The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LIII
No. 1364

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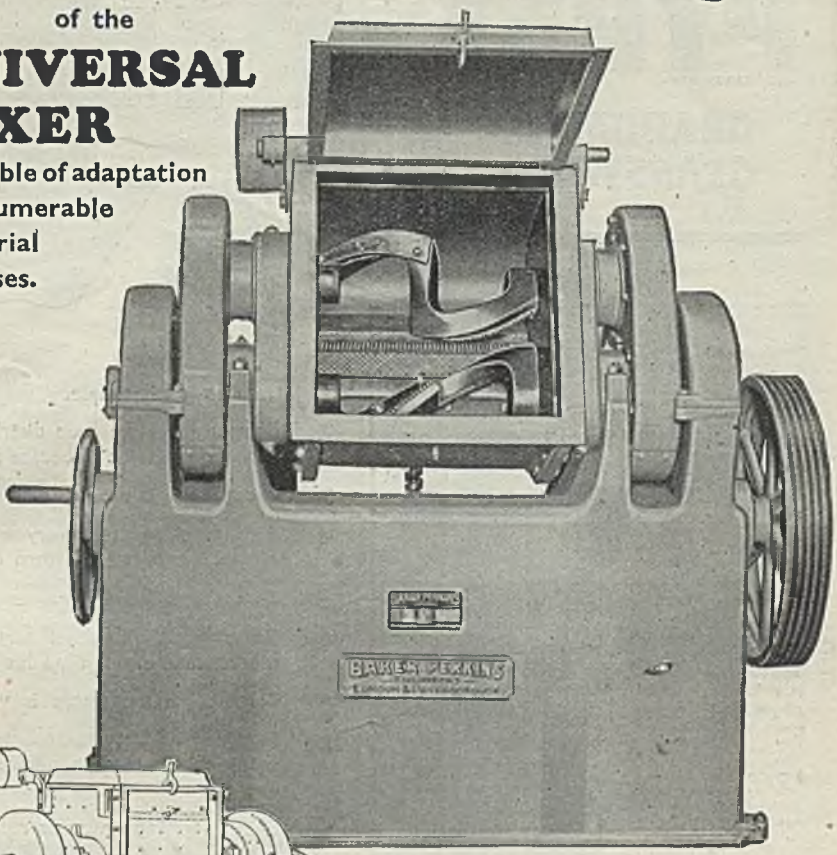

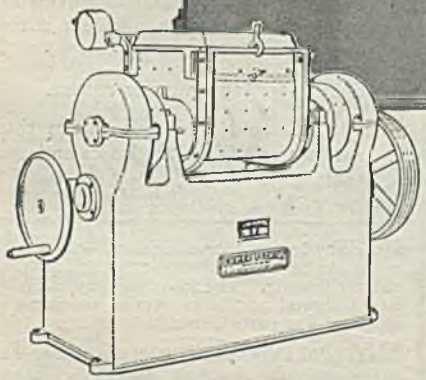

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The Chemical Age

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Atomic Energy

THE announcement that a method has been found for releasing the energy of the atom on a large scale is undoubtedly one of the most important in the history of the world. It may have been that some of the discoveries made by the ancients and some of the problems that perplexed them appeared just as important to them as modern events do to us. We feel, however, that we are justified in declaring that those who are to-day of, or above, middle age have lived in the most exciting period in the world's history. They have seen two world wars on a scale never before witnessed. They have seen great scientific discoveries and from them the rise of great industries. We need only mention the development of electricity, the internal combustion engine with all its consequences, the aeroplane, wireless transmission, and many a discovery in the chemical field to prove that statement. It may well be that the liberation of atomic energy will prove to be the greatest discovery of all. It is a discovery which may make wars impossible, which may make us independent of coal and oil as sources of heat and power, and which may bring about social changes such as to-day are only visions in the brain of the more advanced dreamers.

When writing for scientific people there is no need to emphasise the destructive possibilities of this new discovery. Into the hands of man there has now been placed the power to destroy himself or to rise to heights of material prosperity of which he has not hitherto dreamed. It has again raised in a very potent form the problem whether science should continue to make these discoveries which put such dangerous weapons into the hands of the irresponsible. Mankind is irresponsible, not always individually, but because there arise from time to time nations or outstanding personalities obsessed with the lust for power and prepared to use any means to fulfil their desires. For our part our answer would be that science must continue to make its discoveries. It must go on from strength to strength, from discovery to discovery, leaving the world to apply the discoveries for good or ill. It is for the politicians and the statesmen of the world to see that the powers that science puts into their hands are used for the good of mankind and not for destruction.

On Other Pages

The cost of the present discovery and of its application has been enormous. For at least 25 years scientific men have been working in their laboratories towards this objective and a new chemistry has arisen during the course of this present century, which may be termed atomic chemistry or nuclear chemistry. Step by step there has been built up knowledge of the structure of the atom, of the energy that can be released by the disintegration of matter, and the consequent discovery of the fact that matter and energy are interchangeable. Already by 1939 scientific men could see possible ways in which atomic energy could be released. It has taken a war to bring this possibility to rapid fruition. It required the vision of a Churchill and a Roosevelt to spend £500,000,000 in translating the laboratory experiments of the scientists into the awful actuality of the atomic bomb. The greatest research workers in nuclear physics in Britain and America joined hands in making this discovery and in devising its application. Does not this suggest that if mankind sets its forces to work, any object can be fulfilled, however difficult it may be? There is a moral here.

The technical facts have not been divulged in any detail and it is obvious to the chemical engineer that there are many important gaps to be filled. All that is known with certainty at the moment is that the present method for the release of atomic energy is based on uranium, that vast factories are in operation into which enormous masses of material enter and from which very small quantities of finished products emerge—quantities so small that those who work in the factories have appeared to themselves to be engaging in immense labour without tangible result. It is understood that the warhead of the new bombs weighs only some eight pounds or so and of the possible energy content in that material no more than about 0.1 per cent. is developed when the weapon explodes—if explosion be the right word. It is, however, possible to fill in some of the gaps from the facts as stated and from a knowledge of previous work.

The operation depends in all probability on the bombardment of atoms by particles, such as protons and neutrons, an operation which leads to the shattering of the atoms into two or more parts. These nuclear reactions, unlike normal chemical reactions, commonly involve a change of mass. Thus when a mixture of lithium and hydrogen is bombarded by protons (a reaction first described by Cockcroft and Walton in 1933) an atom of each element disintegrates with the formation of two atoms of lithium. The masses of the reacting elements before the reaction are 8.025 and of the two lithium atoms formed, 8.008. The difference between these weights represents the conversion of matter into energy. One erg of energy is equivalent to the disappearance of 1.2×10^{-21} grams of matter, and if our arithmetic is right, the conversion of a pound of matter would evolve as much energy as can be obtained by combustion at 100 per cent. efficiency from about 1,270,000 tons of boiler coal (C.V. 12,500 B.Th.U./lb.). That means that the replacement of the whole of the coal used in Great Britain annually would require the conversion of less than 160 lb. of matter. Thus nuclear chemistry differs from ordinary chemistry by the fact that both mass and energy must be taken into account. In ordinary chemistry, the masses before and after the reaction are the same; in nuclear chemistry mass plus energy before and after the reaction are the same. The difficulty has hitherto been to cause the reactions of nuclear chemistry to proceed spontaneously; to cause the reactions to occur has required the application of far more power than that generated by the reactions.

The key to this difficulty was found in 1939 when bombardment with neutrons (particles having the same mass as the hydrogen nucleus but carrying no electric charge) was found to cause disintegration; having no charge they could approach the positively charged nucleus without propulsion at high velocity. The disintegration appears to be effected by contact, speed being only necessary to overcome electric repulsion when it exists. Thus the neutron can act without the need for providing immense voltages to set up high velocities of motion. Full information about the induction of operation of nuclear fission is not yet available. It has been observed to be caused by neutron and

proton bombardment of uranium, protoactinium, and thorium, and by the bombardment of uranium by deuterons (the nuclei of heavy hydrogen atoms); hence the interest in "heavy water" in Germany.

Among these reactions, the bombardment of uranium by neutrons stands out as being accompanied by a large release of energy—an energy release sufficiently great to knock several further neutrons from each of the newly-formed nuclei, and possibly from other unchanged nuclei. Thus by bringing a source of neutrons within a mass of uranium, the possibility exists that the reaction may proceed without the application of external energy. Matters had advanced thus far by 1939. It was also known that of the isotopes of uranium, one—the rare U^{235}—would capture neutrons moving at a sufficiently slow speed with subsequent fission, and, in fact, the reaction would be self-propagating. Another isotope, U^{238}, which is in abundant supply, only splits by bombardment with fast-moving neutrons, and if present prevents the propagation of the reaction through the mass. Thus, the problems to be faced in developing the atomic bomb would be (1) to find a source of neutrons that could be put into the uranium and that would not start the reaction until it was required to do so; (2) to obtain the active isotope of uranium in a sufficiently concentrated form. Chemical methods of separation are generally useless, since all isotopes of a given element show the same chemical reactions, so that this problem would be very difficult. No doubt a large part of the enormous factories required would be needed for the production of U^{235}.

Atomic energy has been applied to the destruction of man and his works. The greater problem remains of converting this energy into the pursuits of peace. To do this, the energy must be liberated as and when required in controlled quantities under such conditions that it can be utilised. A method was known as long ago as 1939 whereby the reaction could be thermostatically controlled by addition of a cadmium salt; a temperature is reached at which the rate of capture of neutrons by the cadmium becomes as great as the rate of production of neutrons by the fission reaction. That is the problem for the future. At present the cost of power production from uranium, even if practicable, would be too impossibly expensive to compete with power from coal and oil. But remembering how electricity has developed within less than a century from unpromising beginnings at a time when scientific research was far less advanced than it is to-day, who shall say that it is impossible that within half a century the need for mining coal for the production of heat and power will be unnecessary?

NOTES AND COMMENTS

Final Victory

IT will never, we imagine, be decided whether it was the "atom bomb" or the declaration of war by Russia which gave the final *coup de grâce* to the Japanese will to war. Certainly, no power, already on the defensive and preparing for a hostile invasion, could long withstand two such shattering blows coming almost simultaneously. Let us be thankful, then, that there was no attempt to prolong a hopeless struggle, and that in consequence many thousands of lives have been saved. As scientists, we must necessarily feel a thrill at the idea that physical chemistry played a predominant part in leading to final peace, even though we deplore, once again, that one of the outstanding achievements of science should have been directed, in the first instance, to destructive purposes. Indeed, as Lord Louis Mountbatten said, war is a crazy business.

Tasks of Reconstruction

COMING so soon after VE-Day, final victory makes no great alteration to the world picture. The process of recovery will be accelerated, mercifully, but its direction will not be altered. Demobilisation can proceed more quickly, industry can return to normal more speedily, and shipping can soon be released in quantity to fructify the world's commerce. It is not likely that the destruction of property, except in certain restricted areas, such as round

Manila and in some parts of China and Japan, will be found to be as intense in the Asiatic as in the European theatre of war; it may not be very long before the riches of Malaya and the East Indies are once more at the disposal of humanity. The obvious first task of major importance in the Eastern sphere is the rebuilding of China, the first victim of unwarranted aggression; and it is a happy augury that China's powers of recovery are proverbial. As for Japan, it is not for us to suggest a policy. It is true that the Japanese, both before and during the war, adopted tactics and methods that we have come to regard as "German." Such methods have brought Germany twice to ruin. Is it too much to hope that the Japanese, whom no one would accuse of being an inherently stupid nation, may have learnt their lesson and may realise once and for all the difference between aggression and expansion? The discovery of the controlled release of sub-atomic energy is only one of the advances that science has made—though it is the most striking advance of our age—and it proves to the utmost the contention of every true scientist that there is nothing more futile than the perversion of scientific discovery to war-like ends. It is in the application of science to beneficent purposes that the future of mankind is contained. Elsewhere lies annihilation.

