

trasting pigments, the boundary lines between the colours running uninterruptedly across boats, guns, turrets, etc. Of course, precisely the same principles apply to ships viewed through the periscope of a submarine, but in these early days of the war the submarine menace had not yet become insistent. The main principles outlined above were duly recognised by the Admiralty, one of my letters on the subject written in September being circulated to the Fleet early in November, 1914. Most unfortunately, their carrying into effect was left to the responsibility of the naval officers immediately concerned, without any scientific or artistic supervision. The result was a complete absence of system, and an effect in individual cases calculated to excite, according to one's temperament, derision or tears. In the summer of 1915 I was informed that the principle of parti-colouring had been given up, that the Admiralty had now arrived at a definite decision as to "the most serviceable scheme of colouring for H.M. ships," and that this scheme was one of *uniform* coloration.

I continued to press on the Government—incidentally making myself rather a nuisance to some of my friends—that a system of uniform colouring was *not* the right one, whether applied to ships or to service dress; that of all uniform colours the very worst, whether by day or night, was the black which was then still in use for destroyers, and so on. I also kept on urging that the only way of obtaining really satisfactory results was to place the whole matter of ship "camouflage" under the direction of one individual endowed with practical knowledge of the sea and ships, artistic sense, and grasp of the scientific principles involved.

At last, during the summer of 1917, I had the satisfaction of seeing the principle of parti-colouring come into its own. Discarded by the Admiralty as useless two years before, the value of the principle was now recognised and its application entrusted to skilled hands. Glaring defects which were at first conspicuous were remedied, and the later efforts, such as the great aeroplane-carrier, H.M.S. *Argus*, left little opening for criticism.

The importance of the subsidiary principle—that of compensative shading—as an aid in "camouflage" was, unfortunately, never fully grasped during the course of the war. The distinguished expounder of this principle, Mr. Abbott H. Thayer, was in the strongest sympathy with the cause of the Allies, and I think it a great pity that it was not found possible to enlist his practical help, which I feel sure would have been gladly and freely given.

It is only fair to state, in conclusion, that in my personal communications upon this subject I laid stress upon the use of parti-colouring as a means of rendering ships less conspicuous. I also directed attention to its use in confusing the details, especially vertical lines, which are made use of by the enemy's range-finders, but I did not lay sufficient emphasis on this. Actual experience has shown that in submarine warfare this second function—in particular, determination of the factor of relative movement—is of overwhelming importance. But this does not affect the main point I desire to make, namely, that the leading principle underlying ship "camouflage"—the breaking-up of the form of a vessel by strongly contrasting colours—is one familiar to biologists; that it was made known to the Admiralty in the early days of the war, although its carrying into practice was, unfortunately, bungled; and that consequently newspaper paragraphs which date the discovery of the principle, instead of the more efficient application of it, from the year 1917 are distinctly misleading.

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A Possible Case of Partial Sterilisation in Soil.

WHEN on active service in France in 1918 I had, partly as a hobby and partly for food supplies, a garden on the site of an old brickyard. The land had been waste land for certainly three years, and I believe more. It received a light dressing of dung in February and was dug up in that month; seeds were got in in March. In April or May the land received by chance a light top-dressing of a mixture of charcoal and brick-earth impregnated with potassium carbonate and hexamethylene tetramine. The crops obtained were, in my opinion, abnormally good, and much better than those obtained by some French gardeners on cultivated gardens near by. The chief crops grown were potatoes, dwarf peas, and dwarf beans; the two last gave the best results in the order named. It is not asserted that the top-dressing brought about this result, as the history of the soil is necessarily rather obscure; and as it was not designed as a scientific experiment there was no control plot, but it seems improbable that the small amounts of nitrogen and potassium supplied by it could have made the garden much better than neighbouring ones.

The suggestion is offered that the hexamethylene tetramine may have liberated formaldehyde by the action of dilute acids in the soil and caused partial sterilisation.

I have since subjected to steam distillation (a) a solution of hexamine, (b) untreated soil, garden soil, and (c) garden soil moistened with hexamine solution. Schiff's reagent gave negative results in the case of (a) and (b), but positive results with (c).

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MINERAL PRODUCTION IN RELATION TO THE PEACE TREATY.

IT is gradually becoming more and more clear, as the history of the Great War is further examined, that one of the main objects of Germany in attacking her neighbours was commercial aggrandisement by destroying rival manufactories and by appropriating the raw material of industry wherever it lay conveniently situated for that purpose, this raw material being in the first instance all available mineral wealth. She had already done this with supreme success in 1871; the iron-ore fields of Lorraine then wrested from France had formed one of the mainstays of Germany's industrial development, and she fully expected that the new war would yield proportionately valuable results. This was Germany's avowed policy; in the words of one of the acknowledged German authorities, Frederick Naumann, the object of a country nowadays in going to war is purely "to benefit the economic development of the country," and German writers have ever since the commencement of the war announced their fixed determination to retain in German possession the iron-ore fields of French Lorraine, thus giving Germany "the practical monopoly of iron-ore in Europe," and assuring her of victory in the future wars to which she was already looking forward.

