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The Institute of Metals

Last week, we spent an interesting morning attending the Annual Meeting of the Institute of Metals, and were particularly impressed with the excellent delivery of the various speakers. After the recent spate of political addresses, it was indeed a pleasure to hear pure English audibly pronounced in well-balanced sentences. So good were these efforts that the normal boredom to be associated with the formal business of an annual meeting was replaced by a lively interest. It can be presumed that the Institute of Metals, like all similar bodies, finds itself at the perennial "cross roads." Membership fees are again to be increased, and there is some natural apprehension as to the result. As one who is not without secretarial experience, we would counsel a major effort to ensure that only a minimum number find themselves in arrears, as the majority of losses arise from the inability or the unwillingness to pay a doubled fee.

The new president, Mr. H. S. Tasker, B.A., who is prominent in the lead industry, in his Inaugural Address, clearly showed how industry was very much indebted to the technical institutes for the progress they have achieved, and he was relying on manufacturers' good will to ensure that the Institute of Metals would not be handicapped in the future through lack of funds. As an industrialist, the new President was impressed by the confession of one erudite scientist that the Papers contributed by a second of equal erudition were "beyond his comprehension." This statement was forcefully used to stress—though he was too polite to use the phrase—that Papers dealing with subjects restricted to very specialised fields bored the larger majority of the audience. His remedy was the sensible one of simultaneous sessions or group study circles. We can testify as to the success of this system, as it has been in operation by the Institute of British Foundrymen for a number of years. Moreover, members of the Institute of Metals are not without experience of the worth of meetings organised to interest one important section. Once such matters as annual examinations in various technical activities are established, they are taken for granted very much like fish on Good Friday. Quite indirectly, Mr. Tasker recalled the enormous amount of preliminary work necessary before new examinations could be established. He was referring to the creation of the national certificates in metallurgy and those to be associated with the Institution of Metallurgists. The president deserves well of future generations of students for he has been very active in educational matters. It is obvious that technology alone does not satisfy his conception of education in its fullest and best sense of the word. He would prefer some acquisition of the classics, and suggested as being of use in opening-up this vista to students the devoting of an hour a week to a lecture by a classical scholar on some phase of history, literature or the arts. It was interesting to hear from Professor O'Neill, when thanking the President for his Address, that he had already instituted this activity at the University of Wales.

At a luncheon which followed, Professor Albert Portevin, the well-known French savant, was presented with the Institute's Platinum Medal in recognition of his great services to the metallurgical sciences. His charming speech in acknowledgment was repeated in English by Professor Murphy. The social atmosphere of the meeting was so friendly that we sincerely regretted we could not participate in the functions which followed. Sir Arthur Smout, the retiring president, and the executive officers of the Institute, merit the thanks of the ordinary member for the removal of the "starchiness" which had tended to creep in.

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New Research Station

Construction of a new-style research station that will have in miniature much of the equipment of a steel works is to be started by the British Iron and Steel Research Association in Sheffield during the next few months. Pilot steel-works plant for melting, rolling, drawing and forging, so as to apply research results in practice before modifying the production plant, is to be installed in buildings to be erected on a 2½-acre site at Hoyle Street.

Steel melting will be carried out in a 10-cwt.-capacity electric-arc furnace, which will be used for work on sulphur elimination and on other problems related to electric-furnace practice. A high-speed 14-in. 4-high cold-strip rolling mill will enable B.I.S.R.A.'s scientists to carry further their investigations into such things as "roll force," the measurement of which gives rolling-mill makers and users the equivalent of the boiler engineer's steam pressure gauge in working out safe and economical loads. On a smaller 2-high mill, valuable work has already been done by B.I.S.R.A.'s rolling section, but there must now be installed larger and fully instrumented equipment, more akin to modern industrial practice. There will be an experimental wire-drawing plant in the new buildings.

The new buildings, which will cover 38,000 sq. ft., will cost about £250,000, and will form the first stage of the long-term development plan for the site. They will consist of a three-storey block and two single-storey plant buildings, occupying about half the available space. Work on corrosion, steel founding, refractories and other subjects will also be carried out.

Mr. C. N. Kington, M.B.E., B.Sc., A.M.I.Mech.E., A.M.I.E.E., is locally in charge for the Association as chief engineer and administrative officer. Husband & Company of Sheffield are the civil engineers and architects. The choice of Sheffield for this important research establishment follows the Association's policy of placing its modern scientific facilities in the main industrial centres. The resulting intimate contact between the industry's manufacturers and scientists ensures that problems can be communicated as soon as they arise, and research programmes can readily be modified to meet the changing needs of industry.

C.F.A. Elects Officers

At the eighth annual meeting of the Council of Ironfoundry Associations, recently held in London, Mr. N. P. Newman was unanimously re-elected chairman for the succeeding year. The Committee for 1950-1951 is now composed as follows.—*Chairman*: Mr. N. P. Newman; *Vice-chairman*: Mr. J. D. Carmichael, Mr. F. D. Ley and Mr. H. V. Shelton; *Elected Members*: Mr. D. Graham Bisset, Mr. P. L. Gould, Mr. V. Jobson, Mr. A. E. Pearce, Mr. S. H. Russell and Mr. A. Watson. *Nominated Members*: Dr. J. E. Hurst (British Cast Iron Research Association), and Mr. J. W. Gardom (Institute of British Foundrymen).

The death is announced of Mr. C. J. Johnston, aged 65, the proprietor and for many years, until his retirement in 1948, managing director of Gillett and Johnston, Limited, bellfounders, of Croydon. His firm had a world-wide reputation for the manufacturing of carillons. Among bells exported by his company, the Rockefeller Memorial carillon at New York has 72 bells, the base or bourdon bell of which weighs 18¼ tons and is the largest tuned bell in the world. Mr. Johnston was also chairman of F. W. Elliott, Limited, clockmakers, and in 1945 and 1946 was Master of the Worshipful Company of Clockmakers.

Forthcoming Events

APRIL 12.

Institute of Vitreous Enamellers.

Southern Section:—Annual General Meeting, followed by "Methods of Plant Control for Reducing Enamelling Rejects," by J. H. Gray, at the Howard Hotel, Norfolk Street, London, W.C.2, at 7.15 p.m.

APRIL 13.

Institute of British Foundrymen.

Lincolnshire Branch:—Short Papers Competition, at the Lincoln Technical College, at 7.15 p.m.

Institute of Vitreous Enamellers.

Midland Section:—"Where are we Going? The Future of Vitreous Enamels," by W. Ball, W. E. Benton and H. Laithwaite, at the Chamber of Commerce, New Street, Birmingham, 2, at 7.15 p.m.

Institute of Welding.

North London Branch:—Annual General Meeting, followed by films, at the Regent Street Polytechnic, London, W.1, at 7.30 p.m.

APRIL 15.

Institute of British Foundrymen.

Newcastle-upon-Tyne Branch:—Annual General Meeting, followed by a technical film, at the Neville Hall, Westgate Road, Newcastle-upon-Tyne, at 6 p.m.

Institution of Chemical Engineers.

North-western Branch:—"Acid-resistant Vitreous-enamelled Plant," by G. E. Charlish and E. J. Heeley, at the College of Technology, Sackville Street, Manchester, at 3 p.m.

Forty Years Ago

The Foundry Trade Journal for April, 1910, contains an illustrated description of the Featherstone Foundry, Chicago. It appears that it would satisfy the major requirements of the recommendations contained in the "Garrett" Report. The well-designed stock yard is shown to be serviced by a magnet suspended from an overhead electric travelling crane. Special attention was given to lighting and ventilation. Lockers and washing facilities were provided. There is a long article on grinding machines, and the progress made in this field during the last forty years is noteworthy. There is a note about the supply of steel for the building of the "Dreadnought," the last battleship to be built on the Thames. The death was reported of Sir Frederick Mappin. Sir William Mather, of Mather & Platts, Limited, placed £10,000 in trust, the income from which had to be distributed each year to employees on the occasion of their annual holidays.

I.B.F. Conference Fund

Mr. C. H. Kain, honorary treasurer of the Conference sub-committee of the Institute of British Foundrymen, announces that the total amount of the donations so far received towards the expenses of running the Annual Conference which is to be held at Buxton from June 6 to 9 is £434 2s. 6d. Whilst the direct appeal for funds has been confined to those four branches of the Institute—Birmingham, Lancashire, Sheffield and East Midlands—which centre at Buxton, contributions to the fund from members outside these areas will be welcomed. All should be sent direct to Mr. C. H. Kain at Lake & Elliot, Limited, Braintree, Essex. It is hoped shortly to publish detailed lists of donations received.

A telegram of good wishes for the success of the British Cast Iron Research Association Foundry Conference at Ashorne Hill last week was received from Mr. P. H. Wilson, O.B.E., president of Council, who is at present recuperating in Portugal from the results of an accident which occurred last Christmas. Dr. J. G. Pearce, director of the Association, replied suitably on behalf of the assembly.

Education for Foundry Personnel

By W. Findlay Seivewright

It is generally accepted that education must be something more than merely equipping a man with the immediate "bread-and-butter" knowledge required for his trade. In this Paper, which was presented to the London branch of the Institute of British Foundrymen, the problems of training all grades of foundry personnel are critically examined. The Author, who is on the staff of the International Meehanite Metal Company, Limited, considers that the remedy for the prevalent narrowness of outlook is a broad-based education in which specialised and cultural subjects are carried on side by side.

OBVIOUSLY the future development of British industry, and the whole life of this country, is completely dependent upon education. Education is not merely teaching skills of the hands or brain, important though that is, but rather of creating an attitude or approach to life and certain specific problems. It has been said that a man looks at life in terms of his job, and the particular place in the social structure that that job conveys. This has been reiterated by many people, in close touch with the all kinds of labour, and while not necessarily agreeing, it is felt that these people are in a position to assess this point.

A fact with is appropriate to record is that the best types of worker and certainly the most co-operative are men who have other interests outside their work. This suggests that there is a relation between the breadth of a man's outlook and his ability as a worker. Put in other words, a man's sense of responsibility is related to the width of his outlook. This in itself is a strong indication that education is more than just cramming.

While these points cannot be considered as conclusive, they do suggest a need for a re-study of the subject. Any such examination as this cannot exclude some observation on the question of unofficial strikes.

How many of these strikes would have been prevented if the striker had felt that his contribution was important and that he was a valuable member of the team?

Ideologies with infinite variations are being pumped out by the newspapers and by political leaflets every day. The wireless is the source of potted economics; potted biographies, and things like the brains-trust out of which comes weird and wonderful ideas. The cinema in its turn—and it is noteworthy that the average patron makes a visit three times per week—produces an "easy-way-to-wealth" complex: it glamorises very doubtful behaviour and it tends to glorify types who, in ordinary life, would not be worth anything. It shows people gaining material wealth without apparently working for it.

In the past, the teachings of Christianity have created a moral stability and a strong sense of responsibility which in periods of strain have been invaluable. However, the fact must be faced that by and large Christianity has not the influence that it formerly had and more and more people are living by very material standards—and these standards do not appear to produce stable and dependable citizens.

Education must, if it is to achieve worthwhile results, play its part in inculcating anew these standards.

A study of the lives of some of the great men of industry, particularly inventors and scientists, reveals that the great majority were men of high principles and a keen sense of responsibility, and they all had a wide range of activity—in fact, the busier these men were, the greater the output of high-quality work. The great majority have at one time or other paid tribute to those who taught them and usually that tribute includes some remark on how the teacher opened their minds to many possibilities.

A good workman is usually a good citizen, and this suggests that there are certain fundamental requirements that are common to both the industrial sphere and civic sphere of life. The foregoing allows the postulation of certain limited conclusions on the matter of industrial education in addition to the basic question of teaching the skills required whether of hand or brain.

(1) Part of industrial training must be the reason why certain things are done in certain ways.

(2) Structure of industry and the interrelation of various jobs.

(3) The relationship of the individual's work to the finished product.

(4) The place of the product and its use to society.

Thus industrial education by summation is: the training and teaching necessary to enable a man to make the best use of his talents and to be a stable and productive member of society.

Aims of Education

It is true to say that in the past, education has been divided very largely into two basic watertight compartments: formal education and industrial. Under the new Education Act this distinction will tend to be less pronounced, but it will still be there. Education cannot be an aim in itself, it must produce something; therefore, all types of education should be a part of a whole forward movement of history.

The Act, in an endeavour to give better teaching to a wider section of the nation, gave effect to the raising of the school-leaving age, and at the same time proposed the modernising and re-adjustment of subjects taught, and the idea of central schools, county schools, and part-time further education. However, although the theory was sound, the practice seems to be going wrong. There is a tendency arbitrarily to decide at an early age, by means of a written examination, which is admittedly an imperfect measure, the line along which future training will follow. After this age the training becomes specialised and so-called extraneous subjects tend to be excluded or dealt with very cursorily. This can only have one result and that is, while producing youngsters who are possibly more skilled in a highly specialised degree, their ignorance in other directions will be such that narrowness of

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outlook will become commonplace; this is directly opposed to what education should be and what is the greatest need at the present time—a broad-based education with specialisation and cultural subjects being carried on at the same time.

This approach, or definition of the place and value of education, brings the subject into direct conflict with the pronouncement that the only thing a man is interested in is the size of his pay packet. This is a form, complicated perhaps, but certainly a form of a wishful thinking. It is part of an inserted thought, produced by those who are not prepared to face the implication of the wider issues.

These wider issues can be summed up in a neat statement: interest, prestige, and income, and income by itself is not all-important, but it does measure a man's success, and the success gives him self-respect.

If this is accepted as a reasonable thesis then it becomes clear that to produce stability these three points must be cared for in any education designed to be industrially satisfactory in its result. It implies that a man with a proper training and skill, say in the sense of the old-time craftsman such as Chippendale of furniture fame, is confident in himself and his knowledge, and it is by these very facts that a good citizen is made.

There is an implication that in order to maintain these standards, it is essential to use all available manpower. As there is, as yet, fairly free movement of labour, then each industry is competing for the better qualities of manpower.

The foundry industry has to face the fact that all too frequently it receives the poorest quality of labour in the market. That fact cannot be brushed aside as being caused by working conditions—it is a measure of what else the industry has to offer, or the lack of it. Frequently, the previous training has been far too scanty and hurried for the particular types of individual—the question of over-large classes in schools is not the founders' concern, they can only deal with the result—and boys arrive at the works with sometimes a pathetic lack of even the most rudimentary traces of knowledge, and often full of meaningless parrot cries culled from the cinema and other such places. The challenge is to make the best use of the material, producing a stable and useful member of society.

Education Needs and Requirements

The attitude of most people in the shops is very strongly influenced by the attitudes and actions of those with the most responsibility, *i.e.*, the directors, and it is suggested that they are the next level that should be examined. It is not proposed to spend much time on this particular point, too much has already been said and written, but just as in the case of boys, interest, prestige and income are equally important. These can only be achieved by an education which gives them a broader outlook and an appreciation of the importance of the individual to the unit. This education must cover understanding of the reasons why and how men react to given circumstances.

If this education covered such subjects as structure and history of trade unions—structure of industry—local and central government, and, of course, the appropriate technical skills, which would be taught at the correct earlier stage, then there would be enlightened and better management. Just in case anybody considers that top management does not require education, attention is directed to an advertisement which read:—

"Man wanted, young, active, interested in future progress rather than present emoluments. Interesting and progressive job in foundry concern for right applicant. Those who have managerial and executive experience are the ones to whom this advertisement is addressed. Reply stating age, experience, training and salary expected."

Does this indicate educated management?

Here is another example:—

Three universities were each asked to select a graduate in metallurgy and send him for an interview for a post as manager. The applicants were interviewed by two directors and the secretary of the firm. One of these applicants reported that the questions seemed to be very far away from the question of the job. Eventually he received a note thanking him for attending the interview and saying that they had decided to appoint one of their own foremen. It is obvious that that management did not know just what they required.

The answer lies in education, and there are two types of experiments which appear to be very successful and which are recommended for serious consideration.

(1) Appointment of directors who attend meetings of the board but for the first year do not take part in policy forming.

(2) The formation of a management committee on which there are one or two individuals for whom this is part of training.

The Foreman

The same approach is necessary to the training of future executives only in this case they will be attached to a senior man and be taught by him, but the executive responsible for the training must be carefully chosen. The same will apply on a modified scale to foremen, but here there are complications. The foreman at the present time is in a stage of transition, and it is difficult to see the ultimate results if the matter is allowed to drift. The foreman has a very important function to serve, and he does need all the help that education can provide if he is to give of his best.

His important function is as a leader of his team, as an interpreter of policy to the men, and as an interpreter of the men's views to the management—not a form-filling clerk. His education must be concerned with the human aspect, with attitude, structure of trade unions, structure of industry, and with a wide range of practical skills.

The Shop-floor Worker

How far should the worker's education go beyond what he receives when he enters the industry as a boy? What about the labourer? It is here above all else, that the real value of modern aids to education can be seen. These men, who frequently have to perform the same action day in and day, in a grinding monotony, must be given interest, prestige and encouragement. They must be shown the relation between their actions and the finished product—also the function performed by the finished product in making life better for them and their families. The importance of each man's part in the final result must be stressed, and how much the team depends on his individual efforts for ultimate success. Everybody likes to feel that he is welcome when he goes to a new firm, whether he is an apprentice or a director, but this does not always occur, and real education would give an appreciation of the value of the right reception of new people.

It will be appreciated that, whatever the level, the instructor is the key to success, and his selection must be undertaken with the greatest care. However, theories are all very well, but they can only point to a possible answer. The touchstone of success is the test of practical application. At once the most severe testing ground and most uncomplicated is the new entrant at the end of full-time school education.

The Meehanite Training Scheme

The full implication of the foregoing for the foundry industry meant that at some stage, and it should be early, it would be necessary for these boys to be taken away from their normal surroundings, so that concentration on training should be complete. The development from this stage in the "Meehanite" training school was the application of the public-school principle, boys being away from home for definite terms.

Gradually the management evolved the idea of a short visit to the school with a long period at the home foundry, the now familiar principle of one month at the central school alternating with nine months in their own foundry. This ensured that the basic teaching would be universal, while training in the particular types of work in their own foundry could be carried on.

The training consists of the teaching of moulding, including reasons for doing each action, composition of sands and why particular sands are used, construction of patterns, making blue-prints, fettling, casting, etc. The character is taken care of by creating a monitor system. Each class consists of eight boys, and each boy has a turn of being responsible for the tidiness and cleanliness of the locker and washing rooms, the training foundry, and the classrooms. Marks are given for each boy's individual cleanliness. The place of the foundry in the industrial set-up is shown by several visits to other types of works such as the Stanton Iron Works, to see the blast-furnaces.

