THE Chemical Age

VOL. LXXIII 20 AUGUST 1955 No. 1884

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P. 578

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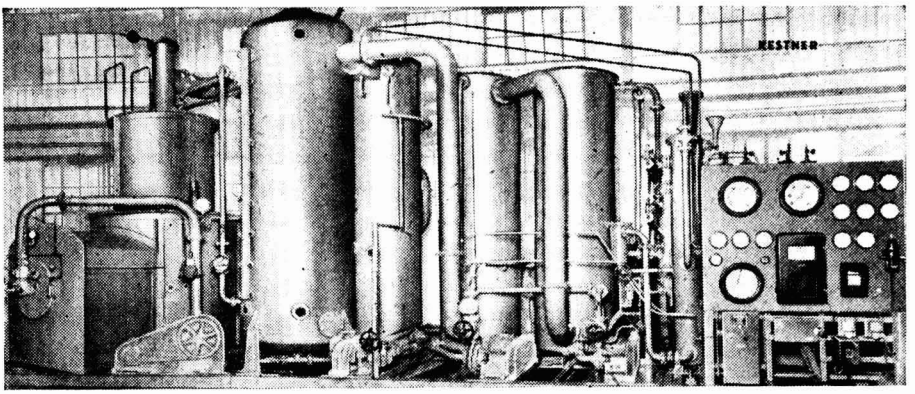

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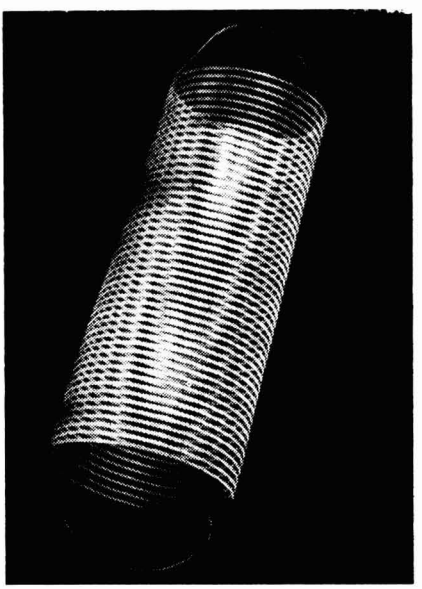

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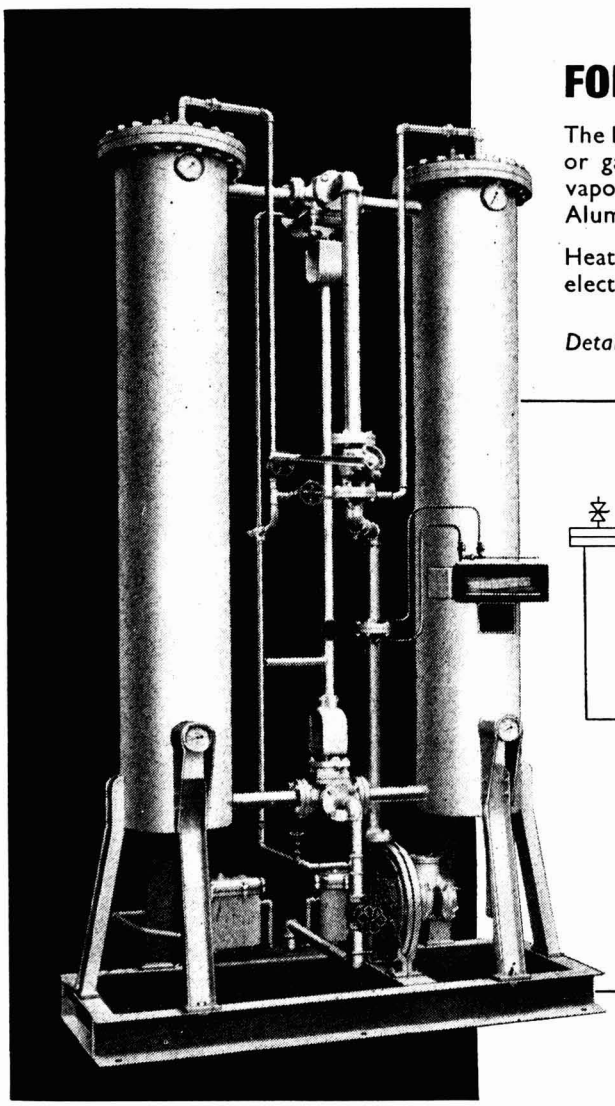

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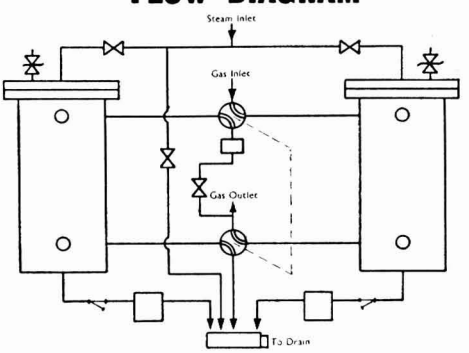
FLOW DIAGRAM



The flow diagram is of a typical instrument air dryer arranged for steam re-activation.
No electric power or circulating fan is necessary.

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CONTENTS

20 AUGUST 1955

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Feeding Europe's Crops

IN the year 1953/54, European countries in the OEEC grouping produced 47 per cent of all nitrogenous fertilisers, 39 per cent of all phosphatic fertilisers, and 48 per cent of all potash fertilisers. This proportion is a remarkably large slice of total world trade.

Here, then, is one field of technology in which the Old World cannot be accused of lagging behind the New for pace and intensity of exploitation. However, not all of this production is utilised at home. OEEC countries are net exporters of fertilisers and for nitrogen and potash they at present export rather more than half the total world export tonnage. These satisfying symptoms of progress are to be readily extracted from the latest OEEC survey, 'Fertilisers, 1952-55,' (1955, Paris).

That Europe should hold so marked a lead in industrial output for one particular section of chemical production is perhaps understandable enough. Side by side with heavy chemical industry, national fertiliser industries have had a long history of natural development. However seriously a country may require fertilisers for its soils, production is difficult and costly to initiate unless a substantial heavy chemicals industry also exists. Notably an abundant supply of sulphuric acid is required; also, the synthetic fixation of atmospheric nitrogen cannot easily be introduced into a country where chemical engineering experience is limited.

The industrial background in Europe has always been most suitable for fertiliser production. So, too, has been the demand of Europe's soils. Rising populations, again the consequence of industrial economies, have steadily required more food, and much of this expanding demand has been loaded upon aged soils. Cropping has become more and more intensive. Those countries with the smallest farming acreages (in relation to their populations) have tended to develop the highest rates of fertiliser use per acre.

Since 1949, consumption of nitrogen, phosphates, and potash in OEEC countries (as a whole) has shown a small but steady annual rise. Nitrogen usage has risen by rather more than a third during this five-year period; phosphate consumption by about a quarter; and potash consumption, like that of nitrogen, has increased by a third. In some countries this partly reflects a recovery of production that up to 1949 was still suffering from war disruptions; in other countries it is simply the result of steadily expanding use.

Hardly anywhere is this expansion attributable to the demands of new land for there is no new land in significant amount to be brought into use. Indeed, the trend in some parts of Europe is contrary—with established farmland passing into the clutches of brickwork and concrete.

