of resin with reference to the given standard on which a sample was sold.

Chemists who reported figures before the year 1900, had obtained samples which could hardly be called shellac, often being samples of garnet lac or button lac, in ignorance of the fact that these admittedly contained 10 per cent., and up to 30 per cent. of resin respectively, and that the figures were taken indifferently as representing pure shellac. Those facts should now be generally known; but Dr. Vaubel had recently reproduced these figures, button lacs and garnet lacs being given with iodine values of 23 and 19, and the saponification values in the same way. The figures now given for moisture and solubility in hot alcohol had very little practical bearing. Shellac legitimately contained all the natural wax which filtered through the bags, which might be up to 5 or 6 per cent.; the natural product was a mixture of 5 per cent. of shellac wax and 95 per cent. of other ingredients. The author referred to his slightly lower ester values; but the speaker had pointed out in the original figures he published, showing an average of 150, that this figure was of very little value. Phenolphthalein was the only indicator which could be used; and, as all shellac contained a small amount of lac dye which reacted differently with acids and alkalis, it was obvious that a clean end action could not be obtained. It was not possible, therefore, to determine the really correct acid and ester values of a shellac. Even if it were, the acid value of shellac was, roughly, about 60, and that of resin was about 160, and the difference between those figures was not nearly so great as the difference between the iodine values of the two products. Therefore, the iodine value gave a far better basis for calculation. The Endemann value, although theoretically very pretty, was quite useless from the analyst's point of view. Dr. Endemann showed an average of 8 per cent. of uncondensable acids from pure shellac. The problem was, whether there were more or less than 3 per cent. of resin, and the figures yielded by a shellac, whether it contained 3 or 5 per cent. of resin, would be identical, and one could not distinguish between the two. He (Mr. Parry) put the iodine figure at 9 and 125; but Mr. Umney at his suggestion had published the later figures, 10; and, taking 10 and 125, one might be doing a slight injustice either to the buyer or the seller. But that was an accepted figure on the London market; and on the basis of the iodine absorption values of lac and resin the reports were made out, and both seller and buyer were willing to accept the slight injustice of 1 per cent. which they might incur. The only real difference on the question was that expressed by Dr. Langmuir of New York, who preferred to use the Wijs solution, which gave higher absorption for both shellac and resin; they were not in exactly the same ratio as were obtained with the Hübl solution, but one always got a result about 2 per cent. higher of resin than by using the Hübl solution. When one considered the difficulty of observing the conditions laid down by Dr. Langmuir and his colleagues for the use of the Wijs process, it was better, he thought, to keep to a process by which any two chemists could obtain practically identical results. Dr. Vaubel had proposed to estimate the amount of resin by dissolving the sample in a solution of borax. It was true that resin, or colophony, was almost insoluble, whilst shellac was dissolved easily, but shellac wax was practically insoluble; and so, not only the colophony, but an unknown quantity of wax and other things, were included in the result. As the principal point for determination was whether there was more or less than 3 per cent. of resin, it was clear that a difference of from 2 to 3 or 5 per cent. of wax tended to vitiate the results entirely. MacMhiney had also recently proposed a process based on the solution of shellac in petroleum ether, with the hope of extracting the colophony, if any quantity were present; but the shellac formed a protective coating on the resin, and one could not get out the whole of it. He did not think any process but the iodine one had been seriously suggested, and that was in his opinion the only one of any practical value to the analyst.

Dr. J. LEWKOWITSCHEW said he had found for genuine seed lacs the iodine values of 9 and 10 by Wijs' method. The figures for the ester value had best be omitted, having been found merely by difference. He agreed with Mr. Parry that the "Endemann figure" was useless. With

regard to the iodine value, he would not say one could not get reliable values by Hübl's process, but certainly Wijs' process was much more expeditious. The calculation of "resin" was, as Mr. Parry had stated, finally deduced from an entirely arbitrary value of 125 for resin; thus one gave away with one hand all what had been obtained with the other.