Imports for 1944

IMPORTS into the United Kingdom for last year, excluding munitions, continued to show an increase, and reached the record value of £1306.2 million, compared with £1232.6 in 1943 and £919.5 in 1938. The value of imported munitions likewise rose from £652 million in 1943 to £1055 million last year. The steady upward trend of the adverse trade balance has been maintained, as exports were valued only at £258 million (against £1298.8 million retained imports), leaving an adverse balance of £1040.7 million, including Lend-Lease goods. A study of the detailed figures of imports under their several heads gives a fair indication of the national end-of-the-war economy. Imports of chemicals (figures in £000) fell slightly from 27,817 (in 1943) to 25,073—still nearly double the 1938 value; non-ferrous metals dropped from 83,987 to 67,441, tin ore from 10,315 to 7053, and iron and steel from 58,976 to 32,933. Refined petroleum, however, went up from 149,575 to 217,570, and most of the food items showed a rise, with the exception of grain and flour, where there was a small drop in value from 66,010 to 65,687. The value of *manufactured* chemicals, dyes, etc., remained more or less stationary: 12,243 in 1943, 12,493 in 1944 (12,668 in 1938). Manufactured oils, fats, resins, etc., continued their tendency to rise with a leap from 52,140 to 81,097, as compared with 35,803 in 1938.

Countries of Origin

THE above figures, it should be noted, refer to the *values* of imports. In fact, as compared with 1938, there has been a rise of 91 per cent. in average values. The volume of retained imports was only 79 per cent. that of 1938, partly as a result of a drastic cutting down of heavy bulk cargoes, such peaceful items as fruit and vegetables being down to 11 per cent. of the 1938 level, silk to 12 per cent., and paper and board to 17 per cent. Steel, non-ferrous metals, and machinery reached a peak in 1943, and it will probably be found that the 1944 figure for petroleum will also have been a maximum. The regional distribution of origins of imports not unnaturally reveals a marked swing towards America, though imports from the U.S., after rising from £352.6 million in 1942 to £535.1 million in 1943, receded to £532.6 million in 1944. Elsewhere, however, the trend is maintained: from Canada the comparable figures (1942-3-4) are 150.2, 200.2, 207.6; Argentina, 49.4, 58.3, 81.2; Brazil, 16.2, 17.9, 18.0. A significant trend is shown by imports from India which fell from 60.1 in 1942 to 59.8 in 1943, but now have risen to 69.1.

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o-Phenanthrolines are reported to have been satisfactorily produced in stable form at the University of Illinois, states *Chem. and Eng. News*. This invaluable tool of the analytical chemist will, it is claimed, detect iron in water in the ratio of 1:1,000,000, and has a strong affinity also for copper, nickel, chromium, cobalt, zinc, and other metals, enabling certain analyses to be completed in 15 minutes which formerly occupied half a day.

The Mixing of Solid Particles—II

Some Practical Experiments

by P. M. C. LACEY, B.Sc., A.C.G.I., D.I.C.

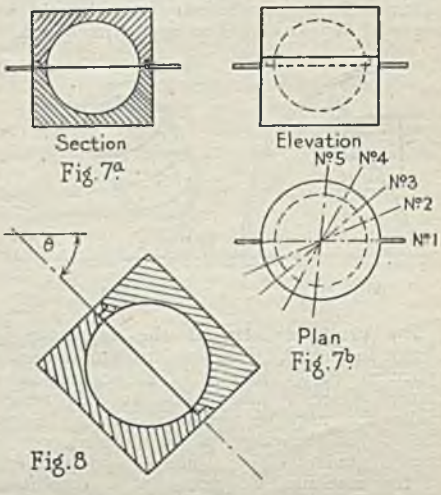
(*Continued from* THE CHEMICAL AGE, *August* 11, *p.* 124)

THE fact that one may obtain the whole of the mixture in one sample is only one manifestation of a process which goes on in all the sampling operations, namely, an interference with the operation of pure chance; for instance, when a number of samples have been taken one may have removed too many of one type of particle, so that one has upset the probability which governs the composition of samples taken subsequently. A factor should therefore be incorporated in the formulæ to allow for this reduction in the number of degrees of freedom. The effect of this would only be felt, however, when dealing with the extreme lower limits of probability, and where the sample size is comparable with the total amount of material present; the formulæ have therefore been left here in their simple form.

If one takes practically unmixed materials in a mixing machine, analyses them straight away into samples of different sizes, and calculates σ, and then M, for each size, a curve will, it is suggested, be obtained something like No. 1 in Fig. 6; if the machine is worked for a little and the material again analysed in the same way, a curve will be obtained resembling No. 2. If the mixing operation is repeated again from zero, but continued for a longer time before analysis, curve No. 3 will result, and so on, the ideal-mixture line being gradually approached more or less asymptotically up a family of curves. Very probably a family of curves of characteristic shape would be obtained for each combination of mixing machine and materials. The amount of material in the machine, too, would be expected to affect the shape of the curves, and, to a larger extent, the rate at which the successive curves were reached.

The important thing to note is that each line definitely represents a particular mixture, and the method of analysis is almost eliminated, for allowance has been made for it at every stage. This emphasises the point that the mixture probably *cannot* be represented completely by a single number. However, when it comes to the practical case, in which one has the same types of machine dealing with the same types of particle, the shape of the family of curves may be more or less fixed, and in this case one might use some single number, which could be *called* the mixing index to indicate which curve one had reached. There are obviously many ways of doing this, depending on the actual shapes of curves one has obtained, and on the order of sample size which it is most convenient to use. For instance, if the samples were small, and the curves were shaped roughly as in Fig. 6, one might take the tangent of the angle θ; this would become zero for the worst mixtures and *tan* 45° (*i.e.*, unity) for the ideal mixture. Another way would be to take the area enclosed between the curve, the non-mix line, and the M axis, and express it as a fraction of the area of the triangle above the non-mix line. This would give the same range of value for the mixing index, *i.e.*, 0 to 1. Or one might take the distance of the minimum in the curve from the base line. But it is all a matter of convenience, determined by the particular case in hand, and is bound to be more or less empirical.

A number of experiments has been carried out to test the foregoing theory, and although circumstances have made it necessary to limit these to a very few preliminary trials, the results are thought to be of interest.



To eliminate as many variable factors as possible, a material was chosen ("bullet tapioca") consisting of small spheres roughly 0.2 in. in diameter, half of them being dyed black. There was therefore no difference between A-particles and B-particles which might influence the mixing.

Again, to eliminate variable factors, as simple a mixing machine as possible was used, with no vanes, paddles, etc. It consisted of a hollow wooden sphere 8 in. in diameter, simply rotated about an axis through

the centre, (Fig. 7). (For convenience in manufacture the external shape of the machine was made cylindrical.) The axis of this was arranged as in Fig. 7a, so that it would be possible to take off the top half of the machine as a lid. Even in this simple machine one undesirable variable is still present—the coefficient of friction between the particles and the wooden surface of the machine. In future work this will be standardised by gluing a layer of the particles themselves to the inner surface. If this machine is rotated about a horizontal axis it will be seen that the material in the centre becomes well mixed, but particles at one end never reach those at the other. What is needed is rotation as shown in Fig. 7b, first about axis No. 1, for a while, and then round a new axis, No. 2, and then round No. 3 and so on; or preferably about a series of such axes, infinitely close together, in succession. Mathematical analysis of such a motion shows that it amounts to simple rotation about a single axis at an angle θ to the horizontal (Fig. 8). If the machine performs x revolutions about this axis, it is exactly equivalent to its performing $x.\cos\theta$ revolutions about a horizontal axis, this axis itself swivelling in the horizontal plane through $x.\sin\theta$ revolutions. The effect on the mixing of altering the angle θ is, of course, one of the points requiring investigation. In the preliminary experiments an angle of 45° was used as a starting point.

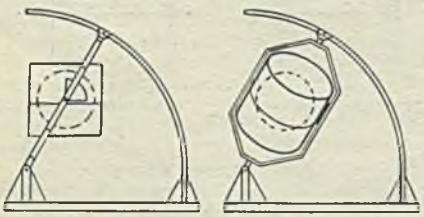


Fig. 9 (a) . . . . (b.)

The practical form of the apparatus is shown in Fig. 9. The wooden cylinder, with spherical cavity inside, is suspended in a frame which rotates about an axis whose inclination may be varied at will by fixing the upper bearing to any point on a curved guide. Fig. 9 shows two positions of the machine, a quarter of a revolution apart. It was arranged in a frame so that, from the external point of view, it would always come up to the vertical (as in Fig. 9a), at the end of each revolution. Since the cavity is spherical all positions of it are alike to the material within it. The machine was always used half full, and it could be stopped at the end of any number of revolutions, when the lower half could be removed and its contents examined, and if necessary subjected to detailed analysis.

The analysing apparatus (Fig. 10), made of tinplate, consisted of a series of trays (a) of various widths, arranged inside a cylindrical casing (b), so as to produce a honeycomb structure, which is seen in plan view at (c). In order to analyse a batch of material the analyser is placed upside-down

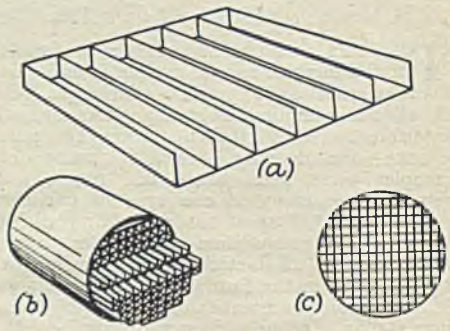


Fig. 10.

on top of the lower half of the machine with its contents, and the whole assembly turned the other way up, so that the mixture falls into the cells of the analyser. This operation requires a special technique to avoid the introduction of extra mixing in the process. The material being all in the analyser, the latter is laid down on its side and the trays, now horizontal, drawn out one at a time.

The material has now been divided by the the trays into a series of columns, this being the first step in dividing it up into roughly cube-shaped samples. The process might be completed by mechanically dividing up the material in each column of each tray in

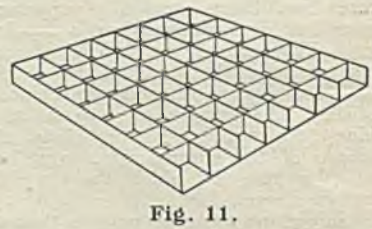


Fig. 11.

the manner indicated in Fig. 11. As, however, it will still be necessary to count the particles in each sample, the following method, though tedious, is more practicable. The particles are removed one by one from each column in turn in each tray, and a record made of the order in which the blacks and the whites are found. This record is then divided up into groups corresponding in size with the smallest sample to be dealt with; in practice it is necessary to choose the dimensions of the samples first, and then, by an experiment on bulk-density, to find out how many particles it must contain.

It is now possible to work out the com-

positions of these individual samples, and finally to calculate σ, the Standard Deviation of the composition. This value of σ will, of course, only relate to the one size of sample; by regrouping these samples, however, in pairs, fours, eights, etc., one may consider the mixture to have been divided up into samples double, four times, eight times, the size. This can be repeated for increasingly large samples until a point is reached where they are so big that they are few in number, and then the results of an analysis have little statistical significance. In the ordinary way, to group the samples in pairs would mean a change in sample shape, which, as already pointed out, may influence the result. However, a shape of sample can be used which does not get altered by this doubling process (*see* Fig. 12). The lengths of the three sides must be in the ratio of $1 : 2\frac{1}{3} : 2\frac{2}{3}$ (*i.e.*, $2^0 : 2\frac{1}{3} : 2\frac{2}{3}$). If the shortest side is doubled, the new shape obtained is actually the same as the first, on a larger scale, but turned round a different way. The process may be repeated indefinately.

In the present work, the smallest sample that could safely be taken contained as many as 40 particles; anything smaller required smaller cell dimensions, and this was found to interfere with the natural distribution of the particles while they were falling into the analyser. Hence the available sample sizes —*i.e.*, values of n—were 40, 80, 160 and so on, up to 1280. At this point there were only some half-dozen samples, and these could not give a reliable result statistically.

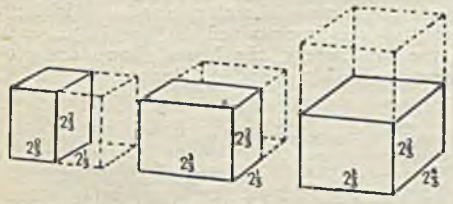


Fig. 12.