To give the broader aspect of education, country walks are taken during which all sorts of subjects are examined and it is fortunate that the school is at Butterley, near some of the finest beauty spots in the country. The Author paid tribute to the courtesy and helpfulness of the Butterley Company, Limited, particularly Mr. Newman, for offering such a fine position and making the whole scheme possible. Of course, games are played at the week-ends and in the evenings.

Incentives and Awards

It will be clear from the foregoing that the question of citizenship and breadth of training is not treated as a special subject, but almost as an incidental to the other parts of training—it has been found that is the best way to treat such subjects in dealing with boys and adolescents. It will be noted that by these means, the question of *interest* is met. Now *prestige* for youth must be both short-term and long-term. The short-term is cared for by means of a monthly prize—this consists of a book chosen by the winning boy—and to encourage further development the two best boys are invited to the International Meehanite Research Institute Annual Conference, one as the guest of the International Meehanite Metal Company, Limited, and one as the guest of the Meehanite Training and Educational Group. The long-term prestige is cared for by means of a certificate given at the end of training to each boy showing the standards achieved during the period of training.

There is also a diploma award which is given to boys who have achieved an outstanding level. The assessment for this award is done by a committee which takes into account not only the scholastic side of training but the boy's attitude and behaviour in his own foundry and the standard of work turned out by him during his last year of apprenticeship. It should be noted that the certificates are not substituted for the normal apprenticeship certificates but are additional and are meant as a measure of a boy's quality as a man as well as a workman—it is in keeping with the desire to raise the standards of men in the foundry industry.

Naturally the question of income remains. Income for apprentices is, of course, fixed, and therefore cannot be dealt with in this context. To keep a boy's interest, and counteract all the things said against the foundry, which tend to take the boy away, is probably one of the major points requiring attention.

This has been met by trying to create the feeling of a team spirit through the method of pointing out that the Meehanite apprentice is something special. After very careful study and discussion with some of the leading authorities on boys, the following was evolved:—

Each boy is supplied with a neat blue boiler suit type of overall prior to his first visit to the school. He is then given an attractive cloth badge to put on the breast pocket, and in addition an attractive enamel badge for the lapel of his ordinary clothes.

In other words, the boy's pride is called into play to help him gain some of those indefinable things which go to make a positive character. During the nine months spent at his own foundry between visits to the school he is under the care of a specially selected man whose main job is to see that he practises the lessons he was taught at the school. This serves the double purpose of ensuring that the total pace is not too great for the slowest type of boy and yet the quick learner has scope to develop.

When a new class of boys is started they are carefully watched and for their second visit they are split into groups which, as far as possible are based on the fact that all boys in the group have a similar pace of learning. By the constitution of the group, the management takes a keen interest and boys are regularly seen by them, thus ensuring that none of the boys gets the feeling that they are just cogs in a machine.

Much credit is due to what may be called the "originals"—the few who by their energy and determination, helped to bring to life a school on these lines.

When the school was opened in the autumn of 1945, no one could tell whether it would be successful—it was the very first attempt in this country to set up such an ambitious training scheme.

Organisation of the Training Group

Now, of course, it is quite certain that in everybody's mind is the question, "Has this succeeded?" Here are some facts by which it is possible to measure the levels of success in operation. There are twelve firms within the Meehanite Training and Educational Group, representing everything from the large to the small firm, machine moulding to highly skilled jobbing moulders, and specialist standard production to the tied foundry producing a certain series of castings to fixed design. Geographically, these firms are scattered over an area bounded by the Clyde on the North and the Thames in the South.

Up to the present, some 100 boys have attended the school. Twenty-four have completed their training and attained the standard pass certificate. Five of these have

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earned a diploma, this being presented at the boy's own works in front of all his workmates.

There is no rule that a boy must wear his overalls and the enamelled lapel badge, yet they all do. Foundry managers are impressed and enthusiastic about the effect on the boys. It has not been possible to check wastage completely, but on present information it appears to be in the region of 5 to 7 per cent. This consists almost entirely of boys going to other foundries for a wide variety of reasons and one boy who was a complete failure, but this was in the early days.

As it is obviously impossible to be statistical on this subject, it must suffice to quote a few cases.

(1) Two boys sent to the school from a very big firm wrote to the managing director, and used the following paragraph:—

"We are just sending you a short report of our first week at the school. In the first place, we would like to thank you for giving us the chance to take advantage of the Meehanite Training Centre. . . . We are going to work hard in the hope of bringing the prize back with us. This prize is given to the best student in the course. We are determined not to let you down."

(2) A boy from a second foundry had made two visits and the foundry manager received a letter from his parents. This letter was laboriously written—the parents were obviously not in the habit of writing. They thanked the foundry manager for giving their boy the chance of this wonderful training. They spoke of the great improvement in the boy's ways and of how courteous he had become at home.

(3) Two boys who had passed the matriculation examination and had attended full secondary school training went into the foundry temporarily. They are taking their training in the normal way at the school and as a result are enthusiastic foundry apprentices.

(4) An adolescent attending the school for the first time was a very keen mischief maker, and a source of real trouble at his own foundry. For the first half of his visit he constantly upset his classmates, and then he quietened down for the remainder of the period. Two months after his return to his own foundry the manager reported that the boy had changed and is now co-operative and a good worker.

The above shows that the Group is operating on the right lines—it has still much to learn before such training can be regarded as having reached its highest standards.

Training Adult Personnel

The Group has experimented with these principles in the training of other types of personnel. One interesting experiment of a ten-day course was for mixed foundry personnel who did not have a foundry-floor training. They were taught the rudiments of moulding, etc. Reports indicate that it worked well and that the men who attended have since found a new interest in their work. Included in this course were two unusual features: (1) Some instruction in the history of the foundry, and (2) a review of the birth and growth of Meehanite—the material in which they all deal, and on which they are dependent for their livelihood.

One other point of interest—the special class was half theory and half practice and those attending were a mixture of practical and non-practical. The idea behind this was to get them to help each other and so by practice realise the importance of each to the final result.

It may be of interest to indicate the methods used in the International Meehanite Metal Company, Limited, in the training of their own specialist staff. When a new man is engaged, he is given over a period of time a picture of what Meehanite is, who the company are, the job done and the responsibilities of each. A technical man has a spell of teaching from the commercial and publicity side of the business, thus creating a complete picture for him and at the same time helping him to gain a sound perspective. He is encouraged to go through records to find out information of all kinds; this is done before he settles down to his special line. Regular staff meetings are held where all kinds of subjects are aired and discussed.

Conclusions

Sufficient has been given to show that there are some very solid grounds for believing that the principles initially enunciated are right, and from experience that they can be applied with advantage to all levels of workers in the foundry industry.

The use of the casting in industry should be demonstrated—exhibitions in the works are an excellent means of achieving co-operation. Charts showing all the related tasks in the completed job help to preserve a sense of belonging. Individual notice by the highest level is important. House magazines creating a sense of kinship, film shows, works sports, etc., all have their place in creating that pride of job, and pride in the firm which are the basis of interest and prestige for these workers. But it should be emphasised that all these activities have to be consciously guided if they are to achieve the educative result.

It will be appreciated that to achieve the results which are essential if founding is to survive as an effective industry, then the instructor becomes a key man for the future. In fact, it is not too much to say that probably the most important job now is the creation of the necessary instructors at all levels.

The qualities required and how to recognise them is the greatest problem; for this there are no golden rules, but it is suggested that the following are essentials:—

(1) A strong sense of vocation.
(2) A high sense of duty and moral standards.
(3) A real appreciation of his fellow-men.
(4) Patience and courtesy.
(5) Ability to impart knowledge, combined with a sound knowledge of the subject.

Do such men exist in the industry? It has been stated that they do not. Personal contact has proved that there are plenty of such men available if the industry has the desire to use them.

It is suggested that the next step for education in the foundry is the creation of a central educational body to which everyone is affiliated, with a director of education and an instructor's training school. Only by this means will the foundry gain the full benefit of all that has already been done and create an industry which is industrious, happy and trouble-free.

The tools of education have been indicated, but attention should be drawn to one of the newest and, as yet, not fully developed aids, that is, the film. It is proposed to follow the Paper with the showing of a film which presents a highly complicated technical subject in a most interesting and instructive manner. The Author is indebted to the Film Producers' Guild for their help in the choice of a film. However, before this, he would like to take the opportunity of paying tribute to his chief, Mr. E. M. Currie, without whose indulgence in allowing complete freedom to pursue those ideas it would not have been possible to prove or disprove them.

Work in a Jobbing Foundry*

By J. F. Dowell and H. London

(*Concluded from page* 347)

Some Typical Loam Moulding Jobs

Paper-drying cylinders, moulding of which is now to be described, must, as is obvious from their function, have machined surfaces which are free from defects, inclusions or blemishes of any sort; they must have a surface which will also take on a high degree of polish. Thus, a strong, close grained iron is needed together with meticulous care in moulding technique.

The mould is constructed in loam in a pit 18 ft. deep below ground level and Fig. 24 shows the general mould set-up. The pit is made in the moulding-shop floor and the mild-steel casing is set into this. The brickwork is swept up and cinders are packed in between the bricks and casing for venting purposes; the inner surface of the bricks is coated with building loam. This sweeping of the mould is carried out by means of a bar set in a bearing at the foot of the pit and held rigidly in a central position by means of a supporting bracket across the top. To the bar are attached the sweep stick and a special harness for the convenience of the moulder. The mould is built up in the usual manner for a loam mould and is "blacked," followed by thorough drying lasting approximately 40 hours, by means of a coal fire lowered into the pit. After drying, plumbago wash is applied, smoothed off and the whole is again thoroughly dried.

The core is likewise swept up in loam; Fig. 25 shows the brickwork partly built whilst Fig. 26 shows the finished core being smoothed off. When thoroughly dry, the finished core is carefully lowered into the prepared mould, is centred at the bottom by the spindle

* A Paper read before the Scottish branch of the Institute of British Foundrymen.

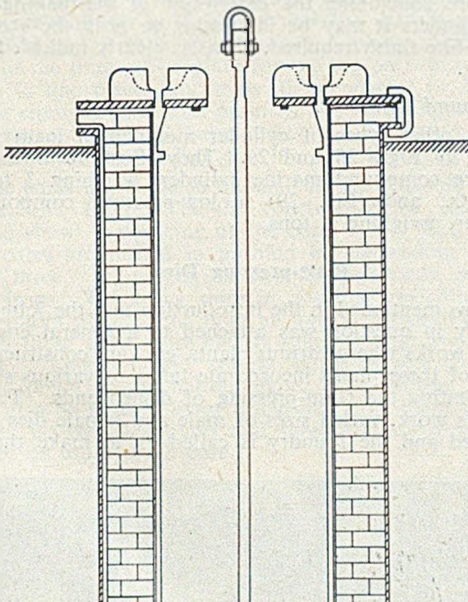


Fig. 24.—Mould for a Paper-drying Cylinder Casting.

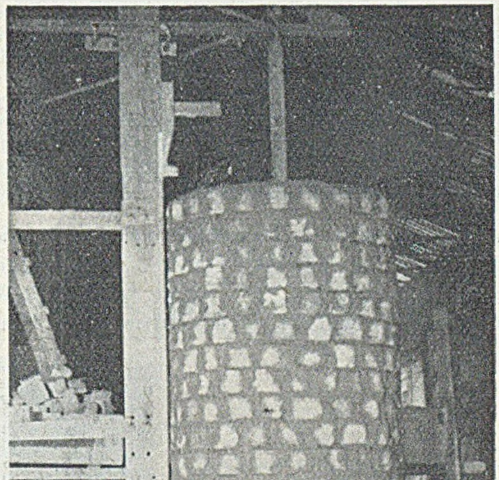


Fig. 25.—Partly-constructed Core for a Paper-drying Cylinder.

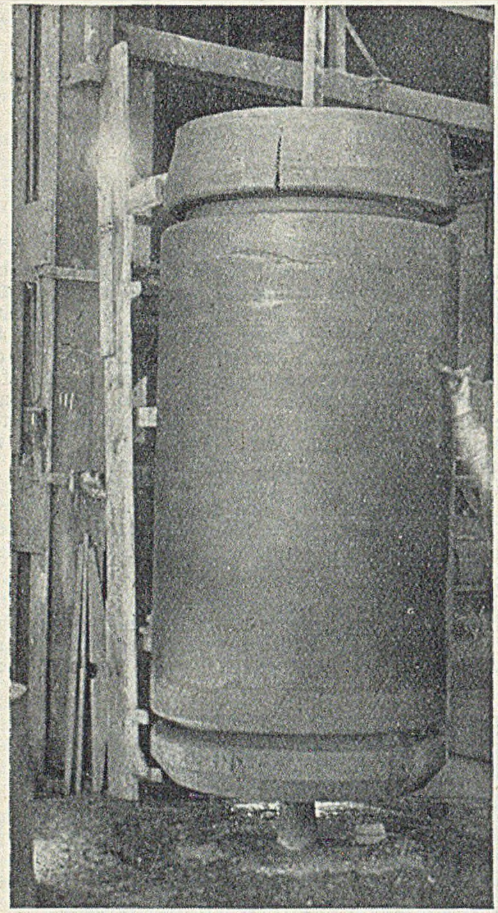


FIG. 26.—FINISHING OF THE CORE FOR THE DRYING CYLINDER.

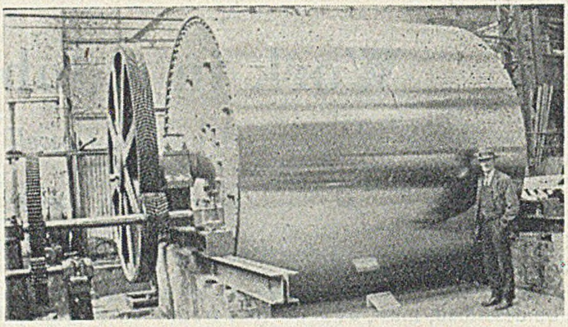


FIG. 27.—" MIRROR " FINISH ON THE PAPER ROLL.

and kept true by means of a gauge stick placed at various points round the circumference. The mould is then ready for the placing of the runner bush and this is held in place by clamps between the rim of the casing and the base plate of the runner bush. In the runner bush are placed fourteen ingates, the 9-in. head is " cast on " as has been indicated in Fig. 24, and the position of the metal outlet is also shown. The various sizes of cylinders cast in this manner range from 30 in. dia. by 16 ft. long to 5 ft. dia. by 12 ft. long, giving finished weights of between 3 and 5½ tons.

Before concluding the description of the making of the cylinders it may be interesting to note the actual mirror-like finish required. This is clearly indicated in Fig. 27.

Compound Cylinders.

Two other types of cylinder moulded in loam are shown in Figs. 28 and 29. They illustrate a high-pressure compound marine cylinder, weighing 3 tons 10 cwts., and (Fig. 29) a low-pressure compound cylinder, weighing 3 tons.

Plate-pressing Dies

It was mentioned in the introduction that the jobbing foundry in question was attached to a general engineering works where various plants, etc., are constructed. Some of these plants incorporate tanks of various sizes necessitating the form-pressing of dished ends. Thus, for this work, varied sizes of male and female dies are required and the foundry is called on to make these.

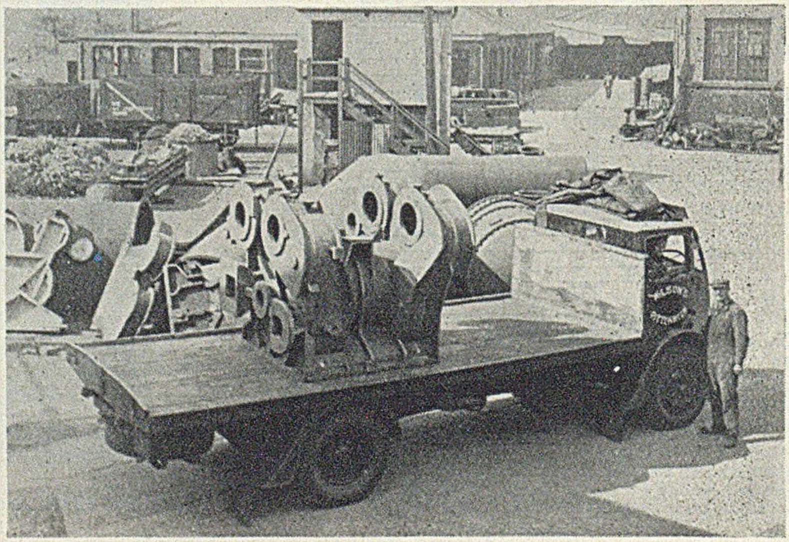


FIG. 28.—HIGH-PRESSURE COMPOUND MARINE CYLINDER.

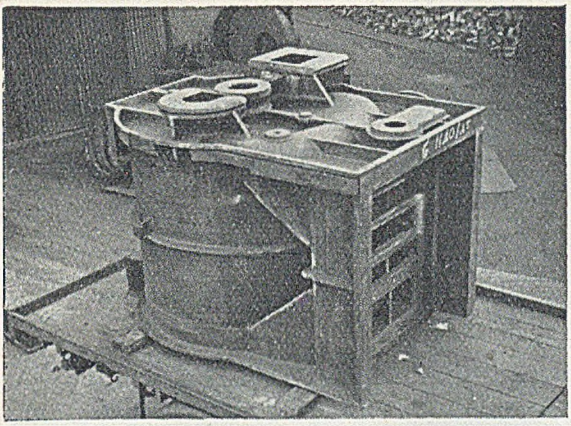


FIG. 29.—LOW-PRESSURE COMPOUND CYLINDER.

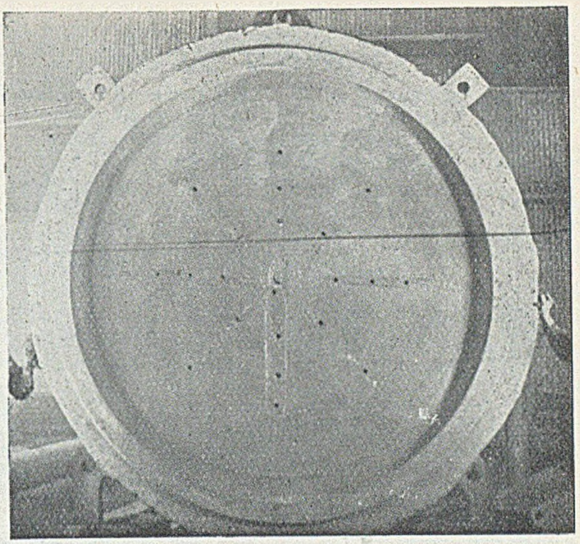


FIG. 31.—FINISHED TOP PART FOR THE DIE MOULD.