The CHAIRMAN said it seemed to him that the most important point of the paper was connected with the determination of the iodine value. With regard to commercial practice, of course buyers and sellers ought to be bound, and they were bound, by some definite process. It would not do to sell according to one process, and when delivery was made to have the article subjected to test by another process giving a different result. As the result of a very extensive experience with oils, he was wholly in agreement with Dr. Lowkowitzsch, that the Wijs' solution was entirely satisfactory, and gave perfectly concordant results. His experience with shellac was not very extensive, but he wished to refer to an iodine value for shellac as determined by the Wijs' solution. The sample was an old shellac, guaranteed as pure, and sufficiently old to have been prepared before the present age of somewhat keen sophistication. It was almost wholly soluble in alcohol and almost equally insoluble in benzol. The insolubility in benzol was in itself a useful means of differentiating between shellac and rosin. For example, with such a substance as sealing wax, a mixture of colophony and shellac with mineral matter, the colophony and shellac was dissolved out with alcohol, and on evaporation of the alcohol the mixed shellac and resin were obtained in a pure state. On now extracting this with benzol the resin was dissolved, leaving the shellac, which was insoluble in benzol to the extent of something like 98 per cent. In connection with a determination of the iodine value of such a substance two considerations at once arose. What solvent should be used, and what iodine solution should be employed? The iodine value by the Wijs' solution was higher than if the Hübl solution was used. The number 125 had been referred to as the recognised value for rosin by the Hübl method. The Wijs solution, in his experience, gave about 134—138, which was about the increase normally obtained in comparing the two methods. When the iodine value of shellac was determined by Wijs' solution using alcohol as a solvent, a value of something like 15.3 was obtained. But for the Wijs iodine value glacial acetic acid was a much better solvent, especially as the Wijs solution itself was made with glacial acetic acid. Using this solvent a value of 28.7—29.5 was obtained. This was practically the number referred to by the author as having been obtained by other observers, but which the author thought was due to impure lac. He would therefore suggest to those interested in the question, the advisability of testing whether or not the employment of the Wijs solution using glacial acetic acid as a solvent was not preferable to using Hübl with the mixture of chloroform and alcohol referred to by the author. Time was, however, of course an element in single iodine determinations. Probably the author had one advantage which many of his hearers did not possess; he was sure of the purity of the shellac with which he was working.

Newcastle Section.

Meeting held at the Technical College, Sunderland, on Tuesday, November 22nd, 1910.

MR. E. F. HOOPER IN THE CHAIR.

THE PRESENT POSITION OF THE COAL-TAR INDUSTRY.

BY ERNEST F. HOOPER.

In dealing with the present position of the coal-tar industry, it is very desirable to make a general survey of the industry as a whole, to enable us to see more clearly the facts as they are brought forward consecutively. Owing to the brilliant chemical researches conducted mainly during the last sixty years, resulting in the discovery of vast numbers of dyes, pharmaceutical, photo-

graphic, and other products, one may be led hastily to assume that the majority of tar products have commercial usefulness in this direction. The fallacy of this contention is shown by the following analysis of a typical tar:—

	Per cent. by weight.	
Water (ammoniacal) ..	3.00	
Naphtha light oil ..	3.10	Yields 1.0 per cent. benzol.
Middle oil	7.68	„ 1.5 per cent. toluol and solvent.
Creosote oil	10.15	„ 8.12 per cent. naphthalene.
Anthracene oil	11.64	„ 0.3 per cent. anthracene.
Pitch	61.00	
Loss	3.43	

From the above figures, crediting naphthalene with as much as one per cent. as used for colour-producing purposes, and assuming one-half the benzol and toluol goes for aniline and toluidine dye purposes, it appears that roughly two per cent. of tar products find their way into colour manufacturers' hands. From my own observation, I am inclined to think even this an outside figure.

It is also necessary to note that, unlike most other chemical products, and especially those of a natural character of well-known types, the supply of coal-tar is, in every country where produced, limited in its quantity. A heavy demand on a certain constituent will, under ordinary circumstances, enhance the value of that product, and the supply of such material is strictly within a very inelastic limit. To illustrate this fact, I need only refer to the remarkable synthesis of artificial indigo from toluene some years ago. After years of patient and unremitting work, it was found impracticable commercially to produce indigo by this means, owing to the fact that to produce indigo on a commercial scale would force the price of the limited supply of toluene to practically famine prices, and were such total supplies, even at a price, obtainable, the quantity available would be far too small successfully to build up a trade in competition with the natural product.