Only four experiments have been completed so far, and Fig. 13 shows the results obtained on calculating the values of M for different sample sizes. In the first place a non-mixture was analysed; that is to say, the materials were placed side by side in the machine and then analysed directly, without any rotation. The points (curve 1) can be seen to lie a little above the theoretical non-mix line, for not only are the particles mixed a little in falling into the analyser, but the mere contiguity of the two kinds constitutes a small amount of mixing, since it can give rise to samples containing both kinds. It is actually impossible for the curve to fall *below* the non-mix line.

In the second experiment the materials were mixed by hand for a very long time; the operation was continued long after the particles appeared to be completely mixed. Analysis yielded curve 4 in Fig. 13 These points do not lie exactly on the theoretical line, but, of course, it could not be guaranteed that the materials *were* as well mixed as they could be. Moreover, there were

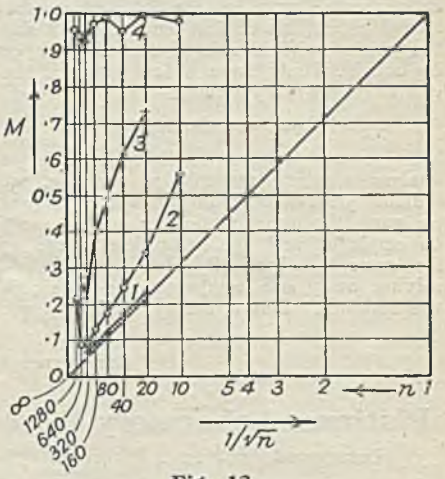


Fig. 13.

only some 20,000 particles in the mixture, and for such a low value of N one may get occasional deviations from the true value of σ, even in the ideal mixture. It must also be admitted that since the calculations are extremely laborious, even with the aid of a calculating machine, arithmetical errors may account for some of the erratic results. Lastly, two cases of partial mixture were considered. Curve 2 is the result of turning the machine through 10 revolutions about an axis at 45°. When it emerged, the material had a large core of white to one side of it, and was definitely a very bad mixture.

The experiment was then repeated with 20 revolutions of the machine, with the unexpected result that the same core of white appeared; and it occurred again even after 40 revolutions. This strongly suggested that the central core of the material never moved at all, probably owing to the very large frictional forces set up between the rather rough surfaces of the particles. Unfortunately, there has as yet been no time to investigate this further, but it was desired, for the purposes of this paper, to illustrate the conditions prevailing in a rather more complete mixture; so the mixing of this last material was increased by giving the machine an extra 10 turns about an axis at right-angles to the original. The resulting curve does not, of course, really belong to the same family as the previous one, but it will serve to indicate the results to be expected. The important point is that the mixture so produced was hardly distinguish-

able by eye from the ideal one, whereas analysis yielded curve 3—a long way from the ideal.

It will be remembered that in Fig. 6, the imaginary diagram, all the curves were made to loop up on the left to reach the M = 1 line, where n approached infinity. The experimental curves so far obtained do show strong indications of this tendency, but since the points on this side of the diagram can be obtained only from a few samples they can never be very reliable.

Random Sampling

It is not suggested that, in order to analyse a given material in practice, this tedious process of counting would have to be gone through; random sampling would be employed and the samples analysed by, for example, chemically or physically dissolving away one component and weighing the residues. But a theory to enable such data to be interpreted can only be evolved from one which is based on the behaviour of individual particles. When this has been extended to cover the mixing of particles of different sizes, practical work can be carried out to determine the effects of such variables as the scale of operation and the fulness of the machine, and the density, shape, surface roughness, etc., of the particles. It may finally be possible to evolve criteria for the comparison of mixing machinery.

Conclusions

The conclusions to be drawn from the preliminary work are: (a) that it is probably impossible to express the state of a mixture adequately by a single number; (b) that the state of a mixture *can* be expressed by a line on a suitable graph; and (c) that this can provide a quantitative as well as qualitative method of comparing mixtures and the performance of mixing machines.

Platinum Laboratory Ware

Improved American Material

AN improvement in the quality of platinum laboratory ware, a war-time necessity in the United States, has been achieved, it is claimed, by a new, and thoroughly tested, material entitled "Capaloy Platinum." This is an alloy combining all members of the platinum family: it has flexibility and its outer surface reveals no scoring after numerous fusions. It shows remarkable resistance to the inexperienced handling which eventually causes cracks in all other types.

Though attacked by boiling aqua regia, "Capaloy Platinum" is resistant to all other acids. This alloy must be used with the same precautions as any platinum ware; namely, not for the ignition of phosphates or arsenates, nor for the reduction of easily-fused metals, such as lead, etc.

The following tables give comparative figures showing some physical characteristics of "Capaloy" and ordinary platinum, as well as average loss in weight per cent. through normal laboratory usage. Although control was maintained in the latter case over two weeks, the losses shown are proportional to those suffered during six months'

TABLE 1

	"Capaloy" hard-drawn	Platinum[2] hard-drawn	Platinum[2] annealed	90–10 Pt–Rh	Crucible platinum
Tensile strength lb./sq. in.[1]	95,100	56,000	43,600	—	—
Brinell hardness[1]	190	90	35	90	30

[1]The above tests were carried out by Ralph K. Witt, Consulting Engineer, Johns Hopkins University, Baltimore.
[2]J. Bishop & Co.'s data calculated from results of testing 1 mm. wire.

Crucibles of this material have been in continuous use for two years in one of America's leading commercial research laboratories, as well as in a chemical warfare arsenal and in individual laboratories.

"Capaloy Platinum" is non-oxidisable, at all temperatures, for all practical purposes, owing to the successful balance of the platinum family alloys with pure platinum.

Its Brinell hardness—190 for hard-drawn—is more than three times that of regular 10 per cent. rhodium-platinum, and 6½ times harder than crucible platinum. Its tensile strength is considerably greater than that of hard-drawn or annealed platinum. Its colour is the silver-grey of regular platinum, but slightly darker, and it keeps the same uniform colour because it does not smear.

use of the crucibles. It is stated that after six months of constant use the "Capaloy" crucibles presented a smooth outer surface without a trace of scoring. During the same period it was unnecessary to reshape the crucibles.

TABLE 2

Average loss in weight per cent. over 2-week period

Use	"Capaloy" crucible[3]	Platinum crucible[3]
Determination of SiO_2 by volatilisation	0.0086	0.018
Fusion of TiO_2 ores with Na_2CO_3 and $NaNO_3$ ...	0.156	0.512

[3]The above tests were carried out in the analytical laboratory of the Chemical and Pigment Company, St. Helena, Baltimore.

Further information is obtainable from Capaloy Platinum Works, 207 West Saratoga Street, Baltimore 1, Maryland, U.S.A.

SAFETY FIRST

Accident Responsibility

by JOHN CREEVEY

RESPONSIBILITY for the avoidance of accidents lies in three distinct directions; it is the concern of management, of sectional overseers or foremen, and of the actual workpeople. Where a safety officer is employed, he may be placed under the heading of management.

When workpeople suffer injury as the result of accident, the avoidable contributory cause is either negligence or ignorance, and sometimes misunderstanding. Negligence can be reduced by removing people from work which is unsuited to them, whether physically or mentally—work which is distasteful, or even temporarily uncongenial. Ignorance can be avoided by proper training for the job, and by continuing that training in more or less occasional talks throughout the year, the extent of such talks to be determined by the nature of the work. The accident-prevention poster and leaflet take the place of the talk, in a limited way, perhaps more as a kind of reminder that accidents do happen and their consequences are evil, though in the main they are avoidable.

The Foreman's Task

By no means the least important people concerned are the sectional overseers or foremen. Their place in the organisation of the works is intermediate between management and workpeople. The foreman is directly responsible for production activities, and also to a large extent for the safety of the workpeople under him. If he is a man who closely follows safe practices, and one who is able to give instruction in safety matters, and who, by gentle pressure, insists upon a close adherence to all that appears to be desirable from the viewpoint of safety, and if he has an eye keen enough to detect small things that ought to be rectified, it should follow that the number of accidents occurring will be kept at the minimum. As each new employee enters his department, the foreman should assure himself that the new employee is not ill-fitted for the work which is to be assigned to him, and, if instruction has not already been obtained, the foreman must arrange for instruction to be given, included with which will be all necessary details concerning hazards and safety measures. The foreman, moreover, must see that no employee under his direction is allowed to continue at any operation for which he is either physically or mentally unfit. If the foreman cannot, or does not, do that, it is the management's duty to replace that foreman by someone more suited to the responsibility which attaches to the post. The foreman must see that each employee wears clothing which is safe and appropriate for the duties to be performed, and that safety devices deemed desirable are not only issued but are also used; persuasion rather than direct enforcement of use is desirable at all times, and with all types of employee. It is also the responsibility of the foreman to see that safety devices on the plant are always in place, and in good working order. Additionally, it is his duty to see that any accident, or illness or injury, is immediately reported to the proper authority in the organisation of the works.

Just as the management should take foremen into their confidence, so should the foremen deal with their workpeople. In order that foremen may keep in touch with new developments, it is desirable that they meet collectively at least once a quarter; on these occasions some really responsible member of the management should address the meeting, at which, apart from what the management contributes, there should also be at least half an hour devoted to a discussion of safety matters. Such meetings should be arranged to suit the convenience of routine at the works, but not less than 80 per cent. of foremen should be present if complete attendance is not possible.

In their separate spheres of activity at the works, foremen should make themselves familiar with all features which concern the workpeople under them, and they should keep their own record of accidents apart from any in the hands of the management. The foreman should not only know his own particular job in the matter of overseeing the workpeople; he must also know the job that they do, and from the viewpoint of their experience. A foreman whose duties bring him (or his workpeople) into contact with a particular chemical should know all that there is to know concerning the safe storage and handling of that chemical.

Knowledge of Chemicals

This knowledge of the nature of chemicals is sometimes a little vague on the part of both foremen and workpeople, but sources are available from which information may be gathered and disseminated. Users of aniline, for instance, should be cautioned that all rooms in which there is storage or handling of aniline must be well ventilated, and, where possible, the aniline should be handled in closed receptacles fitted with tight-fitting covers. The management, on their part, must remember that floors made

of asphalt, tar, or porous materials of construction must be avoided, as such materials readily absorb aniline from spillage, and aniline poisoning is the evil consequence. Aniline oil is readily absorbed by the unbroken skin and the mucous membranes; poisoning by absorption may occur when aniline is splashed on clothing, by the inhaling of fumes, and by direct swallowing of minute particles of liquid or vapour along with dust and saliva. When a man's clothes are splashed with aniline, he should be taken to a place where he will obtain plenty of fresh air but still remain comfortably warm. His clothing should be removed and, after the excess of aniline has been sponged from the body with aid of soapy water, he should be well sponged with vinegar. During this first-aid attention, care must be taken to see that the fumes of the aniline are not breathed by the patient or those attending him. In cases of acute aniline poisoning, there is no harm done by administering a mild stimulant such as strong black coffee, but all alcoholic stimulants must be avoided. Where some of the aniline has been swallowed, it is well to administer one ounce of glucose in water which has been made alkaline by addition of sodium bicarbonate; but this is only possible when the man is still conscious; if he is unconscious, artificial respiration should be applied, while awaiting the arrival of a doctor.

Vinegar for Aniline Poisoning

All this, and more, the foreman in a department handling aniline should know, and, moreover, he should be experienced in giving artificial respiration. Vinegar, or acetic acid diluted to a strength of 3 per cent., should always be available for use in sponging the body after any aniline has come in contact with the skin, and yet in many works where aniline is handled you would find delay in obtaining a supply of vinegar or dilute acetic acid for immediate use.

To appreciate all the things that may happen in a particular plant operation or in handling a particular chemical goes far in eliminating accidents, considered apart from the common accidents; only by realising the dangers is it possible to envisage the precautions to be taken in safeguarding the worker from risks. But it is not only necessary to look at the course of events when things go smoothly; things sometimes go wrong, because some small matter has been overlooked, possibly days earlier, as where lack of attention to maintenance ultimately gives a leaky pipe-joint or a valve which sticks and defies opening or closing at a rather important moment. Of course, the "sticking" valve should be detected by periodical trial operation, as at the start of each shift on the plant, and it is the foreman's duty to see that this trial closing and opening of valves is carried out and, in exceptional cases, he should be personally present.

