name. Samples of English manufacture, kindly furnished us by Messrs. Lyman, Ltd., Montreal, and the National Drug and Chemical Co. of Canada, Ltd., Montreal, were found to contain, respectively, 30 and 31% of ammonia. Being advised by both these companies that the English-made carbonate would undoubtedly be used by Canadian manufacturers of household ammonia, we have calculated our volatile alkalinity to a carbonate of ammonia containing 30% NH_3 .

According to our analysis, none of the brands of solid household ammonia contained as much as 10% of commercial carbonate of ammonia. One of them ran as low as 2%. The chief constituent was in all instances sodium carbonate, but sodium sulphate ran as high as 13½% in one brand. In estimating the wholesale value of the mixture we have allowed one cent. per pound for the carbonate but nothing for the sulphate, which is worse than useless in a washing compound. The contrast between cost of materials and selling price is not so great as in the case of the liquid preparations, doubtless on account of the lower cost of containers and lower transportation charges. But these solid preparations are clearly "misbranded" and fraudulent.

TABLE II.

Theoretical Composition of—	NH_3 , %	CO_2 , %	H_2O , %
Normal ammonium carbonate ($\text{NH}_4)_2\text{CO}_3$	35.45	45.80	18.75
Acid ammonium carbonate NH_4HCO_3	21.50	55.70	22.80
Ammonium carbamate $\text{NH}_2\text{CO}_2\text{NH}_2$	43.00	50.40	—
Ammonia Content of—			
Kahlbaum's ammonium carbonate "Zur Analyse"	22.52	—	—
Kahlbaum's ammonium carbonate, Ph. G.V.	21.43	—	—
Merck's ammonium bicarbonate	21.51	—	—
English ammonium carbonate A	30.00	—	—
" " " B	31.02	—	—

TABLE III.

Solid household ammonias.—Composition.

Constituents determined.	Brand.					
	1.	2.	3.	4.	5.	6.
H_2O ..	18.30	17.57	17.37	16.05	3.08	11.85
Carb. *	—	—	—	—	—	—
Amm. *	9.63	3.40	5.10	1.07	5.20	7.33
Na_2CO_3	57.50	72.88	70.76	78.18	—	—
Na_2SO_4	13.56	5.85	5.80	3.00	—	—
NaCl ..	0.45	0.45	0.51	0.89	—	—
Total ..	99.63	100.15	99.54	100.00	—	—

* Assumed to contain 30% NH_3 .

TABLE IV.

Solid household ammonias.—Price and value.

	Brand.			
	1.	2.	3.	4.
Retail price per lb.	cents. 5	cents. 7.5	cents. 5	cents. 5
Wholesale price per lb. ..	3.75	—	3.75	3.00
Wholesale value of the alkaline ingredients ($\text{NH}_4)_2\text{CO}_3$ at 10 cents, Na_2CO_3 at 1 cent per lb.	1.43	1.07	1.22	0.98
Wholesale value of the ($\text{NH}_4)_2\text{CO}_3$ at 10 cents per lb.	0.00	0.34	0.51	0.20

New England Section.

Meeting held at Engineer's Club, Boston, on Friday, November 20th, 1914.

MR. ALAN A. CLAFLIN IN THE CHAIR.

THE POSSIBILITY OF ESTABLISHING A COMPLETE DYESTUFF INDUSTRY IN AMERICA.

BY DR. D. W. JAYNE.

There has been up to the present time no complete dyestuff industry in America, because hitherto there have been no economic reason for it. The producers of the crude materials had no excess and no other incentive, and the consumers of the dyes offered no inducement, their demands apparently being met satisfactorily by imports.

Until the advent of the by-product coke oven the production of coal tar increased but slowly, being entirely from plants producing coal gas. The first recovery oven in this country was established by the Semet-Solvay Co., about twenty years ago, though at that time by-product ovens abroad were an accepted fact. Besides this, the coal tar from gas plants has always been a factor abroad, especially in England, where as late as 1900 the gas tar alone was more than twice the oven tar of Germany, and seven times the combined production of both gas tar and oven tar in the United States. The small quantity produced in the United States in 1900 was due to the fact that so many plants here manufactured carburetted water gas, the tar from which is not included in these figures, that the tar from coal gas was and still is an exceedingly small item, and even in 1900 the number of recovery ovens was small—the rapid installation period coming after that date. Europe had many years' start of us, because they began to see the desirability, and perhaps the necessity, of providing outlets for the various coal tar products, while we, up to the present time, have found no difficulty in disposing of those coal tar products which might enter into the manufacture of dyes. As a nation we are not apt to plan far in advance, and the tar distiller did not give much thought to the dyestuffs under the existing conditions. The same condition held true in England, for England has no complete dye industry. Germany developed the coal tar dye industry, using not only its own materials but many brought from England, until it has become one of the most complete industries in the world. The German dye manufacturers have also had every advantage of government aid in their development, and they present a united front to all competition. Here, the construction of by-product ovens has gone on until to-day about 25% of the coke is produced in them, and still we have not produced a surplus of coal tar products which could be used for dyes.

