happenings at the works, but on being an aid to the sales department. It does this by describing new models (this time it is Type SV 606—an easy number to remember!), reporting their exhibits at shows throughout the world and printing testimonials as to the efficiency of their compressors from satisfied users.

Light Metals Bulletin, Vol. 13, No. 11. Issued by the Intelligence Department of the British Aluminium Company, Limited, Salisbury House, London, E.C.2.

This bulletin is solely devoted to the presentation of abstracts from the literature and patent specifications covering light alloys. The abstracts are well chosen and succintly presented—so much so that the service given can well claim to be unique. It is available to our readers on writing to the B.A. Company.

The Half Wheel, Vol. 3, No. 1. The quarterly journal of Barnards, Limited, Norwich.

This issue carries a long obituary notice of Mr. George N. Bower, B.A., the chairman of the company, who died last March. There is a description of a new canteen, showers and washing facilities which have been installed at the St. Miles Works. The illustrations included show it to be a very commendable installation. The pattern of the booklet closely follows that of earlier issues.

S. & W. Magazine, Vol. 5, No. 2, Summer, 1951. Published by Smith & Wellstood, Limited, of Bonnybridge.

An announcement of general interest in this issue is the appointment of Mr. R. F. Paterson to organise training schemes for apprentices at the works of Smith & Wellstood and Mitchell, Russell & Company, Limited. Mr. Paterson was a squadron leader during the war and spent 2½ years at the No. 1 R.A.F. School of Technical Training supervising the training apprentices and fitters. He later played cricket for Essex and was secretary of the County Club from 1947 until early this year. As a spare time job he is now player coach for the Stenhousemuir Cricket Club.

Usco Magazine Vol. 2 No. 5 (May, 1951). Published by the Union Steel Corporation, Limited, Vereeniging, South Africa.

There is nothing parochial about the general interest articles in this magazine. There is a continuation of the articles on steel towns and this issue deals with Linz in Austria—a town to be visited in the near future by the Iron & Steel Institute. Then there is a second article by the Radio Doctor (Dr. Charles Hill) on Food Fairy Tales. Fishing in the South Sea islands shows the net has been spread fairly widely. It is certainly one of the most readable—that is, the part we can read, for much of it is in Afrikaans—magazines coming into our hands.

Manpower Rises

During May the country's total working population increased by 20,000 to 23,287,000, the addition being composed entirely of women. Manpower in the basic industries rose by 25,000 to a total of 4,153,000. In the manufacturing industries there was a fall of 5,000 to 8,687,000, the main change being a decline of 5,000 to 4,114,000 in the number employed in the metals, engineering, and vehicles group.

The total number of unemployed fell from 215,700 at mid-May to 190,800 at mid-June—the lowest post-war figure.

Metal/Mould Reaction in Copper-base Alloys

Mr. N. B. Rutherford, B.Sc., A.I.M., in a communication from the British Non-ferrous Metals Research Association to the Institute of Metals entitled "The Effect of Mould Material and Alloying Elements on Metal/Mould Reaction in Copper-base Alloys," summarised the results of his researches in the following terms:—

(1) Reaction will occur between the metal and the mould when phosphor bronze is poured into natural and synthetic moulding sands or core sands bonded with vegetable or mineral oils, cereals, synthetic resins, or cellulose glycollic acid.

(2) The use of a mould coating of plumbago and water on a high-permeability synthetic moulding sand is likely to intensify the reaction.

(3) A mould coating of aluminium paint produces a variable degree of inhibition. Excellent protection is afforded by a coating of aluminium/magnesium-alloy paint on various moulding and core sands, for castings both of phosphor bronze and of gun-metal containing residual phosphorus in excess of 0.03 per cent.

(4) Metal/mould reaction may be almost completely inhibited in phosphor bronze by the addition of 5 per cent. ammonium bifluoride to a synthetic moulding sand.

(5) The addition of 0.5 per cent. silicon to 88:8:4 gun-metal containing 0.1 per cent. phosphorus will inhibit mould reaction.

(6) More than 0.02 per cent. silicon in 85:5:5:5 leaded gun-metal is undesirable; mould reaction is promoted and the surface of the castings is badly affected.

(7) Nominal additions of 0.1 per cent. aluminium, 0.5 per cent. chromium; 0.1 per cent. vanadium, 0.1 per cent. boron, and possibly small amounts (0.01 per cent.) of calcium, will inhibit mould reaction in 10 per cent. tin bronze containing 0.5 per cent. phosphorus. It is probable that pouring and moulding practice would require modification of additions of aluminium and chromium and, possibly, vanadium and boron were used commercially.