In the operation of almost any type of plant there are safety precautions to be observed. Taking a simple form of pulveriser as example, before starting it is necessary to see that the belt guard is fastened in position. It may be needful to turn on water for cooling to the gearbox, and personally to put on a respirator before switching on the electric motor which operates the pulveriser. To tell new workpeople "never to put their hand into the feed hopper while the motor is running" is very necessary although it may seem to be merely emphasising an obvious caution; that caution must be exercised is most obvious when the mill is running, but risk of accident is greater when the mill is at a standstill and the motor is running and merely out of gear with the mill. Human nature is such that when a man has once put his hand into the hopper of a stationary mill without suffering injury while the motor was still running, but out of gear, he has little hesitation in doing so again. It is like the child who feels some fascination for quickly touching the bars of a grate with red-hot coals behind the bars, and drawing away the finger so rapidly that no serious burning results; in due course there is a little longer lag of time, and the result is a burn. Contempt for the stationary mill leads to contempt for the mill when it is actually running, and the hand is suddenly dragged in with part of the charge. Moreover, there is another risk which must be envisaged when the mill is actually stationary and the motor is running, but out of gear: at any moment someone may accidentally put the motor in gear with the mill.

AID TO U.S. PATENTEES

Acting on the assumption that many owners of unexpired patents would be glad to grant licences under their patents on reasonable terms but have not done so for lack of means, the U.S. Secretary of Commerce, Henry A. Wallace, has instructed the Patent Office to come to their aid.

Anyone who has a right to grant a licence under a patent may request the Commissioner of Patents to register his patent. The inventor or his assignee must identify the patent and give the title of the invention and the number of the patent and indicate to whom correspondence is to be addressed. Patents thus registered will be published in the Official Gazette of the Patent Office.

Manufacturers who are looking for new products will be furnished with lists of patents on the register which may appeal to them, and inquiries referred to the owners of registered patents.

U.S. Chemical Companies in 1944

Financial Position and Prospects Reviewed

SALES and earnings of most United States chemical companies continued at a high level in 1944, states an article in the annual chemical number of the *Journal of Commerce*. The average increase in the sales of thirty chemical companies was 7 per cent. in 1944, as compared with the previous year. There was little change in earnings during the year, the average declining only 3 per cent., thanks to higher taxes and some increase in costs.

As shown in the appended table, all but five of the thirty companies reported increased sales. The increases ranged between a fraction of 1 per cent. and a gain of 46 per cent. The declines were moderate in all instances.

While there was little change in average earnings, there was a wide variation in the earnings reported by individual companies. Chas. Pfizer & Co. heads the list with a gain of 31 per cent. in share earnings. This was due in large part to the company's production of penicillin, ascorbic acid, and riboflavin (*see* Table 1).

Since the outbreak of war in 1939, sales of U.S. chemical companies have increased substantially. The average sales increase of thirty companies during the period 1939-1944 was 130 per cent., the increases ranging from 46 per cent. to 350 per cent.

The average increase in net income before taxes of thirty chemical companies during the period 1939-1944 was 159 per cent. Income and excess profits taxes took most of the gains, and the average increase in net earnings, after taxes, was 18 per cent.

The tremendous effect of war-time taxes on earnings can be further illustrated by examining the figures of a few well-known companies (*see* Table 2).

The excess profits tax bears most heavily on those companies that have a pronounced upward trend in sales and earnings. Chemical companies, therefore, were especially affected by this tax. Repeal of the excess profits tax after the war should contribute largely towards increased earnings and dividends of chemical companies.

The record of chemical stock prices over an extended period of time has been out-

TABLE 1

	Earned Per Share Before Taxes 1939	1944	Increase %
	$		
Chas. Pfizer	2.19	18.46	+741
Abbott Labs.	3.20	13.48	+321
Dow Chemical	4.64	17.59	+278
Union Carbide	4.58	13.04	+185
Hercules Powder	4.66	12.56	+169

	Earned Per Share After Taxes 1939	1944	Increase %
	$		
Chas. Pfizer	1.73	4.67	+170
Abbott Labs.	2.61	3.43	+ 31
Dow Chemical	3.95	6.34	+ 60
Union Carbide	3.86	4.06	+ 5
Hercules Powder	3.65	3.26	− 11

TABLE 2—*Sales and Earnings per Share of 30 leading U.S. Chemical Companies in 1943 and 1944*

	Sales (In thousand $) 1943	1944	% Gain	Earnings per share $ 1943	$ 1944	% Gain
Chas. Pfizer	16,746	24,436	+46	3,56	4,67	+31
Bristol-Myers	28,680	34,456	+20	4,02	3,66	− 9
United Carbon...	11,395	13,457	+18	5.15	5,61	+ 9
Abbott Laboratories	33,265	38,428	+16	4,19	3,43	−18
Heyden Chemical	14,212	16,413	+15	1,64	1,85	+13
Texas Gulf Sulphur	28,346	32,459	+15	2,07	2,50	+21
Dow Chemical	105,428	120,427	+14	6,35	6,34	0
Atlas Powder	39,977	45,024	+13	5,45	5,28	− 3
Eastman Kodak	269,044	303,673	+13	8,85	9,15	+ 3
E. R. Squibb & Sons	42,432	47,893	+13	4,81	4,01	−17
Columbian Carbon	21,188	23,562	+11	5,78	5,91	+ 2
Freeport Sulphur	16,555	18,004	+ 9	3,10	3,20	+ 3
Proctor & Gamble	302,154	326,132	+ 8	3,13	2,94	− 6
National Oil Products	13,471	14,455	+ 7	2,20	2,34	+ 6
Monsanto Chemical	81,697	86,996	+ 6	3,56	3,30	− 7
E. I. du Pont de Nemours	612,939	646,168	+ 5	5,59	6,60	+18
Air Reduction	94,114	97,949	+ 4	2,41	2,15	−11
Union Carbide & Carbon	488,351	507,919	+ 4	4,13	4,06	− 2
Mead Johnson	17,297	17,788	+ 3	11,77	10,26	−13
Victor Chemical Works	14,564	14,934	+ 3	1,53	1,41	− 8
International Salt	10,195	10,334	+ 1	2,94	2,70	− 8
Mathieson Alkali Works	18,206	18,380	+ 1	1,34	1,40	+ 4
Owens-Illinois Glass	172,132	174,584	+ 1	3,56	3,06	−14
Westvaco Chlorine Products...	18,177	18,423	+ 1	2,62	2,04	−22
United States Potash...	7,250	7,278	0	3,50	3,58	+ 2
Parke, Davis	49,841	49,811	0	1,68	1,55	− 8
Pennsylvania Salt Mfg.	26,580	26,069	− 2	1,87	1,94	+ 4
Allied Chemical & Dye	303,757	294,717	− 3	8,59	8,14	− 5
Merck & Co.	57,905	52,763	− 9	3,11	1,75	−44
Hercules Powder	122,519	105,678	−14	3,93	3,26	−17
AVERAGE	...	...	+ 7	...	...	− 3

standing in comparison with other major groups of securities.

The broken line in Fig. 1 shows how the investment of an equal amount of money in twenty-four chemical companies made at peak prices in 1929 would have fared to date. The solid line shows the Dow-Jones industrial average over the same period.

Chemical investment in 1945 stood at 132 per cent. of the 1929 standard, as compared with 44 per cent. for the Dow-Jones industrial average.

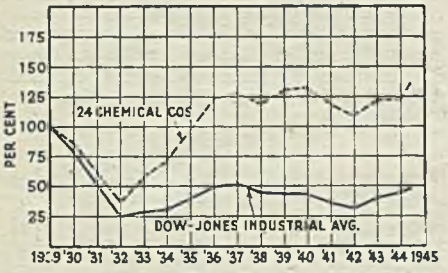


Fig. 1.

Chemical stock prices have had no inflationary rise since the outbreak of the war. As shown in the chart, the average price of twenty-seven chemical stocks to-day is only slightly higher than in 1939. The outstanding progress made during the war years in research and new products has been reflected neither in stock prices nor in earnings. Elimination of excess profits taxes after the war should make it possible for this substantial progress to be reflected in higher earnings and stock prices.

Large Plant Expansion

There are many factors that have a bearing on the post-war outlook for chemical companies. Perhaps the most important question is the large plant capacities provided to meet the needs of the war. More than $1,200,000,000 has been invested in chemical plant expansion during the war; however, it does not follow necessarily that there will be such a large excess capacity at the end of the war as to have a serious effect on earnings of chemical companies in general.

A considerable part of the expansion has been for military explosives, ammonia, toluol, chlorine, other heavy chemicals, synthetic rubber, magnesium and high octane petrol. Much of this expansion has been financed by the Government and the companies have little capital at risk in the business. Since fees for operating the plants are small, curtailment on termination of the war should have little direct effect upon earnings.

For example, du Pont's net compensation for construction and operation of Government-owned war plants amounted to 50c. per share in the five-year period ended December 31, 1944. This is equivalent to only 1.6 per cent. of the company's net earnings during this period. Other chemical companies have had much the same experience.

Some of the military explosives can be turned to peacetime use. For example, pentaerythritol, several times as powerful as TNT, has good prospects of developing a large market after the war in the paint and varnish industry. Pentaerythritol resins impart quick-drying properties and tough durable films to linseed oil base paints.

Ammonia and Chlorine Capacity

Perhaps one of the most critical situations in the early post-war years will be in synthetic ammonia. Capacity has been expanded many times to meet the needs for smokeless powder, toluol, pentaerythritol, hexamethylenetetramine and other military explosives.

Some of the Government plants may be kept in stand-by condition as a military necessity, while others may not be sufficiently well located to compete successfully under post-war conditions. Methanol can be made in ammonia equipment with relatively minor alterations, and plans are being made to convert a portion of the ammonia equipment to this use. Post-war demand for methanol should continue at substantial levels for the manufacture of formaldehyde for the phenolic, urea, melamine and casein plastics.

The probability of large supplies of ammonia at low prices has stimulated research on new uses. For example, du Pont is developing an appreciable market for urea, which is derived from ammonia, as a protein cattle feed.

There has been a large increase in capacity for chlorine. Production in private plants has climbed from 514,000 tons in 1939 to 1,262,000 tons in 1944. This increase is a continuation of a sharp upward trend that occurred in the ten years before the war. After the war, large quantities of chlorine will be required for the manufacture of the new chlorinated hydrocarbons; for the production of a number of plastics such as the vinyls, vinylidene chloride, chlorinated styrene and silicones; for the synthetic rubbers Neoprene and Thiokol; for DDT; and for phosphorus oxychloride which is playing a vital rôle in the manufacture of medicinals. These and other new uses should in time more than offset decreased demand for chlorine in the production of smokeless powder and war gases.

The post-war outlook for the newer synthetic organic chemicals is quite a different matter. Here there is no problem of overcapacity. The principal question is how

soon materials and equipment can be obtained to build the plants necessary to produce the many new chemicals developed by research in the past five years. The post-war building programme of the chemical industry is ready to begin as soon as war and economic conditions will permit.

Penicillin

Almost everybody is familiar with the large volume of business developed in sulphonamides, vitamins and penicillin. In connection with the last, Chas. Pfizer & Co. deserves special mention. Pfizer is the world's largest producer of penicillin, and through lowered costs has progressively and substantially reduced the price. While some of these chemicals may have had a major share of their growth for the time being, this does not mean that there are no further prospects for pharmaceuticals. There are as yet no specific chemicals for the treatment of tuberculosis, cancer, infantile paralysis, and little that is really effective for the common cold. This is a challenge to the industry, and in time, in all probability, the challenge will be largely met.

Plastics

There is no universal plastic that is best suited for all of the many applications. The older plastics—phenolics, acetates, nitrates and ureas—will continue to be used in large quantities because of their desirable physical properties and their low cost. The vinyls already have achieved an important position, production amounting to over 200,000,000 lb. a year. Cost reductions and an ever-widening field of application indicate continued growth in the post-war years.

Polystyrene is the best material developed to date among rigid plastics for short-wave high-frequency electrical insulation. It has found a large market in electronic equipment, and may be required for the solid support member of the central wire in coaxial cables.