The products, which are the basis for dyestuffs, are benzol, naphthalene and anthracene. Benzol and its homologues, toluol and xylol, occur in coal tar in small quantities. The chief source of benzol is the coke oven gases. The Semet-Solvay Co., besides installing the first recovery oven in the United States, also established the first benzol recovery plant in connection with their ovens. They now recover at all their plants, and are the sole producers of that which is available for refining to-day. Several other oven installations which sell gas to cities do remove the benzol from the fuel gas, but use it to enrich illuminating gas. The Semet-Solvay benzol is also used for enriching at some points, so that it is not all available for refining; but even so, there was a surplus of benzol less than two years ago, and the shortage to-day would be less marked had it not been for the depression in steel. Few consumers of benzol realise how fluctuations in steel affect supplies of benzol, but with the lessened demand for coke, less coal is coked, with consequently less by-products.

We are already independent of Europe—negligible quantities only of benzol have been imported during the

past few years—the price levels here and abroad being approximately the same. The demand abroad is also heavy, due to the use of benzol for motor fuel, especially during the recent high price of gasoline.

Toluol is of more importance to the nation on account of its use in the explosive field than in the manufacture of dyestuffs, and an increase in supplies of benzol brings increased supplies of toluol, which will help the situation in the manufacture of explosives for our national defence.

An increase in benzol supplies will also make it possible to manufacture phenol synthetically. Phenol is to-day produced in the United States in less proportion to the country's consumption than any of the chemical bodies occurring naturally in coal tar. Our small production of phenol from our tar is primarily due to the small proportion of gas tar produced here, because the tar from coke ovens is deficient in true phenol. England has always been the great factor in phenol, simply because of its large production of tar from coal gas plants.

Naphthalene, the second crude base, occurs in considerable quantities in coal tar. Until recent years the distillate from coal tar in the United States was taken off in only two portions, light oil and heavy oil; the balance, pitch, remaining in the still and the oils taken off to that point which left the correct grade of pitch. This means that pitch was the primary product sought for, and in fact remains so to-day. This is not to be wondered at, since coal tar yields on the average 70% of pitch, used for roofing, paving and waterproofing; and the American tar distiller began, and has remained, essentially a manufacturer of roofing and paving materials. This is quite different from conditions abroad, where practically their only use of pitch was for fuel purposes, until the advent of its use for road construction, which is of recent date. Credit is due to the American tar distillers for their efforts in building up a big business for pitch, this 70% of all the tar—and for that reason we make a distinction between the coal tar industry, which is an American development, and the coal tar chemical industry, which is exemplified by the German production.

The heavy oil as produced here was sold just as produced, for creosoting timbers. In it was the naphthalene, and most of the tar acids, notably cresol, and with the ever-increasing demand for creosote oil, there was no reason for reducing the amounts available by removing naphthalene from it. Moreover, refined naphthalene has always come into this market at prices so low that it did not pay the tar distiller to remove and refine it. Certainly no more profit could be obtained by so doing than by its sale in the creosote oil, and large plant investment is required for the separation and refining of naphthalene.

Refined naphthalene has been produced here, however, for many years—practically since the beginning of tar distillation in this country, and our present production of it is nearly one third of the country's consumption. But it is nearly all used as a moth repellent—not, any as far as I know, having been used for the manufacture of any product entering into the dyestuff industry.

Conditions have altered somewhat in the past few years. Specifications have been drawn up for creosote oil which eliminate the lower boiling portion, and now an increasing quantity of middle oil is being separated and the naphthalene and tar acids recovered from it. More naphthalene can be recovered and refined, and no doubt will be, if a demand is assured, at a price commensurate with the added investment and cost of manufacture.

The separation of anthracene from the heavy oil is not now carried on in the United States. About thirty years ago there was a plant which separated small quantities of it for export, but this became no longer remunerative and was discontinued. It is now left in the creosote oil, but the quantity which could be obtained is a much less proportion of the tar than is recovered abroad, because all their tar is run to hard pitch, which is the grade used for fuel, that is, briquettes, while as explained, we run, in the United States, for soft pitch. Thus, some of the high boiling oils containing anthracene remain in the pitch. Some hard pitch is made here, however, and if a steady demand arose at a price commensurate with the investment and manufacturing cost, anthracene could be

recovered probably in sufficient amounts for the needs of our dyestuffs.