Until the actual boundaries, as roughly defined in Sections II. and III. of the Peace Treaty, have been accurately settled, it is only possible to form

a general idea of the extent to which Germany's mineral production will be diminished by the territory of which she is to be deprived. Naturally, the first mineral to be considered is coal. In 1913 Germany produced rather more than 190 million tons of coal, of which about 100 millions came from the Westphalian coalfields, 34 millions from Upper Silesia, and 15 millions from the Saar coalfield. So far as can be seen from the Peace Treaty, Germany is to cede to France the whole of the Saar coalfield in compensation for the destruction of the coalfields of Northern France; seeing that the Pas de Calais district produced in 1913 about 22 million tons of coal, and the Nord district about 8 millions, or approximately double the output of the Saar basin, the compensation thus afforded does not err on the side of liberality. It is therefore to be hoped that under Section VIII. Germany will be compelled to deliver over to France as much coal as will bring the total coal supplies of the latter up to at least her pre-war standard until her northern collieries are again fully equipped and in working order.

It appears certain that a considerable proportion of the Silesian coalfields will be ceded to Poland, though how much is by no means settled as yet. It is important that Poland should have ample coal supplies in order that its industrial development may be free and unhampered by any dependence on its neighbours for this indispensable material. Even were the whole of the Silesian coalfields to pass into Polish hands, Germany would still have an output equal to three-fourths of its pre-war output in bituminous coal alone, whilst if lignite is included in the calculation, as it really should be, the annual output of Germany will only be diminished by about 18 per cent.

The restoration of Alsace-Lorraine to France affects two important deposits of minerals—the iron-ores of Lorraine, and the potash deposits of Alsace. In 1913 Germany produced nearly 36 million tons of iron-ore, of which no fewer than 28½ millions were minette ore, more than 21 million tons being produced in Lorraine. It is to be hoped that in the detail of the clauses under which Germany renounces her treaties with Luxembourg conditions will be included that will favour the delivery of the Luxembourg minette to Belgium rather than to Germany. Few things would do more to restore the great iron industry of Belgium, which Germany set herself to destroy with the most brutal deliberation, than such an arrangement as would give Belgium preferential treatment in the matter of this ore. It will be seen that even without any minette Germany will still have an annual production that could easily be brought up to 10 million tons of iron-ore, or, say, 5 million tons of pig-iron, as against 14 million tons in 1913. This production would be ample for the industrial needs of the German nation, though not for the huge output of munitions of war of all kinds for which so much had been employed in the years preceding 1914, and such a drastic reduction of Germany's output of iron is the best guarantee possible for

a world peace, and the easiest and safest means of protecting France from any future attempts of German aggression.

The restoration of Alsace to France implies the shattering of the German monopoly in potash salts, upon which she was relying for forcing other nations to trade with her. To quote from an article in a leading German paper written towards the end of 1917: "The Alsace potash beds are amongst the richest that have ever been found. If these deposits passed into the hands of the enemy, it would be the end of the German monopoly of potash. . . . We need not point out what would follow for our own potash industry and of what a financial weapon the enemy would deprive us" (see *Journ. Soc. Chem. Ind.*, November 15, 1918). In 1913 Germany was producing about 11 million tons of potash salts, containing about 1 million tons of pure potash. The Alsatian deposits are much purer, needing in many cases no refining, and much richer, averaging 22 per cent. of potash, and it is calculated that the entire deposit, as at present known, contains more than 300 million tons of potash, or enough by itself to supply the requirements of the world for many years. So jealous were the older companies that composed the Potash Syndicate of Central Germany of the greater potential value of the Alsace deposits that they allowed the latter only an output equal to 5 per cent. of the total German output. Several companies are, however, operating already in the Alsatian field, and it may be confidently expected that the next few years will see such vigorous developments that all the needs of the Allies can be supplied therefrom. Until this can be done, presumably the Germans will be called upon to supply such potash minerals as we may need; it would probably be better that they should be made to furnish the raw mineral than the purified product; the refining in this country will keep our chemical works busy and provide employment; exporting the raw material will also employ usefully the tonnage taking foodstuffs, etc., to Germany, and prevent the Germans from using those ships for exporting to us competitive articles of manufacture.

This general review of the Peace Treaty so far as it bears upon mineral production shows, therefore, that it has been conceived in no oppressive or illiberal spirit. Restitution to France of the iron and potash deposits taken from her in 1871 is but bare justice; the reparation of the damage done to the French coalfields by the cession of the Saar coal basin is a partial compensation for the injuries inflicted on French industry, and the transfer of the Silesian coalfields to Poland is necessary in order to secure to that nation an independent economic existence. It may be suggested that Belgium is entitled to somewhat more in the way of minerals than it appears to be receiving, but apart from this it is to be hoped that the conditions set out in the Peace Treaty represent the irreducible minimum to which the Allies will agree.

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