On the other hand, a supply of any product exceeding the normal demand is almost necessarily followed by a rapid drop in the value of such a product, as with few exceptions the separation of the constituents must proceed consecutively one with another. To this may, I think, be largely attributed the enormous fluctuations in the value of tar products, unequalled in short spaces of time by almost any other series of chemical manufactures.

Dr. Beilby, in his presidential address at Newcastle-upon-Tyne in 1899 (this J., 1899, 643 seq.), speaking of the excessive quantity of tar available if coal gas were extensively used and by-product coke ovens were widely erected, warned us as to the fact that no possible demand for dyes, narcotics, or febrifuges, or other hydrocarbon products could possibly absorb the increment of material produced already from the above sources. The table I have just alluded to confirms this point. He directed the attention of engineers and scientific men to the utilisation of tar as a fuel of high calorific value. Since that period, however, events have occurred, which have largely neutralised the danger of the excessive over-production of coal tar.

First, the production of tar has increased by no means proportionally to the production of coal gas at gas works, and the annual increment of the rate of tar production

by gas works has not been so great as in past years, one reason being that owing to the change of burners from flat-flame to incandescent mantle burners, in many cases lower candle power gas is made, equivalent to a larger number of cubic feet of gas per ton of coal carbonised; and another being that consecutively with the much greater illuminating power per burner, much less gas per burner is required. This argument is not materially affected by the fact that more lighting, and of a better quality, is, and probably ever will be, the demand of the public.

Moreover, during the last decade, it must be borne in mind that many gas works, rather than extend their plant, as regards retorting power, including naturally condensers, scrubbers, purifiers, and such necessary adjuncts to larger retort output, have resorted to the aid of a carburetted water gas, or other than coal gas type plant, which gives the gas required under special heavy load conditions, such as heavy fog or frost, but little tar. This applies to small gas works as well as those of a larger capacity.

A few words may now not be out of place as to the crude products dealt with. During the last twenty years, many changes have come over the industry as a whole. Coal tar two decades ago consisted almost entirely of tar produced from the destructive distillation of coal in the retorts of gas works. The quality of this tar varied mainly owing to the quality of the coal used in the process and the temperature of the fire-clay retorts. This comparatively simple factor does not by any means cover the present position. Owing to the much higher temperature of carbonisation, due no doubt to the ability of the executive staff of the gas companies in extracting the utmost calorific and illuminating value from the coal, gas works tar has a much higher free carbon or (more correctly, as we shall see later) coke dust content than formerly, to the material loss of the normal hydrocarbons and other products. Again, especially in the Midlands and the North of England, a great number of by-product coke ovens have been erected of late years, yielding large quantities of tar differing very materially from that produced from gas retorts, owing, naturally, to the different method of carbonisation.

The general tendency has been for the gas works to produce a relatively smaller percentage of tar year by year to gas made; the loss, however, has been more than made up by the tar produced from the by-product coke ovens. A considerable quantity of tar, some 200,000 tons per annum is also produced by condensation from the waste gases of blast furnaces. The products from this source, as will be indicated presently, differ materially from gas works and coke oven products; from reference to tar analyses it will be seen that only a small quantity of naphtha and light oil products can be obtained from the latter source.

Recently a new phase has arisen in respect to gas works tar; I refer to the new system of vertical retorts. In Sunderland, we have the first installation erected in England on a large scale, of the Dessau pattern, and the results bear out fully the advantages the inventors have claimed, and the local engineers expected. It appears likely that within a few years gas works retort house practice will see a very extended use of the vertical retorts.

The subjoined analyses show comparative tar yields from a variety of sources. The chart is drawn up based on the relative densities of the tars indicated.

DIAGRAM 1.