Polyethylene, one of the newest plastics derived from petroleum, is one of the best electrical insulating materials among flexible plastics. It is being used along with polystyrene in electrical insulation, and a wide field of application is available.

Some of the silicone plastics possess the highest heat resistance of all plastic materials, and have many promising post-war applications.

Perhaps one of the most important plastic developments is in the field of so-called "contact resins"—that is, resins that will cure on contact without application of heat and pressure, thus eliminating need for expensive high-pressure moulding machinery, and greatly broadening the field of plastic application. Allyl phthalate derived from petroleum and phthalic anhydride, a coal-tar product, belong to this group.

The chemical industry occupies a favourable position with respect to conversion from war to civilian production. Most of the chemicals used in war are the same as those used in peace. Conversion involves principally a change in customers and uses, rather than a costly change in products and factory equipment.

Women in Factories

An Examination of Conditions

TWO interesting booklets dealing with the health of women employed in industry were published this week by H.M. Stationery Office. These are *Why is She Away?* (price 4d.) and *A Study of Women on War Work in Four Factories* (price 9d.). According to these the illnesses which cause most lost time are respiratory, nervous, fatigue, and digestive ailments. Work on the night shift seems to be responsible for many of the digestive troubles. Night work was definitely disliked by one-third of the women, while another third definitely liked it. The main reasons for the dislike of the night shift (apart from the digestive troubles) were inability to sleep during the day, alleged poor ventilation in factories at night, longer hours, and disturbance of family life. Those who liked working at night said it was mainly because of the comparative absence of disturbing and distracting influences and because it gave them a chance to do things during the day.

In *A Study of Women on War Work in Four Factories* it is stated that about 59 per cent. of the women interviewed claimed to have had good health before entering the factory, and 46 per cent. alleged that their health had been impaired by factory work. Younger married women and older single women had the poorest health histories. About half had worries and anxieties mainly connected with menfolk overseas, health matters, and home affairs. The shorter of the two booklets, *Why is She Away?* is written in a more popular style and is based on the facts given both in the other booklet and in an earlier investigation on the same subject.

In general, it seems that the women were content if the wages and comfort reached reasonable standards, if hours of work were not too long, and if they were not moved from their usual jobs. Not more than 2 per cent. were seriously dissatisfied with their jobs and with everything connected with them, while from 10 to 15 per cent. were moderately dissatisfied.

The Chilean Government, in order to facilitate an increase in nitrate of soda production, has made arrangements to exploit certain fiscal nitrate reserves in the Province of Tarapacá.

Dust-Collecting Unit

Compactness and Simplicity

THE "Drymat" Unit, manufactured by Dallow, Lambert & Co., Ltd., Spalding Street, Leicester, is a compact, self-contained dust collector of exceptional performance. It comprises a steel cabinet which houses a fan, motor, primary dust separator, lint trap, filter, dust drawer, and filter-shaking mechanism. In operation the dust-laden air enters a low-velocity chamber where heavy dust is deposited. Lint or matter of a fluffy nature is collected by a special trap. The fine dust then passes upwards to a special form of filter, which provides a maximum fabric area in a minimum space. This filter is of unique design, and comprises a series of mats on to the outside of which the fine dust is deposited. It occupies less than half the space that is required by a filter consisting of the conventional type of 6 in. diameter filter bags.

Owing to the consequent very low air

Polishing machine with standard "Drymat" equipment in a large aero-engine works. The hand-shaker, for depositing the lighter dust, is seen on the front of the unit.

velocity through the fabric, it is claimed that an unusually high separating and collecting efficiency is obtained with practically any type of dry dust. The cleaned air passes on through the fan which is of efficient curved blade design, and is powered by a totally enclosed motor running at 2800 r.p.m. All heavy particles of dust and lint are automatically collected in the dust drawer, the lighter dust being deposited into this same receptacle by the simple hand-shaker. The drawer is easily handled, and no water or oil is used in the collectors.

Unit collection of process dusts is essentially modern. Machines equipped with units can be re-disposed in shop layout without necessity for costly re-arrangements of ducting schemes. Individual machine control effects power savings, and where the cleaned air is not discharged to atmosphere, air changes and corresponding heat losses in a building are obviated. Even where the air is discharged to outside atmosphere, the saving is still considerable inasmuch as only the units in operation have their fans running.

Short ducts represent cost and maintenance savings, and continuity of machining operations is permitted without diverting components to separate polishing or grinding shops. Where multiple connection plants are still required, the makers have the facilities for design, manufacture and installation.

AIR SPEEDS (ft./min.) RECOMMENDED IN DUCTS TO CONVEY VARIOUS MATERIALS

Grinding dust ...	3,500	Light alloy swarf	5,000
Polishing lint (dry)	2,500	Rubber dust ...	3,000
Polishing lint (sticky)	4,000	Sander dust ...	2,500
Sawdust (dry) ...	3,500	Cast iron dust	3,000
Sawdust (damp)	4,000	Plastics dust ...	3,000

(These figures are only a general guide, as it is usual to vary velocities according to local conditions, concentration of dust, particle size, and specific gravity).

These figures are only a general guide, as it is usual to vary velocities according to local conditions, concentration of dust, particle size, and specific gravity.

Styrene from Still Residues

New Canadian Process

A CATALYTIC process has been developed and patented in the United States by Dominion Tar and Chemical Co., Ltd., Montreal, for the production of styrene, nuclear substituted styrenes, and kindred products, by the decomposition of diaryl ethanes, produced synthetically or derived from benzol still residues.

Based on the observation that benzol still residues contain phenyl aryl ethanes, such as xylyl ethane, the new method consists essentially of the simple molecular decomposition of such diaryl substituted paraffins by closely controlled circulation of vapours of hydrocarbon oils containing such substituted paraffins through a converter, packed with hydrated aluminium silicate as a catalyst, at operating temperatures of 350°-600°C. Other claims, embodying the employment of vapour diluents including water, benzene, and fixed gases, cover methods of increasing yield, obtaining high purity products, and prolonging the life of the catalyst.

Among the chemicals manufactured to date by this conveniently operated and economical process, apart from styrene, are *p*-methyl and dimethyl styrene, chloro- and dichlorostyrene, and other vinyl compounds.

French Chemical Notes

Slow Improvement Maintained

IMPORTS of olive oil into France during the first half of this year were valued at 559 million francs, compared with nil in 1944, 7000 francs in 1943 and 152 million in 1938. The great increase in value as compared with 1938 is largely due to the heavy increases in prices since that date. The value of exports of French products (in million francs) in the first half of 1945 included 71 for essential oils, 63 for chemical products, 129 for perfumery, and 69 for pharmaceutical products. Two large superphosphate plants in the Rouen district have been able to resume operations thanks to the arrival of pyrites and phosphates.

Sodium and Chlorine Products

The production of sodium carbonate is about to be resumed at Varangéville; and, meanwhile, the arrival of a further 10,000 tons from England is expected. Chlorine production has regained the 1943 level, and caustic soda is increasingly in better supply, especially in the Alps. Hydrochloric acid, on the other hand, remains in short supply, though it is reported that a further plant has been put into operation in the Midi.

Sodium bichromate production has been resumed, and 6150 tons of tanning extracts were imported in the last month, or a total of 9560 tons since the liberation. Increased activity has been shown in the carbonisation plants in the Landes regions, but in the oil and varnish industry difficulties are being encountered through lack of solvents. The slight increase in activity shown in the glass industry during the last quarter of 1944 was maintained during the first half of the year. The index of total output (1938=100) rose to 23 in February, 32 in March, 37 in April, 47 in May, and 49 in June. This last figure, lower than that established during the years of occupation, seems to constitute a ceiling which the persistence of the coal crisis will not allow to be exceeded within the near future.

L'Air Liquide

The annual report of the Soc. L'Air Liquide states that, since September, 1944, all the company's efforts have been concentrated on the resumption of operations in its plants, the most seriously affected of which have been those of La Seyne, Brest, Lyons, Rousies, Reims, and Nevers. In spite of the difficulties encountered, 25 oxygen and 25 acetylene plants had been restored by the end of the year. In Belgium, the Langerbrugge, Couillet and Ougrée plants had suffered damage, but in Spain and Portugal results had shown a slight improvement. In Sweden the situation appeared scarcely to have been maintained, but accounts for the second half of the year arrived too late to be included in the balance sheet. The results of operations in North Africa and the majority of overseas divisions, though favourable, had likewise not been incorporated in the accounts. Operations in France had shown a loss amounting to 40,337,672 francs, after writing off 10,927,064 francs for amortisation. M. Jean Delorme was elected president and M. Deschars vice-president and managing director.

Kuhlmann Report

At Kuhlmann's annual meeting a minute's silence was observed in memory of the late M. Raymond Berr, formerly vice-president and managing director, who was deported to Germany in March, 1944, and died in Auschwitz concentration camp in September. The accounts, showing neither profit nor loss, were approved; taxation charges amounted to 76,657,000 francs, representing 14.5 per cent. of the nominal capital. Resumption of operations had been slow and difficult, since the few means of transport left at the disposition of the French economy were devoted to military needs, and the small amount of fuel mined was reserved for priority demands; so that, in spite of an increased supply of raw materials, the situation will remain grave if the company is not supplied with fuel. The repairs progressively effected during the last few months have remained without effect owing to the lack of sufficient coal and coke.

Ciments Français is to increase its ordinary capital by 16,384,000 francs, and to bring its social funds up to 500 million and its debenture issue to 400 million francs. The new issues will not be made immediately.

Indian Chemical Delegates

Manufacturers' Visit to U.K.

THE Government of India have agreed to give facilities to the Indian Chemical Manufacturers' Association to send a delegation to the United Kingdom and the United States of America with a view to studying latest developments in the chemical industries in those countries. The delegation would consist of about ten representatives of the prominent chemical concerns all over the country who are members of the Association. The delegation is expected to leave for the United Kingdom some time this month.

Self-Raising Flour

Proposed Revision of Standard

THE Ministry of Food has under consideration a revision of the existing standard for self-raising flour in the light of a report from the Inter-Departmental Committee on Food Standards. Any manufacturer or other party desiring to make any comments on the recommendations contained in the report should send them in writing to the Ministry of Food, Cereal Products Division, Bryn Euryn, Colwyn Bay, Denbighshire, not later than August 31.

Previous Regulations

The Food Standards (Self-Raising Flour) Order, made in January, 1944, created the following standard for self-raising flour: (1) Self-raising flour shall yield not less than 0.45 per cent. of available carbon dioxide and not more than 0.65 per cent. of total carbon dioxide.

(2) (a) The total carbon dioxide shall be determined by ascertaining the weight thereof evolved when the self-raising flour is treated with excess of dilute sulphuric acid at room temperature, the evolution being completed either by boiling for 5 min. or by means of reduced pressure.

(b) The available carbon dioxide shall be determined by ascertaining the difference between the total carbon dioxide and the residual carbon dioxide; and the residual carbon dioxide shall be determined in the following manner. The self-raising flour shall be treated with water first for 20 min. at room temperature, then for 20 min. on a boiling-water bath and subsequently by boiling for 1 min. The residual carbon dioxide is the weight thereof evolved when the self-raising flour so treated is further treated with excess of dilute sulphuric acid at room temperature, the evolution being completed either by boiling for 5 min. or by means of reduced pressure.

As a result of complaints that the prescribed analytical details were not sufficient, and as the supply position of phosphatic chemicals had eased considerably since the committee's recommendations were originally made, the committee has decided, in a supplementary report, to recommend a revision of the procedure for determining residual carbon dioxide and to abolish the required figure for total carbon dioxide. Several tests conducted, however, indicate that the minimum of 0.45 per cent. for available carbon dioxide should not be reduced.

New Recommendations

The committee accordingly recommends that: (1) The standard for self-raising flour should be amended by: (a) deleting the figure for total carbon dioxide; and (b) replacing the existing method for the determination of residual carbon dioxide by the following procedure.