It is well to remember that less than 10% of tar consists of bodies which can be used for making dyestuffs, the balance being neutral hydrocarbon oils sold, even by Germany, for creosoting purposes only.

It is true we have an American coal tar dyestuff industry. Nearly 20% of our consumption is manufactured here, but until three years ago all the dyes made here were from imported intermediate products; or else were imported in a condition requiring only slight alteration to make them suitable for the trade.

In 1910 the Benzol Products Co. was formed. This company had as a central thought the fact that some day a very considerable amount of benzol would be recovered here, and that it was an opportune time to start operations in order to be ready to take advantage of those conditions when they arrived. Therefore the manufacture of nitrobenzol and aniline oil was undertaken. Thirty years ago the Schoellkopf plant, at Buffalo, had made aniline oil, and more recently the Barrett Manufacturing Co. had tried the manufacture of aniline and toluidine, and had a small plant which, however, had been used almost exclusively for toluidine, as toluol had been a drug on the market, its use for explosives, such as trinitrotoluol, not yet having been started. This previous experience had demonstrated the large part played by sulphuric and nitric acids in the manufacture of aniline oil, many more pounds of acid than of benzol being required for the manufacture of aniline oil; so that in the formation of the Benzol Products Co., the manufacturer of acids was represented. This same condition is evidenced in the plants in Germany, which have built themselves around and in connection with the manufacture of acids, alkalis and heavy chemicals in general.

Since the Benzol Products Co. began it has perfected its manufacturing operations, and no doubt exists as to the quality of the product. The quantity, however, has been limited, primarily, because of the efforts of the foreign convention to nip its operations in the bud, and secondly, because of the shortage of benzol which was felt soon after it was in position to expand. Under these conditions it was deemed unnecessary to sacrifice any more benzol than was necessary to take care of those few buyers who had given visible evidence of their desire to encourage this American industry.

Here we see the attitude of the American consumers of dyestuffs. They were being supplied, at comparatively low prices with a wide variety of dyes, continually improved as to fastness and new shades. They were buying direct from the representatives of the great German firms: why buy one item such as aniline oil from us especially as every offer as to price from us was bettered by their present suppliers? In fact, when a 10% duty on aniline oil and salt was secured in the recent tariff, the European Convention not only absorbed that duty, but made lower prices than before. There were several notable exceptions to this condition, and among them were several of the American dyestuff manufacturers. They no doubt realised more than the consumer how utterly dependent the United States was on foreign makers for our supplies of dyes. For them we continued to make aniline, but that was not enough encouragement to warrant any expansion, so that the outbreak of the war found us still only manufacturing aniline oil, and not enough benzol in sight to warrant immediate steps to enlarge so that we could at least supply the country's demand on that one item.

The reason why we had not a better established and more complete dye industry years ago was essentially a matter of international economics. The United States had no surplus coal tar products to dispose of, and no incentive in additional profits if it did offer refined products to dye makers, as the intermediate products such as aniline oil, beta naphthol, etc., as well as the hydrocarbons themselves, such as naphthalene and anthracene, could be imported more cheaply than the tar distiller cared to attempt to make them. The manufacturers of dyes themselves had to meet very keen competition. In 1880 there was a sufficiently high duty on these dyestuffs

and no duty at all on the intermediate products, so that at that time the dyestuff industry, based on imported intermediates, began to thrive; but in 1883, the specific portion of the duty on dyes was abolished, and a considerable duty assessed on the intermediate products, and as such intermediate products that far back could not be produced in this country, primarily on account of shortage of supplies at that time, many of the established factories closed down shortly after. There was again a period during which the intermediate products came in free, but the experience was evidently sufficient to prevent any resumption of this industry by the erection of any new plants, and the few factories who have stuck to their manufacture during the varying periods have made but little profit.

The possibilities and prospects primarily depend on the consumers of dyestuffs. Do they want an American dyestuff industry? Are they willing to help pay the price needed to establish it, and if so, will they come forward and say so?

In the first place, there is sufficient coal tar produced in the United States to-day to give the necessary quantity of naphthalene and anthracene to supply our needs of dyes made from it. Plants to recover them could be erected as soon as plants to use them can be.

Benzol exists in by-product coke oven gases in quantities far exceeding the present needs of both the dyestuff requirements and the trades consuming benzol as a solvent. Efforts have been made, ever since a shortage was seen to be inevitable, to secure the erection of additional recovery plants, but little of the possible supplies can find their way to the dyestuff manufacturer and the other outlets are the controlling factor. However, there seems good reason to hope for partial relief during the next year at least to an extent sufficient to enable the manufacturers of aniline oil to increase their production. It takes time to demonstrate to the owners of the ovens the advisability of investing in such a recovery plant, especially steel companies in times of depression as have existed, and it takes just as long to get the plant erected after the preliminaries are disposed of.

