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R. D. HENDRY.



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R. D. HENDRY.

The members of this Society know that we are dependent on Germany for most of our artificial colours. How do the German manufacturers manage to keep such a hold of this trade? It is due in the first place to the fact that their research work never stops, and in the second place to their method of organising and developing their sales by experts.

Some ten or twelve years ago the head of one of the largest chemical works in Germany answered the question as follows:—"Because of the manner in which we go about our research work. In my own firm's laboratories we have over one hundred expert chemists at work. They are Doctors of Chemistry before they enter our laboratories, and when they join our staff they have a position for life. A man may work for many years and discover nothing. That is very discouraging for that man, but it is not his fault, because he may be working on lines which he is directed to by the head of that branch, and which very probably do not contain the possibility of a profitable discovery. The man is well paid, and his position secure. The result is, we have no leakage. We get all that is discovered in our laboratories, and one discovery of value pays for many men whose

work has not been of monetary value. In Britain you have not done so. You do not have sufficient chemists, and if one failed to give you something new in a given time you would dismiss him."

In the colour trade it is very desirable to have an expert pushing the use of a new colour. This trade differs from nearly all others. You can draw plans and build a new house, a new works, or a new ship, to your desire. You can design and manufacture a new cloth to meet your requirements, and give a date for the completion of the work. You cannot invent or discover or manufacture a new colour to order. You often can get one which meets part of your requirements, but its application may be of a novel character, and the expert who has tried it in the laboratory and dyed it in the experimental dye-house is the man best fitted to get the new colour adopted by the trade.

The lack of any systematic nomenclature is responsible for a great many absurdities and wastes in buying. Take a standard black, which may be referred to as F. Every colour firm in Germany, Switzerland, and Holland, as well as England, sells this colour, and each has its own name for it. They each make it a different strength. If you take the original make as 100 per cent., then you can get it at 45 per cent., 50 per cent., 75 per cent., 105 per cent., and 190 per cent.

Yet you find manufacturers who know very little regarding their dyeworks, and cashiers and clerks, who know less, buying colour on name or price. These same firms, who would not open their lips on the drawbacks or the advantages of certain methods of dyeing and

finishing to their neighbours lest they give something away, will pour out their trouble to some German chemist salesman, will take him into their works, and show him what they mean and what they want.

Having thus briefly indicated the poverty of our position in regard to colour, and some of the disadvantages to our trade in the present method of German colour and chemical selling, we come to the real question. Can colour-making in Scotland become a reality? Can we manage to found and build up a branch of this great industry in the northern portion of these realms? Most emphatically I answer yes. There is no country in the world better situated than this country is for such a trade. There is no country with a type of brain better calculated to excel in the fields of research, of thought, of deduction, and application. No country where the chemist will find to his hand the engineer so fitted to take the product of the research laboratory, and make it the commercial success of the works. There is no country so favourably situated for the collection of raw material and for economic working and cheap distribution.

Scotland in trade as in war is a nation of keen fighters, dour fighters, and clean fighters. We want no loot of German brains, we need no grant of public funds; we need nothing from the Government but the undeniable right to a free and unrestricted supply of pure alcohol for the purpose of chemical manufacture.

But there are disadvantages, too; our users are spread from Dumfries and Hawick in the south to Aberdeen and Inverness in the north; from Dundee on the east to Glasgow on the west.

Let this war be finished, and the usual trade channels opened, users—especially those of goods where a high degree of excellence is required in the colours employed—will be forced to buy for many years to come from German makers.

Can we devise a scheme which can overcome these difficulties, and open the way to the establishment of works in Scotland?

Dr. F. M. Perkin, in his most interesting address to the West Riding Section on November 10th last, gave five causes for the present unsatisfactory position of the colour industry in this country. His fourth was German business organisation. I will start with organisation, and endeavour to work forward to a point where the trained chemist would be the next requirement.

My scheme is split into two parts:—First, the organisation of colour users; second, the establishment of colour-making works.

First I propose the formation of a Colour Users' Association, to consist of all the users of colour in the country—cotton dyers, calico printers, wool dyers, jute dyers, paper stainers, pigment makers. I suggest that one share be taken for every £250 worth of colour used per annum.