(8) Nominal additions of 0.5 per cent. iron or manganese, or 0.2 per cent. magnesium, will intensify the reaction.

(9) The reaction is unaffected by small additions of nickel, beryllium, titanium, zirconium, barium, or sodium.

Sulphur Reduction by Kalling Process

The Domnarvet Iron Works in Central Sweden during the past six months have been reducing the sulphur content of iron on an industrial scale by a new method employing a rotary furnace invented by Professor B. O. Kalling. Involving coke, the final product is claimed to be equal in quality to Swedish charcoal pig-iron. In this process, pig-iron is tapped from the blast furnace into a ladle having a capacity of 12 tons, and transferred to the rotary furnace. Burnt lime in the proportion of 2 per cent. of the total weight of the pig-iron, as well as some coal dust, are added, and the furnace is then closed and rotated at about 34 r.p.m. When tapped into the roller furnace, the pig-iron contains 0.09 per cent. of sulphur, which begins to fall rapidly, and then more slowly, reaching about 0.005 per cent. in approximately 30 min. At the same time, the proportion of silicon is reduced to about 10 per cent. The sulphur absorbed by the burnt lime produces calcium sulphides the oxygen then freed unites with the silicon, yielding silicon dioxide.

Personal

MR. A. J. MOORE, managing director of Ariston Alloys Limited, Mill Lane, Croydon, left this country last Thursday for a lengthy business trip to Canada and the U.S.A.

THE MIDLAND SECTION of the Institute of Vitreous Enamellers recently made a presentation of glassware to Mr. A. K. Williams on the occasion of his wedding.

MR. W. A. ROBOTHAM, a director of Rolls-Royce, Limited, has been appointed general manager of the company's new oil-engine division. The Rolls-Royce oil engine has been designed and produced at the new works, in Victory Road, Derby.

THE HON. R. A. BALFOUR, a director of Arthur Balfour & Company, Limited, succeeds MR. S. W. RAWSON, who has been appointed director general of Machine Tools, as president of the National Federation of Engineers' Tool Manufacturers. Succeeding Mr. Balfour as the new vice-president is COL. F. A. NEILL, a director of Jas. Neill & Company (Sheffield), Limited.

MR. G. C. R. MATHIESON, a graduate of Glasgow University, who was senior scientific officer in the aerodynamics department of the National Gas Turbine Establishment at Pyestock, has been appointed senior lecturer at the School of Gas Turbine Technology, Farnborough. Born near Perth, he studied at the Royal Technical College, Glasgow, before taking the degree of B.Sc. (Hons.) in mechanical engineering at Glasgow University. He served with the firm of Wm. Denny & Bros., Limited, Dumbarton, and with the Blackburn Aircraft Company, Limited. During the war he was in charge of a test and despatch flight of the R.A.F. in Persia. Mr. Mathieson is 31.

DR. GEORGE WEBSTER, principal surveyor for Scotland, Lloyd's Register of Shipping, is retiring at the end of September after 37 years' service. He will be succeeded by MR. H. R. GIBBS, who has been senior ship surveyor at Glasgow since March, 1950. His father, the late Mr. H. A. Gibbs, was principal surveyor from 1928 to 1935, when he was succeeded by Dr. Webster. MR. J. R. CLARK, who has been in charge of the plans department under Dr. Webster since October, 1940, will become a principal surveyor for the approval of plans of new ships to be built in Scotland. MR. H. MCQUEEN at present stationed at Newcastle, will succeed Mr. Gibbs as senior ship surveyor at Glasgow.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

MONTEVIDEO, August 9—Malleable cast-iron fittings for water pipes, for the Ferrocarril Central del Uruguay. Room 1084 (CRE (IB) 65191/51).

ULSTER, August 3—Grinding wheels, pistons, high-speed steel twist drills, reamers, tap and dies, iron castings, high-tensile bolts and nuts, etc., for the Transport Authority. The Stores Superintendent, Duncrue Street, Belfast.

FOUR MEN employed at the Consett Iron Company's works (Co. Durham) were taken to hospital and one was detained recently after being overcome in the gas-cleaning plant. Two other men were treated at the works and allowed to go home. It is understood that a seal attached to pipes carrying carbon-monoxide gas blew open and the men were affected by the gas before the seal could be closed.