Any thought of prompt relief in the dyestuff situation is out of the question. We can have the whole complete industry for future use, if the consumers want it, but without a strong plea from the consumers, neither the tar distiller, the manufacturer of intermediates, nor the manufacturer of dyestuffs will risk the large amount of capital necessary.

To establish such an industry, to protect the country from a future shortage requires one thing and one only; that is, adequate protection. Adequate protection means a higher duty on *all* dyes, and one-half the duty on dyes to be assessed on intermediates, and it also means protection against competitive methods which are aimed to crush and with which we have had experience. This latter protection can probably be best secured by a proper anti-dumping clause in our tariff.

Nothing else is necessary. We have the materials, we have the technical knowledge, we have the capital, we have sufficient unpatented dyes to make nearly everything actually needed, but we need protection.

The need of protection against unfair competition is obvious, but is the need for a higher duty equally so? Bearing in mind that we have no surplus products as yet, it must be made more profitable for the tar distiller to separate and refine the products needed than to leave them as they are to-day, to be sold in the oils. This means higher prices to the dye manufacturers and they, therefore, need some offset to enable them to sell their output in competition with the imported dyes. This immediately suggests the thought of the ultimate result on the price of materials if dyed with the higher priced dyes. I have been assured that the price of the dye itself is an absolutely negligible item in most costs of finished goods, and cannot possibly affect the price to consumers, and therefore puts the question directly before the users of the dyes. It is a question for them to answer whether they want an American dyestuff industry independent of Europe and are willing to pay the price to have it.

My personal opinion is that the additional price necessary to be paid by the users of dyes, in order to secure this industry, would not be a permanent increased cost. Tariff protection during the period of development only should be considered. Such an industry would be competing with one of the strongest and richest industries in the world, and competing only on products which are free to all as regards patent restrictions, while the German industry has made vast sums on its products during the life of the patents and continues to reap large profits on those items on which the patents have not yet expired. This means competing on those items which are now sold on close margin and having no exceedingly profitable items which have helped the Germans to earn their immense profits. Protection over a term of years to protect a growing industry has already been given by this government. The often cited example is the tinplate industry, which was given assurances of a continuing protection for at least ten years, and whose development was immediately begun with that promise. To-day it is certainly able to hold its own with anyone. The same would be true of a dyestuff industry.

The initiative lies with the consumers of dyes. Will they make it plain to Congress that they want an American Coal Tar Dye Industry?

Nottingham Section.

Meeting held at Nottingham on Wednesday, October 28th, 1914.

MR. JOHN WHITE IN THE CHAIR.

THE WORK OF THE PUBLIC ANALYST IN RELATION TO MANUFACTURED PRODUCTS.

(CHAIRMAN'S ADDRESS.)

(Abstract.)

The object of the address was the discussion of certain points, connected with the preparation or manufacture of articles of food, which arise from time to time in the administration of the Sale of Food and Drugs Acts, and upon which the views of the Public Analyst and the manufacturer do not always coincide.

For example, a matter upon which the Analyst and the manufacturer or trader not infrequently disagree, is the policy euphemistically called "trade custom." This term covers a somewhat wide field, and a multitude of sins, and may include among other practices: (1) the substitution of some article for the particular article asked for by a purchaser, as for example the sale of tapioca as sago; (2) methods of bleaching, dyeing and colouring, as the bleaching of flour, the dyeing of beet-sugar to imitate Demerara sugar and the colouring of milk and butter; (3) the addition of substances known as "improvers," as phosphate of lime and potassium persulphate to flour; (4) methods of "facing" and polishing, such as the facing of rice or pearl barley with talc or French chalk; (5) "grading" articles during their preparation, with the object of leaving in the finished material an undue proportion of some worthless or semi-worthless ingredient, such as cocoa shell in cocoa, pepper husk in pepper; (6) the sale of mixed articles under the name of the article they purport to represent, with an attached label, printed in microscopical characters, notifying the admixture; examples, mustard mixed with starch and turmeric, cocoa mixed with sago and sugar; (7) the addition of salicylic acid as a preservative to unfermented wine.

From this list it may be gathered that gross methods of adulteration are declining, and in fact adulteration is rapidly becoming a scientific operation, carried out methodically by the manufacturer on lines laid down by his chemical advisers.

In further illustration was mentioned the article known as milk-blended butter, a substance originally prepared