"Not less than 5 gm. of the self-raising flour shall be mixed to a smooth paste with distilled water and a further quantity of distilled water amounting in all to not less than 20 times the weight of the flour shall then be incorporated. The liquid shall be heated on a boiling-water bath for 30 min., being vigorously stirred for the first 5 min. and thereafter for periods of ½ min. at intervals of 5 min. The liquid shall immediately be brought to the boil and shall be maintained boiling for 3 min., being vigorously stirred to ensure escape of available carbon dioxide and to avoid charring. The liquid shall be transferred to an apparatus for determining carbon dioxide and that apparatus and liquid shall be freed from available carbon dioxide by passing carbon-dioxide-free air through them for 10 min. The residual carbon dioxide is the weight thereof evolved when the self-raising flour so treated is further treated with excess of sulphuric acid, the evolution being completed either by boiling for 5 min. or by means of reduced pressure."

(2) The standard should not include a maximum limit for the proportion of residual carbon dioxide.

(3) On the basis of the information available at present, no change should be made in the existing figure of 0.45 per cent. for the minimum content of available carbon dioxide.

Poland's Chemical Industry

Quick Recovery Reported

POLAND'S chemical industry has suffered considerably less damage than was feared. While Germany was subjected to heavy air raids from the West, the Germans had moved many plants to what was then the Government-General, and when the Red Army advanced through Poland, the Germans had not enough time to destroy all the plant even though they managed to evacuate some of the more valuable machines and equipment. The Polish chemical industry is also in the fortunate position of having adequate supplies of coal from local sources, while other continental countries grievously lack fuels. Production of fuel is sufficiently large to enable Poland to export coal and coke in exchange for raw materials, and to meet local requirements.

Particular attention has been paid to the resumption of activities in the fertiliser industry. The Chorzow plant will deliver 30,000-35,000 tons of nitrogenous fertilisers before the autumn sowing. The Polish Government has set aside the sum of 90,000,000,000 zloty for the reconstruction of

the Moscice plant (which seems to have suffered considerable damage) and for repairs and improvements at Chyrow and Chorzow. The trade agreement with the U.S.S.R. provides for imports of 40,000 tons of apatite, and the Carpathian potash mines will supply substantial quantities of potash salts. A project is afoot for the transfer of a German nitrogen plant to Poland, where it would be re-erected as a complete unit.

Transfer of Oil Plants

Similarly, it is proposed to transfer one of the German synthetic oil plants to Poland. Thus, it is projected to dismantle the synthetic fuel plant at Schwarzheide, which was originally designed for an annual production of 150,000 tons and to re-erect it at Oswiecim where ample supplies of coal would be available. This scheme draws attention to the Polish liquid fuel position which seems to be somewhat strained. Crude oil output has greatly declined and is little more than 9000 tons a month at present. Motor spirit has been imported from the U.S.S.R., and an order for 50,000 tons of crude oil has been placed in Rumania. Supplies are to be stretched by use of mixtures in which benzol and alcohol are included. In this respect, great hopes are placed on the alcohol distilleries in Western Pomerania which have a larger output capacity than all Polish distilleries together.

The production of sodium compounds is so large that soda is exported to Sweden in exchange for wood pulp. Soap factories suffer from a shortage of oils, but the glass industry is not hampered by the lack of raw materials. In addition to the three existing match factories at Lodz, Czestochowa and Czechowice, new factories are to be opened at Danzig and in the new western territories. At present the industry employs 1000 skilled workers on a monthly production of 30,000,000 boxes.

Apparent Vitamin C

"Ovaltine" Research Report

OVALTINE Research Laboratories, Kings Langley, Herts, directed by Dr. F. Wokes, F.R.I.C., with Mr. E. H. Johnson, F.R.I.C., A.M.I.Chem.E., as chief chemist and a staff of five research workers, have issued their annual report for 1944, although some delay in its publication was caused by the destruction of the administrative offices by enemy action early in 1944. There has been gratifying indication, it is stated, that their long-continued efforts to promote co-operation between academic and industrial workers in the field of nutrition are at last beginning to bear fruit.

Particularly interesting is the work that has been done on "apparent vitamin C," a series of substances occurring in natural and processed foods, which, while closely related chemically to vitamin C, from which they cannot be distinguished by ordinary analytical methods, do not possess the anti-scorbutic properties of the true vitamin. Most natural vegetable foods appear to contain, in the total vitamin C content, only some 5-10 per cent. of apparent vitamin C, not enough, in fact, to cause any serious error in estimating the vitamin value of the food. Walnuts, however, are a notable exception. Total vitamin C content is very high, exceeding 2 or even 3 per cent., and the concentration of apparent vitamin C is also high, perhaps more than half the total vitamin C.

Examination of the various parts of the walnut tissue has given evidence of a new theory concerning the evolution of vitamin C in plants. If the vitamin were produced directly by photosynthesis, it should occur in highest concentration in the outer tissues. The Ovaltine workers' results show, however, that its highest concentration is not in the outer tissues, but in the endocarp. On the other hand, the outer tissues contain apparent vitamin C in higher concentrations, thus suggesting that the action of the sun's rays leads to the formation of the apparent vitamin, which may pass to the inner tissues and be converted to the true vitamin.

Storage and Stability

Storage conditions also affect the concentration of apparent vitamin C. This may be increased in syrups by the action of fruit pectins, since apparent vitamin C may be produced by storage of a solution of pectin at the *p*H normally found in fruit juice. Storage conditions likewise affect the stability of true vitamin C, light and temperature being important factors. At room temperature, in syrup stored in partly-filled bottles exposed to sunlight, half the vitamin might be lost in 4-5 months. Protected from light and air, only one-tenth of the vitamin was lost in this time at the same temperature. Loss at higher temperatures was much more rapid. Further confirmation of their previous findings was obtained, showing that the vitamin C in rose-hip tablets is much more stable than that in syrup stored under the same conditions.

DU PONTS SAFETY AWARD

The U.S. National Safety Council's "Distinguished Service" Award has been presented to E. I. du Pont de Nemours & Co. for the third successive year. In 1944, 58 Du Pont plants operated without a single lost-time injury, the nylon plant at Seaford establishing a world's record in 1944 of 18,871,795 injury-free hours.

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Personal Notes

MR. C. S. GARLAND, M.I.Chem.E., has been elected a Fellow of the Imperial College of Science and Technology.

MR. S. E. COALSTAD, B.Sc., A.R.I.C., has become chief research officer with Beckers Pty., Ltd., manufacturing chemists, Adelaide, South Australia.

DR. W. F. P. MCLINTOCK, D.Sc., F.R.S.E., F.G.S., has been appointed director of the Geological Survey of Great Britain and Museum of Practical Geology. He has been deputy-director since 1937.

DR. MARCUS FRANCIS, F.R.I.C., director of the British Pottery Research Association, has returned to this country after a visit to the U.S.A., notably the Ohio pottery-manufacturing districts.

BRIG.-GEN. SIR HAROLD HARTLEY, F.R.S., is one of the members of the board of governors of the new College of Aeronautics which is being created in accordance with the recommendations of the Fedden Committee.

MR. A. C. MCDONALD, senior research metallurgist at Kalgoorlie Metallurgical Laboratory, has been put in charge of the newly-formed research department of Broken Hill Associated Smelters, Ltd., Port Pirie, South Australia.

MR. A. L. L. BAKER, B.Sc., has been appointed to the Chair of Concrete Technology at the Imperial College of Science and Technology in the University of London. He has recently been employed in the chief scientific adviser's division at the Ministry of Works.

MR. J. E. C. BAILEY, chairman and managing director of Baird and Tatlock (London), Ltd., has been elected president of the Scientific Instrument Manufacturers' Association in place of MR. FRANK WAKEHAM, who retires after three years of office.

Obituary

MR. JOHN MCKENZIE, whose death took place recently at Prestwick, Ayrshire, was well known in the Scottish metal trade as export manager for Stewarts & Lloyds, Ltd.

PROFESSOR HERBERT WILLIAM GARTRELL, whose death on June 8, at the age of 62, is reported from Australia, occupied the Chair of Mining and Metallurgy at the University of Adelaide, with which he had been associated since 1910.

MR. GEORGE MADEL, F.R.I.C., who died at Swansea on August 6, aged 70, had been associated with Vivian & Sons, Ltd., copper refiners for 50 years. He was a past chairman of the South Wales (Swansea) section of the Royal Institute of Chemistry and was elected to the Fellowship in 1926.

New Control Orders

Relaxation of Lead Control

THE Ministry of Supply announces that, from August 10, applications to the Non-Ferrous Metals Control, Rugby, for licences to acquire lead for U.K. consumption will be considered by the Control without restrictions in respect of the type of article to be manufactured.

The statutory provisions regarding the acquisition and disposal of lead are still in force, but it is no longer necessary to submit schedules of Service or home civil orders with applications for licences for lead. Instead, each application must be accompanied by the following signed statement: "We certify that the quantity requested on the accompanying application is needed to cover orders for our products, and that in the case of applications for virgin metal full allowance has been made for our expected intake of scrap."

Certain restrictions on the release of lead for export remain in operation, and schedules of export orders must continue to be submitted. Lead will, however, be released in future for the production of some additional classes of manufactured goods for export to all countries. Details are being communicated by the Board of Trade to the bodies concerned.

Institution of Chemical Engineers

Report on the Associates' Examination

OF the 60 candidates who sat for the Associate Membership Examination of the Institution of Chemical Engineers this year (including those who were required to take portions only of the examination), 29 were successful. On the results, the William Macnab Medal has been awarded to Mr. E. A. K. Patrick; the work of Mr. P. J. Platt was highly commended.

In their report, the examiners complain of a certain lack of conciseness in many of the papers, and comment on the excessive or misguided use of reference books. In Section C, they say that greater attention should be given to the study of fuel economy in boiler practice and to pyrometry. Greater familiarity with drawing office practice is also considered desirable many of the drawings submitted having been of a low standard. The list of reference books made available to the candidates is to be revised, and the Council has announced that for the 1946 examination the use of reference books for Section I will not be permitted.

New U.S. Chemicals

Tetrachlorophthalic Anhydride

AMONG new industrial chemicals developed in the U.S.A. is tetrachlorophthalic anhydride, announced in *Chem. Eng. News* for June 25 by the Niagara Alkali Co., New York, N.Y. "Niathal" is suggested as an intermediate or compounding material in the manufacture of dyes, pharmaceuticals, fungicides, esters, plasticisers, protective coatings, synthetic resins, synthetic rubbers, insulating materials, and lubricants.

A white, odourless powder with a purity greater than 99 per cent., it is free-flowing and non-hygroscopic, melts at 254-255°C., and boils at 762°C. It has an appreciable vapour pressure only at elevated temperatures. Experience indicates that it is non-irritating and non-toxic, but suitable precautions are recommended in making new compounds and products therewith.

In this new chemical all four hydrogens of the phthalic anhydride molecule have been substituted by chlorine, resulting in a stable compound containing almost 50 per cent. chlorine. The stability and the high melting point suggest that products made from "Niathal" may be used at higher temperatures than those from phthalic anhydride. The high chlorine content improves resistance to fire.

A Versatile Solvent

Commercial Solvents Corp., Terre Haute, Indiana, are producing 2-methyl-2,4-pentanediol, a water-white, high-boiling dihydric alcohol or glycol. It is a mild humectant, and claims to be an excellent solvent for many dissimilar materials and to have valuable penetrating and lubricating properties.

It can be used in the manufacture of brake fluids, cutting oils, dry-cleaning soaps, duplicator fluids, glass cleaners, greases and lubricating oils, grinding assistants, leather oils and dressings, mercerising assistants, metal cleaners, paper coatings, printing pastes and inks, soluble oils, surface-active agents, textile specialties, and as a plasticiser.

Ink for Glass

To the growing list of special glycerol-utilising inks for glass may be added the product described by J. C. Wilson in Can. Pat. No. 424,925. According to his specifications, a smooth ink for glass marking consists of: lampblack, 50 g.; titanium oxide, 10 g.; silver oxide, 3 g.; and glycerol, 150 c.c. After intimate mixing, the first three ingredients are gradually added to the heated glycerol with stirring, and the resulting mixture is passed through a paint mill.