Hungarian Foundry Scrap

F. VARGA, writing in "Többtermelés," reports that owing to the high production of scrap in the Hungarian foundry industry an analysis was taken of the production of wasters in an iron foundry. This report indicates the following causes of scrap in percentages: 56.14 due to defective preparation of moulds; 11.33 to inadequate ramming or gas venting; 9.1 to faulty assembling; 5.6 to unskilled pouring; 2.25 to various inefficient work; 3.88 to faulty core-making; 6.08 to careless removal of castings from the moulds; 4.32 to inaccurate patterns, and 1.3 to miscellaneous causes. A special committee was established for initiating systematic research work based on the above data in an attempt to find the extent to which the causes of scrap may be ascribed (*a*) to the possible lack of specialised training (*b*) to carelessness and (*c*) to shortcomings in technical guidance. It was established that 84 per cent. of the scrap was the result of carelessness and incompetence, and 16 per cent. was due to the shortcomings in technical guidance.

Drawback on Zinc Sheets

The Treasury has made the Import Duties (Drawback) (No. 19) Order, 1951, which approves a new scheme for the allowance of drawback of customs duty paid on certain plain zinc sheets used in the manufacture of perforated zinc sheets. The scheme increases the rate of drawback from £14 to £29 per ton, and reduces from 1¼ tons to 1⅛ tons the quantity of material in respect of which drawback is allowable per ton of the perforated sheets.

The Order came into operation on July 19.

David Brown Acquisition

When Lee Mills, Scholes, near Holmfirth, were offered by auction last week, they were acquired by the David Brown engineering group of Huddersfield and Meltham. The woollen mills belonged formerly to E. H. Sellers and Sons, Limited, and were bought in April, 1950, by the Ocean Trust Company, Limited, of London, who later closed them down. The premises are to be reopened shortly as a machine-tool reconditioning works.

More Technical Colleges

The Minister of Education (Mr. Tomlinson) is "pressing forward with a large and increasing programme of new building" to meet the deficiency in technical college accommodation. He announced that he was certainly not satisfied that there was sufficient such accommodation to meet all requirements. His programme had already been sanctioned, he said.

DURING THE PAST THREE MONTHS £145 has been paid to 36 employees of A. Reyrolle & Company, Limited, manufacturing electrical engineers, of Hebburn-on-Tyne, for suggestions they have put forward for improving production and reducing costs. About 500 suggestions yearly are submitted to the suggestion committee, and one employee has been granted £50 for one idea.

AFTER 37 YEARS' SERVICE, carrying thousands of holidaymakers and passengers from the Clyde to Ireland, the Burns & Laird Line vessel Lairdsglen is to be broken up. This popular veteran, built by the Ailsa Shipbuilding Company, Limited, Troon, in 1914, will go to Smith & Houston, Limited, Port Glasgow shipbreakers, and the scrap recovered from her will be sent to the Lanarkshire steelworks.

News in Brief

MR. S. BARBER, personnel manager of Sheepbridge Engineering, Limited, recently arranged for 150 members of the supervisory staff to make a tour of the South Bank Exhibition.

OVER 150 large works schemes for the better working of freight traffic are in progress on British railways, or have recently been authorised, and will be carried out as quickly as conditions of labour and materials allow.

DAVID MUIR & SONS, LIMITED, brass-founders, Burnside Road, Bathgate, are to build a single-storey brick structure to be used as a machine shop, and to extend the existing office block to provide additional facilities.

JET ENGINES for the Canberra bomber, which is built by the English Electric Company, Limited, will be made at a Bootle factory where work for 6,000 will be found. The construction of the factory will begin in the Autumn.

WHEN EXTENSIONS are completed at the Sunny Hill works of Qualcast, Limited, Victory Road, Derby, they will cover an area of 60,000 sq. ft. Part of the Sunny Hill works will be used for lawn-motor production, and some for storage.

BORAX CONSOLIDATED, LIMITED announce a new price schedule effective as from July 9 as follows:—granular borax (technical), £38 10s. 0d.; granular boric acid (technical), £67 0s. 0d.; and Dehybor (anhydrous borax), £58 10s. 0d. per ton all in multiwall paper bags; for packing in hessian sacks £1 per ton extra.

BURNTISLAND SHIPBUILDING COMPANY, LIMITED, have received an order for a bauxite ore carrier of 7,850 tons d.w. for Aaguenay Terminals, Limited, associates of the Aluminium Company of Canada. The new vessel will be of 420 ft. long and its engines will be constructed by Rankin & Blackmore, Limited, Greenock.