Broadly the usage expansion is the result of rising rates of application per acre. For the OEEC countries the 1949 rates (in kilograms per hectare) were 10.7, 16.1, and 13.2 for N, P_2O_5, and K_2O respectively; by 1954 these had

become 14.1, 20.0 and 17.9. It is fair to say that the verdict of agricultural science is that fertilisers could be profitably used in Europe if present rates were raised by 50 or 60 per cent. Nevertheless, the advances since 1949 reflect the greatest credit upon official advisory services and the determinations of most governments to give one form or another of economic encouragement to farmers' investment in fertilisers. Changes do not occur swiftly in agriculture save under the compulsions of war.

No survey of a commodity's production and consumption can be sensibly divorced from the price factor. This applies particularly to fertilisers. A farmer will not spend heavily or even adequately upon fertilisers if he considers that they are expensive, and his view of 'dearness' is not only a matter of price per ton, but is related to the prices that crops are likely to fetch. One difficulty in Europe is economic reminiscence. Before the war fertilisers were extraordinarily cheap, a consequence of depression in other sections of industry; major raw materials needed in fertiliser manufacture were often by-products in surplus availability.

Many farmers remember this period and measure contemporary prices against it. Yet in most OEEC countries fertiliser prices have risen much less severely than the prices of most commodities.

Thus, with 1949/50 prices taken as 100, the 1953/54 prices in certain countries were as follows:

	Nitrogen	*Phosphate*	*Potash*
Belgium	106	111	79
Denmark	111	125	81
France	125	139	145
Germany	127	130	128
Ireland	126	120	84
Holland	111	107	100
Sweden	117	124	85
Britain	101	98	97

These changes, not all of them upwards, compare most favourably with price changes in the same period for other manufactured commodities. It must be pointed out, however, that forms of subsidy operate in a few cases; the British case is one of these, and here 100 is the index of 1952-53 prices. Changes in the system of subsidies would make comparison with 1949/50 price levels hopelessly misleading.

A similar set of figures based upon fertiliser prices for the 1955-56 farming year will certainly show small rises in price in most countries, but this upwards movement is still relatively small. Only the obstinate memory factor of the farming mind promotes the frequently stated opinion that fertilisers are 'too dear.' The factual truth is that manufacturers have faced the burden of rising industrial costs, especially that of labour, extraordinarily well and much of the price-raising pressure has been dispersed by better methods of materials handling and by improvement of production flowlines. An industry that before the war was rightly enough classified as the Cinderella of the chemical industry, a disposal-unit for many wastes of other industries, has found its fairy godmother and become a modern branch of industry in its own right.

Moreover, the unavoidable increases in fertiliser prices have been 'on the whole, less than the increase in prices of agricultural products'. The farmer as a fertiliser buyer is better off than he was in the inter-war years of industrial and agricultural depression. Only one change in the general economic balance could invalidate this in the future, and that would be the advent of agricultural depression without an accompanying industrial depression. Then fertiliser prices would remain at their present levels or be even higher while crop prices would be lower, and the profitable return upon investment in fertiliser applications would decline.

However, an economic swing of this nature is unlikely. The growth of populations alone ensures that crop prices will not plunge in a uniquely falling market. More food is constantly required, and it is an under-appreciated achievement of modern farming that so little evidence of the world's food/population pressure has been revealed so far in this second half of the twentieth century.

Statistically that pressure remains and rises each year. Cropland acreage cannot possibly increase at the same pace as the annual rise in world population. The surest and simplest means of relieving that pressure is to produce more and more food per acre by using more and more fertiliser. The point of diminishing return has not yet been reached in any country, not even in the world's heaviest fertiliser users, Belgium and Holland.

Notes & Comments

Chemicals in the Netherlands

THERE has lately been given to members of the Coke Oven Industry in Great Britain some interesting details of the Chemical Industry of Staatsmijnen in the Netherlands by J. P. M. van Waes, who is the Director of the Chemical Division of Staatsmijnen, and in charge of production and chemical construction. Mr. van Waes gave a reminder that in the last 50-60 years an important chemical industry has been developed on the basis of coal. In this chemical industry two important stages can be distinguished—the production and processing of coal chemicals obtained when bituminous fine coal is converted into coke; and the synthetic manufacture of ammonia; methanol, and liquid fuels on the basis of synthesis gases produced from coke oven gas, coke or coal. Although in the last few years the growth of the chemical industry on a mineral oil basis has been drawing a great deal of attention, it was interesting to have Mr. van Waes' review of the possibilities of coal as a starting material for the manufacture of chemicals. An outline of the development of the Staatsmijnen is followed by a description of the Maurits and Emma coking plants with emphasis on the processing of by-products, the utilisation of coke-oven gas especially in the ammonia, nitric acid, sulphuric acid and fertiliser plants and the manufacture of organic products. The sales of Staatsmijnen can be divided into three nearly equal parts: sales of coals, sales of coke and gas, and sales of chemicals.

Research & Development

BESIDES the departments directly engaged on research problems at Staatsmijnen, the Central Laboratory comprises several service departments, among which the material testing department and the corrosion and analytical departments are the most important. Some of the principal processes developed in this laboratory are the manufacture of nitro-lime, nitro-phosphate and caprolactum. Important work has also been done in the field of the gasification of coke and coal, while a process has been worked out for producing calcium carbide in slagging generators by utilising the high temperature prevailing therein. The training of young people before they enter the services of Staatsmijnen receives continuous attention. A school has been founded in the neighbourhood of the chemical works where young people, after primary school, can attend a technical education course which takes two years. After that, they have over two years more of alternating practical courses in the workshops and laboratories of Staatsmijnen and theoretical courses in school. When they have successfully finished these courses they are placed in the chemical works becoming fully-skilled workers at the age of 21-22. At present about 700 people of the chemical division attend some course or other.

Chemical Output

A HIGHLY encouraging report on current chemical trading appeared in a recent issue of *The Financial Times* (9.8.55). Exports of all types of chemicals had increased by 21 per cent in value in the Jan.-May period of 1955 compared with the same period in 1954. Unfortunately this substantial progress was offset by the effects of the dock strike in June and the overall rise for January-June was reduced to 12 per cent. Total chemical production seems to have risen by 9.3 per cent over last year, but figures are somewhat slowly available for this type of comparison. However, if this rate is kept up for the rest of 1955, the chemical industry will be the first national industry to have doubled its output since 1946, with only the motor industry running this performance at all closely. But the labour force employed in the industry will have risen by only a fifth in the same period. It would be difficult to find a better example of progress in productivity. Much of this advancement must be attributed to the plastics section of the industry, and to

polyvinyl chloride, polythene, and polystyrene in particular. In the last two years polythene's output has been trebled and that of polystyrene doubled. Nor is there any sign that the rate of increase in output will slow down. Very large expansion schemes are being actively pursued and present annual tonnages are likely to be doubled again in the next few years.