Piperine Insecticides

Research workers at the Boyce Thompson Institute, Yonkers, N.Y., have obtained effective insecticides by mixing piperine and pyrethrins in varied proportions. Piperine, an alkaloid of black pepper, is a piperidide of piperic acid, and has no appreciable odour. It appears to be actually more toxic than pyrethrum, but its paralysing action, when unaccompanied, is too slow. A mixture made up with 20 per cent. piperine and 10 per cent. pyrethrins provided a 99.8 per cent. kill of houseflies in 24 hours; the percentage kill with an official test insecticide under parallel conditions was 59.9.

General News—From Week to Week

The Zinc Corporation reports that the British Government's running contracts for Empire zinc and lead for war purposes expired on August 9.

"Notes on the Prospect Confronting Post-War British Patent Property," is the title of an article by Mr. Hughes, published in *Agenda, A Quarterly Journal of Reconstruction* (1944, 3, 3, 45; Oxford Univ. Press; 6s.)

The Review of Commercial Conditions in Egypt recently published by the Department of Overseas Trade (H.M.S.O., 1s.) surveys the growth of industrialisation in Egypt during the war, and the post-war market for goods of United Kingdom manufacture. It draws attention to the probability of a large demand in the immediate future for capital goods, machinery spares, and high quality consumer goods.

"How to Look After a Boiler Plant" is the title of Fuel Efficiency Bulletin No. 41, issued by the Ministry of Fuel and Power. Its contents consist of a list of references to previous bulletins applicable to boiler-plant maintenance.

The D.S.I.R. is considering the erection of a new research station, in which some of its divisions, now separated, might be brought near to one another. It is now reported that Watford (Herts) Town Planning Committee has approved proposals from the Ministry of Works for the establishment of such a centralised research station on the Munden Estate, east of the town, provided that the plans are satisfactory and that no obnoxious fumes or smoke are produced. It will be recalled that the Water Pollution and the Building Research Stations are already in this area.

The Paraffin Emulsion (Reduction of Liquid Paraffin) (Scotland) Order, 1941 (which limited the amount of liquid paraffin to be contained in paraffin emulsion) is revoked by the Paraffin Emulsion (Reduction of Liquid Paraffin) Revocation (Scotland) Order, 1945 (S. R. & O. 1945, No. 943).

Sir Harold Mackintosh, chairman of the National Savings Committee, has announced that the surrender of Japan would not affect arrangements for the Thanksgiving Savings Weeks Campaign which opens in London on September 15, and will continue throughout the country to the end of November. "In fact," he says, "the title of the campaign is more than ever appropriate."

Among the 70 new names in the schedule of persons with whom relations of any kind are unlawful, in accordance with the Trading with the Enemy (Specified Persons) (Amendment) (No. 9) Order, 1945 (S.R. & O. 1945, No. 936), are: Vorquímica S.L., Vigo, Spain; and Nordchemika Kemisk-Tekniska Fabriker A/B, Stockholm. A large number of deletions, all in South America, is included in the Order.

The fall of 0.3 per cent. in the wholesale price of chemicals and oils in July, lowering the Board of Trade index figure from 151.1 to 150.7, was essentially due to the seasonable drop in the price of fertilisers. Coal-tar products and white-lead paint rose by 1 per cent. on the month. Non-ferrous metals went up from 127.2 to 129.3 (1.7 per cent.) owing to increases in the prices of zinc, lead, and brass which came into effect on June 11. Iron and steel were stationary at 189.6.

The news that uranium is one of the essentials of the atomic bomb has aroused considerable interest in Cornwall, as it is generally known among mining experts that various mines in Cornwall have already been proved that they possess this metal. The South Terras mine at St. Stephens was worked for uranium both before and after the discovery of radium, latterly by a French company, one of the moving spirits of which is now reported to be actively engaged at Great Bear Lake in Canada.

Although the Italian Government and Italian firms are now free to conduct direct transactions with foreign firms, British importers are reminded that trading-with-the-enemy restrictions have not yet been lifted in respect of trade with Italy, so that it is not yet possible to conclude a contract with the Italian Government or private traders. Inquiries for the future may be made of Italian exporters, but British importers are reminded that import licences will continue to be required for all goods imported from Italy which do not come under an open general licence.

Foreign News

Last year, 98,700 tons of iron ore were exported from Rio de Janeiro to Great Britain.

The semi-official Institute Bacteriológico of Chile is now stated to be an established producer of penicillin.

The I.G. plant at Marburg is working at full capacity on the manufacture of serums and anti-toxins.

Kalle & Co. of Biebrich (Germany) is now turning out cellophane casings for sausages as well as other wrapping materials.

Production of boron minerals in the U.S.A. in 1944 was the highest since 1941, according to the Bureau of Mines. Sales of contained B_2O_3 were 91,700 short tons in compounds, a quantity increase of 5 per cent. over 1943.

The Finnish Government is considering a plan for the erection of a big nitrogen plant in Northern Finland, and the Finnish State is also taking an interest in the manufacture of sulphuric acid and superphosphates.

New vegetable dyes for carpets are reported to have been discovered at the Soviet Institute for Art and Industry Research. These are claimed to maintain their lustre unaffected by either sun or air.

Dealings in rotenone in Canada are subject to written authorisation from the Administrator of Fertilisers and Pesticides, Ottawa, according to an order which came into force on July 16.

Official authorisation has been granted by the Spanish Government to the Sociedad Bilbaína de Minerales y Metales to install additional plant for the manufacture of urea, and to the R.A.P.S.A. company for the manufacture of cetyl alcohol.

Bauxite deposits in Surinam (Netherlands West Indies) have been acquired by the Billiton Maatschappij, incorporated in Holland. The Arnhem smelting plant is comparatively undamaged and will soon be ready for work.

Among more important recent developments in Panama, the establishment of a match factory, the Fábrica Nacional de Fósforos, with a monthly output of 500,000 boxes, deserves to be mentioned. A company for the manufacture of cement, with an authorised capital of $1,500,000, plans to produce 90,000 tons yearly, after machinery on order in the U.S. has arrived.

The U.S. State Department is negotiating the adoption of a formula, by international agreement, whereby American patent rights would be recognised by Russia on the usual royalty basis. For a long time the National Association of Manufacturers has supported such a move and has felt that the absence of such an arrangement so far has virtually blocked any exchange of technological information between America and the U.S.S.R.

The Aluminum Co. of America has made a grant of $200,000 to the endowment fund of the Carnegie Institute of Technology, Pittsburgh, to establish a professorship of light metals in the Department of Metallurgical Engineering.

Supplies of chlorine for maintaining a decent standard of water in the city of Vienna have been asked for from the British Army in Austria by the military authorities who are preparing the way for setting up the Allied Commission in the city.

The Australian Ceramic Society has been established in Melbourne, with Dr. A. S. Fitzpatrick as first president. Its main objectives will be to investigate native clays and allied materials, and to assist in the study and working of clays.

The electrode plant at Ratibor, Silesia, has been brought under Polish management, and it is proposed that other factories in Silesia, in particular pharmaceutical works, are to supply substantial supplies to central Poland where many chemical plants cannot be repaired.

Shawinigan Chemicals, Ltd., are to build a new plant at Shawinigan Falls, Canada, for the production of chloral—one of the main ingredients of DDT—from acetaldehyde and chlorine. Monochlorobenzene, the other principal ingredient, is already being produced there by Canadian Industries, Ltd.

Industrial acid waste from the manufacture of Plexiglas transparent plastic is converted into much-needed fertiliser in the ammonium sulphate plant designed by Röhm and Haas chemical engineers at Philadelphia with a view to reducing the pollution of the Delaware river.

Four superphosphate plants out of Sicily's five are now in operation, treating Tunisian phosphate rock. From August 1944, when the first plant was put back into operation, up to March 31, 1945, about 28,200 tons were produced. Inadequate transport facilities have retarded distribution.

A plant has been erected at Oscarshamn in Sweden for the manufacture of optical glass, which had formerly to be imported. Local firms confined their activities to grinding and polishing, covering only 1 per cent. of requirements. Chief suppliers have been Germany and France.

The Celanese Corporation Fellowship in Chemical Engineering at Princeton University has been established by the New York concern of that name. It is for a term of five years from the time of the appointment of the first recipient, who will be chosen by mutual consent from qualified students in the Graduate School of Chemical Engineering. The Department of Chemical Engineering at Princeton will have the final decision on the nature of the subject to be pursued at any time.

Cod-liver-oil capsules are to be made at a refinery on the French islands of Saint-Pierre and Miquelon, south of Newfoundland. Experiments are being made concerning the addition of calcium salts to the oil. An annual output of 6 to 8 million capsules is envisaged.

The American Society of the Plastics Industry reports that this industry employs at present about 50,000 workers, compared with 18,000 in 1939. Production amounts to about 200,000 tons yearly, three times the pre-war output. A further considerable increase is not expected.

Imports of celestine (strontium sulphate) into the U.S.A. from Mexico, in short tons, were 987 in 1941, 6201 in 1942, and 11,060 in 1943. From the U.K. the corresponding figures are 3306, 2682, and 1387; from Spain, nil, 1475, and 4454. Imports for 1944 may not be revealed

Liquid oxygen is produced by a new method developed by Professor Peter Kapitza in a Russian plant which has been in operation for six months now. The daily output is six or seven times larger than in comparative plant of the old type. Compactness of plant and economy in labour are claimed as special advantages of the new process.

Uranium ores on Mount Painter in the Flinders Range, 400 miles north of Adelaide, South Australia, have been worked for some time, as the result of a request from Mr. Churchill to the late Mr. Curtin. The country is exceptionally rugged, and camel transport is used between the mine and the railhead 80 miles away.

The first approved commercial allocation of DDT has been announced by the Chemicals Bureau of the U.S. War Production Board. At the request of the War Food Administration, a limited quantity of technical grade DDT has been made available, in Oregon only, for use against the potato tuber flea beetle, whose ravages there, it is stated, cannot be prevented by calcium arsenate or cryolite

Forthcoming Events

September 7. Society of Chemical Industry (Food Group). Members of the Group have been kindly invited by Roche Products, Ltd., to a semi-social summer meeting at their factories at Welwyn Garden City, Herts. The meeting, to which ladies are invited, starts at 11 a.m. with a visit to the Research and Pharmaceutical Departments. A lecture on the large-scale synthesis of certain vitamins and their use in enriching food will precede a visit to the factories in the afternoon. Luncheon will be available at 5s. each (payable at table) to members and their friends; tea will be provided by Roche Products, Ltd.

COMPANY MEETINGS

Benn Brothers

Death of the Chairman

THE 49th annual general meeting of Benn Brothers, Limited, proprietors of THE CHEMICAL AGE, was held at Bouverie House, Fleet Street, E.C.4, on August 10, Sir Ernest J. P. Benn, C.B.E., presiding. The report showed net profit for the year of £99,705 11s. 10d., less income tax, E.P.T. and N.D.C. £55,325 8s. 2d., leaving £44,380 3s. 8d., to which was added the balance brought forward of £16,343 1s. 11d., making a total sum available of £60,723 5s. 7d After allocating £4000 to Jubilee Pension Fund and £1500 to leasehold reserve, there was a net amount for appropriation of £55,223 5s. 7d. The unchanged dividends recommended have already been reported in our columns (July 28, p. 89). On the occasion of the victory celebrations a special staff bonus was announced at the rate of 10 per cent. on the year's salaries and wages.

Moving the adoption of the report and accounts, Sir Ernest Benn referred to the great loss suffered during the year by the death of Mr. Gordon Robbins, the late chairman, and he spoke also of the grief felt at the death of Flt./Lt. E. P. C. Kidd, who entered the company's service as a boy of 17 and rose to the position he was just beginning to fill in the Benn tradition as editor of a great paper. Sir Ernest said he was presiding that day in the enforced absence of the chairman of the company, Major E. Glanvill Benn. He was still away on his military duties in Italy, but a month ago they had been able to welcome back Commander A. O. Gillett, R.N., and Major John Benn had also, on the previous day, got into "Civvy Street."

Staff's War Effort

Alluding to the company's services, Sir Ernest said: This old ship has managed to weather two disastrous wars and has come out not only unscathed but sound. The business has been founded on the right lines and the new directors would continue to be guided by high principles and experience. He must express his feelings about the staff and the work of the last five years. This had been a total war, and even in the presence of one or two gallant men there who had faced the proper business of war, he did not hesitate to say that the brunt had fallen on such people as those inside the building. Whoever a few years ago would have thought of a paper being put to bed with bombs falling on each side of the building; or of going on with the job when V-bombs were crashing a mile or two away; or of five people doing the work of seven and, later, of three people managing to do the work that the five had struggled to do? They had carried on in conditions as near to hell as he hoped to experience. He was there to say "Thank you" and to express appreciation of that work. The difficulties were, strangely enough, intensified to-day.