Thus the buyer of £250 worth of dye per annum would have one share, of £1,000 four shares, and of £10,000 forty shares. That the capital be used for the fitting up of laboratories in Glasgow, in which the colours of all makers should be tested and classified, and carefully listed for all those different fastnesses which experience has shown to be necessary. I would place these laboratories under two men—not

necessarily chemists—one representing animal fibres and one representing vegetable fibres, with assistants for such special branches as might be necessary. These men would be advisers and buyers to the whole of the members of the association.

Thus, while every colour user could order any colour from any maker, he would only do so through the office of the association in Glasgow.

If the heads there found that Messrs. A. B. were ordering Alpha Black from Messrs. C. D., of Germany, at 1s. per lb., which was the same black as Beta Black, of Messrs. E. F., of Switzerland, at 10d. per lb., then the attention of Messrs. A. B. would be drawn to the fact. They could then please themselves whether they bought Alpha Black at 1s. or Beta Black at 10d. By putting all the purchases of colour into one office it would be possible to place contracts for these colours in such a way that the lowest prices would in every case be secured, prices in most cases very much lower than could be secured by the average individual firm.

With a few exceptions the saving thus effected would yield the members a percentage on their shares such as would astonish them, even after deduction of a certain portion of the discounts for the running expenses of the office and laboratories.

Think, further, what this means; every colour user in Scotland would have a properly equipped laboratory serving his requirements, at a cost to 200 users, which at the present moment represents little more than the cost to one.

Prices would be uniform, and all f.o.r. or f.o.b. Grangemouth. The smallest user in Skye would purchase at the same price as the largest user

in the West of Scotland, the difference, instead of amounting to something like 1s. 1½d. to the large user and 3s. 6d. to the small one, would be the difference in carriage.

That I am not overstating the case is known to every buyer for large firms and combines, and the saving that would be effected by the sellers, and which will suggest themselves to every intelligent mind, would be reflected in prices lower than the best heretofore possible, even in the cases of the biggest corporations. If in addition you treat the men at the head of this association in the manner and spirit which the German firm referred to earlier treated their research chemists, you will have an office from which there can be no leakage, from which you could obtain the concentrated experience of the country in any matter submitted to them, but no knowledge of what your competitor was doing.

You would still receive from every colour-maker his samples and circulars referring to new dyes, and could have your own opinion confirmed or doubts verified by independent examiners without the risk of your methods and business being carried to the alien.

Such a laboratory would afford information as to the country's consumption of every class of colour used, of sulphuric acid, of Glauber's salt, of all the heavy and simpler chemicals.

You could furnish to the works the particulars which would enable them to put down the requisite plant to produce any given colour in the necessary quantity, and therefore at the lowest possible price. You would have simplified the matter of competition, because you would know the best the foreigners could do,

and your colour works would know that having met that best they were sure of a market.

The formation of such an association will probably call for more tact and will probably present more difficulties than the actual establishment of colour-making works themselves. The absence of such an association would not prevent the successful working of the second part of the scheme, but its existence would almost certainly make the colour works a huge success, and because I have reason to believe that it would in itself be a paying concern from the day of its formation, because I think that the present crisis has caused a spirit of loyalty and solidarity to permeate all interested in our British trade, I have ventured to put forward the suggestion. After all we must recognise the fact that the actual cost of colouring material is but a small part in most cases of the cost of dyeing a given colour. The methods employed and the quantities handled are the important factors. I will give you a typical instance which has come under my notice within the last few days.

Three firms in one district are dyeing the same colour on the same fibre with the same dyestuffs. In one case, that of a very small firm, the working charges amount to 1d. per lb.; in the second case, that of a larger firm kept fully employed, the working charges are 0·6d. per lb.; and in the third case, that of a still larger firm, with up-to-date machinery and labour-saving devices, the working charges are 0·3d. per lb. In view of facts like these I appeal to our Scotch colour users to combine for the two-fold purpose of their own good and security and the ensuring

of the successful establishment of an important industry in our midst.