Surge of Expansion

DYESTUFFS have maintained stability rather than shared in this surge of expansion. Production and sales at home have been about the same as 1954, which was a notably good year; but export sales have shown a fall of about ten per cent (in value) so far in 1955, mainly as a consequence of intensified German competition. The recent plunge in share prices as a result of the Chancellor's credit squeeze was followed by good recovery in prices of leading chemical shares. Undoubtedly the 1955 production and sales figures for the industry justify this verdict of the market. No foreseeable turn in events can alter the view that holdings in sound chemical companies are outstandingly good investments for both return and growth-potential.

And in the US

PROSPECTS for the industry are viewed no less optimistically in America. 'Good times for chemicals are far from over' is the first sentence of an article in *Chemical Engineering* (1955, **62**, [8], 254). The Chemical Market Research Association has forecast rises from 50 to 90 per cent by 1960 for many organic chemicals; but dyestuffs are expected to maintain output rather than increase because consumption per head is unlikely to rise significantly. Rises expected by 1960 for inorganic chemicals will be smaller but for products in good demand 25 per cent expansions in output are probable. The synthetic fibre section of the industry is forecast with less certainty, but prospects for non-cellulose fibres seem better than for the older cellulosic types. As in Britain, huge rises in plastics output are expected. Increases of 130 per cent are confidently predicted over the next five years. Again the polyvinyls, polythene, and polystyrene seem to be picked out for star performances, but the US view seems to be rather more cautious for polythene for there is some fear of over-production being reached by 1960 or thereabout. Steady prospects are anticipated for pharmaceuticals and fertilisers.

Likenesses

THERE are many likenesses in these simultaneous appraisals of the UK and US chemical industry scenes. The same groups of products seem to have the best prospects of huge expansion. This consistency in economic soothsaying encourages confidence that its indications are correct. Taking the broadest possible view, it would seem that there are two basic influences at work—one, that in general the market for chemicals in modern communities is under-saturated, and the other, that rising standards of living for rising populations are steadily creating bigger demands. In some cases these two influences perhaps merge into a single influence, but in others, particularly where long-established products are concerned, they are separate because in the past the demand for such products has been under-developed.

Ramsay Memorial Fellowships

THE Ramsay Memorial Fellowships trustees have made the following awards of new fellowships in chemistry for 1955-56:—Mr. B. R. Hammond and Mr. E. Haslam, General British Fellowships at the University of Cambridge; Mr. H. Inokuchi, a Japanese Fellowship at the University of Nottingham; Dr. R. V. Jordana, Dr. A. Esteve and Dr. Garcia-Moliner, Spanish Fellowships at the University of Cambridge; and Mr. Theodore Cohen, a US Fellowship at the University of Glasgow.

The trustees have renewed the following fellowships for the same year:—Dr. J. A. Davies (Canadian Fellowship) at the University of Leeds; Dr. L. H. Ruiter (Netherlands Fellowship) at the University of Bristol; Dr. C. Alfonso (Spanish Fellowship) at the University of Birmingham.

New Tower Packing Developed

By-Product of British Atomic Research

ANOTHER useful by-product of atomic energy research was revealed to-day with the report of the first large-scale commercial use of a new tower packing developed by the British Atomic Energy Research Establishment, Harwell. The announcement was made by Seymour Schwartz, president of S. Schwartz & Associates, consulting engineers of New York City.

The packing was installed in a major plant of one of the United States' largest chemical firms located in Charleston, West Virginia. Previous to this installation it had been used in a four foot diameter polymer plant stabiliser of a major mid-western refinery where it was used to eliminate a production bottleneck.

This new installation, in continuous operation since early July, states Mr. Schwartz, represents a major test of performance and efficiency of this packing, labelled 'Spraypak'.

Tower packing is material used to promote the intimate contact of gases or vapours with liquids in distillation, absorption, fume scrubbing and similar operations.

In this most recent installation, states Mr. Schwartz, 60 feet of Raschig rings were replaced with 30 feet of Spraypak in a seven foot diameter high pressure absorber operating at 1,000 lb. per sq. in. With only half the height of the old packing, Spraypak permitted almost doubling of the previous capacity at the same number of theoretical trays.

American Licensing Agent

S. Schwartz & Associates were the consulting engineers on this project working with the American licensing agent, the packing fabricator and the user of Spraypak.

The Ministry of Supply has granted a licence to Fractionating Towers Inc. of West New York, New Jersey, to manufacture and sell this packing in the United States and Canada under the name Spraypak. Under this arrangement Fractionating Towers will exchange developmental information with Britain's Atomic Energy Research Establishment concerning non-confidential uses and performance of Spraypak tower packing, and S. Schwartz & Associates will provide engineering and technical services covering commercial installations in the United States and Canada.

Because Spraypak is so efficient and has such a high capacity, Mr. Schwartz notes, a 12 in. diameter column is the rock-bottom minimum that is practical for commercial or testing purposes. Spraypak is currently being evaluated in a number of minimum size columns by several major petroleum refiners on the west coast and in the southwest. One of the unique uses currently being engineered is the removal of odour from petroleum wax under high vacuum.

Heavy Water

British engineers originally developed Spraypak to remove heavy water from ordinary water by distillation, an operation considered almost impossible. It is now being used in a large project in New Zealand to produce heavy water by distillation using geothermal steam as a source of energy.

The performance of this type of packing was described recently by Dr. H. R. C. Pratt and his associates, under whose direction the development was carried out, at a meeting of the Institution of Chemical Engineers in London. To produce one ton of heavy water it was found that 330,000 tons of ordinary water had to be distilled.

In attempting to develop an economical packing for this type of service, a number of commercial packings were studied and found to be lacking either in efficiency, capacity or low cost. These scientists finally hit upon the use of an expanded metal, of which Spraypak is fabricated, having openings that are louvred and pitched in the direction of liquid flow.

In large towers, Spraypak is assembled in the form of interlocking horizontal diamond-shaped cells placed adjacent to and over one another, the walls of which are made of the special expanded metal. In this manner a cellular structure is formed so that liquid passing down the column flows as a thin film along the walls of the cells into the trough between adjacent units.

continued on page 378

FluoSolids

Use of Low Grade Sulphur Ores

WHEN the Anaconda Copper Mining Company, claimed to be the second largest copper producer in the world, re-opened the Yerington mine at Weed Heights, Nevada, they were requested by the American Government to develop their own sulphur supply for the production of sulphuric acid used in leaching copper oxide ores.

After preliminary investigations it was decided to make use of the Leviathan deposit of sulphur ore in Alpine County, California. This ore is of low quality (25-30 per cent sulphur) and for successful roasting it is necessary to use the FluoSolids process.