Mr. Norman French, joint managing director, seconded the resolution, which was unanimously carried. Captain K. E. Hughes and Mr. B. H. Tripp were re-elected to the board.

Beechams Pills

Further Expansion

THE 17th ordinary general meeting of Beechams Pills, Ltd., was held on August 9 at the Dorchester Hotel, London, W., Sir J. Stanley Holmes, M.P., chairman and managing director, presiding.

The following is an extract from the chairman's statement: The trading profit for the year ended March 31, 1945, earned by the companies of the Beecham group amounted to £2,501,642, as compared with £2,409,256 in the previous year. During the six years ended March 31, the group's total contribution to the National Exchequer has amounted to over £7,000,000.

Export profits for the year amounted to £375,726, as compared with £322,600 last year, a result which represents a substantial increase in sales, particularly of non-medicinal gods. This is most gratifying, having regard to the exceptional difficulties of export after five years of war. The Beecham group has its plans laid for a rapid expansion in its export business.

Company's New Name

The directors propose that the name of the company shall be changed from Beechams Pills, Ltd., to Beecham Group, Ltd. The title of Beechams Pills, Ltd., is a misnomer, as the sale of the famous pills represents only 3 per cent. of the turnover. The change of name will prevent our seeing in the Press in the future, as we have in the past, our profits described as coming from the sale of pills, a statement which ignored the large part of our revenue derived from many other products.

For some time we have been building up a research department, and recently we registered a company, Beecham Research Laboratories, Ltd., a very valuable addition to the Group.

For a number of years our policy has been that, while we would continue to develop the sales of our world-famous proprietary medicines, we would broaden the base of our business in other directions. In pursuance of this policy we have recently entered the food market and have purchased a number of businesses producing proprietary foods, and in particular that of C. and E. Morton, Ltd., The name of "Morton" is renowned as the purveyor of the best foodstuffs of all kinds. It is perhaps not so

well known in the United Kingdom as abroad, because it has concentrated on overseas trade. The business is more than 100 years old, but has gradually lost ground through failure to adapt itself to modern methods of production and salesmanship and to international changes. We hope to put this right and to restore this business of high repute to its former prosperity.

The strength of the Beecham group to-day lies in its products and its personnel. Its many companies throughout the world are managed by men, and in a few cases by women, who have established their value by their ability and their wholehearted and loyal team spirit. It will be invigorated by the return of many in the Services and by those who have been lent to Government departments.

The report and accounts were unanimously adopted and the proposed change of name was approved.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an '— followed by the date of the Summary, but such total may have been reduced.)

FLEETWOOD CHEMICAL CO., LTD., London, S.E. (M., 18/8/45.) July 25, £300 debentures, part of a series already registered. *£1970. December 31, 1943.

Company News

International Bitumen Emulsions, Ltd., are to pay a dividend of 8 per cent. (7 per cent.), less tax, for the year ended March 31.

The Manchester Saccharose Chemical Co., Ltd., Ferrybridge, Yorks, has changed its name to Kromo-Klean, Ltd.

A. S. P. Chemical Co., Ltd., Gerrards Cross, Bucks, has increased its nominal capital, beyond the registered capital of £3000, by the addition of £45,000 in 45,000 4½ per cent. cumulative redeemable preference shares.

New Companies Registered

Jeffrey & Edworthy, Ltd. (397,668.) Private company. Capital, £100 in £1 shares. Reconditioners of abrasive instruments and metal objects, by chemical, electrical or other processes, etc. Directors: J. Jeffrey; H. G. L. Edworthy. Registered office: 22 Great Smith Street, London, S.W.1.

Friedman-Athill, Ltd. (397,474.) Private company. Capital, £10,000 in £1 shares. Manufacturers of and dealers in gas, electrical, liquid-fuel-consuming, mechanical, and chemical equipment and accessories, etc. Directors: G. Hawkes; H. Friedman; L. C. H. Athill. Registered office: 240 High Holborn, London, W.C.2.

Chemical and Allied Stocks and Shares

AWAITING Japanese surrender developments, a victory boom developed in stock markets, dealings recorded on Monday exceeding the previous highest total during the war period. Shares of companies with Far East interests took the lead, particularly rubber shares, which displayed an all-round rise. As in most sections, however, profit-taking reduced earlier gains, a more cautious attitude developing on Tuesday prior to the King's Speech and the opening of Parliament. British Funds remained firm, however, and earlier gains were held, with Consols 2½ per cent. and Local Loans continuing to attract particular attention, accompanied by talk of a new Government loan and a possible reduction in the Bank rate.

After rising to 39s. 4½d. Imperial Chemical eased to 38s. 9d. Dunlop Rubber showed a good rise to 52s., and were up to 53s. 4½d. at one time on the company's Far East interests. Textiles became prominent on the statement that the Government is not to propose nationalisation of the industry, Calico Printers rising to 20s. 3d., Fine Spinners to 26s. 3d., Bradford Dyers to 26s. 10½d., and Bleachers to 14s. 7½d., although, as in most other directions, earlier gains were not fully held, profit-taking developing.

In comparison, iron and steel shares and those of armament and kindred companies were relatively dull, sentiment being affected by the latest developments which will have the effect of accelerating problems of the switch to peace-time working. Allied Ironfounders went back to 50s. and Staveley to 44s. 6d. On the other hand, good features were provided by Davy Engineering at 32s., Tube Investments at 5 5/32, and Stewarts & Lloyds at 50s. Elsewhere, Borax Consolidated were better at 41s. 9d. and British Drug Houses rallied to 36s. 6d. after changing hands at 35s. Lever & Unilever were 49s. Murex firmed up to 96s. 3d., and Pinchin Johnson to 37s. 3d. Turner & Newall, after a sharp rise, receded 1s. to 79s. United Molasses, however, were good at 43s. 6d., and Distillers at 115s. 6d. British Plaster Board were 36s. 3d., after

37s. 9d., and Associated Cement at 56s. 6d. lost part of an earlier rise. B. Laporte were firm at around 86s., W. J. Bush 75s., Monsanto Chemicals 5½ per cent. preference 23s., and Greeff-Chemicals 5s. ordinary 9s. British Glues 4s. ordinary kept firm at 11s. 3d. A rally to 16s. 6d. was shown by General Refractories 10s. shares, but elsewhere Gas Light & Coke eased slightly to 21s. 3d. Triplex Glass, after moving ahead, relapsed 1s. 4½d. to 41s. 10½d. Wall Paper Manufacturers deferred have been steady at 41s., but in other directions Barry & Staines rose to 54s. De La Rue strengthened to £10⅝, and Amalgamated Metal were better at 18s. 9d., also Imperial Smelting at 14s. 2d. and Metal Box at 90s.

Boots Drug were higher at 55s. 7½d. and Sangers improved to 30s. 6d., Griffiths Hughes to 39s. 4½d., and Timothy Whites to 42s. There was a good deal of activity in British Oxygen, which changed hands up to 87s. 6d., later easing to 86s. British Aluminium were 43s. 6d. British Match showed steadiness at 42s. 3d., and among paint shares Lewis Berger were better at 113s. 9d., Goodlass Wall 22s., International Paint 116s. 3d., and Paripan 29s. 6d. Low Temperature Carbonisation 2s. shares eased to 2s. 6d. and the shares of the Cementation Co. to 5s. 4½d. Oil shares participated in the market trend under the lead of Burmah Oil, which rose sharply to 88s. 1½d. on the Far East developments. Shell were 86s. 3d. and Anglo-Iranian 5⅝. Lobitos rose to 55s. and Attock Oil to 67s. 6d.

British Chemical Prices

Market Reports

QUIET conditions have prevailed in the London general chemical market, which is still influenced by the holiday period, and little interest in fresh business has been reported. There has been a fair amount of export inquiry, but no improvement in the shipping position is reported. Prices show no change on the week and the undertone remains firm. In the soda products section there is a steady call for contract deliveries of both solid and liquid caustic soda, while fair quantities of soda ash and nitrate of soda are being taken up. A moderate business continues in acetate of soda and a steady demand is reported for hyposulphite of soda, both technical and photographic grades. Among the potash compounds outputs of home makers of permanganate are being steadily absorbed and a ready outlet is reported in respect of caustic potash and acid phosphate of potash. In the acid section there is a fair call for supplies of hydrochloric acid and offers of oxalic acid are being readily taken up. Salicylic acid is steady and all grades of acetic acid are meeting with a good demand at controlled rates. There has been little fresh in the general position of the coal-tar products during the week and prices remain unchanged.

MANCHESTER.—Trade has been brisker on the Manchester chemical market after last week's extreme holiday dullness, and it is probable that the next few weeks will see the end of the holidays as a trade factor. Contract deliveries of heavy chemicals are going forward fairly steadily to the textile and other using works and a moderate volume of fresh business in rather a wide range of soda compounds and other materials has been reported. Taking the market as a whole, prices are on a steady to firm basis. Except in one or two classes, principally lime, slag, and sulphate of ammonia, in which a fair trade is being done, interest in the general run of fertilisers is at a seasonally low level. Among the tar products, creosote oil, crude and refined tar, and most of the light materials are in steady demand.

GLASGOW.—Conditions in the Scottish heavy chemical trade have been rather quiet during the past week for home business. There is no change in the export position. Prices remain firm.

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THE Proprietors of the Patents Nos. 463,437 and 507,040 for "Improvements in or Relating to Wood Pulp adapted for Chemical Use" are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications should be addressed in the first instance to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

SITUATIONS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

THE BRITISH IRON & STEEL RESEARCH ASSOCIATION

APPLICATIONS are invited by 7th September for the following positions :—

PRINCIPAL OR SUPERINTENDING METALLURGIST with Headquarters in London to take charge of this field of activity of the Research Association.

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OTHER POSTS OF A MORE JUNIOR CATEGORY for chemists, physicists, engineers and metallurgists.

The salary scales for Scientific Officers are as follows: Scientific Officers £300—£550. Senior Scientific Officers £600—£800. Principal Scientific Officers £840—£1200. Superintendent £1250 per annum upwards.

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All Technical appointments to the Association are pensionable in accordance with the F.S.S.U. Scheme.

Applications will be considered irrespective of the date when the applicant is free to take up an appointment.

Applications for the above positions should be submitted, with full details of qualifications and experience, to the Secretary of the British Iron & Steel Research Association, Steel House, Tothill Street, Westminster, S.W.1. Additional posts will be announced later.

ASSISTANT MANAGER, Chemical Section, wanted by Chemical Engineering firm (E.W.O.) in London. Applicants must hold Ph.D. degree Chemistry, wide knowledge of basic organic and inorganic chemical processes used in industry. Some chemical plant operational experience is essential. Special knowledge of physical chemistry is required. Previous experience of translating research results into practical schemes an advantage. Age preferred 30/40. The post is permanent and progressive. No application will be considered unless the following information is supplied in writing: Nationality at birth, age, education, particulars of past positions held and responsibility at present, availability under E.W.O. and Service regulations, salary required. Box No. 2231, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

INTELLIGENT man required to take charge of production of Waxes and Crayons on small scale plant. Excellent prospects. Write giving age, experience (in detail) and salary required. Box No. 2227, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

QUALIFIED CHEMIST required for old-established Firm of Cable Manufacturers in the London Area to take charge of the Paper Cable Laboratory. In addition to supervising the routine work of the Laboratory, applicants must be capable of undertaking investigational and development work and of dealing with various chemical problems arising in power cable construction, installation and operation. Sound experience in the technique of cable practice is essential and preference will be given to applicants familiar with high voltage applications. Age about 30-35. Commencing salary £400-£500 according to qualifications and experience. Participation in the Company's superannuation scheme is a condition of employment becoming effective after one year's service. Applications will be treated as strictly confidential and should give full details of education, training, and qualifications and complete record of all previous experience. Box No. 2229, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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