The Colour Works.—I have no scheme for the capture of the German colour trade; I do not know that such a thing is to be desired in the interests of the colour users themselves, and for a variety of reasons—trained brains, experienced craftsmen, capital required, and having a due regard to business morality—I do not see the possibility of any such comprehensive scheme. There is, however, no reason why we should not build up a colour industry as the Germans did, bit by bit. That we have more to encourage us in the attempt than they had when they began can be demonstrated.

Let us consider what is required to start such works. I cannot put this before you better than by giving two quotations, the first from Dr. Perkin's address at Bradford on November 10th. He says:—"My own feeling is that a large portion of the raw products should be made by some of our large gasworks, that is to say, those which have tar distilling plants. They have there, in their works, the benzol, toluol, naphthalene, anthracene, &c. Why should not nitrobenzene, aniline, and some of its derivatives, nitrotoluene, toluidine, the naphthols, naphthylamines, phthalic anhydride, and many other substances, which are the raw materials for the colour works, be made at the source of supply of the raw products for their manufacture? About 10,000,000 gallons of benzene are produced annually, and before the war two-thirds of this went to Germany, a portion of which they used for making aniline."

The second quotation is from an instructive article by "A Research Chemist" in the *Dyer*

and *Calico Printer* of November 20th, in which it is stated that:—"The following plants would be required:—A contact plant for the manufacture of fuming sulphuric acid, which is absolutely necessary for making numerous sulphonic acids; an ordinary vitriol plant, for a hundred and one purposes in colour manufacture; a nitric acid plant for producing all the various nitro bodies required for intermediate products of which I name a few:—Nitro-benzol and nitro-toluol for aniline and toluidine; nitro-naphthaline for naphthylamine; bi-nitro-benzol and toluol for meta-phenylene and meta-toluylene-diamine; di-nitro-chlor-benzol and di-nitro-phenol for the manufacture of sulphur blacks. A hydrochloric acid plant for general use and for the manufacture of aniline salts. A chlorine plant for the manufacture of chlor-benzene for di-nitro-chlor-benzene for sulphur blacks. Sodium nitrite plant for the manufacture of all azo colours. Formaldehyde plant for the manufacture of basic colours."

Now it may be quite possible for the larger gasworks to manufacture the nitrobenzene, aniline, and the other raw materials required for colour working, but instead of so many different plants and controls, it seems to me absolutely certain that a more business-like method would be to concentrate that work under a single company.

There is in Scotland a large supply of raw materials in our gasworks and at the coking plants of various large collieries. Let us make a start in our future colour works with the distillation of the tars and the production of the various bases for colour manufacture.

In seeking for a scheme which would be self-supporting from the beginning, we should start with the manufacture of the various acids and salts required in our dyeworks and in colour works alike. We have in Scotland works which already make a number of these chemicals, and I think the first step of the proposed company should be to acquire by purchase the control of the best of these and to carry on the present trade with a view to its ultimate removal to the works to be erected. The members of the Colour Users' Association would be able to absorb the bulk of the present chemicals manufactured, and as the management and connections abroad would be retained, not only should there be no doubt as to this portion of the works paying, but you would have selling agencies abroad ready to your hand whenever you were in a position to offer colour as well as acids and salts. As to the manner and extent in which colour making should be attempted, that is a matter for expert chemists, but it should not be attempted at any greater pace than the profits from the articles which you can make and use yourselves would allow. That is profits for a term of years should be devoted to development and research.

For the works I suggest that the best site would be Grangemouth. That a large area of ground should be secured stretching from the River Forth back across the Forth and Clyde Canal and over the railway. You would have water-borne transit to all the important centres—the canal to Glasgow, the river to Dunfermline, to Alloa, and to Stirling for Dunblane; round the coast to Dundee and to the Tay for Perth and middle Scotland; the same for Aberdeen

and the north, and your railway for Midlothian and the South. The works would be on the coal-fields, and the great foundries and engineering works would be at your doors.

The barges which took heavy chemicals and colours to Glasgow would bring back raw materials from Glasgow and the Clyde; those which carried material to Dundee and Aberdeen have the bye-products of the gasworks of these cities and districts to carry back; those which sailed up the Forth could come back with the alcohol that district would naturally provide.