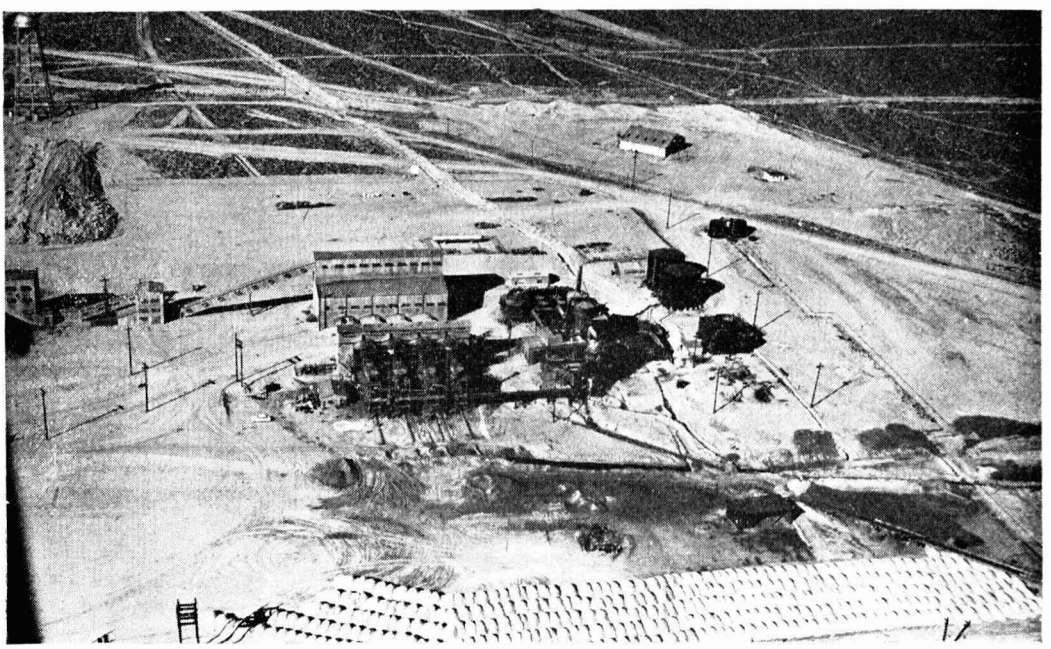
FluoSolids is a process for fluidising a mass of solid particles. If air at a pressure of 3 to 5 lb. per sq. in. is introduced through a constriction plate at the bottom of a reactor chamber it will cause a partial suspension of a 1 to 5 ft. bed of particles ground to 14 mesh or finer. This mass of solids acts as a fluid and will flow through pipes or overflow weirs.

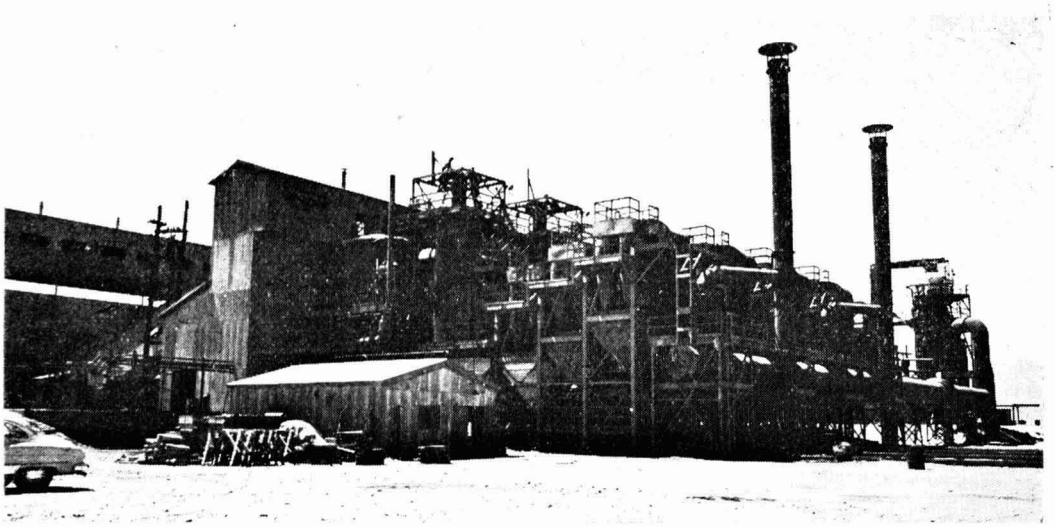
The procedure adopted by Anaconda was developed by the Dorr-Oliver Incorporated engineers and has the advantages of no moving parts, intimate contact between air and solids, high chemical efficiency and uniformity of temperature. The process is well instrumentised and close control of temperature and other conditions can be maintained.

The ore, ground to the correct size, is fed in from the top of the reactor. It was found that in this way it is possible to avoid clogging of the inlet chutes which otherwise tends to occur with the damp, sticky ore from the stockpile. The roasted calcines are removed from the bottom of the reactor. Bottom discharge of the calcines permits a coarser grind to be used, with a consequent reduction in the control required over the rod mills.

The four FluoSolids Reactors, of which only three are in operation at any one time, are 18 ft. in diameter by 25 ft. high, and are lined with a 4½ in. layer of fire brick surrounded by a layer of insulating brick. This insulation combined with the large heat capacity of the bed enables the Reactor

A general aerial view of the plant





to be shut down for several days without the bed temperature falling below 490° C.

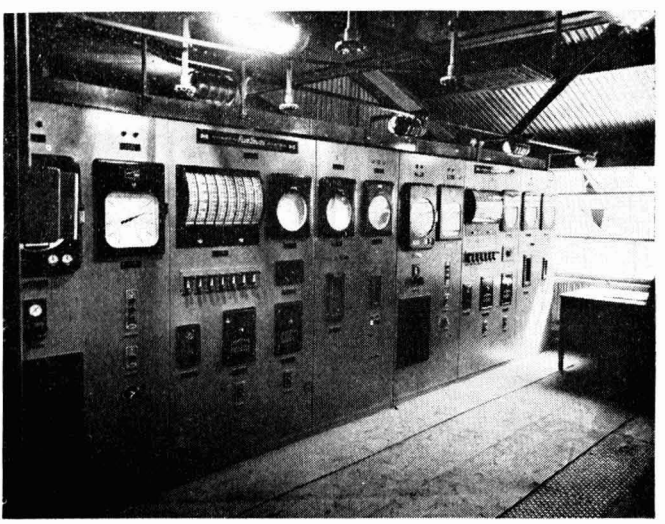
Air for the windbox is provided at 3 lb. per sq. in. by a 13,000 cfpm. blower and is fed in through a horizontal perforated steel plate which is fitted with a number of stainless steel nozzles. Normal procedure is to use a 4 to 5 ft. bed of material and to feed new material in at the rate of 9 tons per hour. The detention time is said to be approximately 5½ hours.

To start up, the Reactors are heated with propane burners till the temperature reaches 490° C and material is then fed in. After a shut down the reactors hold enough heat to start up simply by putting the blowers and feeders back into operation. The temperature of the bed is 650° C while the temperature above is approximately 30° to 50° C higher.

The gas produced by the Reactors contains 8 to 12 per cent of sulphur dioxide together with a considerable quantity of dust. This gas is introduced into a two-compartment cooler where it is cooled to 430° C by means of 20 high pressure water sprays. The gas then passes through a series of Buell cyclones where approximately 92 per cent of the dust is deposited.

When three Reactors are operating, about 32,000 cu. ft. per minute of product gas is passed to the acid plant. The theoretical

Top: The four FluoSolids Reactors



Bottom: View of operating room from which the whole process is controlled

maximum gas strength is 18 per cent but 12 per cent is adequate for acid plant work and the installation was designed to produce gas of this strength.

Calcines and dust deposited in the coolers and cyclones are sluiced to an evaporation area. Sulphur content of the combined calcines is about 1 per cent.