Type of tar.	Coal source.	Specific gravity.	“Free carbon.”	Tar acids.	Distillate through open retort					Pitch.	Analyst.
					to 170° C.	to 230° C.	to 270° C.	to 300° C.	to 350° C.		
Blast Furnace	..	1.054	..	..	..	2.0	..	6.07	33.0	55 to 60 per cent.	Hooper
“Coalite”	..	1.058	0.15	23.0	..	14.0	13.6	..	29.0	41.7	Hooper
“Coalite”	..	1.070	..	..	10.8	..	20.0	..	30.0	39.2	Warnes
Vertical retort	Slkstone	1.084	3.6	..	6.7	..	21.7	..	22.5	48.5	Lunge
Water gas tar	Durham	1.090	1.38	nil	..	5.8	9.10	..	34.34	34.91	Hooper
Water gas tar	..	1.092	trace	..	1.30	15.45	..	..	42.30	18.23	Tutweiler
Inclined retort (Bueb) ..	..	1.095	2.6	..	4.4	..	28.5	..	19.2	47.5	Warnes
Vertical retort	..	1.100	2.4	..	5.85	..	12.32	..	26.0	49.75	Lunge
Coke oven (Simon-Carvés)	Durham	1.106	..	..	1.6	4.7	..	18.0	34.0	30.5	Lunge
Vertical retort (Dessau)	Durham	1.113	4.0	5.3	13.0	..	21.0	..	9.0	50.0	Hooper
Chamber retort	..	1.180	11.1	..	0.4	..	10.2	..	30.1	53.0	Warnes
Coke oven (Otto-Hilgenstock)	Durham	1.198	10.5	3	9.4	..	9.8	..	24.8	51.0	Hooper
North Country (horizontal)	Durham	1.220	17.25	3	4.9	..	18.4	..	9.0	60.6	Hooper

Blast furnace tar shows by far the lowest specific gravity, but this is not explained by a large percentage content of light, or naphtha products, but by the low specific gravity of all the distillates. The pitch contains 5 to 10 per cent. of ash, 65 to 70 of volatile matter and 15 to 20 per cent. of free carbon.

Coalite tar shows 12 to 14 per cent. of light paraffin bodies that are found in the earlier fractions, an abnormally low free-carbon content and bright, lustrous, brittle pitch. The tar acids are high but contain very little phenol.

Vertical retort tar has a very low free carbon content, low naphthalene, and gives a brittle pitch, besides containing more than traces of the paraffin group.

Water gas tar, of which not a considerable quantity is produced, shows a very little free carbon, considerable quantities of creosote and heavy oils, and a poor quality of pitch.

Durham coke oven tar more nearly approximates to ordinary gas works tar. The free carbon contained is 10 to 12 per cent.; the pitch residue is lower, however, than in a normal tar by roughly 10 per cent.

Normal North Country gas tar.—Here we reach the highest specific gravity, greatest pitch yields, and consequently a higher volume of free carbon. Naphthalene is contained in large quantities in both the Durham coke oven and North Country coal gas tars.

In the accompanying diagram, which has been prepared after closely testing a variety of tars, we find that the percentage of free carbon can be closely and easily determined by the formula. Percentage of free carbon = $0.04 N - 10$, where N = degrees Twaddell. The statement is based on this figure. The figures are calculated on the tar free from water, and the free carbon content has been estimated by washing the tar with approximately 150 runnings through the Soxhlet apparatus, with first benzene, secondly pyridine bases testing by distillation in a Wurtz flask 90 per cent. at 140°C ., and thirdly methylated spirit (unmineralised) in about 50 exhaustions each. These solvents seem to be the best for this purpose. The free carbon yielded no further soluble bodies to carbon bisulphide

Tar.	Degrees Twaddell.	Free carbon by formula $0.04 N - 10$.	Free carbon found experimentally.
1. Coalite tar	15.0	0.4	0.15
2. Water gas tar	18.0	1.52	1.38
3. Vertical retort tar	21.5	3.77*	2.50
4. Dessau Drhm. coal tar	22.0	4.08	4.00
5. a Horizontal	35.0	12.40	10.07
6. b "	39.0	14.83	14.91
7. Average tar	41.2	16.36	16.00
8. Inclined retort tar	41.0	16.24	16.51
9. c Horizontal retort tar	42.0	16.88	16.51
10. d "	42.0	16.88	17.23
11. e "	48.0	20.72	20.78
12. f "	57.0	22.04	22.04
13. g "	51.5	22.96	23.52
14. h "	54.5	24.88	25.58

* This determination was not made in the author's laboratory, and he is unable to test its accuracy.

or other solvents by which it was tested, and the weight proved constant when dried at 120°C . for a considerable period. The composition of the free carbon is being investigated.