BLACKETT, HUTTON & COMPANY, LIMITED, Steel Foundry & Engineers of Gainsborough, announce that, consequent on the death of Mr. J. T. Blackett, late founder and chairman of this company, Mr. E. Bruce Ball has been appointed chairman of the board of directors; Mr. J. Currie has been appointed managing director, and Mr. John H. Lawrence has been elected to the board of directors.

THE NEW iron-ore discharging quay being built at a cost of £1,000,000 at Tyne Dock, South Shields, by the Tyne Improvement Commission in conjunction with the Consett Iron Company, Limited, is expected to be completed by the end of 1952. When the plant is in operation ore imports are expected to rise to 1,000,000 tons annually. There will be accommodation for ships of 20,000 tons capacity. The new quay will be 860 ft. long and 94 ft. wide.

THE BOARDS of Powell Duffryn Carbon Products Limited and of Great Lakes Carbon Corporation of New York announce that an agreement has been entered into under which a jointly-owned Company, British-American Carbon Corporation, has been formed in the United States to manufacture and sell carbon and graphite, and a wide range of carbon and graphite products used principally by the chemical, metallurgical and other processing industries. The offices will be situated initially at 18, East 48th Street, New York City, New York.

MR. F. C. PYMAN, managing director of William Gray & Company, Limited, the West Hartlepool shipbuilders, writing in the firm's magazine, expresses the opinion that any increase in the capacity of Britain's shipyards, now in the middle of its biggest boom, would, in time, become redundant. Because of the shortage of materials and labour, the shipyards were already slowed down to a rate of 925,000 gross tons per annum, which was 25 per cent. below capacity, and in the long run he estimates that demand is not likely to average more than a million tons a year.

THE DIRECTORS of the Irish Aluminium Company, Limited, announce that the resolution for an increase in the capital was not passed. It had been recommended that £30,000 of undistributed profits be capitalised in issuing 30,000 new £1 ordinary shares in the proportion of three new for every ordinary held. Subsequently a further 20,000 ordinary were to be offered to ordinary shareholders in the proportion of one new at 20s. for every two held, and 20,000 preference shares were to be offered to preference shareholders at 20s. per share in the proportion of two for every share held.

WHEN THE National Metal Exposition and the World Metallurgical Congress gather in Detroit, they will operate on two overlapping but distinct schedules. The distinctions should be noted:—National Metal Exposition, October 15-19, will be an exhibition of metal products, tools, processes, and will be staged at the Michigan State Fairgrounds on the edge of the city. World Metallurgical Congress, October 13-19, will hold some of its sessions on the Fairgrounds, some in downtown Detroit hotels and college halls. It is at the Congress that scientists and engineers from over the world will give technical Papers in 31 sessions.

DAVID BROWN TRACTORS (ENGINEERING), LIMITED, of Meltham, have submitted a scheme to establish a housing association at Meltham, and Meltham Urban Council has offered its help. If the scheme matures, it should greatly assist the Council to solve its housing problems, as a large proportion of the applicants for houses on the Council's waiting list are employees of the firm. It is understood that any housing allocations granted to the housing association by the Ministry of Local Government and Planning would not affect the Council's allocations. If the scheme is approved by the Ministry, houses built under it by the association would rank for exchequer subsidies.

ALFRED BULLOWS & SONS, LIMITED, of Long Street, Walsall, have appointed Ferro Enamels, Limited, of Wombourn, Wolverhampton, as sole distributors of Bullows spraying equipment and air compressors to the vitreous enamelling trade in Great Britain, Ireland, France and French Colonial Empire. This arrangement applies only to equipment for the vitreous enamelling trade; Alfred Bullows & Sons will continue to market equipment directly to all other trades. A similar arrangement has been made with Ferro Enamels (Holland), N.V., of Van Helmonstraat 22, Rotterdam (West), Holland, covering the vitreous enamelling and ceramic industries in Egypt, Israel, Lebanon, Turkey, and all countries in Europe except France.

BORAX & CHEMICALS LIMITED announce that their boron products have in the past invariably been supplied packed in hessian bags, but now, unfortunately, there is considerable difficulty in arranging adequate supplies of this container. Such being the case, the co-operation of customers is desired in accepting, when occasion demands, supplies in 6-ply paper bags. Considering this, prices have been amended to the following with immediate effect:—Borax, granulated, 99½ to 100 per cent., £38 10s., boric acid, granulated, 99½ to 100 per cent., £67, and "Pyrobor" (dehydrated borax), £58 10s. per ton carriage paid to U.K. customers. Surcharges for small quantities remain unchanged, but where hessian bags with paper liners are used, the prices are £1 per ton higher.