These dies are moulded in loam sand and the moulding method described for a "male" die is typical:

The drag part of the mould is built up on a cast-iron bottom plate made in two pieces, the lower ring having an outside diameter of 12 ft. 6 in., a width of 3 ft., and a thickness of 3½ inches; the upper plate is 9 ft. dia. and 3½ in. thick. The brickwork, building loam and ashes are built-up on this ring and the drag is swept up. The top part is swept up on a plate, as in the case of the drag. The plate for the top part, this time made in one piece, has brads (daubers) cast in, large at the circumference and progressively smaller towards the centre, this step being taken to strengthen the actual mould by binding the loam-work together.

The cores are made in oil sand in the requisite core boxes, and Fig. 30 in the construction of the die mould shows the placing of the cores in the drag part. The cores are placed in position by suspending them from three "S" hooks attached to staples cast in the core irons. The cores, once in position, are bolted to the bottom plate of the drag by long bolts, and Fig. 32 shows these bolts more clearly together with the "S" bolts. Likewise, the central bottle-shaped core is bolted down to the bottom plate. The venting pipes may also be noted. Prior to closing, stud chaplets are placed between the cores and three-stud chaplets are placed on top of each core.

Fig. 31 illustrates the finished top part and shows the positioning of the twenty runner gates so placed that the metal runs into each web. Locating of the top and bottom part is brought about by a male and female joint in the top and bottom parts respectively. The positioning of runner bushes is shown in Fig. 33, together with the binding beams and with clamping hooks and wedges. Feeding is carried out through the gates, helped by two risers placed centrally. The finished casting is shown in Fig. 34 and shows the machined face and edge. The size of this die is 10 ft. in over-all diameter with a 15 ft. radius making it approximately 20 in. high in the centre; the height at the edges is 10 in. The metal thickness at the circumference is 2 in., 3 in. at the centre. The weight of the finished casting is 6½ tons.

Metallurgical Aspects

In the jobbing foundry where the work is of a varied nature, including some of the types of jobs cited in this Paper and probably ranging from $\frac{3}{16}$-in. to 6- or 7-in. thickness, one of the main considerations is the

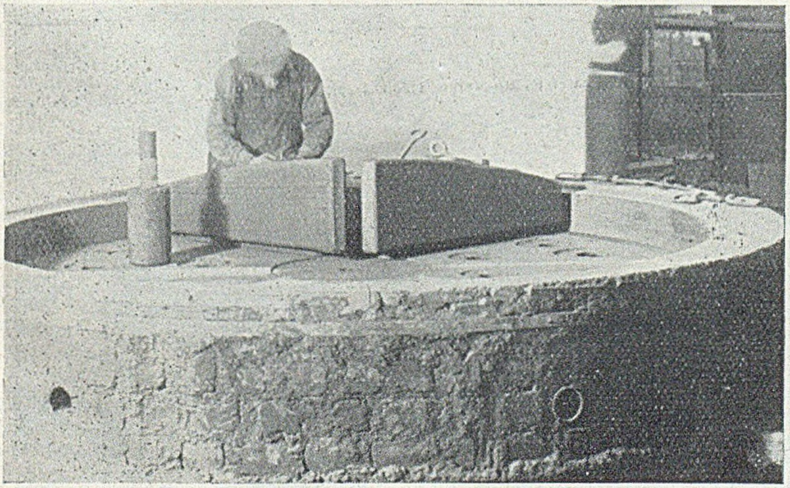


FIG. 30.—CONSTRUCTION OF A DIE MOULD—PLACING THE CORES IN THE DRAG PART.

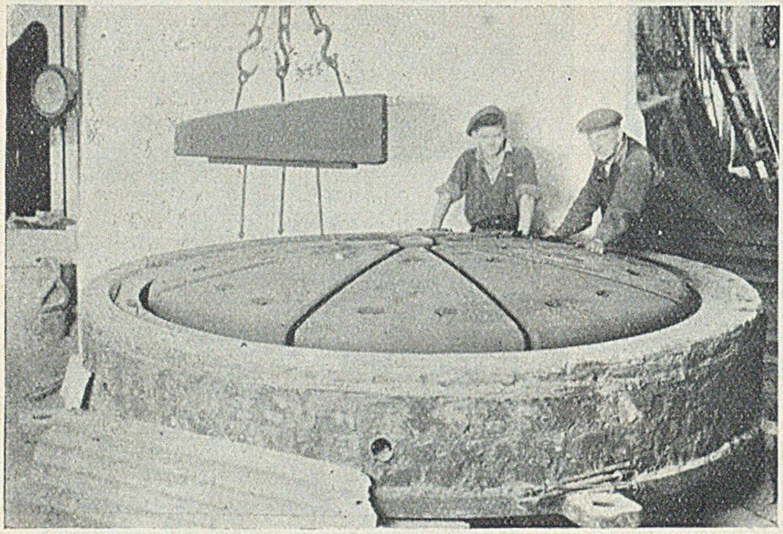


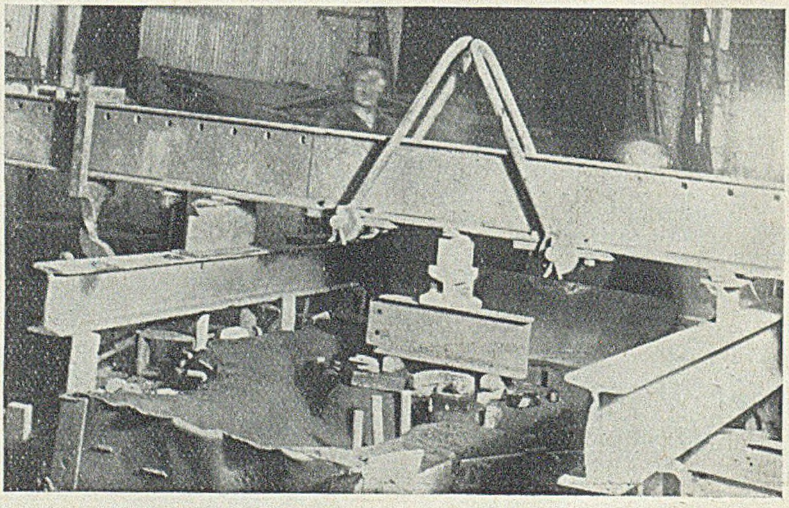
FIG. 32.—CORE, SHOWING ANCHORING BOLTS AND "S" HOOKS USED FOR ITS SUSPENSION.

quality and type of the cast iron to be melted. The foundry in question possesses two cupolas, one with a melting rate of 3 tons per hr. and the larger of 7 tons per hr. Both are fitted with receivers; in the case of the smaller furnaces the receiver capacity is 30 cwts., and the larger one holds 3½ tons. The advantages of these receivers include (1) the storage of an appreciable quantity of metal and (2) the "pick up" of sulphur and carbon is at a minimum since the metal is not in contact with the coke bed for any length of time. One disadvantage is, however, the loss in temperature of the metal at the tapping hole, for if metal is taken from the receiver at a temperature of 1,360 deg. C. it means that the metal temperature in the cupola channel needs to be somewhere in the region of 1,460 deg. C.

Because of the amount and size of some of the larger jobs passing through the foundry, only the larger cupola furnace is at present in use. In order, therefore, to derive full benefit from the receiver as far as holding capacity, etc., are concerned, the furnace is "slagged" whenever the day's melt exceeds 12 tons. This is effected by means of a slag hole placed in the receiver. The average tapping temperature of this furnace is 1,365 deg. C., which is quite satisfactory for the class of work being produced.

The normal method of charging for a day's run is to charge in the special or high-duty mixtures first, followed by the grey-iron mixture. Thus, if the metals required for one day's work include hematite, drying-cylinder iron, loam-mixture iron and normal grey iron for green-sand work then they are charged in that order. This is due to a consideration of the metal analyses—these being made as progressive as possible with respect to the ordinary iron. Separation of these irons in the furnace is effected by strict control and observation of the melting rate and by increasing the coke splits between the last charge of one mix and the first of the next. The charge for the ordinary grey iron consists of 50 per cent. No. 1 pig iron and/or No. 3 pig iron plus 50 per cent. of scrap made up of 20 per cent. returns, the remainder being bought scrap. This 50/50 mixture is maintained because of the amount of green-sand moulded castings which have to be machined. It had been found previously that, if the pig proportion were less, trouble occurred in machining the castings due to the hardening effect of returned scrap. The 50/50 mixture is also chosen to keep the analyses of iron for green-sand work in the

FIG. 33.—PLACING OF RUNNER BRUSHES, CLAMPING AND WEDGING OF THE DIE MOULD.



following range:—Total carbon 3.25 to 3.40; silicon 2.30 to 2.50; manganese 0.80 approximately; sulphur 0.15 maximum, and phosphorus 0.75 per cent. approximately. This analysis gives quite satisfactory results in all green-sand moulded work.

Sand preparation is another important factor. It has been found in this jobbing foundry that the best results are obtained if the green-sand used for facing has the following average physical properties:—

Moisture 7 per cent.; permeability No. 25; green compression strength 8.5 lb. per sq. in.; and dry compression strength 45 lb. per sq. in. This sand suits all of the medium-section work and incorporates the following:—4 parts floor sand; 1 part Scottish red rock sand (obtained

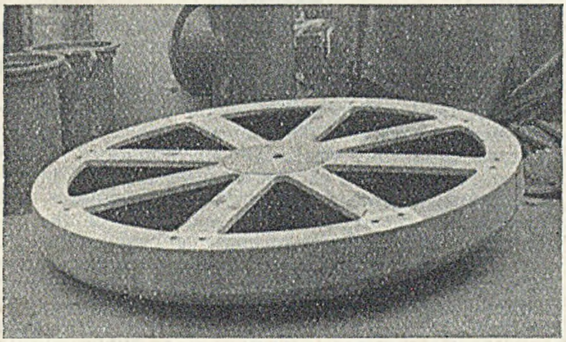


FIG. 34.—FINISHED CASTING FOR THE PLATE-FORMING DIE.

locally) with the addition of 1 per cent. of coal dust. This is mixed in a Pneulec mill for approximately 2 min.

For smaller work, a mixture incorporating a yellow sand is used and gives the following physical properties:—

Moisture 7.5 per cent.; permeability No. 20; green compression strength 5.6 lb. per sq. in. and dry compression strength 23 lb. per sq. in. The oil-sand for core making is made up as follows:—6 parts sharp sea sand; 1 part old cores; 1 part red rock sand and 4 per cent. semi-solid binder. Water is added to give a final moisture content of approximately 2.5 per cent. The physical test results are:—Permeability No. 108 and dry compression strength 380 lb. per sq. in. It is found that this sand gives good venting, is fairly strong and is quite easily "knocked-out" when fettling the castings.

Technical Control

With such a varied field of work, a fair amount of technical control is required and this is adequately taken care of. Each type of iron in one day's melt is analysed and mechanically tested in the laboratory. Sands are likewise checked daily. Careful inspection, involving examination of appearance, checking dimensions, etc., of the finished castings is also carried out by the inspection department daily before the castings are passed out to the machine shops for delivery to customer. For complicated work, the castings are X-rayed, a method which has also proved itself invaluable in studying moulding technique.

Acknowledgments

In conclusion, the Authors wish to thank Mr. Lindsay Burns, director of Henry Balfour & Company, Limited, for permission to read this Paper and James Bertram and Sons, Limited, for permission to use Fig. 27. Their thanks are also due to those of the laboratory staff concerned in the preparation of photographs and slides.

Book Reviews

Through Five Generations: The History of the Butterley Company. By R. H. Mottram and Colin Coote. Published by Faber & Faber, Limited, 24, Russell Square, London, W.C.1. Price 12s. 6d. net.

The sub-title of this excellent book might well have been "Ichabod," an unusual christian name found in the Wright family and meaning "the glory has departed." The book does not set out to decry the nationalisation of the coal industry, but to put on record for all time the magnificent story of hard work, devotion to duty, enterprise and enlightened leadership through five generations of family ownership of the Butterley Company. It is right and just that this should be done, as it is far too fashionable in some quarters to brand all private employers as "grasping, grinding, glowering incompetents," and to assert that the Coal Board took over a uniformly badly-run industry. Moreover, it has been recorded by two Authors peculiarly suited to their task. Foundrymen hoping to see some mention of that dynamic personality, Mr. Fitzherbert Wright, so well known in foundry circles, will be disappointed, but will realise that this is inevitable in a chronicle which concerns itself almost exclusively with the coal-mining side of that company of vastly varied interests. There are many references, however, to the great engineering achievements of the Butterley Company which will especially interest foundrymen, particularly those carried out at Charing Cross Hotel, St. Pancras Station, Edinburgh, and the cast-iron aqueducts of the Caledonian Canal. The summary of these engineering achievements, it is pointed out by the Authors, is in the nature of a prospectus and not an obituary, for the Butterley Company is not included amongst the "steel" firms to be nationalised.

L. F.

The Calculation of Sheet Metal Work. By A. Dickason. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 15s. net.

This book has been written as a text book for students and craftsmen, and throughout there is the marked imprint of the sympathetic and efficient teacher. Thus there is a gradual approach to the more difficult problems from the very simplest. That is the hall mark of a good text book. The book starts with mensuration, and progressively deals with the circle, volume, the right cone, pyramid and transformer, the sphere, the spiral blade and up to elbows and bends. Chapter XII is important as it deals with the accurate development of templates; it is here that the craftsman can exercise his skill. A short chapter is devoted to costing, but it manages, without going into details, to give the necessary essentials. Useful for the student is the final chapter on a typical examination paper set by the recognised educational authorities. In its field, this book will serve students for many years, for like patternmaking, the basic principles never change.

THE SCIENTIFIC FILM ASSOCIATION, of 4, Great Russell Street, London, W.C.1, have organised a Conference on Photography and Cinematography by Invisible Radiation to take place on April 15, from 10.0 a.m. to 9.30 p.m., at the London University Institute of Education, Malet Street, London, W.C.1. Groups of Papers are to be given by well-known specialists, and the day's meeting will terminate with the presentation of a programme of films from 7.30 p.m. to 9.30 p.m.

Economic Survey for 1950*

Implications of Government's Report

The Government's "Economic Survey for 1950"* stresses repeatedly that Britain's outlook for this year depends on the fulfilment of the following conditions:—(1) Increased efficiency in British industry in order to keep down costs, and so retain the advantages in overseas and particularly dollar markets given by devaluation; (2) continued stability of wages and all other incomes to keep prices down and so maintain the drive for exports; (3) continuation of Marshall aid, though on a diminishing scale; (4) continuation of a high level of world demand and particularly of business activity in the United States.

The record output of 15.55 million tons of steel in 1949 is expected to go up to between 15.75 and 16 million tons in 1950.

Pointing out that the experience of 1949 underlines the necessity for continuing through 1950 the same policies that have successfully reduced the pressure of internal demand during 1949 and have encouraged the movement towards a balancing of our overseas payments, the "Survey" says that increased production of the right kinds of goods is essential for dealing with both problems and this can only come from higher productivity.

The primary task is, therefore, to increase efficiency. But increased productivity must not be accompanied by higher money costs and prices, which would endanger the opportunities which devaluation has created and make more difficult the task of meeting increasing competition from exporters in a number of non-dollar countries. Consequently, it is vital also that restraint in demands for higher personal incomes should continue.

One of the healthiest aspects of the British economy since the war has been the rate of increase of both production and productivity. The claims upon total resources must, however, be expected to increase considerably in the next few years. Certain social services will cost more because in those years there will be more of the population in the age groups for which these services provide—*e.g.*, more children of school age, more old and potentially infirm people, and there will be a natural tendency to raise the standard of these services. A high rate of investment will also be necessary in order to enable the equipment of British industry to be kept up to date with modern developments. Moreover, a secure and rising standard of living, which can be maintained without special external assistance, is a fundamental object of all economic policy. The extent to which these additional demands can be satisfied will depend on the rate at which production and productivity expand.

There is no easy way to secure all the additional output which will be needed. Unless exports to the important markets can be increased substantially not even essential supplies of food and raw materials will be secure. Yet these exports have to be sold in the face of keen and growing competition and only a continually increasing efficiency of production and salesmanship can enable us to maintain and increase the volume of exports. No specific target is set for productivity. The "Survey" says that we require and should seek to achieve the greatest possible increases in output per head.

The balance of payments appears certain to remain the central economic problem in 1950 and for many years ahead. There are two main tasks; first to close the gap in the dollar accounts of the sterling area, and second to maintain a reasonable balance in the external accounts of the United Kingdom with the world as a whole. We must solve both these problems if we are to make ourselves independent of special external aid and restore the strength of sterling on which so large a part of the world's trade is based.

STEEL

The output of steel ingots and castings rose from 14.9 million tons in 1948 to 15.55 million tons in 1949—just over the upper figure of the range given in the last "Survey." Imports of steel at 0.9 million tons were a little lower and exports at 1.7 million tons rather higher than was expected. Total consumption of steel by home users in 1949 was about 10.36 million finished tons, of which about 48 per cent. went to the metal-using industries (engineering, shipbuilding, vehicles, and miscellaneous metal industries) and most of the remainder to various forms of constructional investment.

Steel-furnace capacity in operation will increase during 1950, but it is unlikely that the supply of steelmaking materials could permit so great a rate of increase of output in 1950 as occurred in 1949. Output in 1950 is expected to be between 15.75 and 16 million tons.

Domestic requirements are likely to be about 250,000 tons greater, in terms of finished steel, than in 1949, since the reduction in the amount of steel used for constructional investment will be more than offset by the expected increase of from 4 to 5 per cent. in the output of the metal-using industries. Exports will be considerably higher in 1950 than in 1949; there will be a substantial increase in deliveries to the Commonwealth. To meet the total requirements of steel for export and for home consumption, it may be necessary to make some limited drawing on stocks.

ENGINEERING INDUSTRIES

In this context the engineering industries include mechanical and electrical engineering, electrical goods, the manufacture of road and rail vehicles, scientific instruments, and certain metal goods. Shipbuilding, vehicle repairs, and metal making are excluded. About two-fifths of the exports of manufactured goods are made by the engineering industries, and these are, therefore, expected to contribute substantially towards the higher level of exports needed in 1950.

After the end of the war, there was a rapid rise in the output of the engineering industries as factories returned to their normal work. This phase has passed, and future expansion of output depends mainly on increasing productivity. During 1949, however, output increased by 7 per cent. over 1948 and was 55 per cent. above 1946 or some 60 per cent. above 1938. Supplies of materials were generally sufficient to allow a free flow, though certain types of steel and special timbers were scarce.

If the demand remains strong, as seems likely at present, output may increase again by as much as 4 per cent. in 1950 without being limited by labour or materials.