The sulphur dioxide gas produced by the Reactors is passed to a Peabody scrubber for elimination of fine dust and four Cottrells in parallel for precipitation of sulphur trioxide mist. The gases are dried in a tower containing 93 per cent sulphuric acid. This purified gas then goes to the contact acid plant. Primary and secondary convertors in each section of the acid plant produce sulphur trioxide, with a conversion efficiency of 97.5 per cent. Sulphur trioxide is then passed through two heat exchangers and is absorbed in 98 per cent sulphuric acid.

Fine dust produced from the hydroscopic tufts and volcanic agglomerate gangue in the sulphur ore could present a serious problem. Dust of this sort would blind the vanadium pentoxide catalyst in the convertors and build up back pressure at that point. It has been found that the Peabody scrubber which operates at 95 to 97 per cent efficiency handles the problem quite adequately.

The whole of the FluoSolids System is controlled from an operating room containing four control panels—one for each Reactor. These panels indicate and control the entire operation from the feed to the rod mills to the sulphur dioxide content of the stream leaving the cyclone.

It is believed that the application of the FluoSolids process to the production of sulphuric acid represents a great advance in technology as it makes it economically possible to use low grade ores, ores which previously would have been rejected.

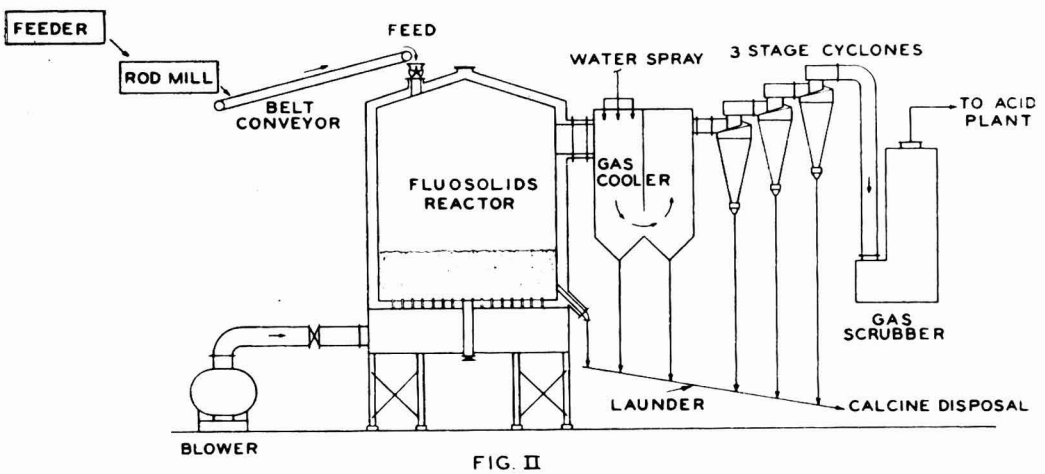


FIG. II

SCHEMATIC FLOW SHEET
THE DORRCO FLUOSOLIDS SYSTEM
ANACONDA YERINGTON, NEVADA

Water Coolers

UNDER a joint agreement with the Marley Company of Kansas, Heenan & Froude Ltd., of Worcester, manufacturers of water coolers since 1909, will manufacture coolers for practically all countries outside North and South America. They will be of Marley design with slight modifications for British requirements.

The Marley Company holds a cross licence to build the Heenan type cooler, which will be used in cases where it is the most suitable type.

The first models to be marketed by Heenan & Froude will be the single flow Aquatowers. These will be followed later by larger types. The range includes low temperature cooling from 200 to 4,800 gallons per hour and high temperature cooling from 600 to 13,500 gallons per hour.

The Danger of Dust

by ALEC WEBSTER, M.Sc., M.I.Chem.E., F.R.I.C., L.I.Fir.E.

IN CONSIDERING the question of the dangers arising from dusts, the old adage —' Prevention is better than cure '—holds in full, and measures should always be taken to keep dust in bounds, having in mind that, almost invariably, the finer the dust, the more dangerous it becomes. The better way is to avoid producing the dust in the first case, though this is not usually easy.

For those dusts which have a toxic hazard, adequate ventilation is probably the only cure and it is important that the ventilation should be such that it draws the dust away from the operator's face. It is important, therefore, to ensure that the velocity, not only in the duct, but past the operator, is adequate to effect the removal, and this often means that the flow through the duct must be higher than is thought necessary. This means that the air velocity along the ventilation duct should be carefully calculated before the installation is put in.

When air is used to remove dust by means of trunking, all air discharged from the building through a duct must be replaced through some other opening. If the weather is cold, in order to maintain the statutory minimum temperature, the air may be heated before passing into a building. To avoid excessive heating costs, ventilating air is sometimes re-circulated.

Recirculation of Air

There are two points which affect the re-circulation of air. The first one, which is indirect, is that, if the point at which air is expelled from a building at the end of a ventilation system is very close to a point where air is drawn in, as in a Plenum system, and if the suction velocity into a building is relatively greater than the exit velocity, contaminated air may be drawn in and so re-circulated. Therefore, the points of exit and ingress should be situated as far apart as possible.

If, for any purpose, it is considered necessary to re-circulate the air, it is obvious that the efficiency of removal of rust must be extremely high, or else the concentration of dust will increase until it is above the maximum limit which can be allowed. So far as toxic dusts are concerned, those which are most liable to penetrate into the lungs and not be discharged are in the range which would not normally be visible to the naked eye, except in rays of bright sunlight and, in order to ensure that the dust removal is satisfactory, even for particles in this range, it is necessary to make periodic visual examination, using a very powerful beam of light. Apparatus for carrying this out is available.

The particle size concerned is usually within the range of 0.3 to 1.0 μ. Speeds along ducting vary considerably from, say, 200-300 ft. per minute for a very light material such as cotton fibre, to 2,000-2,500 ft. per minute in heavy dust such as emery. Tables are available which give suitable velocities for the air travel along ducts.

Turbulent Flow

The distance through which dust will travel along a duct before settling can be determined approximately using the resultant of its vertical and horizontal velocities. It will usually be found that air speeds in the ventilating duct are large enough to produce turbulent flow, as distinct from streamline flow. This will tend to prevent the dust from settling to a degree which will vary with the size and shape of the duct, the nature of the dusts, the particle size, etc. The calculated figure will therefore err on the right side. Regular cleaning is a necessity and this cleaning should form part of the scheme of planned maintenance. The period which can elapse between cleaning is easily decided.

Often, it may be advantageous to handle both explosive and toxic dusts in a wet condition. If the solvent is one which is non-inflammable, it will considerably reduce, if not entirely eliminate, the risk of fire and explosion. It will also tend to prevent lung damage through inhalation. If the dust is dissolved in the solvent, one is, in effect, handling droplets of liquid; the liquid will tend to evaporate, and so there may be a tendency to form sticky deposits.

In the case of toxic dusts, the importance of bodily cleanliness and the provision of

washing facilities cannot be stressed too highly, and every encouragement should be given to employees to make full use of the facilities provided for their benefit.

If a dust is inflammable, and its concentration in the medium carrying it (usually air) is above the lower explosive limit, there is a possibility, unless care is taken, that ignition will take place. The smaller the size of particle, the more rapid will be the ignition, so that, in the case of quite fine powders, this ignition will be so rapid as to be regarded as an explosion, that is to say, apart from the ordinary development of pressure due to gas formation, there will be a pressure-wave and an impulse-wave against the walls of the container which may cause their rupture.