Raw Material Markets

Iron and Steel

Deliveries of all grades of pig-iron to the foundries continue to be much below demands, and users have no opportunity of building up stocks. The general engineering, motor, and textile foundries are feeling the effects of the scarcity of supplies acutely, as they are heavily committed for export and home trade. Reports continue to circulate of increased iron-ore deliveries to the furnaces, but the foundries have not yet received additional supplies of hematite or other grades of pig-iron. Hematite makers have insufficient stocks of ore to enable them to obtain maximum production from the furnaces now in blast, and producers of low- and medium-phosphorus irons are similarly handicapped.

The possibility of obtaining supplies of foreign iron is being considered by some foundries, but there is little, if any, hematite or low- and medium-phosphorus iron on offer from abroad. Prices, anyway, are very high compared with the home market. Offers of Continental pig-iron in the higher phosphorus grades are being made, and it is reported that some parcels are being taken up, but there is no great interest shown because of the high cost.

Deliveries of home-produced high-phosphorus pig-iron to the jobbing and light foundries show very little improvement, furnaces being heavily in arrears.

Foundry coke is coming forward in satisfactory tonnages for current use, but stocks are not being augumented appreciably. Limestone, ganister, and firebricks are available to requirements, while foundries in need of ferro-alloys are able to obtain most of the grades required.

Many of the re-rollers continue to receive parcels of Continental steel semis, but the overall supply position is still very unsatisfactory, and most mills are working a reduced number of shifts. Orders on hand are plentiful for all sizes of sections, bars, and strip, while the re-rollers of sheets cannot produce anything like the quantities called for. Home steelworks are sending out all available supplies of billets, blooms, and slabs, as well as defectives and crops, which arise, but there is a wide gap between the tonnage available and that required. Much larger tonnages of sheet bars are also required by the sheet re-rollers.

Non-ferrous Metals

Monday saw the publication of yet another Order giving effect to the upward adjustment in brass scrap, secondary zinc, and lead, as required by the recent increase in virgin lead and zinc. As anticipated, the rise represented about 90 per cent. of the £30 added to zinc and the £20 to lead. One adjustment was made in copper, the price of bright untinned H.C. wire and commutator bar coming down to £217. Perhaps the most acceptable item in the Order was the fixing of upper limits for brass ingots and billets; no mention is made of a price for copper ingots. Many consumers will probably feel that the upper limit chosen for brass ingots is on the high side, leaving a fairly wide margin over the controlled limits of brass scrap. It must, however, be remembered that at ruling prices casters are involved in quite heavy monetary loss through the wastage incidental to melting operations.

Now that the long awaited control of ingot prices has been announced, it is to be hoped that matters will improve, but it is too much to hope that, in spirit and in letter, all evasion of the control Order has been checked. Doubtless the Ministry of Supply would institute proceedings in respect of any detected transgression against the regulations, but it is probably far from easy to bring the wrongdoer to book. The new scrap prices (per ton) are:—

LEAD—Remelted, containing by weight not less than 96.00 and not more than 99.96 per cent. of lead, £165.

ZINC—Remelted, £181; hard spelter, £171.

ZINC ALLOY—To B.S.S. No. 1141, £204.

BRASS—To B.S.S. No. 218 or 249: (*a*) Cropped billets £234, (*b*) uncropped billets £232, (*c*) ingot £229, (*d*) other than (*a*)-(*c*) £229; 65/35 casting quality: (*a*) ingot 229, (*b*) other than ingot £229; 70/30 casting quality (minimum 68 per cent. copper): (*a*) ingot £235, (*b*) other than ingot £235; 63/37 strip ingot for rolling, £237; 70/30 strip ingot for rolling, £243.

COPPER SCRAP—Clean bright-untinned or tinned wire, commutator bar, £217; firebox cut to crucible size, £217; firebox not cut, £212; No. 1 wire, £207; clean heavy, £202; No. 2 wire, £197; braziery, £180.

LEAD SCRAP—Cable sheathing, £165; other than cable sheathing and containing by weight not less than 96 per cent. of lead, £161.

ZINC SCRAP—Cuttings, £161; old zinc free from tar, £142.

ZINC ALLOY SCRAP—Alloy diecastings free from inserts, £181; alloy diecastings not free from inserts, £156.