The total working population was about the same in 1949 as in 1948. Since the numbers in the Armed Forces and on release leave fell during the year, the industrial population increased slightly. Outside the Development Areas the amount of unemployment was extremely small.

* "Economic Survey for 1950." Cmd. 7915. Obtainable from H.M. Stationery Office. Price 1s.

Vitreous Enamelling Section

Fusing of Enamels*

By J. A. Clarke, B.Sc., A.R.I.C.

By way of a preface for the detailed account of experimental work on fusing of vitreous enamels, the Author outlines some general features of the process. Furnace design instruments, atmospheres, refractories and operational methods are discussed in this section. Thereafter, the results of practical fusing tests for varying times on metal samples are quoted. The development of the final finish is traced, with particular emphasis on its chemical and physical aspects and on gas-bubble formation. The Author is on the staff of Stocal Enamels, Limited, Stoke-on-Trent.

THOUGH the larger part of this Paper is devoted to a discussion of the chemical and physical aspects of the actual fusion process, one or two points of interest embodied in the broader meaning of the term " fusing " are dealt with to present a background for the new work described.

Furnaces

The furnace is perhaps the most obvious starting point for consideration of the subject, since it is in the furnace that most of the enameller's troubles become evident, even though they do not always originate there. The types of furnace in use in this country at the moment can be broadly classified into two types—the box type, and the continuous. Where large runs of similar articles are to be processed, the latter is undoubtedly ideal. With the continuous furnace, the temperature is thermostatically controlled, the rate of passage of work through the hot zone is constant and it is immediately evident that large, uniform production runs are readily obtained. Naturally, with such conditions, it is imperative that variation of metal thickness, in weight of enamel per square foot, etc., should be kept to a minimum; in fact, it is necessary to extend rigid control to every other process in the plant. If this control is not maintained, then the main value of continuous fusing is lost.

Where there are many types of work of a diverse character, the continuous furnace loses much of its value, and the box-type furnace becomes the obvious choice. In modern box-type furnaces also, the temperature may be thermostatically controlled and as close a check as possible should be kept on the time of fusing, so that maximum efficiency is obtained. However, the human element is bound to be a factor in this type of furnace, and results normally are not quite so consistent as those obtained on continuous furnaces. It is the Author's opinion that one of the most important features in the enamelling shop is the control of fusing, whether it be in continuous or box-type furnaces. Without this control, all the work already done on the articles may be negatived, or the quality may be impaired and, since the fusing process is the last in the cycle of operations, losses here are all the more costly.

Control Instruments

It is advisable to have recording instruments, rather than indicators on the furnaces, since the former will give a permanent record of the temperature at any time, and in addition, each load of ware charged into the furnace can easily be identified, and thus the performance, and cost of operation of the furnace can be more readily assessed. A further control on furnace performance, and one which is probably not often carried out, is the regular checking of flue gases to ensure the complete and economical combustion of the fuel used. This, of course, does not apply to electrically-heated furnaces. The analysis of flue gases is of great value, and may be performed with the usual gas-analysis apparatus, or much more easily by the electrical method. By the latter method, the percentage of carbon dioxide (CO_2 12 is the optimum figure), and the temperature of the flue gases are quickly obtained. In fact, recording apparatus is available to show on a suitable chart a continuous record of the percentage of carbon dioxide in the flue gases. The benefits to be derived from such analyses are more efficiency of furnace operation and considerable saving in fuel. Ryder, in his Paper, "The Operation of a Gas-fired Enamelling Furnace," states that up to £500 per year may be lost in the operation of one furnace, if good adjustment of the air to gas ratio is not maintained.

The types of fuel used for enamelling furnaces are coal, oil, gas and electricity. Coal is, of course, the cheapest of these fuels, but unfortunately it is the dirtiest, and the least amenable to control.

The writer has no figures available for oil-fired furnaces, but the cost of running a gas-fired furnace is about four times that of coal, and electricity seven to eight times. If other than coal fuel be used, it is more imperative, therefore, that the furnace be used to full capacity. Ryder, in the Paper mentioned above, states that it is far better to employ more labour per furnace, and obtain greater production thereby, than to economise on labour, since the cost of fuel soon outstrips the cost of the labour used to man the furnace.

Furnace Atmosphere

The atmosphere inside the muffle is of great importance for the efficient fusing of enamels. Most

* A Paper read before the Midland Section of the Institute of Vitreous Enamellers.

Fusing of Enamels

enamels require an oxidising atmosphere, but in open muffles such as are used in the enamelling industry, this condition is almost invariably met, due to the influx of atmospheric oxygen. Other gases which may enter the furnace from the flues can have a deleterious effect on the finished product. The best known of these is sulphur dioxide, which can cause serious scumming on the enamel surface. Five per cent. of carbon dioxide can, according to Ryder, cause scumming, and this, it is felt, is perhaps not so well known. The obvious remedy is to ensure maximum tightness of muffle joints when the furnace is constructed, but careful adjustment of dampers, together with correct combustion of fuel can go a long way towards remedying these faults. There does, however, seem to be a great variation in the tendency of different enamels towards scumming, and in any occurrence of scumming consideration should be given to causes other than furnace atmosphere, such as recrystallisation of the opacifier or slight de-vitrification, which does occur with certain enamels, particularly on re-fusion, and has an appearance similar to contamination of the ware by the furnace atmosphere. Another fault which can be confused with furnace scumming is that produced by bad suspension, particularly in acid-resisting enamels, when the clay, and/or the electrolytes float to the surface during drying, and so cause a scum on fusion.

Refractories

Although the question of refractories in some respects may affect the furnace builder more than the user, it is considered expedient to consider at this stage the refractories used in the building of enamellers' muffle furnaces. Ordinary fireclay bricks were originally used for this purpose, but have been largely superseded recently by the use of fused-alumina bricks. Fireclay bricks generally contain less than 30 per cent. of alumina, and their properties of heat transference are rather poor. They are also very susceptible to slagging, and do not withstand a very great load at working temperature. Sillimanite bricks have been used with great success, and these bricks are highly refractory, insensitive to sudden changes of temperature, and have a high resistance to slagging, as well as a better ability to carry loads at high temperature. They are manufactured by bonding sillimanite, a mineral corresponding to the formula $Al_2O_3 . SiO_2$, with clay. Since the mineral is at present in rather short supply, these bricks are not now readily obtained.

Fused-alumina bricks are widely used for muffle construction, and are made by bonding fused alumina with fireclays. They generally contain about 70 per cent. alumina, and are highly refractory, have a fairly low coefficient of expansion, a very good heat transfer property (about three to four times that of ordinary firebrick) and a very good resistance to slagging. The fact that their properties of heat transfer are much better than those of fireclay automatically increases their life, since a much lower flue temperature will give the same muffle temperature. Finally, silicon carbide has been used in the manufacture of muffles, and these bricks also have excellent properties. Their heat-transfer properties are initially about double those of fused-alumina bricks, but there is reason to believe that after a few months of use, the values drop considerably. This apparently does not always occur, but does so quite frequently, and on this account, the bricks do not appear to be ideal for muffle manufacture. Research is still going on, however, and since other properties of silicon-carbide bricks are very good, it may well be that in the future this material will be one of the best refractories for enamelling muffles.

Loading of Furnaces

The loading of furnaces, particularly those of the box type, is a procedure which can very materially affect the efficient running of furnaces, and should be seriously considered with a view to increasing output. The data quoted below are relative to the fusing of cast iron. The furnace in question is coal fired, and the figures are the mean figures obtained from a large number of loads:—

When flat loads were fused the proportion of the weight of load to the weight of perrets was 0.97. The same type of work was then fused on leaning perrets, and the ratio of load to perret weight immediately increased to 1.45. The proportion of the total weight (work plus perrets) of the leaning load to the flat load was 1.4, and the ratio of the respective fusing times was 1.43. This, therefore, appears to follow a definite trend. The proportion of the weight of work on the "leaning" load to the flat load was 1.68. It is thus apparent that for an increase of fusing time of 43 per cent., an extra fusing weight of 68 per cent. could be accomplished. This shows a net production gain of 17½ per cent.

The Author also considers that, in the case of cast iron, the slower heating-up of the heavier load, provided that it is not too prolonged, is beneficial in producing a better-enamelled article. When the "leaning" load enters the furnace, the drop in temperature is much more pronounced than with the flat load, and when the fusing is effected from a lower temperature, it assists in heating up the base casting at a similar rate as the enamel layer. This effect was proved by laboratory trials. The enamel used was a cast-iron acid-resisting black, which is probably one of the most difficult enamels to work. A casting was taken which had not been annealed and, after shot-blasting, was sprayed with the enamel and dried in the usual way. It was placed in the furnace at about 400 deg. C., and then heated to 750 deg. C. in about 35 min. The resulting enamel surface was perfect. If a similar test-piece was fused in the normal way, serious "boiling" was encountered. It was necessary to give the samples a good annealing treatment before reasonable results could be obtained with the normal fusion method. Further tests were carried out using annealed samples, but at progressively increasing fusing temperature. It was found that as the temperature increased, so did the tendency to boiling. It would appear, therefore, that when fusing is started from a low temperature, the casting heats up with the enamel layer, and the gases are evolved from the casting before the enamel fuses, and so are dissipated relatively easily, through the biscuit. As the initial furnace temperature increases, however, the enamel layer, being a poor conductor, tends to heat up before the casting, and so, when the gases are evolved from the casting, the enamel is already in a fluid state, and relatively large bubbles are entrapped in the enamel layer. These can then only be fused down with difficulty, particularly in the case of acid-resistant enamels, and so a casting exhibiting boiling or pinholing results.

This same effect explains why, on a "re-fire," a casting often exhibits boiling more than on the initial "fire," since in the former case the enamel is already fused, and any further evolution of gas can only occur after the enamel has re-fused, and thus appears as "boiling." There is a school of thought which suggests that, in such cases, since the casting is somewhat

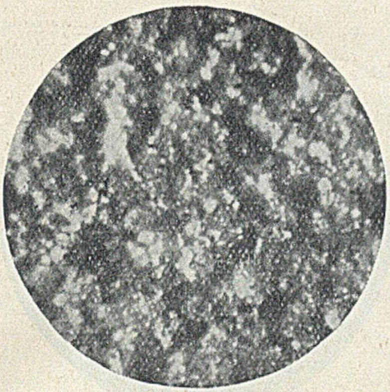


FIG. 1.—GROUND-COAT ENAMEL AFTER DRYING.

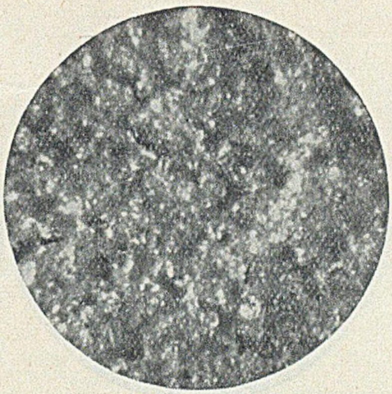


FIG. 2.—ENAMELLED SAMPLE AFTER 1 MIN. IN THE FURNACE. DRYING CRACKS ARE VISIBLE.

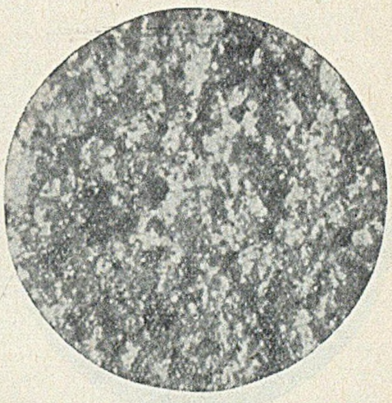


FIG. 3.—SAMPLE AFTER 1¼ MIN. IN THE FURNACE. MORE PITTING OF THE SURFACE IS APPARENT.

porous, the gas may be forced out through the reverse side before the enamel re-fuses, but though this may be a possibility on thin-section castings, it would appear that the thicker the section the less the likelihood of this occurring. In passing, this may explain why boiling is often more severe on thick- than on thin-section castings.

Reactions during the Fusion of Ground Coats

The following work was carried out with a view to showing the progress of the reactions taking place during the fusing of a sheet-iron ground-coat enamel.

The test plates used were 4- by 2-in. pieces of enamelling iron, and were grease-burnt and pickled under exactly the same conditions, and then dipped in ground-coat to give a coat-weight of 42 gms. per sq. ft. (dry weight) on both sides. The ground coat used had a fineness of 8 gms. residue on a 200-mesh screen from a 50-ml. sample. After drying, the samples were placed in the furnace singly, the initial furnace temperature being the same in all cases, and the rate of temperature recovery was maintained constant. The first plate was withdrawn after one minute, and subsequent plates at quarter-minute intervals up to three and a half minutes, the final plate being fused for four minutes.

Fig. 1 shows a plate in ground-coat enamel after drying only. This, and all the subsequent illustrations except where otherwise stated were taken with oblique lighting, and the magnification in all cases is × 55 diam. Unfortunately, the reproduction of this and the next two or three illustrations is not too good, due to light reflections through the more-or-less transparent frit particles, and to the rather uneven nature of the enamel surface. The surface at this magnification appears somewhat "mountainous," and the darker patches are what might be called the valleys. Fig. 2 shows the surface of the plate which was left in the furnace for one minute. The illustration shows a few definite cracks, or craters, in the biscuit surface, which are no doubt due to the completion of the drying of the biscuit, with the evolution of water vapour, to some slight gas evolution from any freely-volatile material in the biscuit and also to gas evolution from the metal base. The plate as a whole showed some slight hardening of the biscuit, but this material could be readily removed to reveal a definite black scale on the metal surface. Fig. 3 shows the plate which was fused for a further ¼ min., and this shows more pitting of the surface. The biscuit could still be removed fairly easily from the plate, and a heavy black scale was present on the metal surface.

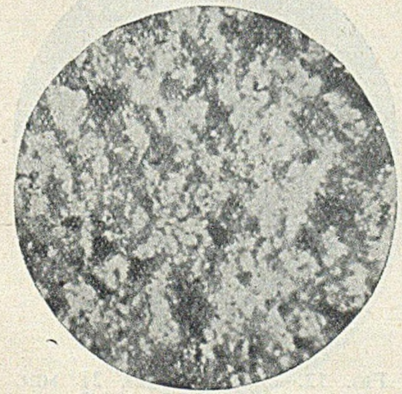


FIG. 4.—SAMPLE AFTER 1½ MIN. IN THE FURNACE. ROUNDING OF THE PARTICLES HAS TAKEN PLACE.

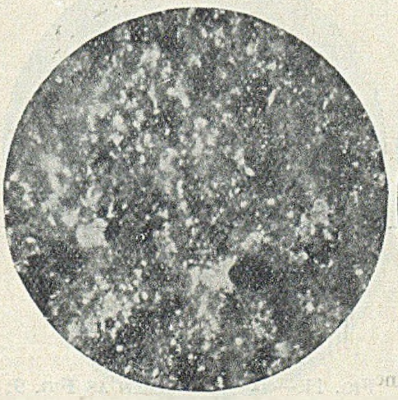


FIG. 5.—SAMPLE AFTER 1¾ MIN. IN THE FURNACE. DEFINITE HOLES ARE PRODUCED.

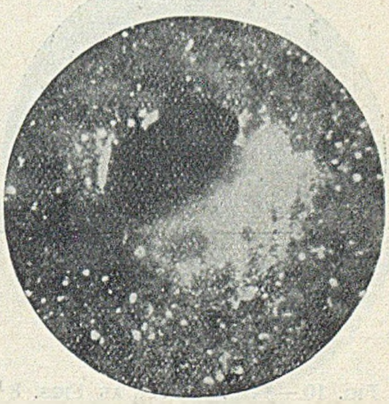


FIG. 6.—SAMPLE AFTER 2 MIN. IN THE FURNACE. SINTERING IS IN PROGRESS.

FIG. 7.—SAMPLE AFTER 2¼ MIN. IN THE FURNACE. GROSS HOLES AND BUBBLES HAVE BEEN FORMED.

FIG. 8.—SAMPLE AFTER 2½ MIN. IN THE FURNACE. SLIGHT HEALING OF THE HOLES HAS OCCURRED.

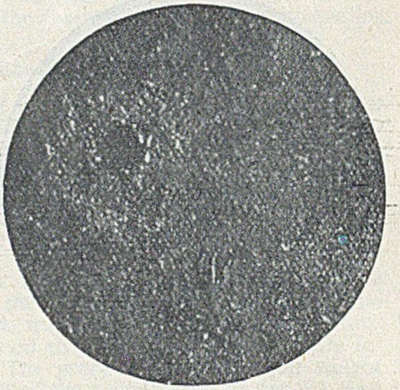


FIG. 9.—UNDERSIDE OF ENAMEL AFTER 2½ MIN. IN THE FURNACE. CHANGE OF TEXTURE CLOSE TO METAL IS APPARENT.

On the plate which had 1½ min. fusing, the biscuit, if it could then be defined as such, was very hard, and could only be removed with difficulty. Under the microscope, rounding of the frit particles could be observed, and though this is not immediately obvious from the illustration, a difference of texture can be seen in Fig. 4. Fairly large craters due to continued gas-evolution are in evidence. Fig. 5 illustrates the plate which was fused for 1¾ min., and here very definite holes can be seen. The plate itself showed slight visible sintering. After 2 min. fusing, the plate shows the progress of sintering, and Fig. 6, taken from this plate, shows relatively gross holes, and the eruption of frit, etc., therefrom. With 2¼ min. fusing, gross holes and bubbles visible to the naked eye appear, and run in definite lines along the plate. Fig. 7 shows their relative size. The fact that the bubbles run in definite lines tends to prove that gas evolution at this stage is taking place from the metal, since bubbles produced in the enamel layer could not be expected to conform to any set pattern.

Fig. 8 shows the progress of the fusing at 2½ min., and is similar to Fig. 7, except for the slight healing-over of some of the holes. In this illustration, very tiny bubbles can be observed, and these are the bubbles which are evolved from the decomposition of the clays, electrolytes, etc., present in the enamel layer itself.

A portion of the enamel layer was detached from this plate, and left the metal quite bright and clean, but a black scale was found to be adhering to the underside of the enamel; Fig. 9 shows this section. It is at once apparent that the texture is quite different from that of the top side of the layer (seen in the previous illustration), and the two large holes, together with other smaller ones, penetrate right through the layer, as can be seen by reference to Fig. 10, which is a photograph of the same spot, but taken with transmitted light. A section of the layer is shown in Fig. 11, where the black scale adhering to the enamel can be seen.