For central situation and cheap carriage I know of no site in the kingdom to equal it, and as the works developed, with the certainty of a large trade on the continent, you would load your steamers at your own wharves for a speedy and cheap transit to continental ports.

Briefly and roughly that is the outline of my proposal for the establishment of colour works in Scotland. Let me summarise and deal with the financial aspect in the shortest possible manner. I propose first the formation of a Colour Users' Association for the purposes already indicated. The capital required is not large, and probably $2\frac{1}{2}$ per cent. on one year's purchases of colour and chemicals would be sufficient to meet all requirements. The largest colour buyers would be in as good a position, and probably better, than they are to-day; the smaller users would reap very handsome advantages. This association would float a company for the manufacture of chemicals and colour, and I suggest that a similar amount to that subscribed for the first company should

be subscribed by the members of that association in the form of founders' shares, in the second company.

The balance of capital required for the purchasing of some existing chemical works, and the erection and working of plant for tar distilling and the manufacture of raw materials for colour making could, I think, be secured from the wealthier members of the parent association in ordinary and preference shares. Proceeding thus in a united manner with every possible business guarantee that the products of your manufacture would meet with a certain sale, the outside investors would have every confidence in subscribing debentures to be secured on the ground, buildings, and vessels of the company. There is only one more thing to be considered, and that is the prospect of being able to train a sufficient number of chemists for the requirements of this trade. In Scotland, with its comparatively large number of well-equipped and well-endowed Universities, this task should prove to be quite as easy as in any country in the world.

By the adoption of some such schemes as these, or by any other means whatsoever, I hope we may establish here in Scotland a branch of that great industry which, starting with the bye-products of our gasworks, leads to the manufacture of colour and through that to the discovery and manufacture of those wonderful chemicals which play so magnificent a part in the health and healing of the nations. I believe that in Scotch perseverance and Scottish brain there lie the possibilities of carrying this great work as far as it could be carried by

any race under the sun. It lies with those presently and most directly interested to give that brain its opening.

DISCUSSION.

The Chairman (Mr. Chas. Glen) said his solution of the present difficulty was to impose a 25 per cent. surcharge on all German colour coming into the country. That should be a condition for the next twenty years. But do we want twenty, or ten, or five years to cultivate a trade and conquer this difficulty of making colour in this country? I don't believe we want two. We have expert chemists with brains, and there is plenty of money available. He warmly supported the Government scheme.

Mr. A. B. Steven strongly condemned the attitude of this country towards research work. There was no doubt that in colour making the most important factor was the chemist. He doubted if in Britain there had been twenty chemists engaged in research work. Single firms in Germany had from 300 to 400 chemists so engaged. We could never secure any share of that trade without chemists, and we would never get chemists unless we gave them proper prospects of a livelihood.

Mr. W. B. Jackson was in favour of Government support for the establishment of colour-making works, but thought that many years would elapse ere these works could manufacture any large proportion of the better-class colours presently made in Germany.

Mr. James Crawford supported Mr. Steven's views regarding the necessity for a sufficiency of properly trained and properly paid chemists.

Mr. W. W. Wilson did not think it would be possible to form a Colour Users' Association, as large users would want very much better terms than small users. Generally, he approved of the rest of the scheme.

The President of the Society (Mr. R. D. Pullar) and Mr. Harry Christie spoke at considerable length regarding the Government scheme now before the country.

Mr. J. H. Davies said we did not give sufficient encouragement to chemists. They were better treated and better paid in Germany. There were many chemists who had had to leave this country in order to get a living. The conditions both as regards laboratories and works were ever so much better in Germany than in this country, and he had the highest admiration for the manner in which the German firms had gone about the development of their great chemical industries. We have good Technical Colleges in Glasgow and in other large centres in this country, and he thought that the Government might with advantage endow the training of research chemists in these places. At the same time, that would do no good unless business men in this country treated research chemists in a very much better manner than they had done heretofore.

The Society of Dyers and Colourists.

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