Beyond the tars mentioned, but still worthy of note, are those produced from Mond gas, oil gas, and producer gas.

Another process should not be passed over without notice, although the future of the process is hardly out of the experimental stage. I refer to low temperature carbonisation and its products, as exemplified in the "Coalite" process. The tar made under these conditions approaches very closely to the tar made in the earlier days of the gas industry with cast iron retorts. This tar is very thin and does not contain much free carbon.

Quantity of raw material available.—The Board of Trade figures show an output of coal for 1909 from the United Kingdom of 263,774,000 tons, giving direct employment to 1,013,998 persons, an increase over 1908 of 26,185 persons. Of this, 15,000,000 tons were used in the production of coal gas. This gives, based on the yields of 8.1 gallons of tar per ton of coal carbonised, an available quantity of tar equal to 750,000 tons. We may reasonably assume an output of not less than 150,000 tons from by-product recovery ovens, and not less than 200,000 tons of blast furnace tar is produced. Water gas tar, coalite, and other tars are at present an almost negligible quantity. We have, then, in sight a total of about 1,100,000 tons of coal tar available.

It must be borne in mind that very large quantities of tar are lost to the distillers annually to the gain of the surface of our highways. In the southern counties, especially round London, some thousands of tons, in a refined state, are being placed on the roads to preserve the surface and abolish the dust nuisance. This use is likely to develop largely in the future in other parts of the country.

Products generally prepared, and their uses.

From the first fraction and light oils we obtain:—(a) Carbon bisulphide (little is, however, prepared commercially from this source). (b) Benzene, toluene, and the xylenes, produced in a pure state for dye manufacturing and solvent purposes. Toluene is the base for artificial saccharin. Benzol, or "nineties" as it is known in the trade, is becoming more and more useful as a spirit for internal combustion engines of a motive character. (c) Carbofic and cresylic acids. The second fraction yields naphthalene, heavier solvents, besides phenolic bodies, and the third fraction yields lower grade naphthalene and oil most suitable for preserving timber. Of late years, one of the factors which relegates the possibility of tar, or even oil burning, to a distant future is the ever increasing demand of creosote for the American continent. For many years a considerable quantity of oil has been sent to the United States of America, but during the last five years the demand for timber preserving oil has grown so rapidly that the old method of cask packages has almost disappeared, and instead the oil is being sent to the other side of the Atlantic in properly fitted tank steamers. The collection, maturing, exporting, and the transit and distribution on the other side has grown to vast proportions. Over 25,000,000 gallons were received from England in 1909, and the demand is still growing. Six years ago, oil burners were installed at the Sunderland works to use up some of the excess of oil produced, which was over and above the demand of the local firms using creosote. Since then the vista has changed remarkably and now the oil has a steady outlet. The manipulation of this oil, liquid only at an elevated temperature, requires special experience and handling. There are now more than five shipping installations in Great Britain alone. The demand came at a very crucial time to tar distillers and has proved of value at a time when it would have been difficult to dispose of the excessive make.

The fourth fraction gives anthracene, not extensively separated of late years, and heavy oil. The latter is now being largely superseded in the manufacture of lubricating oil by imported petroleum bodies. Carbazol is also obtained from this source. To show the fall in the value of anthracene at the present time, in 1908 only £5,094

worth was exported, in 1909 material to the value of a few hundred pounds was wanted abroad.

Methods of separating the products.

By far the greater proportion of the tar is worked up in this country by the ordinary pot or intermittent stills. The usual design of a tar still is convex-concave—an upright cylinder with domed top outwards, on the top surmounted by a cast iron still head. The still bottom is domed upward inside to give a maximum of heating surface from underneath.