The next plate in the series was fused for 2¾ min., and shows definite smoothing-down to a more normal appearance, the colour of the enamel layer becoming lighter also. The surface of the plate is shown in Fig. 12, and the healing over of the gross bubbles is

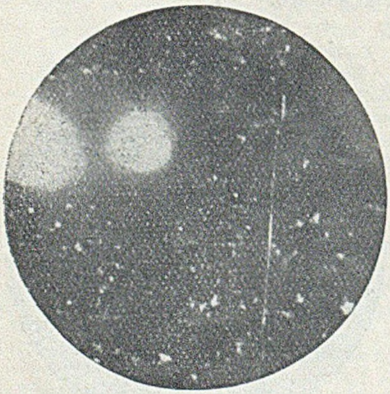


FIG. 10.—SAME SAMPLE AS FIGS. 8 AND 9, PHOTOGRAPHED WITH TRANSMITTED LIGHT, SHOWING HOLES PENETRATING THE ENAMEL LAYER.

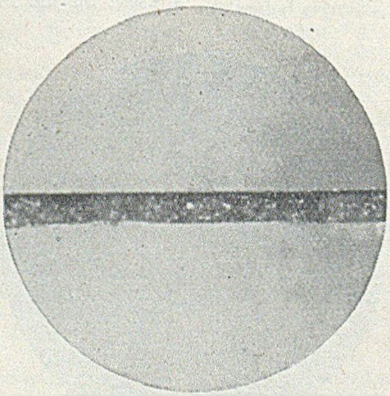


FIG. 11.—SAME SPECIMEN AS FIG. 9; VIEW ACROSS THE SECTION SHOWING BLACK SCALE ADHERING TO THE ENAMEL.

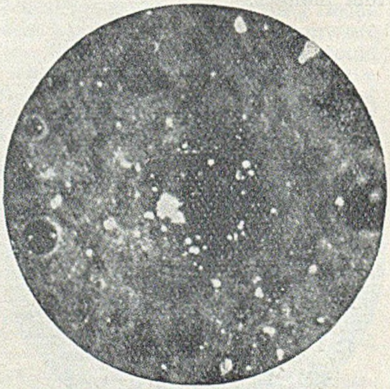


FIG. 12.—SAMPLE AFTER 2¾ MIN. ENAMEL HAS LIGHTER COLOUR AND SMOOTHER APPEARANCE.

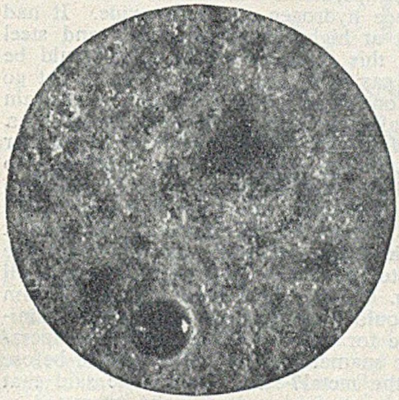


FIG. 13.—SAMPLE AFTER 3 MIN. MORE SMOOTHING-OFF IS APPARENT BUT LARGE GAS BUBBLES ARE STILL PRESENT.

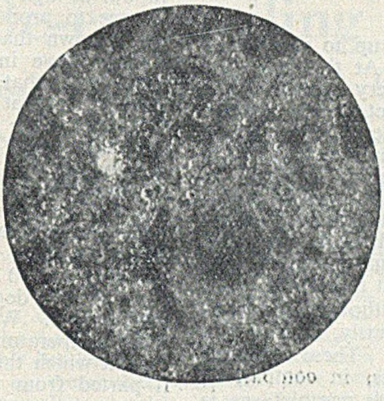


FIG. 14.—SAMPLE AFTER 3¼ MIN. DEFINITE HEALING OF THE LARGE GAS BUBBLES HAS OCCURRED, BUT REACTION BUBBLES HAVE INCREASED IN SIZE.

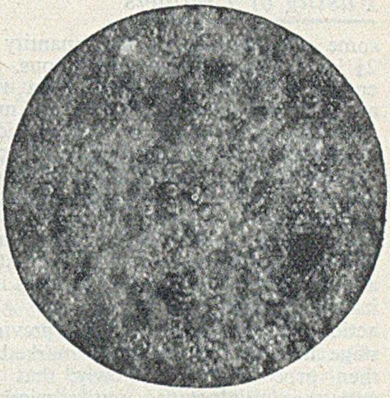


FIG. 15.—SAMPLE AFTER 3½ MIN. ENAMEL REMAINS UNDER-FUSED.

now apparent, the remainder being of more normal size. The bubbles derived from the enamel layer itself are now more in evidence. At 3 min. fusing time there was still further smoothing-off, as can be seen in Fig. 13, although relatively-gross bubbles are still in evidence. The "reaction bubbles" are also increasing in size. After 3¼ min. fusing, a reasonably good plate was obtained, except for the fact that it was under-fused. There were very few gross bubbles left, and in the photograph of this plate, Fig. 14, there is to be seen very definite healing-over of the gross bubbles, and the continued increase in size of the reaction bubbles. At 3½ min. we see merely a progression from the last plate, and this one, though better fused, was still under-fused. The surface is shown in Fig. 15, and here the reaction bubbles are increasing in size, and the healing-over process is reaching completion—that is, as far as is ever reached in normal fusion.

Fig. 16 shows the plate which had 4 min. fusing, and this plate was almost completely fused. The reaction bubbles are still increasing, and with further fusion continue to grow and burst. The healing-over process has progressed quite well, but tiny bare areas are still present, and will remain, however much fusing the plate has, since all ground-coat plates show very much porosity to the high-frequency spark tester. A tiny piece of enamel was detached from this plate, and the underside still appeared to have a black scale adhering to it, but was much more close-textured than that shown in Fig. 9. This sample did not photograph very well, owing to its being almost plain black, and therefore no illustration is reproduced. It would appear that the enamel had now penetrated this scale layer to some extent. That the layer is still porous is shown in Fig. 17, which was taken with transmitted light, but the large holes have, of course, disappeared. Fig. 18 shows a section of this layer, the blackish scale on the underside being evident.

If this last illustration is compared with Fig. 11 (2½ min. fusing), the increase in thickness with the fusing time is most evident. This supports the view that the original bubbles came from the metal, and subsequently from the enamel layer itself, thus causing the increase of thickness.

Conclusions

Summing up, it would appear that, first, gas is liberated from the metal, causing some disturbance of the "biscuit," and this gas liberation continues with

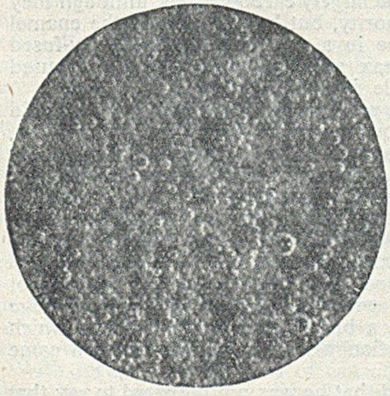


FIG. 16.—SAMPLE AFTER 4 MIN. IN THE FURNACE. FUSION ALMOST COMPLETED.

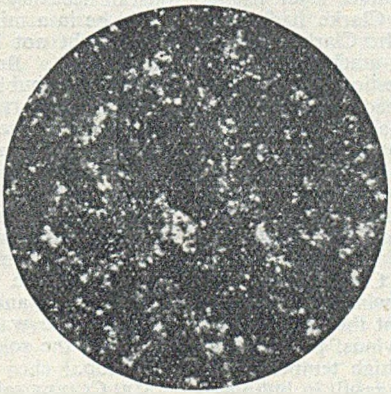


FIG. 17.—ENAMEL FROM SAMPLE SHOWN IN FIG. 16, PHOTOGRAPHED UNDER TRANSMITTED LIGHT.

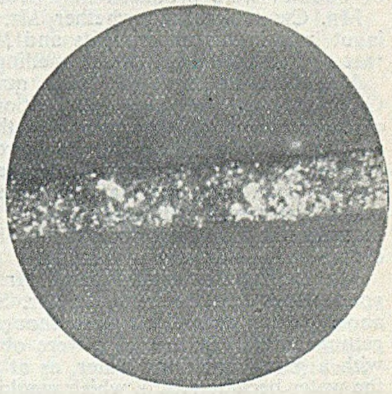


FIG. 18.—SECTION THROUGH ENAMEL SHOWN IN FIG. 17; BLACKISH SCALE IS STILL IN EVIDENCE.

Fusing of Enamels

some violence, and in fair quantity up to about 2 to 2¼ in., under the above conditions. At this stage, the enamel has started to fuse to a very viscous state, and the gas liberation from the metal then appears to cease, or slow down very considerably. It might be noted here, that, from parallel trials carried out at varying temperatures, the enamel begins to sinter at around 650 deg. C., and shows definite signs of fusion at 700 deg. C. It could be inferred, therefore, that gas evolution is at a maximum up to about 700 deg. C., and after this temperature it gradually ceases. At about this same point, the reactions in the enamel layer itself seem to become evident. Although some reaction may have taken place previously, it is at this stage that they becom very marked. These reactions then proceed slowly, slowly, that is, in comparison with the initial stages, until fusion is complete as is understood in the enamelling shop.

Acknowledgments and thanks are due to the directors of Stocal Enamels, Limited, for permission to publish these remarks.

DISCUSSION

Mr. Swindells said that he did not agree with Mr. Clarke's statement regarding bubble formation, that the gases are formed solely from the base metal, as he had enamelled a heat-resisting glass and succeeded in producing the same bubbles as when enamelling cast iron. The position of the bubbles would depend a great deal on the viscosity of the enamel. The bubbles would tend to rise more easily in a comparatively fluid enamel than in a harder one, where the larger bubbles would tend to be held down on to the interface.

Mr. Clarke agreed that all bubbles do not come from the metal, but he was submitting that all the gross bubbles which came in the initial stages of fusing did come from the metal. One could not say definitely that the bubbles went right down to the metal, but a microscopic examination tended to confirm that they did, as light could be transfused right through and gave every appearance that the bubbles were caused by gas evolution from the metal. As some of them came during the very early stages of melting there could hardly be said to be a reaction, but when the enamel became more fluid and wetted the metal surface better, the reaction between the metal and the enamel then progressed far more readily. Summing up, it seemed fairly certain that a lot of the gross bubbles in the early stages did come from the metal. Later, of course, large numbers of bubbles were produced in the enamel layer itself.

Mr. Croxton asked whether Mr. Clarke had used ingot iron in his experiments and Mr. Clarke replied that he had used 18-gauge enamelling-grade ingot iron.

Mr. Clarke, replying to a question from Mr. Gardner, said that when he mentioned the re-coating of cast iron, he intended to convey that one very often got a perfect re-coat on cast iron, providing the second coating was done a reasonable time after the fusing of the first coat. The fact that the enamel layer was fused on to the metal before re-heating did not definitely increase the tendency to boiling, should the enamel evolve gas on the second heating.

Mr. Laithwaite congratulated Mr. Clarke on a very good Paper and, referring to Mr. Swindell's remarks about putting enamel on glass, thought the reasons for getting bubbles in that case were obvious, particularly with a glass containing water, as at high temperatures the water became steam, which would result in bubbles. He agreed that, in fusing, most of the gas came from the metal, but this did not mean that the gas was in the metal at the start. It might be quite likely that water vapour at high temperatures would react with the iron surface to produce hydrogen and iron oxide. It had been shown that at high temperatures iron and steel could behave in this manner; therefore, it would be quite likely that gas would be present. Gas might go into the metal at one stage in fusing and come out again at a later stage after a series of temperature changes. Mr. Laithwaite felt that there was possibly another explanation for the presence of coarse bubbles. No practical enameller would be prepared to argue as to whether the ground coat was fused or not. It would be difficult to define from a scientific point of view the right fusion position in a ground coat. Many would fire correctly at 850 to 860 deg. C. and some were still all right at 870 deg. C., but there must be an optimum temperature. Would it be possible to define the minimum temperature for a ground coat, as that temperature at which the enamel layer could be broken before it parted from the metal? Mr. Laithwaite said that some years ago his company were very interested in the question of gas bubbles. They experimented with some typical ground-coat speciments—heated these in a vacuum and fused them, causing them to bubble, and then analysed them by micro gas analysis, and it was found that 90 per cent. of the gas was hydrogenous.

Mr. Clarke agreed that the majority of the gas evolved was hydrogenous and pointed out that a normal enamelling grade of iron contained 3 to 5 ml. of hydrogenous gas per 100 gm. before anything was done to it at all. It was interesting to note that in a previous Paper read before the Midland Section it was stated that if one used an enamel, ground with no clays or electrolytes, the number of bubbles retained in the enamel layer on completion of the enamel fusion would be very few indeed—this would tend to support the theory that one did lose most of the gas coming from the metal before the enamel was in a sufficiently fluid state effectively to trap them.

Replying to the question regarding the fusion of the ground coat, Mr. Clarke said that the average enamel which was accepted as being properly fused still retained quite a large number of bubbles and, if the fusion time was increased, the ground coat would be almost denuded of bubbles; but by that time quite a large amount of iron would be dissolved into the enamel layer, hence it would take on a green colour and the black oxide layer would definitely be dissolved into the enamel. With regard to Mr. Laithwaite's remark about the reaction between water vapour and the metal layer producing hydrogen and iron oxide, this would be possible, but he had of course referred to small bubbles. A lot of the small bubbles were produced from the clay, but these must of necessity be largely carbonaceous, although they would be in a minority, but bubbles left in the enamel layer might not be in a minority in a properly-fused ground coat. Borax and sodium nitrate also caused considerable bubble formation.

Mr. Laithwaite was surprised that Mr. Clarke should suggest carbonaceous gas came from the clay, because, if the offending properties were removed from the clay first, it would not contain carbonaceous matter (*i.e.* if it were properly washed and processed).

Mr. Swindells referring to Mr. Laithwaite's remarks regarding the breakdown of water and vapour iron into iron oxide and hydrogen, said that his experience had been that at the bottom of all the bubbles was a spot of iron oxide, and with about 90 per cent. or the large bubbles there was a brown spot on the bottom which went into the solution with the enamel and then came to the top.

Mr. Clarke said that he was not prepared to say that water would cause further oxidisation underneath the enamel layer.

(*Continued on page* 380.)

De-enamelling*

Discussion of Mr. B. B. Kent's Paper

SOUTHERN SECTION

Below is a report of the discussion which took place after Mr. Kent presented his Paper on "De-enamelling" to the January meeting of the Southern Section of the Institute of Vitreous Enamellers.

The first speaker was MR. C. P. STONE, who thanked Mr. Kent for an excellent lecture, and he felt it should be accepted that Mr. B. B. Kent and his brother were experts in the art of de-enamelling by the molten-caustic method, but he thought that de-enamelling should be used only as a necessity. Articles which had been chipped in service would have to be de-enamelled, but with at least 80 per cent. of the jobs which are de-enamelled, the defects could be avoided if proper attention were given to the parts in question at the right stage of the process. Mr. Kent had stressed the question of quality of the metal. It was well known that caustic would clean iron, but the majority of the troubles encountered could be corrected in the plant for cleaning and pickling. With regard to the use of hydrofluoric acid by the hot method, his company had experimented with this some years ago, and had encountered so much trouble within the plant that they had found it cheaper to scrap the article. In those days metal was more easily obtained. It was important to remove all the caustic soda after the job of stripping.

MR. A. B. KENT said that he had listened to the lecture with much interest, as he was associated with Mr. B. B. Kent in 1936, when the plant described had been put down. Mr. Kent had mentioned in his Paper that "the sludge was discarded," and he wondered how the sludge was disposed of. With regard to the heating of the gas tank using the caustic solution method by means of tubes, he had recently seen a plant where the tubes had been run parallel along the sides of the tank, and this effected a considerable improvement.

MR. B. B. KENT replied that his company had employed nine different contractors in two years to remove sludge.

Severity of Inspection

Referring to inspection, MR. WILLIAMS said that in many large plants, especially those with automatically-controlled conveyor systems, a piece of enamelled ware might be scrapped where there was only a small spot on it, and in such a case this might amount to many thousands of pieces, which would be extremely wasteful. With regard to normalising the welds on the tanks, a furnace to normalise welds was large and costly and he thought there would be caustic embrittlement, especially in a "molten" tank, as the strength of the mild steel was progressively lowered. He felt that it was an advantage to shot-blast articles with corners and, sand-blasting these tanks would be out of the question.

In connection with sludge disposal, MR. WILLIAMS said that the sludge was neutralised with waste acid before being disposed of. If it was more or less neutral to litmus, there was no further difficulty.

With regard to the action of caustic soda in beaded ware, he considered that close-beaded ware could not be satisfactorily de-enamelled. The difficulties experienced could be overcome to some extent if the capillary action was destroyed by drilling holes round the beads. The ground coat sometimes burned off the ware after it had been de-enamelled, due to the fact that soda became impregnated in the steel itself, this being very difficult to get rid of. The action of the soda film on un-neutralised sheets would lessen the yield value of the ground coat. After long immersion in acid, this trouble would not occur, but this would incur considerable extra cost for acid. If the sheets were properly neutralised, even to the extent of over-pickling, the ground coat would not burn off. Although most de-enamelled ware was satisfactory, blisters would occur due to the presence of caustic. This could, however, be overcome by installing the process between the de-enamelling and the pickling shop, so that the sheets were as clean as possible before entering the shop.

MR. A. B. KENT mentioned that he had seen in a cooker works a large panel scrapped because of one speck on the bottom, and he thought this was a wicked waste, as this would not be considered harmful by anyone purchasing an article.

MR. HALLSWORTH said his practical experience of de-enamelling had been very limited during the past ten or twelve years, although he had learned a good deal in the past in connection with molten-caustic de-enamelling. Fortunately, the manufacturers of caustic soda had made de-enamelling by this process much easier than in the days when he was doing experimental work. He asked Mr. Kent whether any special refractory was used for the lining of the tank he had described.

MR. KENT replied that an ordinary firebrick was used.

Working Details of the Process

MR. N. L. EVANS (Imperial Chemical Industries) said that he would like to add his quota of praise to Mr. Kent for a very enlightening Paper; a number of interesting points had been raised. With regard to burns, he felt that it might be wrong to draw a distinction between a burn caused by molten caustic soda and one caused by a 50 per cent. boiling caustic solution. There was not much difference between them, as they both caused a severe burn. In designing a modern plant, when the molten-caustic soda tank was used, precautions had to be taken against articles being put in which were not perfectly dry, as this would cause an explosion.

Contrary to general belief, caustic soda was a highly dangerous material to handle. It was made by his company, and they took many precautions in their own work, although, fortunately, the most drastic of these had not yet been used. Supplies of ammonium-chloride solution should be kept for treating burns—in his works a large tank of ammonium-chloride solution was placed on a stand and there was a chain mechanism which would release the whole contents of the tank if necessary. Precautions must be taken so that the caustic soda would not get on to the workers, but this should be easy if the tank was properly screened.