ADMIRALTY GUNMETAL SCRAP—In any form not less than 9 per cent. tin and not more than 0.5 per cent. lead, £263.

COMMERCIAL GUNMETAL SCRAP—In any form, £225.

CUPRO-NICKEL SCRAP—70/30 process scrap, £257; 70/30 used condenser tubes, £217; 80/20 process scrap, £235.

GILDING METAL SCRAP—In any form, £212.

BRASS SCRAP—QF cases free from primers, £208; QF cases not free from primers, £202; SAA cases mechanically treated or fired, £198; SAA cases muffled or furnaced, £192; cuttings, £199; rod and fuze scrap not burned, £188; swarf, £178; heavy, £173.

There are some signs that resistance to the prolonged fall in tin is developing, and there is, of course, always the chance that America may again enter the market as a buyer. In the meanwhile, stocks are still very short on the London Metal Exchange, and that accounts for the persistence of a backwardation.

Figures issued by the Copper Institute in New York show that production of crude copper in June was 87,100 short tons, against 96,800 tons in May, while in refined copper the corresponding figures were 105,100 tons and 113,500 tons. From these it will be noted that a fairly sharp fall took place in output. Deliveries to domestic users in June were 114,100 tons, against 118,100 tons in May. Stocks of refined copper in producers' hands at June 30 were 60,900 tons.

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

Cash—Thursday, £855 to £860; Friday, £837 10s. to £840; Monday, £832 10s. to £835; Tuesday, £832 10s. to £837 10s.; Wednesday, £862 10s. to £865.

Three Months—Thursday, £821 10s. to £822 10s.; Friday, £816 to £817; Monday, £816 to £818; Tuesday, £813 to £814; Wednesday, £835 to £837 10s.

New Catalogues

Business Control Methods. A brochure received from the British Tabulating Machine Company, Limited, 17, Park Lane, London, W.1, describes and illustrates a range of Hollerith machines used for the control of accountancy by means of punched cards. It runs to 24 pages and carries sufficient detail to make the subject really interesting. It is available to our readers on writing to Park Lane.

Magnetic Clutches and Brakes. Rapid Magnetic Machines, Limited, of Lombard Street, Birmingham, 12, have sent us an eight-page brochure which describes and illustrates a range of magnetic clutches and brakes. Especially useful are the two tables of technical data printed on page 6, yet the insertion of a code number might be of help where business is effected by cablegram. The booklet (publication No. 126) has been attractively carried out using black, white and pale pink. It makes a nice change from the usual blues and yellows. As these components have many uses in foundries, those interested can have copies by writing to Birmingham.


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

(*Delivered, unless otherwise stated*)

July 25, 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., 32s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 34s. 9d. 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. 3¼d. 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, £862 10s. to £865 ; three months, £835 to £837 10s. ; settlement, £862 10s.

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

Lead.—Good soft pig-lead (foreign) (duty paid), £180 ; ditto (Empire and domestic), £180 ; " English," £181 10s.

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

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

Brass.—Solid-drawn tubes, 25⅛d. per lb. ; rods, drawn, 28¼d. ; sheets to 10 w.g., 30⅛d. ; wire, 31¾d. rolled metal, 28⅞d.

Copper Tubes, etc.—Solid-drawn tubes, 26⅞d. per lb.; wire, 261s. 9d. per cwt. basis ; 20 s.w.g., 288s. 9d. 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), £346 to £360 ; Admiralty GM (88/10/2), virgin quality, £346 to £350 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £354 to £390 ; L.P.Bl, £309 to £322 per ton.

Phosphor Bronze.—Strip, 38½d. per lb.; sheets to 10 w.g., 40⅝d. ; wire, 42⅝d. ; rods, 38½d. ; tubes, 43½d. ; chill cast bars : solids 4s. 1d., cored, 4s. 2d. (C. Clifford & Son Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 7½d. per lb. (7%) to 3s. 7¼d. (30%) ; rolled metal, 3 in. to 9 in. wide × .056, 3s. 1½d. (7%) to 4s. 1¼d. (30%) ; to 12 in. wide × .056, 3s. 1¾d. to 4s. 1½d. ; to 25 in. wide × .056, 3s. 3¾d. to 4s. 3½d. Spoon and fork metal, unsheared, 2s. 10½d. to 3s. 10¼d. Wire, 10g., in coils, 3s. 7¼d. (10%) to 4s. 7d. (30%). Special quality turning rod, 10%, 3s. 6¼d.; 15%, 3s. 11d. ; 18%, 4s. 3¼d. All prices are net.