The capacity may vary from 8 to 20 tons. Steel or wrought iron is the material employed for the manufacture of the still, the thickness generally being used about half an inch. The top of the still below the head generally consists of a dome plate rivetted to gusset plates, these in turn being joined to the cylindrical shell plates. Below these the channel, or floor plates, are rivetted to the lower gusset plates and these again to the internal dome plate. Some distillers favour a single plate covering the bottom entirely; these large plates can now be procured. The fittings consist of still head, safety valve, inlet for tar, inlet for steam, testing cock, and pitch run-off pipe. Some 10 to 30 hours is required, according to circumstances, for the cycle of operations. Briefly, this is as follows:—The chargemen fill the stills to a certain mark and run the distillate with fire heat till the last fraction, the heavy anthracene oil, begins; then steam is injected and the distillation proceeds to the finish. The fractions are in some cases determined by a thermometer in the still dome, but generally by the specific gravity of the fraction and by the quantity of the distillate and its appearance on a steel blade. This factor is largely determined by the commercial requirements for the time being.

The main advantage of the pot form of still is that as a still becomes worn, and the wear and tear is great, one still or another can be put out of use without the plant, as a whole, lying idle. In some works the stills run under partial vacuum and consequently lower temperatures are required and more perfect condensation of the earlier products results.

The stills are sometimes fired with other fuel than coal, viz., coke, oil fuel, or producer gas. With tars of a lower free carbon content no form of internal agitation in the still is necessary, but much may be said for this method with some denser tars.

The condensing arrangements for the distillates consist of steel or iron tanks containing a coil of steel or cast-iron pipes of requisite internal diameter, from 100 to 150 feet in length. The pipes terminate outside the tanks in a goose neck trap into a receiving chamber, whence the running of the stills may be observed, samples taken, and out of which the products may be transferred to their proper store tanks for further treatment. The first fractions are sent from their store boilers to a crude naphtha still, which is similar in design to a tar still, with the exception that it has, in the place of an ordinary still head, a fractionating column of some approved design. This still is worked, as a rule, by fire and the distillate tested and the fractions separated by control from the laboratory, by means of continuous specific gravity and distillation tests. The residues from the still are highly charged with naphthalene and are run into the creosote tanks. The distilled products from this plant go to the benzol washing house where, after treating with sulphuric acid to eliminate the basic bodies, and with caustic soda to remove the phenols, further acid treatment takes place to remove the more easily sulphonated bodies; from thence they pass to the steam rectifying still for the preparation of either benzol or toluol, or higher-grade benzene, toluene, and other xylenes.

The light oil and carbolic oil fractions are often re-distilled, as is the first fraction, and washed with sulphuric acid and soda also. From this source the later fractions give high-grade naphthalene; this latter product is passed to the naphthalene plant where, by means of hydraulic presses or centrifugal machines, a high melting-point "salt" is obtained, especially after re-distillation in a proper still, without difficulty.

The creosote fraction contains basic bodies of little commercial value, but considerable quantities of phenolic bodies may be secured by washing, and if necessary, naphthalene. The main bulk of the material, however, is utilisable without much treatment for timber preservation.

The anthracene fraction comes from the still as a dark yellowish green oil of buttery consistency when cold, and yields no basic or phenolic bodies of interest other than carbazole. When anthracene had a high commercial value this was an important fraction. At the present time, however, it does not pay most works to extract the anthracene, except to prepare heavy oil for lubricating purposes, only a high-grade "A" quality anthracene being worth any consideration.

Pitch residue.—The residue left in the still at the termination of the distillation is pitch. This body, or more correctly speaking, this combination of bodies, is used almost exclusively for the purpose of briquette manufacture.

Dehydrators.—Retracing our steps to the tar as first received at the works:—Of late years it has been found desirable to arrange some method for eliminating as much of the ammoniacal liquor as possible before the tar enters the still, and many means have been devised, the favourite one being to have a receptacle heated by waste steam or flue gases, or even conjointly with the condensers, to heat the tar to a point at which the water rises to the surface and distils over, or by means of a separate plant and series of various shaped stills to drive off some of the water and lighter products before the tar is conveyed into the tar stills for further distillation.