With regard to caustic embrittlement, Mr. Evans said that this was caused by both molten and aqueous caustic soda. Mild steel would be embrittled by a caustic-soda solution of 30 per cent. strength and upwards, at temperatures over 60 deg. C., but only steel in a stressed condition would be embrittled, and the stresses could be relieved by heating the tank to 650 deg. C. If 50 per cent. solution were used, one could say for certain that a tank would fail within three months. Referring to

* Printed in the JOURNAL, February 2.

Discussion—De-enamelling

the heating of caustic-soda tanks, Mr. Evans said that both immersion heaters and electrodes had been tried. His experience was that electrodes were unsuitable, as they became coated with enamel slime, and it was only with difficulty that sufficient current could be passed through to keep the tank uniformly heated. This trouble was not, however, experienced with immersion heaters. Another method was by external gas heaters, which should be applied to the sides of the tank, not to the bottom; with these a sludge tray could be used to cover the whole area of the tank, thereby saving a good deal of trouble. A speaker had mentioned a bath which had the tubes at the side instead of at the bottom; this was very useful, as in this case, also, the whole of the bottom of the tank could be covered with a sludge tray.

Mr. Kent had referred to the need for double de-sludging every ten days, and in most works this happened automatically over the week-end. Mr. Evans felt that this method could be improved upon. At one time his company thought that the correct way was to allow the tank to cool down to 100 deg. C. and afterwards remove the sludge tray, but this was not very satisfactory, and a better system was now used, *i.e.* at the end of a day's work, before the sludge was allowed to settle, the tray was removed and an empty one was put in. Having removed the sludge, the make-up caustic soda could be put in and this would be melting overnight and would help in the cooling of the tank. Next morning the temperature could then be brought back again and the next shift started. This method saved a good deal of time.

On the question of temperature with the molten-caustic-soda process, Mr. Evans said Mr. Kent had indicated that trouble was experienced with the steel if a temperature exceeding 500 deg. C. was used. Mr. Evans thought that this was slightly over-cautious. He had found that the efficiency was greatly increased if the temperature was raised to 530 deg. C. as a maximum.

As regards the system used of adding the caustic soda, Mr. Kent said that his company added this immediately they stopped operating the tank. He agreed that it was a good idea to take one tray out at that stage, but he thought that it was desirable to start work with a clean tray, as otherwise there might be too much sludge accumulating, which would over-run the sides of the tray.

With a temperature of 530 deg. C., unless the tank was very thick, there would be a risk of burning it. This was why his company kept it down to 500 deg. C. (He was referring to a gas-heated tank). Referring to Mr. Evans' remarks about the side-heating of the tank with tubes, Mr. Kent wondered whether this method could be used with the type of work which was agitated in a basket.

Dr. Niklewski mentioned that he had seen agitation provided by the provision of water carried by means of pressure pipes going to the bottom of the caustic-solution tank, causing a small explosion when the water entered the tank sufficient to remove the sludge. This dispensed with the movement of the whole tray, and if the pipes were very thin, bubbles were formed of steam which moved the whole solution. He had not used the side-heating method with work requiring agitation, but without agitation it had proved quite satisfactory. There was a lack of the tendency of the liquor to roll, as with bottom heating. His company would, however, be interested in getting some form of filtration of the liquor to avoid the necessity of de-sludging it every third week.

Mr. A. B. Kent said that he had also tried to accomplish this, but could not obtain a pump to stand up to the work.

Mr. B. B. Kent asked if anyone in the audience knew of a pump which would pump caustic soda between 250 and 2790 deg. F.

Mr. Evans replied that he could name the makers of a pump suitable for handling strong caustic soda and other solutions, and would pass this information on to members after the meeting.

Dr. Niklewski said that his company had tried both the solution and the molten-caustic method. For treating flat ware, they had found that the cheapest method was the solution, but for very bulky ware, such as a bath, which would take 8 to 12 hours, it would prove too costly by the solution method, and it would be better to use the molten-caustic method. Neither method was suitable for work such as a large refrigerator panel, because of the time taken to de-enamel; it would become so distorted that it would not be usable, and it would be better to scrap the part.

Mr. A. B. Kent said that in his experience with flat work, a "solution" tank, roughly the same size as the "molten" tank, would give double the output in 12 hrs. The "molten" tank was very much easier to clean, but from an output point of view, the "solution" tank was better.

Alternative Procedures

Referring to the solution process, Mr. Guy said that his company had found it more economical to discard the whole contents of the tank within a fortnight, as by doing this, the life of the tank would be about 3½ weeks. Just recently, they had been getting the work out with a heavy compound on the metal surface, which was extremely difficult to remove—he had not discovered what the compound was, but it was found on analysis to contain about 24 per cent. iron, which he thought might be due to iron getting into the solution between the ground coat and the base metal. The temperature of the tank sometimes got rather low overnight, and he wondered if this might have some effect on the extra time taken to de-enamel by the solution method. Referring to the process described by Dr. Niklewski of blowing in water for agitation, he thought this method would be satisfactory, as it would not only agitate the tank, but would keep it at boiling point, and never higher than boiling point.

Mr. Williams felt that the suppliers should look deeper into the question of the optimum concentration of soda. If the solution were boiled over a certain temperature, *i.e.* 200/280 deg. C., a layer would form, which made de-enamelling difficult. It would be necessary to take the ware out, clean it, and put it back again. As far as soluble salts in the soda were concerned, he said that his company had had analyses taken of the caustic sludge at different times, and they had found that with quite a substantial concentration of the caustic soda, most of the other soluble salts were thrown out of the solution. Trouble would be caused by the sodium carbonates if the tanks were not kept clean, as a thick incrustation of sodium carbonates would form along the inside of the tank.

Mr. A. B. Kent said Mr. Guy had mentioned that his company discarded their solution periodically, and he wondered if they topped up from day to day with new caustic soda.

Mr. Guy replied that they did not do this—the tank was run until the solution was no longer effective, *i.e.* until the concentration of caustic got too low for efficient working, and the whole was then discarded.

Mr. A. B. Kent said that the temperature could only be kept to 265/270 deg. C. by adding extra caustic, and if the concentration of caustic were allowed to go right down, a considerable amount of time would be wasted in trying to work with the tank at the wrong temperature.

MR. B. B. KENT remarked that every time ware was taken out of the tank, so would caustic be taken out.

MR. GUY agreed that as work was taken out, the caustic content would go down, but the total concentration of dissolved matter would remain constant. At the end of three weeks their tanks had exactly the same boiling point as at the beginning. He did not think it was possible to tell the concentration of the tank by its boiling point, as other soluble salts went into the solution and the boiling point would be no measure of a spent tank.

MR. HALLSWORTH considered that there were fairly simple ways of determining the amount of free caustic soda in a 50 per cent. solution.

DR. NIKLEWSKI said that the thermometer was a good guide. He had tried putting some other solids in the solution, but they did not raise the temperature as much as expected. In fact, owing to the amount of sludge produced by so many solids being involved, the temperature might drop.

MR. EVANS supported the view that the thermometer was a very good guide. He said that it was possible to determine the amount of free caustic soda in a solution, but this was a complicated and costly process, taking a considerable time, whereas the test could be made with a thermometer quite frequently and without much cost. There was a simple test which could be carried out, *i.e.*:—

> The 50 per cent. solution, if allowed to cool down to normal room temperature, would still be liquid, whereas caustic soda which had been used for a week in de-enamelling would be solid by the time it reached room temperature. This had been proved by a number of people to be a sound method of testing.

Treatment of "Bad" Steel

MR. WHITAKER mentioned that his company occasionally received steel components which were very difficult to enamel because of a slag inclusion which appeared on both sides of the sheets. They had sent some of these components back to the maker, stating that they were not suitable. These were then de-enamelled by Mr. B. B. Kent's company and when returned again, were found to be quite satisfactory. Mr. Kent was of the opinion that this was because of the normalising effect of the de-enamelling process. Might it not be the caustic removed impurities from the sheet?

MR. B. B. KENT replied that they had found this was so. De-enamelling would take all the impurities out of the steel, and a part that had been de-enamelled in molten caustic would re-enamel well.

MR. A. B. KENT mentioned that there was a certain type of steel in use some months ago which could be enamelled only after the blanks had been put through caustic soda solution, and the steel makers had agreed that this was the only way of doing the job. The caustic attacked scale impurities in the pores of the metal, so that the enamel could be put on satisfactorily.

MR. STONE was of the opinion that there should be a more satisfactory means of removing the caustic when the article was taken out of the tank, other than by scratch brushing and then pickling in the normal way, as this was a very costly process. He asked if anybody knew of any more satisfactory method.

MR. EVANS described another method as follows:—The articles when removed from the molten caustic bath should be allowed to cool down to approx. 100 deg. C. and then put in a bath of hot water (or an open-ended steam pipe could be put into the bath). All that would be left on the surface would be a very thin film of enamel sludge, which could be rubbed off with a brush under running water. Hot and cold water dissolved the caustic more readily than cold water alone.

MR. WILLIAMS said that he had found the best method was to get a fairly high concentration of acid and pickle in that. It was always best to pickle the ware in this way prior to its going into the enamelling shop; also to make sure that it had a slight surface etch.

MR. A. R. PARKES asked what method was recommended for de-enamelling cast-iron parts and the answer was that shot blasting was the only method.

MR. BIDDULPH then referred to the question of inspection, which had previously been discussed. He agreed with Mr. Stone that if proper attention was given to every stage of the enamelling process, there would be no need for a de-enamelling tank. The question had been mentioned of hydrofluoric acid fume removal; Mr. Biddulph said that he had used the method quite successfully and without any great expense being involved. The work was carried out in a lead-lined tank, with an addition of chromic acid. Above the tank was a chimney containing a gas burner to create a draught.

With regard to de enamelling generally, Mr. Biddulph said that when he was abroad some time ago he visited a works where there was a de-enamelling plant and at least three-quarters of the rejects were through chipping. After de-enamelling several times they were still bad. He knew of a firm in this country who were recently considering the question of de-enamelling to save their work, which was mainly rejected also due to chipping. It was obvious that the trouble was due to bad design, and Mr. Biddulph had advised them to get the design right before installing a de-enamelling plant. He felt that design was very important, and if this was studied carefully and the job was carried through correctly in the first place, a de-enamelling tank would not be necessary.

NORTHERN SECTION

Mr. B. B. Kent delivered the same Paper on "De-enamelling" to the February meeting of the Northern Section of the Institute of Vitreous Enamellers. What follows is a report of the Discussion which took place on that occasion.

MR. STEVENS opened the discussion by asking if Mr. Kent could quote any figures relative to the cost of de-enamelling processes.

MR. B. B KENT replied that this was impossible because of the wide diversity of shape and size and condition of ware for de-enamelling.

MR. CRITCHLEY declared that in an eight-foot tank he had as much as 14 in. of sludge; he used 0.85 to 0.90 lb. caustic soda per sq. ft.

MR. KENT could not understand why there was so much sludge. He himself had only 6 in. of sludge and used only 0.38 lb. caustic per sq. ft. Explaining further, he said that in their own plant they de-enamelled any ground-coated material which was not perfect and this saved trouble later and economised on materials.

MR. MCARTHUR asked if steam heating was suitable for cleaning after de-enamelling.

MR. KENT replied that it would be very expensive to use steam; hot, running water was ideal for the purpose and was cheaper. De-enamelling was not very satisfactory with some types of hollow-ware because it was impossible to rid the seams of caustic. Sometimes, he contended, de-enamelling could improve steel from the enameller's point of view. Fouled metal could be

Discussion—De-enamelling

made workable by dipping in molten caustic for a few minutes.

A MEMBER asked if agitation was necessary in the solution process for de-enamelling. Also, what type of shot and what air pressure should be used when de-enamelling heavy components by the shot-blasting process.

MR. B. B. KENT said that the use of No. 18 shot was more or less the standard practice and good pressure was most important in shot blasting. Even when the shot had disintegrated into dust it could still be used.

MR. DENT said his firm had had trouble with excessive sludge. Not only did the material penetrate through the tank, but it either made the caustic viscous or became so hard that it could not be taken from the tray. Mr. Dent also complained of distortion of ware, but he thought this might be because they were working on light-gauge material.

MR. B. B. KENT referred to his own practice in which it was found necessary to repair the welds on the caustic tank about every four months. A disadvantage of de-enamelling was that it might lead to carelessness in enamelling—especially if supervision was lax—when it became known that spoiled ware could be de-enamelled and salvaged. Manpower for the plant was a difficult problem, as he found few people were willing to work with caustic soda.

Discussion—Fusing of Enamels

(*Continued from page* 376.)

MR. BIDDULPH was very interested in Mr. Clarke's reference to furnace loading, particularly with regard to ratio, which he considered was a very important factor, and he felt that a great deal of work could be done in following up what Mr. Clarke had said in his reference to Mr. Ryder's work. A considerable saving in cost could be made by work done on perrets, and he felt that this was not fully realised; also there was still room for improvement in the design of perrets. He suggested that ground coat on steel was properly fused, when a flake could not be broken away from the metal.

MR. CLARKE agreed that large savings could be made by proper adjustment of the work-to-perret ratio. With regard to moisture, when a slip was dipped in sheet-iron ground-coat enamel, a fairly good job could be produced without " rolling " and this was due more or less to the work of the clay in holding the moisture.

MR. HALLSWORTH said that Mr. Clarke had referred to thermostatic control only in connection with the continuous furnace, and he wondered whether he inferred that this could not be obtained on the static furnace.

MR. CLARKE explained he meant that when controlling thermostatically the rate of working was controlled, and right through the furnace the output was satisfactory providing everything else was constant.

MR. HALLSWORTH pointed out that it was possible to control a box-type furnace as easily as a continuous furnace, but the latter did of course give more satisfactory results. He was surprised to hear Mr. Clarke's remarks about the relative cost of fuel. Before the war he always estimated that the cost ratios were 1/2/3 for coal, oil and gas. At the same time it was a mistake to consider the fuel cost only without taking into consideration the labour and maintenance costs which could accrue.

MR. CLARKE replied that the figures quoted included the cost of firing, cost of disposal of ashes, etc., and while these figures might not be absolutely correct, they were based on consumption and labour. The cost of maintaining a coal-fired furnace was much in excess of a gas-fired furnace.

DR. MARTIN referring to the discussion on bubbles, said that his company had found occasions when they were an advantage. In experiments with one ground coat, the work had a tendency to "fish-scale," and as the fish-scale effect was caused by hydrogen, if the hydrogen was reduced there was less " fish-scaling." By the addition of more clay, the " fish-scaling " became far worse, but with less clay it was eliminated. If the bubble structure was removed, the enamel " fish-scaled " very badly. The addition of extra clay might also cause suspension difficulties.

MR. TODD was very interested in Mr. Clarke's observations regarding furnace loading, and in full agreement with his statement that greater utilisation of leaning frames would increase the furnace output. He observed that there were many practical enamellers opposed to the leaning of ware, but he advised them to make more extensive trials; the right type of leaning frame was well worth while. Mr. Todd proposed a vote of thanks to Mr. Clarke for his Paper and the chairman closed the proceedings.

Welding Research

The annual report of the British Welding Research Association for 1948-49 points out that the Association continues to remain very dependent for the major portion of its industrial income upon the generosity of a relatively small number of its members. To them the satisfactory progress of the researches and equipment of the laboratory is in large part due. To spread the support of the Association more equitably throughout the industries using welding to provide the additional finance which is necessary to meet research costs which rise with other costs, and to commence new investigations which are needed and demanded by industry, a further substantial increase in membership is necessary. Only in this way can stability and ordered progress be assured. The handicaps peculiar to the Association were represented to the D.S.I.R., and more favourable conditions of grant have been allowed for the five years 1949-54. These conditions, which are subject to review in two years' time, provide that if industry contributes £20,000 the Department will grant £20,000 and £100 for each additional £100 industrial income up to a maximum additional grant of £20,000 for the year. The effect of these terms should be to raise the Government grant by some £5,000. This will permit the further expansion of a very necessary aspect of the Association's activities.

Vitreous Enamellers' Association

The annual dinner and dance of the Vitreous Enamellers' Association was held on Friday, March 24, in the Midland Hotel, Birmingham, the chairman, Mr. J. W. G. Pedder, presiding.

Mr. H. H. Aston gave a very clear explanation of the complementary functions of the Institute of Vitreous Enamellers and the Association, both of which worked in the closest collaboration and harmony. Mr. R. J. Rogers pointed out that the Association concentrated on the commercial side and thus appreciated and supported the research and technical developments policy sponsored by the Institute of Vitreous Enamellers. He also announced that the first students would be enrolled this year at Stoke-on-Trent for training in vitreous enamelling.

Notes from the Branches

London Branch—Slough Section

A very successful session of the Slough section of the London branch of the Institute of British Foundrymen was concluded with the annual general meeting, held in the lecture theatre of High Duty Alloys, Limited, on March 21. A notable feature of the preliminary formal business was the election of Mr. R. B. Templeton as *president* for the next session, Mr. E. Raybould and Mr. J. Pike being elected *senior* and *junior vice-president* respectively.

After the formal business of the evening there followed a Paper entitled, "Plain Bearings—Materials Fitting and Design," by P. T. Holligan, B.Sc.(Tech.), F.I.M. of the Glacier Metal Company, Limited. As an introduction, he dealt briefly with the theory of friction, showing that with point contact of different metals on steel, very high local heat was generated, and if these point contacts were of low-melting-point metals such as lead or tin, temperatures corresponding to their melting points were obtained, any excess heat being absorbed as latent heat of fusion. The application of this phenomenon lay in the development of soft bearing metals, where a low-melting-point matrix of lead or tin was able to provide a superficial molten layer mitigating against the production of high localised friction, and thus preventing seizure. With the bronze bearing, however, the principle was different in that the matrix although hard and relatively infusible, wore away preferentially to the harder delta constituent to provide an oil-holding surface which minimised friction. The choice of a bearing for a particular purpose, however, where there were always a considerable number of incompatible factors to be considered, could not be decided from theoretical principles; the only sure criterion was to prove it effective in practice. Furthermore, different structural formations were desirable for different applications, as instanced by the copper/lead type—in one case a globular lead form was found to be effective, whilst in another the continuous inter-dendritic form was better in a case where oil feeding was required from a remote point.

A survey followed of the types of bearing materials and their applications—white metals, lead-bronzes, copper-lead, silver and aluminium alloys, lead, lead-tin and lead-indium plated bearings. The thin-wall bearing and its high degree of engineering precision with regard to interference fit and running clearance was described, also crank-shaft and crank-case materials were dealt with. In conclusion, typical bearing failures were illustrated by slides, their causes and prevention being elaborated upon.