The list of dusts which can cause explosions is very numerous, including as it does almost all organic products (provided they are finely divided and of the right moisture content), a number of metallic dusts, and a number of inorganic dusts.

The general causes of fires involving dusts are given in the table below, which is quoted from 'Fire Protection Association Technical Booklet No. 5':—

TABLE 1

Source	*Number of Fires*
Electrical sparks	6
Sparks or friction inside machines	
(*a*) Conveyor belts, elevators, etc.	3
(*b*) Disintegrators (including ducting and dust separators)	25
(*c*) Size grading machines	7
(*d*) Dust extractors from polishing, sawing processes, etc., (including ducting and separators)	8
Frictional sparks outside machinery	6
Friction outside machinery	2
Naked lights, cigarette ash, etc.	11
Part of manufacturing process	5
Spontaneous combustion	2
Unknown	16
Total	91

This booklet gives a survey of a large number of fires involving dusts, and it may be of interest to quote the nature of dusts involved in fires, the table below again being quoted from the same source:—

TABLE 2

Nature of Dust	*Number of Fires*
Inorganic	
Magnesium and aluminium (and alloys)	33
Other inorganic dusts	4
Organic	
Foodstuffs	27
Cloth	11
Wood	7
Plastics	4
Other organic dusts	5
Total	91

It will be seen from Table (1) above that sparks form by far the greater proportion of causes of dust ignitions and, therefore, all possible steps should be taken to prevent the generation of sparks, either by static electricity, or friction, Static electricity can be largely dispersed by the earthing of ducts, etc., but this does not necessarily discharge any static electricity which is in the dust cloud itself and, therefore, it is useful to incorporate in any duct along which the cloud of dust is flowing some form of earthing wires which will discharge the static electricity from the cloud.

Sparks from ferrous metals can be prevented by passing the dust over a magnet and, in this case, it is safer to use a permanent magnet than one which derives its power from an electric current as, should the electricity fail, the magnet ceases to operate, and not only will it then fail to remove tramp iron but it will also release any tramp iron which it has previously succeeded in collecting.

If it is essential to use an electro-magnet for removing ferrous material, the current for the magnet must be interlocked with the fan current which causes the dust to travel along the duct. It is important, when planning this interlocking, or whatever other electrical device may be adopted, to ensure that the fan cannot be run until the magnet has been energised and that, in the event of the current of the magnet failing, the fan is cut off and a brake applied to it.

Where the fan is extracting from a continuous process, a problem of this sort may be serious, and requires very careful design to ensure that there is no difficulty. Should there be a stoppage, it is important that any accumulation of material which has dropped from the magnet is completely removed before a re-start is made. A procedure for this should be in writing.

Sticky Materials

It may perhaps be opportune to refer to deposits on ducts which are caused by relatively sticky material, as, for example, paint-spraying. In such a case, the dust at the source consists of a mixture of pigment, lacquer, for example, cellulose nitrate, a plasticiser and a solvent, the last-named evaporating as the particle proceeds along the duct.

It is, however, quite likely that the dust will be sticky and will tend to aggregate into larger particles, which will ultimately settle

on the sides of the duct in the form of a layer which is difficult to remove. In ducts for handling deposits of this sort, particular care must be taken that the cleaning facilities are adequate to meet the requirements. The soot in the flue of an industrial apparatus burning either coal or uncleaned producer or other similar gas at low efficiency, or with the intention of giving a reducing atmosphere is another example of such a dust.

Considering that, generally, the presence of oxygen is a requirement for a dust to burn, it is desirable, when grinding highly inflammable dusts, to carry out this operation in a closed circuit using an inert gas or, at any rate, so to dilute the air with an inert gas that there is no longer sufficient oxygen to cause the necessary combustion. It is probably better in this case to 'go the whole hog' and use a complete circulation of inert gas rather than take the risk of not carrying out the dilution far enough. The inert gas can be carbon dioxide or nitrogen or any other suitable one.

In such a case, any dust filter will have to be incorporated inside the closed circuit and arrangements will have to be made to draw off the dust by means of suitably designed valves. It will also be found desirable to maintain a slight positive pressure in the closed circuit to ensure that no air is adventitiously drawn into the system. This requirement for grinding in an inert atmosphere is a statutory requirement in some industries in the United States.

Cleanliness

Cleanliness is of considerable importance and it must be ensured that dust which is likely to fly is not allowed to settle on the tops of girders or on window ledges, which latter can, when convenient, be made to slope sufficiently steeply that dust will have considerable difficulty in lodging.

In dealing with the removal of dust from the source, there are a number of features which need to be considered in designing a ducting. The first thing is that sharp bends should be avoided as they tend to allow dust to accumulate. There is also a contrary opinion that, as a double right-angle bend in a pipe will often act as a flame trap, or an explosion trap, double bends might, with advantage, be included, but having in mind that one's aim is to prevent the explosion occurring, it would seem undesirable to allow piles of dust to accumulate in a corner which, should an explosion occur, would almost certainly produce the necessary cloud to give the secondary explosion. Explosion reliefs need to be inserted in the ducts at intervals and these should be based on the possible rise of pressure in a duct—the calculation of which is difficult. It is doubtful whether such a calculation is of much guidance, and it is far better to be liberal with the explosion reliefs and dispose of them strategetically along the duct, having in mind that, should an explosion occur, the flame will come out of the explosion relief.

Pressure Peaks

It is now fairly well understood that, when an explosion takes place and the blast wave travels along a duct, there are pressure peaks, and it is at points on the ducts where these peak pressures exceed the bursting pressure of the duct, that fractures occur, and the obvious place for an explosion relief to be put is some distance short of the place where a pressure peak will occur. As it is very difficult to forecast where pressure peaks of this type are likely to occur, the only thing to do is to be very liberal in provision of explosion reliefs, so that the damage will be minimised.

It is important that this flame should be led away to the outside of the building, so that it can do no harm. Facilities should be provided for cleaning ducts, and these could take the form of junctions near bends, so that a brush of a type used by chimney-sweeps could be pushed down. Where a duct is of considerable length, there is no reason why a short side tube should not be put on for this purpose, but it should not in any way be regarded as a suitable place to fit an explosion relief.

There are numerous ways of collecting dust, probably the most common is the cyclone, the design of which will be familiar to most readers. It consists of an inverted conical vessel into which the air is led tangentially and removed from the centre. The velocity of their stream causes the dust to move to the edge of the cyclone and gradually drop down into the cone where it can be drawn off as required.

It is necessary to put in an adequate explosion relief in a cyclone, if the dust is likely to catch fire or explode, and, for most dusts, a figure of 5 sq. ft. per 100 cu. ft.

volume will be found adequate. This explosion relief should be situated at, or near, the top of the cylone.

Where a cyclone is used and the air is being re-circulated to prevent excessive cost in heating, it may be found that a cyclone designed to remove the dust to the degree necessary would be uneconomical in operation, and so it may be found more satisfactory to arrange for two-stage cleaning, that is, a cyclone to remove particles above a certain size, coupled with either a bag-filter or a set of water sprays to complete the final cleaning.