An engineering company in London has recently brought forward a plant capable of dealing with water in tar and also for the simultaneous extraction of the naphtha and light oils. The crude tar is pumped through a pre-heating coil, and thence to a coil still in which a temperature is maintained of over 100° C. Passing from this still, the vapours are drawn off and condensed and the tar, free from water, passes from the apparatus. The principle is good and might well be further developed.

Continuous stills.—First amongst this class of still in point of age, and also in the amount of tar worked through them at the present time, is the still designed by Mr. Frank Lennard, of Messrs. Forbes, Abbott, and Lennard. This still consists, in the first instance, of a long series of pipes laid in a furnace and carefully heated. The tar is pumped, under pressure, through this series of pipes running grid-iron fashion backwards and forwards from one side of the furnace to the other. The tar is heated by this means to pitch temperature and then, as the end of the furnace is reached, each fraction is allowed to condense in its order. The pitch remains at the first stage; next, the anthracene fraction is allowed to cool, and further creosote, then light oil and naphtha. The last condensing plant is wisely utilised to heat the crude tar before entering the furnace at the commencement of the operation.

It appears desirable to heat the furnace by means of some method other than by coal fire so as to obtain a regular temperature, which is the essence of the successful carrying out of the process. Properly speaking, this method should be indicated as a fractional condensation method of tar distillation. Another form of continuous still has been patented by W. Hugendick, of Essen-Rüttenscheid, who combines a pre-heater of pipes behind the still somewhat allied to the Lennard pattern, with a series of pot stills, and heats the tar before entering the pot stills with the chimney flue gases.

Another type of continuous plant is that designed by an Italian, Ettore Ray. This plant does not appear to have been extensively tested; its principle is that of heating the tar in a chamber at a considerable elevation and with one or more still heads. The light products are worked off in this chamber and thence to lower and still hotter chambers, eventually pitch being run off at the bottom as the final product. The characteristics of this form of fractional distillation appear to be of a correct type, but whether the plant can stand the crucial tests of present day practice, I have no information. Messrs. Poetter,

of Dortmund, also have a plant of somewhat similar plan, but as far as I can learn, no large plant of this design has been erected.

In conclusion, a few figures which are submitted as to the general chemical trade of the country, and tar products export trade in particular, may be of interest.

Chemical exports for the United Kingdom have risen from £12,079,000 in 1903 to £17,059,000 in value in 1907, and later, but incomplete figures, point to a continued annual rise.

The imports of dyes and dyestuffs from January to December, 1909, were as under:—

	Cwt.	Value	£
Alizarine and anthracene	55,901	"	244,196
Aniline and naphthalene	239,956	"	1,318,727
Synthetic indigo	33,494	"	117,100
Other coal tar dyes	713	"	3,965
			1,683,988

United Kingdom:—Export of coal tar products from January to December, 1909:—

	Quantity.	Value.
		£
Aniline oil and toluidine	lb. 2,075,579	44,380
Anthracene	lb. 1,807,762	5,712
Benzol and toluol	galls. 2,374,681	80,987
Carbolic acid	cwt. 95,001	103,189
Coal tar, crude	cwt. 102,598	13,620
Refined tar and black varnish	galls. 2,692,080	43,630
Naphtha	galls. 773,240	27,089
Naphthalene	cwt. 90,376	21,880
Pitch	cwt. 9,959,629	595,651
Tar, oil, creosote	galls. 20,839,561	390,994
Other sorts	galls. 395,719	120,009
		£1,456,210

These figures point to the fact that while we import tar colours of considerable value, the balance of exports from the tar products industry goes a considerable way to pay for the material imported.

Uses for tar other than by distillation.—Having considered the coal tar distillation industry as such, it would, in conclusion, be worth while noticing briefly the uses of tar in other directions. As fuel, by itself or with coal or coke, it is consumed, especially at long distance from tar works. It is used in ever increasing quantities, but not with the best expert advice, in rendering roads dustless, especially where motor traffic is considerable. Those who have gained experience almost unanimously press for refined tar of make suitable to each district. Tar also finds its way into coal briquette factories, where the blocks are subsequently partially coked to get rid of the oily condition inseparable to the use of crude tar. A small quantity is also used in the manufacture of carbons for the electric arc.