DISCUSSION

Replying to points by Dr. Scheuer the lecturer said that it was not attempted to cast a thin white-metal layer on to the steel shell, but it was more economical to cast on a layer about 1-in. thick, and then machine to the necessary 0.004 in. thickness. The 16 copper-lead bearings were produced by powder metallurgy.

Mr. Raybould raised the question of differential expansion in thin-wall bearings, and it was stated in reply that the temperature attained in service was sufficient to relieve stresses set up in the white metal caused by its greater expansion.

Mr. Logan deplored the use by some manufacturers of single phase-structure bronze strip as a small-end bearing. The lecturer was in agreement, but pointed out that in some cases it had proved satisfactory, and indeed, he had even known brass strip to be used.

To Mr. Pike's query on shafting materials, it was stated that many types were satisfactory, but it was impossible to be dogmatic, and again the best answer was to try a set-up in practice.

A vote of thanks was proposed by Mr. S. B. Michael and this concluded the meeting.

Newcastle-upon-Tyne

Over a hundred members and visitors attended the March meeting of the Newcastle-upon-Tyne branch of the Institute of British Foundrymen at which a departure from the normal monthly technical meeting was made in that it took the form of a mock trial, complete with judge's dais, jury box and public gallery. The main characters were played by the following members of the branch:—As judge, Mr. W. Scott, O.B.E., J.P.; as prosecuting counsel, Mr. C. Lashly, M.C., as defending counsel, Mr. C. R. Tottle, M.Met., A.I.M.

The accused—Mr. J. R. Charlton—was charged that on divers occasions he had, through negligence or wilfully, endangered the national economy by (1) producing castings containing such faults as are beyond the wit of man to define, (2) producing castings of a type not within his instructions and intended for a nefarious purpose. Mr. R. F. Hudson and Mr. G. Elston acted as expert witnesses for the prosecution and defence respectively. After the case had been thoroughly "investigated," the jury, which was drawn from members in the hall, retired for only ten minutes to find the accused guilty on both charges!

Mr. W. S. Paulin proposed a vote of thanks to those who had made the evening most entertaining and instructive, and congratulated the characters on their knowledge of court procedure, which he hoped they had gained from outside the dock. In seconding the motion, Professor A. Preece, M.Sc., F.I.M., expressed the view that this novel method of imparting foundry technique had been highly successful and rarely in an hour and a half had he seen such a pleasing display of the intricacies of procedure involved in the making of a casting.

London Branch—East Anglian Section

The East Anglian section of the London branch of the Institute of British Foundrymen met at the Central Library, Ipswich, on March 9, Mr. W. L. Hardy presiding. At this meeting the section was honoured by a visit from the branch president, Mr. F. Arnold Wilson.

Mr. P. A. Russell, B.Sc., F.I.M., of S. Russell & Sons, Limited, Leicester, presented his Paper on "Where Is Cast Iron Going To?" and this was followed with interest by the members. The history of cast iron from its early days to its present development of the high-strength ductile cast irons was illustrated with slides. Mr. Russell made it very clear that the new-type ductile irons were products entirely different from cast iron as previously known, and would probably find their application in a totally different field.

At the conclusion of the lecture, Mr. L. W. Sanders emphasised that although this new type of iron had received much publicity in the technical Press, there were still major problems to be overcome before the iron could be made readily available on a production basis. Mr. Carrick proposed a vote of thanks to Mr. Russell for his excellent Paper.

Mr. H. S. Tasker, chairman of Goodlass Wall & Lead Industries, Limited, and of Walkers, Parker & Company, Limited, lead smelters, both Oxted (Surrey), and a director of Cookson Lead & Antimony Company, Limited, Newcastle-upon-Tyne, and of Locke, Lancaster & W. W. & R. Johnson & Sons, Limited, Oxted, was on March 29 elected to succeed Sir Arthur Smout, a director of I.C.I. Limited, as president of the Institute of Metals.

News in Brief

THE GOVERNMENT intends that summer time this year will be from April 16 to October 22.

AS FROM MAY 1, the Sheffield Furnacemen and Stokers' Technical Society will be known as Sheffield Fuel and Steam Technical Society.

MR. J. E. HARLE, foundry superintendent, Indian Iron & Steel Company, Limited, Kulti, Bengal, is at present on leave in this country. He returns to India in May.

AN ORDER for the construction of two hopper dredgers of 530 tons and 270 tons capacity, has been placed with Fleming & Ferguson, Limited, Paisley, by the Admiralty. This contract brings the total number of new vessels ordered from Clyde yards since the year began to 17.

MR. L. E. BROOKES, general manager of C.V.A. Jigs, Moulds & Tools, Limited, Hove, Sussex, whose firm contemplate starting in Dundee, visited the city and called on various industries last week. He explained that his firm decided to go to Dundee because, after making full inquiry, they believed Dundee had a great future.

SPECIAL COURSES in plant engineering, open to young men possessing national certificates, and leading to associate membership, are planned by the Incorporated Plant Engineers, Mr. D. Lacy-Hulbert, national vice-president, told members of the South Yorkshire centre at the recent annual meeting. It is hoped that the syllabus will be ready this year.

THE MINISTRY OF EDUCATION announces that the number of Technical State Scholarships available this year is to be increased from 100 to 120. Eighty of the scholarships will be available to candidates under the age of 20 on July 31 next, and up to 40 scholarships for candidates aged 20 or over at that date. There is no upper age limit for the latter awards. Explanatory leaflets and application forms may be obtained from the Ministry of Education, Curzon Street, London, W.1.

CALEDON SHIPBUILDING & ENGINEERING COMPANY, LIMITED, Dundee, have received an order from Alfred Holt & Company, Liverpool, to construct a single-screw cargo liner. The vessel will be 452 ft. long by 64 ft. by 35 ft. 3 in. Propelling machinery will be supplied by Metropolitan-Vickers Electrical Company, Limited, Manchester, and will comprise a 3-cylinder cross-compound, high-pressure, impulse-type steam turbine. Steam will be generated by Foster Wheeler boilers having a working pressure of 600 lb. per sq. in. and steam temperature of 950 deg. F.

MR. G. D. ELLIOT, of the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited, who, as reported in our last issue, has been awarded the Sir Robert Hadfield Medal of the Iron and Steel Institute, has spent the whole of his working life with the Appleby-Frodingham Company. After two years as a college apprentice he was appointed assistant manager at the Frodingham blast-furnace plant. When, before the war, the South Iron Works was under construction, Mr. Elliot, then only 30 years old, was appointed to manage it. He now holds the position of works manager (iron). He has visited the principal steel-making countries in Europe and has twice visited the United States, the last occasion being in 1949, when he addressed American blast-furnace managers and refractories technicians on the use of carbon as a blast-furnace lining. In 1944 Mr. Elliot received the Williams Prize of the Iron and Steel Institute for a Paper he wrote on "Iron-making at the Appleby-Frodingham Works of the United Steel Companies, Limited," in collaboration with his colleagues at the ironworks and the United Steel Companies' central research department.

Obituary

COLONEL WILLIAM W. ROSE

Formerly executive vice-president of the Gray Iron Founders' Society, Inc., died on February 20. He was buried with full military honours. Colonel Rose was born in Harrisburg, Pennsylvania, on April 20, 1883, and graduated from the U.S. Military Academy at West Point in 1906. Assigned as a 2nd Lieutenant to the 16th Infantry, he was later transferred to artillery in which he served in World War I as a commander of a railway artillery unit in France. He was honoured by being awarded the Purple Heart and Distinguished Service Medal. In 1919 he resigned to join the foreign service of the Bethlehem Steel Corporation and became the firm's representative in Brazil.

In 1934 he became deputy administrator of the National Recovery Administration and was placed in charge of heavy industries, in which capacity he was largely responsible for developing the grey-iron foundry code. Following the termination of N.R.A., the Colonel became executive vice-president of the Gray Iron Founders' Society on January 1, 1936. Until his retirement in 1946, he served as executive head of the Society and was instrumental in building the organisation to its present membership, particularly during World War II, when the importance of the industry's products was well recognised by the service departments.

DR. GILLETT

We regret to record the death of Dr. H. W. Gillett, a former director of the Battelli Institute and one of the world's foremost metallurgical scientists. During the war, he presented the Edward Williams' Memorial Lecture to the Institute of British Foundrymen. In his youth, Dr. Gillett was an associate of Thomas Edison. He was a prolific writer, and for a period edited "Metals and Alloys." His editorials were of outstanding merit and his resignation was a profound loss to technical journalism. He was 66 years old.

MR. EDGAR GEORGE BROWN, founder of the Chesterfield Engineering Company, Chesterfield, died on March 21, aged 83.

MR. MALCOLM COLQUOHON COWAN, a director of Brigham & Cowan, Limited, engineers and ship repairers, of South Shields, has died at the age of 51.

MR. H. L. JONES, a retired representative of Parker, Winder & Achurch, Limited, manufacturers of pumps, etc., of Broad Street, Birmingham, 1, has died at the age of 85. He joined the company in 1894 and retired in 1942.

Wills

ARNOLD, C. H., commercial director of Kayser, Ellison & Company, Limited, steelmakers, etc., of Sheffield	£3,490
YOUNG, HUGH, manager of the North Woolwich (London, E.16) works of Harland & Wolff, Limited, shipbuilders, etc.	£13,357
CRUMBLEHULME, W. L., of Heaton, Bolton, who was associated with Wilfred L. Crumblehulme (Heating Engineers, Bolton), Limited	£5,467
CEARNS, W. J., chairman and managing director of W. J. Cearns, Limited, proprietors of the Structural Engineering Company, London, E.15 ...	£60,399
SHILLINGTON, A. H. F., for many years chairman of Musgrave & Company, Limited, heating and ventilating engineers, foundrymen, etc., of Belfast...	£39,046
COLE, B. G. W., a director of Falk, Stadelmann & Company, Limited, manufacturers of heating and cooking appliances, etc., of Farringdon Road, London, E.C.1	£15,653
REDMAN, JAMES, a director of Prince-Smith & Stells, Limited, worsted machinery manufacturers, etc., of Keighley (Yorks) and of Textile Machinery Makers, Limited, Oldham	£11,915

Company News

The information under this heading has been extracted from statements circulated to shareholders, speeches made at annual meetings, and other announcements.

London Aluminium Company, Limited:—Recalling that the company had developed plans laid down long before to equip itself to produce plant for the dairy, brewery, and chemical industries both here and overseas, the chairman, MR. DUNCAN CAMPBELL, says that this was a wise policy is proved by the fact that, although the total sales for 1949 were comparable with 1948 the hollow-ware sales during the year suffered a sharp fall, whereas the heavy engineering showed a satisfactory increase. At the present moment, he says, the company is working on a contract—one of very many—which runs into nearly £200,000, the completion date of which is March next year. These contracts, while in progress, have naturally to be financed for materials, labour, overheads, etc., and this largely accounts for the difference in the cash position set out in the accounts.

Each year he has told shareholders that the order-book for heavy engineering was filled for two years ahead, and although this was from some angles comforting, there was another side to the picture, namely, clients after having decided to embark upon extensions did not relish waiting two years before the plant was delivered or erected by the company. Consequently, when last autumn the opportunity arose to acquire additional ideal modern engineering works in Birmingham, the directors decided to make the purchase although this meant further capital expenditure of approximately £100,000.

Mr. Campbell says that, in addition to the cost of the factory, substantial sums have had to be spent in re-equipping and alterations to meet requirements, on which there has at present been no return but which the directors are confident will eventually prove a tower of strength to the company.

The rapid expansion of the company's activities in the heavy engineering field during the last six months of the year, which results have, of course, yet to appear in the trading accounts, makes it essential, he says, to conserve the cash resources of the company and led to the decision to reduce the final dividend.

Robert Stephenson & Hawthorns, Limited:—The company has a satisfactory order-book which should ensure full employment throughout the current year and well ahead, says the chairman, MR. F. S. WHALLEY. It is, however, clear that competition both in this country and in the export market is becoming increasingly keen, and export orders have already been secured by locomotive builders in France, Germany, and Japan, in competition with this country. In certain cases the earlier delivery which our competitors have been able to offer has influenced the placing of the order. In such conditions there is increasing necessity to explore railway requirements and all other possible sources of future orders in overseas markets.

Murex, Limited:—The directors state that, during the current financial year to date, there has been no material change in the overall demand for the company's metallurgical products in the home market. Business in the European export market has continued at the lower level experienced in the opening months of the year. Sales of welding rods and equipment have shown a moderate improvement, although there is a lessening demand in the home market; competition is becoming keener.

Company Results

(Figures for previous year in brackets.)

FEDERATED FOUNDRIES—Dividend of 10% (same).

AMALGAMATED METAL CORPORATION—Dividend of 6% (5½%).

BRITISH ROLL MAKERS' CORPORATION—Dividend of 15% (same).

ELECTRIC FURNACE COMPANY—Interim dividend of 3½% (same).

BRITISH OXYGEN COMPANY—Final dividend of 12%, making 20% (same).

CAMMELL LAIRD & COMPANY—Final dividend of 6½%, making 9½% on doubled capital. (Final dividend of 7½%, plus bonus of 3%, tax free, making 12½%).

HADFIELDS—Final dividend of 12½%, making 17½% for the year ended September 30, 1949 (final dividend of 8%, making 13% for the previous nine months).

INTERNATIONAL DIATOMITE COMPANY—Interim dividend of 10%. (For the previous period of 15 months to June 30, 1949, two interim dividends of 10% and a final dividend of 10% were paid, making 30%).

NATIONAL GAS & OIL ENGINE COMPANY—Trading profit for 1949, £290,340 (£215,021); net profit, after depreciation, taxation, etc., £139,474 (£91,265); to writing off patterns and drawings, £58,500 (nil); general reesrve, £50,000 (same); dividend of 5% (same); forward, £43,172 (£55.416).

G. D. PETERS & COMPANY—Consolidated profit for 1949, £250.902 (£239,447); balance, after depreciation, etc., £228.659 (£219.670); tax repayment, nil (£8,202); to income tax, £95,000 (£87,000); profits tax, £30,000 (£27,000); general reserve, £25,000 (£60,000); contingencies reserve, £25,000 (£28,731); staff reserve, £10.000 (same); past service pensions reserve, £25,000 (nil); final dividend of 7½% and bonus of 2½%, making 17½% (same); forward, £49,938 (£45,897).

RADIATION—Group trading profit for 1949, £1,091,753 (£1,010,461); net profit, after depreciation, tax, etc., £431,545 (£382,931); undistributed profits retained by subsidiaries, £239,889 (£191,111); net profit of parent company, £191,656 (£191,820); final dividend of 7½%, making 12½% (same); forward, £164,114 (£163,897); brought in by subsidiaries and undistributed profits, £986.819 (£856,930); transfer to stock obsolescence reserve, nil (£110,000); post-war reserve, £500.000

JOHN BAKER & BESSEMER—Consolidated trading profit for 1949, £266,637 (£187,673); balance, after depreciation, tax, etc., £135.663 (£104,602); brought in, £140,697 (£87,420); balance of Harrison & Camm, Limited, transferred to capital reserve on liquidation, £21,760 (nil); to first and second preference dividends, £13.518 (£10,398); dividend to outside shareholders, £14 (same); capital duty and costs written off, £1,168 (nil); final ordinary dividend of 15%, making 30% (same); forward, £198.986 (£140,698)—to parent £198,740 (£118,254), to subsidiary £246 (£22.444).

R. W. CRABTREE & SONS—Consolidated trading profit for the year to December 31, 1949, £303,555 (£234,644); net profit, after depreciation, taxation, etc., £110.046 (£81.653); EPT repayment, £44.000 (nil); transfer to reserve, £100.000 (£138.373); off goodwill of subsidiary, nil (£6.046); dividend of 5%, less tax, and bonus of 1%, not subject to tax, from capital reserve, both payable on capital of £600.000, as increased last December by a three-for-one share bonus (dividend of 8%, less tax, and special non-taxable bonus of 5% on capital of £150,000); forward, £93,990 (£66,632).

(nil); consolidated balance forward, £650.933 (£910.827).

CLYDE CRANE & BOOTH—Gross profit for the year to November 30, 1949, £117,594 (£75.279); net profit, after depreciation, taxation, etc., £63,392 (£54.850); to preference dividend, £4.560 gross (£4,545); cost of redeeming preference shares, £1.760 (£1.694); ordinary dividend of 25% (same); capital assets reserve, £15,000 (nil); general reserve, £10.000 (£9.000); pensions reserve, £5.000 (£12.000); off patents, £980 (nil); forward, £26,569 (£22,977 after crediting £4.454 refund from final adjustment of war taxation, less interest over-credited).

ENGLISH CHINA CLAYS—Consolidated trading profit to September 30, 1949, after foreign tax and deferred repairs, £775,774 (£573.150); net profit, after depreciation and amounts written off, tax, etc., £292.249 (£222.487); to contingencies reserve, subsidiary, £35.000 (same); general reserve, subsidiary, £50.000 (same); dividends to be paid by subsidiary to outside holders—preference £28 681 (£28,697) and ordinary £22.517 (same)—preference dividend, parent, £15.364 (same) and ordinary 4%, £32.925 (same); forward—parent £18,627 (£18.573) and subsidiary, £253.758 (£146.050).

ALUMINIUM CORPORATION—Trading profit for 1949, £95.466 (£78 309); net profit, after depreciation, tax, etc., £36.359 (£33.769); tax provision in previous years not required, £2.065 (nil); to stock reserve, £2 811 (£2.463); general reserve, £10.000 (same); debenture redemption premium reserve, £5.000 (same); plant replacement reserve, £15.000 (£10.000); dividend of 10% on ordinary and "A" ordinary shares (same); forward, £16.974 (£15.486). The sum of £40.773, received during the year from the liquidator of the subsidiary, being surplus to date on realisation of ordinary shares, has been placed direct to contingency reserve.

Raw Material Markets

Iron and Steel

Pig-iron production in March, as in the previous month, has been on a reduced scale, owing to the temporary inactivity of blast furnaces which are being re-lined. Pending their resumption, stocks of pig-iron are being drawn upon and current outputs generally are being promptly absorbed. Only refined-iron makers have any surplus available for export. Consumer demand for most grades of foundry iron is steady, and although the production of hematite is on an impressive scale, it is not in excess of immediate requirements. Owing to a reduced demand for light castings, some of the high-phosphorus brands are in less demand. Blast-furnace coke supplies are reasonably satisfactory, and the intake of foreign ores is well up to the high standard of 1949.