A bag filter is a device in which the air stream is drawn through fabric bags so that the dust remains on one side of the fabric and the air goes through uncontaminated. There are a number of standard types of bag filters on the market. Some types are designed to be continuously vibrated so that the surplus dust is shaken off and drops down into a receiving hopper.

Wetting-Out Agent

Another method is to cause the air current to impinge on the surface of a liquid which contains a wetting-out agent, so that the dust will be wetted by the liquid and fall to the bottom. In such a case, it is, of course, necessary that the specific gravity of the dust is sufficiently greater than that of the liquid, so that it will fall to the bottom at a fairly rapid rate. It would obviously be unsuitable for particles sufficiently fine to exhibit a Brownian movement.

In dealing with the general organisation of works where dust explosions are possible, the same basic principles should be adopted as in the design of an explosive works, that is to say, the work should be carried out so far as possible in small units separated by reasonable distances, so that, should an explosion occur, the effects on surrounding buildings will be very much minimised. It is realised that this is not always practicable; for example, in a flour mill, but where it can be done, it should.

It is also very desirable that plants should operate without any personnel in the immediate vicinity, and this is not difficult to arrange. In such cases, it is the best practice to arrange that the door of a building can only be opened when the grinding plant is not in operation and, also, the grinding plant cannot be started until the door is shut. This can easily be arranged by the use of an interlock, such as a Castell key.

Generally speaking, all electrical installations should be dust- and flame-proof. In the case of very fine dusts, it may be necessary to achieve this by the use of conduit pressurised with nitrogen.

Some dusts are liable to spontaneous heating and, where this is likely, precautions should be taken to deal with any rise in temperature. If the dust is in large heaps, a thermometer can be inserted into the pile and the temperature watched. If the temperature rises to 20° F above ambient, this should be a warning that some action is necessary to prevent further heating.

A small amount of water is useless—a dust must either be spread out, or else flooded. It is doubtful whether a smothering agent such as carbon dioxide, or carbon tetrachloride, would be really effective because the oxygen supply is usually coming from some source in the dust itself, particularly in the case of carbonaceous dusts.

The number of dusts which are liable to develop spontaneous heating is very large, and includes most organic materials. It is surprising how few cases of breach of smoking regulations actually occur in an explosives factory, and the institution of a similar code in other works is largely a matter of education. In the case of naturally occurring organic material, such as cotton, leather shavings, coal dust, etc., the presence of a small amount of moisture accelerates the tendency to spontaneous ignition and, therefore, if it has been found necessary to spread out a pile of such material, which has got over-heated, and it is then flooded with water, there is again a rather dangerous period when it begins to dry out.

Spontaneous combustion is often quoted as a cause of fire, when an examination of the remains shows that the fire has actually started from some other cause, such as a carelessly disposed of cigarette end, and, whenever there is any likelihood of fire on any occasion whatever, a rigid factory discipline in relation to smoking should be imposed.

APPENDIX

THE hazards from dusts are two—the danger to human beings from poisoning, and the danger to buildings from a fire or explosion. The latter is by far the more spectacular because, although the symptoms, for example, over-heating of a pile of dust, may

sometimes be there for a period, the results are literally over in a flash.

The toxic hazard is far more insidious, as the dusts, being everywhere, are continuously inhaled and, if those dusts have any toxic effect on the lungs, or the stomach, their presence should be ascertained and steps taken to remove these dusts or, better still, to prevent their formation.

To make a list of the dusts which can have a toxic effect on human beings would be a lengthy business. There are a large number which are known to have a deleterious effect on the lungs, for example, silica and asbestos, and certain beryllium compounds, but cases have also been quoted where it is considered that lung damage was caused by the continued inhalation, in the course of work, of particles of iron oxide.

For particles to inflict damage on the lung, it is usually necessary that they are within the range of 0.3 to 1.0μ and such particles can only be detected by a very bright light such as a beam of sunlight. Therefore, any attempt made to remove them will need to be controlled by some form of apparatus producing a strong beam of light, so that the effects of the preventive measures can be readily ascertained.

There are a number of metallic dusts, such as cadmium, zinc, lead, which, in themselves, can cause damage, but it would appear that the effects are more due to ingestion than inhalation. In order to cause bodily injury through ingestion, it is necessary for the chemical to be soluble in the gastric juices and, in this respect, it is interesting to note that barium salts are toxic, but barium sulphate, which is insoluble, can be given as a meal for X-ray analysis.

Poisonous Substances

Generally speaking, the list of substances which are poisonous are fairly well known, but mention should be made of the effects of small quantities of supposedly harmless drugs being inhaled over a lengthy period; for example, the writer had occasion to consider, at one time, a case of illness in the making of weed-killer, and it was found that, although ventilation had been provided, the ailing person had been packing this product for some three years, and had been constantly taking in very minute doses which had ultimately necessitated a period on other work.

In this particular case, although the air rate along the ventilation duct was adequate to take the particles along satisfactorily, the size of the hood at the end had had to be sufficiently large to make it that there was not an adequate current of air over its opening.

Turning now to a question of a fire and explosion, any compound, which is easily oxidised and is in a sufficiently fine state of division, can be heated up to a sufficient temperature, because of its oxidation, to make it ignite fairly readily, or to be in such a state that quite a small spark will set it alight.

Explosive Mixture

In general, the lowest amounts of combustible materials which are required to form an explosive mixture are nearly all between 0.02 and 0.04 oz. per cu. ft., but the upper limit of explosion of these substances is not known. A large number of products have been tried in the Ministry of Labour testing apparatus, and regular information as to results of some of these tests can be obtained.

Suffice it to say that most cellulosic organic materials, when in a fine state of division, can cause rapid burning, even to the extent of being called an explosion. Several metals, which oxidise readily, such as aluminium, iron, zinc, and magnesium, can also develop sufficient heat to ignite any organic matter in contact with them.

The same may be said of such dusts as perchlorates, perborates, peroxides, quicklime, when in a fine state of sub-division and in the presence of suitable combustible matter. Quite a number of sulphides combine with oxygen sufficiently readily and quickly to develop a high temperature.

In dealing with the problem of fires from dusts, there is one aspect which may easily be overlooked when considering the collecting system and, that is, the effect of mixing two different dusts together. For example, if iron oxide dust and aluminium happen to be mixed together in the same collecting cyclone, one has in that cyclone a thermite mixture which is naturally a good deal more hazardous than the two materials separately.

The same effect can be noticed if oil-impregnated cotton dust and wood shavings were allowed to mix together and to remain unattended for any length of time.

Oxford Discovery

MRS. Dorothy Crowfoot Hodgkin, F.R.S., working in the Laboratory of Chemical Crystallography at Oxford, has analysed a complete molecular structure of B_{12}, a liver extract used for combating pernicious anaemia. The project was carried out in association with research workers under Sir Alexander Todd, the Glaxo laboratories at Greenford, and the University of California, Los Angeles. Since the vitamin was isolated seven years ago scientists have been trying to discover the chemical structures of B_{12}.