New York Section.

Meeting held at Chemists' Club on Friday, October 21st, 1910.

DR. C. F. MCKENNA IN THE CHAIR.

DR. H. SCHWEITZER.

The following resolution was passed unanimously:—

WHEREAS Dr. Hugo Schweitzer has resigned the office of Honorary Secretary of the New York Section of the Society of Chemical Industry, which Section was founded mainly through his instrumentality and effort, and

WHEREAS after sixteen years of unselfish and arduous service he is compelled by reason of pressure of other duties to retire from the office he has so successfully filled—

RESOLVED that we tender him the heartfelt thanks of the Section for his work in its behalf, and in accepting

his resignation with great regret convey to him our earnest wishes for his future prosperity and happiness, and be it

FURTHER RESOLVED that in token of the regard in which he is held by the Section, the Committee appointed for the purpose cause these resolutions to be spread in full on the Minutes of the Section, and present a copy thereof to Dr. Schweitzer in a permanent form signed by the officers of the Section and by the Committee.

Committee—T. J. Parker, E. G. Love.

Chairman—Charles F. McKenna.

Vice-Chairman—M. C. Whitaker.

Secretary—Parker C. Mellhiney.

Treasurer—F. C. R. Hemingway.

BUILDING UP AMERICAN CHEMICAL INDUSTRY.

BY DR. CHAS. F. MCKENNA.

In making my first appearance amongst you since this honour of the Chairmanship has been awarded to me, I cannot refrain from adding to my sincere words of appreciation some expression of views upon the prospects of our Society, upon our duties under the Charter by which we exist, and upon the hopes which we cherish of fulfilling them to advantage. It has seemed to me that this would go far towards vindicating your choice, for I cannot imagine that much more is required of your executive officers than that they shall be competent guides, who will pick the best roads, keep the lanterns bright, and show you what traps to avoid. In order that the views to be taken of chemical industry may have such perspective that the necessary appreciation of fullness, roundness, and extent may follow, I have asked more renowned members to take the floor with me to-night, and help marshal the facts which will enable all inside and outside the profession to survey the field which we are tilling, and see the rich rewards which are promised in it.

When this Society was founded in England in 1881 its principal object was thus stated:—"To advance applied chemistry in all branches." The same purpose guides the Society in Great Britain to-day; the same impulse animates each of the sections. But it is only natural for us to say that we take an insular view of our position, and believe that one of the best and most direct ways for us to "advance applied chemistry in all branches" is to advance chemical industry in this country.

Though upon its establishment the Society grew to be almost world-wide, it is fair to assume that the men who assisted at its birth had chiefly their own country in view as the scene of its operations. We may be pardoned, therefore, for being ourselves provincial at times.

This country is the place in which we come in closest relation to the applications of chemical talent; this is the field in which for us the possibilities are alike the encouragement and the cause of aspirations for grander development of our people. The chemical merchant, the chemical manufacturer, the professional chemist, must work together for the development of our department of human activity in our corner of the world. We feel that we can reach that development by healthy growth and stimulation of the chemical and technical activities of civilisation. Then if we would do so, let us look at the conditions.

The principal feature which always astonishes the economist in considering our material growth, the factor which always appeals to the American himself, is, the natural resources of America—the theme of the orator, the statesman, the editor, until we are threatened with exhaustion of our forests to supply the paper to print it all. Our beautiful and magnificent country affords us choice and diversified materials; geological ages have stored up uncountable treasures—warm suns and moderate rainfalls bring horns of plenty annually. Nothing seems wanting but ourselves. These stored-up treasures and this periodic fertility are not met by us in the right spirit of responsibility and adequacy. Our resourcefulness is paralysed by the plenitude of our resources. We do not seem to think we need to learn how to adapt or trim down, or to consider relative proportions, or apply any of the means that meagre resources impose on the national economies of other peoples. We are lavish with our