There are as yet few signs of any recession in the finished steel trade. Bookings for steel plates for Period II are on a very extensive scale, a strong home demand being supplemented by substantial export quotas. Rollers of light sheets, both black and galvanised, can book new orders just as rapidly as they complete old commitments, and if there is a slight easement in the call for large bars and sections, rollers still have work in hand. Regular employment is assured at the rail and wire mills, and there is little variation in the requirements of the collieries in the form of roofing bars, props, and arches.

Non-ferrous Metals

The Ministry of Supply's zinc price to home consumers was increased on Tuesday by £2 per ton to £91 10s. per ton, this being the third increase of £2 within three weeks. The Ministry's decision followed an increase on the previous day of ½ cent per lb. in the US zinc price to 10.50 cents per lb., East St. Louis. The UK zinc price is now £4 per ton above the immediate post-devaluation level of £87 10s. made operative on September 21.

Also as from Tuesday, the Ministry of Supply, in an effort to stimulate the use of its forward-buying facilities for copper, lead, and zinc, halved its charges, additional to the basic price, for forward buying of lead and zinc, and cut those for copper by 40 per cent. These charges were introduced in July, 1949, when the Ministry decided to maintain UK non-ferrous metal prices in parity with dollar values. The Ministry says that the reductions, made as a result of the original promise to review charges in the light of experience, had been decided on after consideration of the working of the scheme and on representations from the trade.

On the London Metal Exchange tin was sold down to £580 for the cash position last week, but closed on Friday afternoon £2 better at £582. A contango was maintained throughout the week and at the close three months' metal commanded a premium of £2. Very little business can have been done by the Government broker, for during practically the whole of this period under review the quotation ruled below £600. Quotations were firmer on Tuesday, cash tin showing an increase of £3 15s. and three months of £4 5s.

A good deal of uncertainty is felt regarding the outcome of the meeting in Paris of the Tin Study Group, for it would seem that American consuming interests are not keen on supporting any arrangement calculated to support prices and maintain them above their natural level. On the other hand, it must be admitted that statistically the outlook for tin is not promising, for it is estimated that this year there will be excess production amounting to some 45,000 tons. In the long run such a situation is bound to depress prices unless something is done to regulate output. Those who followed the fortunes of tin before the war will remember that the Tin Buffer Pool was functioning satisfactorily.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £589 to £589 5s.; Friday, £579 to £580; Monday, £578 10s. to £579; Tuesday, £582 5s. to £582 10s.

Three Months—Thursday, £593 to £593 10s.; Friday, £581 to £582; Monday, £580 to £580 10s.; Tuesday, £584 5s. to £584 10s.

Statistics for February issued by the British Bureau of Non-ferrous Metal Statistics show that stocks of zinc declined during February by about 6,000 tons to 48,210 tons, while consumption at 26,910 tons compared with 27,264 tons in January. In lead, there was a rise in stocks from 60,130 tons to 64,123 tons, but consumption fell to 26,164 tons from the previous month's figure of 27,940 tons. In copper, the decline in stocks was about 11,000 tons, the comparative figures being 130,200 tons at January 31 and 119,317 tons at the end of February. Consumption of virgin copper in February was 25,506 tons, against 25,086 tons in January, while the corresponding figures for copper and alloy scrap (copper content) were 14,574 tons and 16,887 tons. On the whole, these tonnages must be accounted as satisfactory and indicative of continued steady activity in the non-ferrous industry.

British Standards Institution

Standard for Verification of Testing Machines (*B.S.* 1610—*Pt.* 1: 1950)

Advances in recent years in the efficient use of engineering materials with the concurrent increase in the use of hydraulically-operated and multi-lever testing machines, have resulted in the need for standard methods of verifying testing machines and the grading of these machines in terms of the maximum permissible errors. The advantages of verifying machines under load, that is, in the condition in which they will be used, must be obvious, but it has not always been possible to do this in the past.

It is now possible, due to the production of high-precision portable load-measuring devices, to test under load many machines that could not previously be tested to the requisite degree of accuracy; particularly since the installation of the 50-ton deadweight primary standard of load at the National Physical Laboratory is now available for calibrating these load-measuring devices.

There are, of course, other methods of verifying testing machines and Section A deals in general terms with methods of load verification by (*a*) standardised weights, (*b*) proving levers, (*c*) elastic devices, (*d*) test samples, and (*e*) combination of linear measurements and load. Section B deals with tensile and compression machines, laying down specific requirements as to the range over which the machine may be verified, the procedure to be followed, grading and certification of the verification. It is intended to deal with other types of testing machines in further sections, the preparation of which is shortly to be commenced. Copies of this British Standard can be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 2s. post free.

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

(Delivered, unless otherwise stated)

April 4, 1950

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £10 4s.; Birmingham, £10 0s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £11 15s. 6d., 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 2s. 6d.; South Zone, £12 5s.

Scotch Iron.—No. 3 foundry, £11 18s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £12 14s. 6d.; South Zone, £12 17s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 4s. 6d.; South Zone, £13 7s.

Cold Blast.—South Staffs, £15 16s. 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, £11 16s. 6d.; Scotland, £12 3s.; Sheffield, £12 9s.; Birmingham, £12 15s.; Wales (Welsh iron), £11 16s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 8s.

Basic Pig-iron.—£9 17s. 6d., all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.)

Ferro-silicon (6-ton lots).—45 per cent., £33 15s.; 75 per cent., £49.

Ferro-vanadium.—35/60 per cent., 15s. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 8s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £100 per ton.

Ferro-tungsten.—80/85 per cent., 7s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 8s. per lb. of W.

Ferro-chrome.—4/8 per cent. C, £60; max. 2 per cent. C, 1s. 5½d. lb.; max. 1 per cent. C, 1s. 6d. lb.; max. 0.15 per cent. C, 1s. 6¾d. lb.; max. 0·10 per cent. C, 1s. 7d. lb.

Cobalt.—98/99 per cent., 13s. 6d. per lb.

Metallic Chromium.—98/99 per cent., 5s. 1½d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £25 14s. 8d.

Metallic Manganese.—96/98 per cent., carbon-free, 1s. 5½d. per lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £16 16s. 6d.; tested, up to 0.25 per cent. C (100-ton lots), £17 1s. 6d.; hard (0.42 to 0.60 per cent. C), £18 16s. 6d.; silico-manganese, £23 19s.; free-cutting, £20 1s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C, £22 4s.; case-hardening, £23 1s. 6d.; silico-manganese, £26 6s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £19 16s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 1s. 6d.; acid, up to 0.25 per cent. C, £23 1s. 6d.

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Plates, ship (N.-E. Coast), £20 14s. 6d.; boiler plates (N.-E. Coast), £22 2s.; chequer plates (N.-E. Coast), £22 19s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £19 13s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 6s.; flats, 5 in. wide and under, £22 6s.; rails, heavy, f.o.t., £19 2s. 6d.; hoop and strip, £23 1s.; black sheets, 17/20 g., £28 16s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £36 8s.; nickel-chrome, £52 16s. 6d.; nickel-chrome-molybdenum, £59 9s. 6d.

Tinplates.—I.C. cokes, 20 × 14, per box, 41s. 9d., f.o.t. makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £153; high-grade fire-refined, £152 10s.; fire-refined of not less than 99.7 per cent., £152; ditto, 99.2 per cent., £151 10s.; black hot-rolled wire rods, £162 12s. 6d.

Tin.—Cash, £582 5s. to £582 10s.; three months, £584 5s. to £5 84 10s.; settlement, £582 5s.

Zinc.—G.O.B. (foreign) (duty paid), £91 10s.; ditto (domestic), £91 10s.; "Prime Western," £91 10s.; electrolytic, £92 5s.; not less than 99.99 per cent., £93 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £84; ditto (Empire and domestic), £84; "English," £85 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations, £107 10s.; rolled zinc (boiler plates), all English destinations, £105 10s.; zinc oxide (Red Seal), d/d buyers' premises, £87 10s.

Other Metals.—Aluminium, ingots, £112; antimony, English, 99 per cent., £160; quicksilver, ex warehouse, £18 5s. to £18 10s.; nickel, £321 10s.

Brass.—Solid-drawn tubes, 15⅞d. per lb.; rods, drawn, 19¾d.; sheets to 10 w.g., 20⅛d.; wire, 20⅜d.; rolled metal, 18⅞d.

Copper Tubes, etc.—Solid-drawn tubes, 17⅞d. per lb. wire, 177s. per cwt. basis; 20 s.w.g., 205s. 6d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £101 to £115; BS. 1400—L.G.3—1 (86/7/5/2), £110 to £122; BS. 1400—Gl—1 (88/10/2), £158 to £200; Admiralty GM. (88/10/2), virgin quality, £185 to £195, per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £162-£210; L.P.Bl, £120-£128 per ton.

Phosphor Bronze.—Strip, 27¾d. per lb.; sheets to 10 w.g., 29⅝d.; wire, 29½d.; rods, 27½d.; tubes, 32⅞d.; chill cast bars: solids, 27½d., cored, 28½d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 1s. 9½d. per lb. (7%) to 2s. 7¾d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 3½d. (7%) to 3s. 1¾d. (30%); to 12 in. wide, × .056, 2s. 3¾d. to 3s. 2d.; to 25 in. wide, × .056, 2s. 5¾d. to 3s. 4d. Spoon and fork metal, unsheared, 2s. 2d. to 3s. 0¼d. Wire, 10g., in coils, 2s. 8¾d. (10%) to 3s. 7¼d.; (30%). Special quality turning rod, 10%, 2s. 7¾d.; 15%, 3s. 0¼d.; 18%, 3s. 4½d.

Personal

Mr. H. W. Keeble has recently joined the staff of A.P.V., Limited.

Mr. Charles Hilary Scott has been appointed to the board of Derbyshire Stone, Limited, Matlock.

Mr. F. J. Clark has been appointed to the board of the British Oxygen Company, Limited, as managing director.

Mr. William Wallace, Edinburgh, has been appointed a director of William Beardmore & Company, Limited, Parkhead Forge, Glasgow.

Councillor H. B. Preston, a member of Kidderminster Town Council, has been appointed Midland organiser of the Amalgamated Union of Foundry Workers.

Mr. J. E. Chamberlain, managing director of Switchgear & Cowans, Limited, Old Trafford, Manchester, 16, is to succeed Mr. H. Burroughes as chairman of the company.

Mr. W. K. B. Marshall, who recently resigned his position as assistant director of the British Welding Research Association, has taken up an appointment with Rockweld, Limited, Croydon.

Mr. W. E. A. Redfearn, a special director of the English Steel Corporation, Limited, Brightside, Sheffield, has been elected president of the National Association of Drop Forgers and Stampers.

Mr. Frank Parr, who now fills an executive position with the British Iron and Steel Federation, is joining the Whitehead Iron and Steel Company Limited, and their associated companies as a special director.

Lord Brabazon of Tara has accepted the presidency of the College of Aeronautical and Automobile Engineering. Last Friday he laid the foundation stone of the reconstructed college wing, which was damaged by bombing, at Sydney Street, Chelsea.

Mr. A. N. Black, Reader in Engineering Science at Oxford University, has been appointed Professor of Mechanical Engineering and head of the Engineering Department at University College, Southampton, in succession to Prof. Cave-Browne-Cave, who is retiring at the end of the present session.

Mr. F. Hudson, F.I.M., is to present the official Exchange Paper on behalf of the Institute of British Foundrymen to the American Foundrymen's Society at this year's convention at Cleveland, Ohio, which is being held from May 8 to 12. His subject is "Aluminium-alloy Castings—A Review of British Achievement."

Mr. A. W. Davis, B.Sc., M.I.Mech.E., engineering manager of Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, has been appointed a director of the company. He began his apprenticeship with the company in 1929, and within 11 years had risen to the position of chief engine designer. In 1948 he was appointed engineering manager.

Lt.-Col. J. Rankin, who has been elected president of the Industrial Association of Wales and Monmouthshire, has served on many bodies connected with the electricity supply industry, including the Council of the British Electrical Development Association, the National Consultative Committee of the Central Electricity Board, the District Joint Industrial Council, and the District Board (North-Western Area). He has been a member of the North Wales District Committee of the Welsh Board for Industry for some years past.

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

EXECUTIVE in medium-sized London non-ferrous foundry (aged 40), seeks change offering greater administrative interest and scope for enterprise; experience mainly in loose pattern production of castings in brass, bronze and light alloys, labour control, costing, purchasing, negotiations, correspondence accounts, and general foundry and commercial management.—BM/AFNN, London, W.C.1.

FOUNDRY RATEFIXER, residing Manchester area, 28 years' practical and technical experience of iron, steel and non-ferrous castings, desires similar position, due to closing down of foundry; A.M.I.Brit.F.; own house; willing to travel.—Box 290, FOUNDRY TRADE JOURNAL.

METALLURGIST, Cambridge Graduate, ex-Forces, seeks position in foundry.—Box 276, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER seeks appointment, any district; 30 years' experience in all classes of foundry practice; expert on mechanisation.—Box 328, FOUNDRY TRADE JOURNAL.

FOUNDRY Commercial Man (aged 37), with considerable experience in buying, material control, production control, with firms in Iron and Non-ferrous, seeks suitable position immediately.—Box 254, FOUNDRY TRADE JOURNAL.

FOUNDRY PLANT DESIGNER, experienced in melting, fettling, and core shop plant, requires improved executive post as WORKS, PLANT, or TECHNICAL SALES MANAGER, offering scope and four figure salary; investment considered.—Box 272, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

CROWN AGENTS FOR THE COLONIES

CHARGEHAND (FOUNDRY) required by the East African Railways and Harbours Administration for one tour of 40/48 months, with prospect of permanency. Commencing salary according to age in the scale £462, rising to £570 a year. Outfit allowance £30. Free passages and quarters. Liberal leave on full pay. Candidates, under 35 years of age, must have served an apprenticeship in a foundry dealing with non-ferrous and iron castings and have had subsequent experience. They must have had experience of oil-fired brass melting furnaces, and moulding machines and cupolas.—Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, London, S.W.1, quoting M/N/25358/3B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications, and will communicate only with applicants selected for further consideration.

SITUATIONS VACANT—*Contd.*

CHEMIST, experienced in stage analysis of iron and steel, to take charge of small laboratory on the North-East Coast; day shift only, 5-day week.—State age, experience, qualifications, and salary expected, to Box 318, FOUNDRY TRADE JOURNAL.

AN exceptional opening occurs for a TECHNICAL SALES REPRESENTATIVE, to cover an area embracing the Midlands, London and Eastern Counties; the man we are looking for must have a successful sales record and a sound knowledge of modern mechanised foundry practice.—Reply, stating age, full particulars of qualifications and salary required, Box 310, FOUNDRY TRADE JOURNAL.

FIRST-CLASS JOBBING MOULDER required for West Country; district rates, plus production bonus; flat available.—Box 248, FOUNDRY TRADE JOURNAL.

FOREMAN wanted for Malleable Foundry in Yorkshire; capable of supervising melting and maintaining production at a high level; must be able to fix piece-work prices and be keen and ambitious; it is essential that applicant shall have held a similar position previously.—Apply, stating experience and salary required, Box 300, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for post offering good prospects; duties include complete charge of development of semi-mechanised plant, under direct supervision of Works Manager; North-East England; good iron foundry knowledge in production of grey iron castings, ability to organise and initiative are essential qualifications; housing difficulties can be assisted.—Please give fullest details of experience and remuneration to Box 312, FOUNDRY TRADE JOURNAL.

MOULDERS (experienced) required.—Apply to SEAGER'S FOUNDRY, The Brents, Faversham, Kent.

WANTED, immediately, several First-class DRAUGHTSMEN; experienced in structural steelwork and/or general mechanical engineering.—Apply, stating age, salary required, etc., to FOUNDRY EQUIPMENT, LTD., Leighton Buzzard, Bedfordshire.

RICHARDS (LEICESTER), LTD., require first-class ASSISTANT in Laboratory; principal duties Sand Control in Mechanised Foundry.—Particulars to PHŒNIX IRON WORKS, Leicester.

WANTED.—Experienced CLERK, to take charge of progressive Foundry Office in Swansea area; state experience and salary required.—Apply Box 270, FOUNDRY TRADE JOURNAL.

WANTED.—CASTINGS INSPECTOR for Cylinder Castings; must have held similar position; wages £11; 47 hours, 5-day week.—Apply MACMILLAN FOUNDRIES, LTD., 130, St. Albans Road, Watford.

SITUATIONS VACANT—*Contd.*

FOUNDRY SUPERINTENDENT required to control pattern shop and jobbing foundry of about 70 men making Grey Iron Castings (part of a General Engineering Works in the Midlands area); adequate assistants in both departments; must have good all round experience, including pattern making, and be able to control labour, estimate, and fix piece-work prices; age over 30; suitable salary, etc., to right man; give full details of above experience, age, etc.—Box 264, FOUNDRY TRADE JOURNAL.

NIGHT FOREMAN wanted for Non-ferrous Metal Ingot Foundry in Birmingham; also FURNACE MEN.—Apply Box 284, FOUNDRY TRADE JOURNAL.

PATTERN CHECKER required for mechanised Foundry producing Iron and Steel Castings; must be fully experienced in all types of Wood and Metal Pattern work, and would have the responsibility of final checking of patterns into foundry; the position is permanent and progressive, and a good wage would be paid to a first class man.—Apply in confidence to JOHN FOWLER & CO. (LEEDS), LTD., Sprotborough Works, Doncaster.

QUALIFIED METALLURGIST required by Engineering firm in the Dudley area to control quality of castings from new general Iron Foundry, with an output of 50-60 tons per week; applicants should state qualifications, age, experience, and salary required.—Box 304, FOUNDRY TRADE JOURNAL.

RATE-FIXER/ESTIMATOR required for large Mechanised Foundry at Doncaster, producing wide range of medium-heavy and light Iron and Steel Castings; applicants must have experience of estimating from drawings for quotation purposes, and rate-fixing on a mechanised plant.—Write, giving full particulars of experience, age, and salary required, to JOHN FOWLER & CO. (LEEDS), LTD., Sprotborough Works, Doncaster.

REPRESENTATIVE, on commission basis, required by Non-ferrous Foundry, London area; mechanised, producing first-class work.—Box 282, FOUNDRY TRADE JOURNAL.

WANTED.—WORKS MANAGER for Steel Foundry and Engineering Concern situated in the North-East Coast, employing approximately 700; present output of metal 100 tons per week from basic electric furnaces; large proportion of output finished machined castings.—Apply by letter, stating age, remuneration expected, and giving full details of past experience, with references, to Box 302, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE required to established connection in East Midlands area, to handle complete range of Foundry Supplies; position calls for sales ability and knowledge of up-to-date foundry and core shop practice; car owner essential; please state, in confidence, age, and full details of experience; our staff have been notified of this appointment.—Box 324, FOUNDRY TRADE JOURNAL.