Cliftonville Conference

A PAPER, 'Science and the Changing Pattern of Industry', will be read by Dr. A. King, C.B.E., D.Sc., chief scientific officer of the Department of Scientific & Industrial Research, Teddington, Middlesex, at the Purchasing Officers' Association national conference at Cliftonville from 29 September to 2 October. Three sectional meetings at the conference will be devoted to new materials—silicones, titanium, and Terylene. The speakers will be: Mr. K. A. M. Barton, sales director of Midland Silicones, Mr. J. T. Richmond, M.A., B.Sc., F.R.I.C., A.Inst.P., chemical research controller of Laporte Titanium Ltd., and Mr. C. L. B. Carter, of the I.C.I. Terylene council.

Memorial Prize Revived

THE Institute of Metal Finishing is reviving in modified form the William James Memorial Prize, a competition which lapsed at the outbreak of war. Unlike the original competition, the revived version will be in two sections; one limited to competitors of not over 25 years of age, the other, no age limit.

As the primary function of the Institute is to furnish a medium through which technical information on metal finishing and related subjects can be disseminated, the competition is being resumed to help further this object.

The proposed rules for the revised competition are: essays from a theoretical or technical standpoint on any aspect of metal finishing or related subject for competitors up to 25, and essays based on practical knowledge or experience for which there is no age limit.

Essays should be from 1,000 to 5,000 words and may be illustrated. Entries should be sent to: The Secretary, Institute of Metal Finishing, 22 Great Ormond Street, London W.C.1, not later than 31 October.

New Textile Institute Section

RATE of growth of the Textile Institute membership since the war has demanded the formation of several new sections and branches. Latest section to be formed was at Leeds following a meeting at Leeds University on 26 July which was attended by almost 80 members.

Chairman of the new section is Professor J. B. Speakman, F.T.I. (Hon.), Professor of Textile Industries at Leeds University. Mr. D. Bramley, of British Nylon Spinners Ltd., was elected honorary secretary, and Dr. P. W. Carlene, F.T.I., of I.C.I., Harrogate, honorary treasurer.

Tower Packing

continued from page 369

Liquid mixing occurs at this point, with the small pool of accumulated liquid dividing and flowing down the mesh to the next lower cell. Rising gas or vapour passes through the louvred holes in the expanded metal, which are similar in shape to Venturi openings, so that intimate spraying action occurs between the descending liquid film and the rising gas. Because Venturi openings cause maximum mixing at minimum permanent pressure loss, Spraypak offers low resistance to flow.

At liquid rates close to the flooding point, pressure drop is of the order of an inch of water per foot of packed height. On shutdown the packing drains completely free of liquid.

In the British report of the performance of Spraypak in the distillation of water and of other systems, Spraypak was rated two and a half times better than bubble cap trays and 1.4 times better than a recently developed slat-type tray, on the basis of capacity and equivalent heights.

Spraypak, currently available under licence from Fractionating Towers Inc., is expected to have numerous uses in the chemical, petroleum, liquor, pulp, rayon, pharmaceutical and petrochemical industries including atmospheric pollution applications.

Leather Chemists' Societies

International Union Holds Stockholm Meeting

THE IMPORTANCE of the work carried out by the Swedish chemist Carl Hylten-Cavallius on the leather tanning process was emphasised by Dr. K. H. Gustavson in his presidential address to the International Union of Leather Chemists' Societies' fourth biennial conference (Stockholm, 1-4 August).

Working at the Royal Institute of Technology, Stockholm, Cavallius carried out investigations into the chrome tanning process.

Satisfactory leather can be obtained by his two bath method which is a combination of the chrome and iron tanning methods. Cavallius also carried out many other investigations apart from his work on the tanning process. He studied the reaction of glue with acids and other chemicals and made the first investigations of the pickling process.

Speaking on 'The Mechanism of Vegetable Tanning as Revealed by Monolayer Studies', Dr. K. G. A. Pankhurst said that it is possible to study tanning reactions by measuring the changes in surface viscosity that occur when collagen is spread as a monomolecular surface film on the surface of dilute solutions of tannin.

Changes in surface pressure and surface potential give information on the nature of the chemical reaction taking place. An increase in surface viscosity, which characterises most tanning reactions, provides evidence of cross-linking.

With vegetable tannins two main effects are observed; an increase in viscosity, and a condensation of the film. These changes may or may not be accompanied by a reduction of surface potential, depending on *p*H conditions. Condensation of the film indicates a very close packing of the polypeptide chains, which is attributed to the interaction of the tannin molecules and the —NH—CO— groups of the protein, probably by hydrogen bond formation. The importance of non-ionic forces in vegetable tanning can be demonstrated by using films of N-methoxy methyl nylon in place of collagen, where similar results are obtained despite the absence of ionic groups.

There is some evidence that in the case of some hydrolysable tannins ionic forces play a certain part. These are considered to be subsidiary to the main reaction.

Dr. D. Balanyi reviewed 'The Fundamental Chemistry of Chrome Tanning'. Only those chromic salts which are protolysed in aqueous solution are able to tan, he said.

When chromic salts are made basic OI groups (—OH— —) are formed giving polynuclear complexes. Multipoint linking of these complexes to adjacent collagen chains is then possible.

Next Dr. T. White discussed 'The Chemical Principles of Vegetable Tannage'. After surveying briefly our present knowledge of the nature of collagen and of vegetable tanning extracts he devoted attention to the potential sites of combination present in the reacting system and to those physico-chemical characteristics of the system which contribute to the leathering effect.

The combination of vegetable tannins with collagen has been variously ascribed to electrical neutralisation of oppositely charged colloids, simple salt linking effects, hydrogen bonding, dehydration and elimination of bound water, absorption effects, oxidation-reduction processes involving reaction of tanning molecules as quinones, and to physical deposition of insoluble matter.

'Some Aspects of Modern Sole Leather Tannage' were discussed by N. L. Holmes. He stressed the importance of a clear conception of the distribution of tannin in leather/liquor systems. He showed that this distribution was in line with classical ideas of phase distribution, having regard to the very long time required for the establishment of equilibrium. The role of bound water and the relative affinity of hide for water, acid and tannin were also important, he said, and a fuller knowledge of these factors would throw more light on the nature, of the chemical and physical bonds which were operating.

Papers read at the conference are being published in various British and foreign journals. Full details are not yet available but information can be obtained from the Hon. Secretary, Mr. A. Harvey, 'Craigieburn', Duppas Hill Road, Waddon, Croydon, Surrey.

Publications & Announcements

IN the August issue of *Agriculture*, price 9d. from HMSO, there are articles on potash fertilisers by G. A. Cowie, M.A., D.Sc., Ph.D., F.R.I.C., and on brush-killers by F. D. Smith, D.Sc. In his article on potash fertilisers, G. A. Cowie writes: A characteristic trend in the use of potash fertilisers in recent years has been the increasing preference for the most concentrated type of salt—muriate of potash (60 per cent K_2O). Before the war muriate of potash (59 per cent K_2O), which was then the highest grade of muriate available, accounted for only 35 per cent of the total potash used. Now muriate of potash (60 per cent K_2O) constitutes the source of nearly 80 per cent of the total potash used. Writing about brush-killers, F. D. Smith also reports on trials with the hormone brush-killers, 2,4-D and 2,4,5-T on his own farm.

* * *

TWO Lancashire firms, Cygnet Joinery Ltd., makers of laboratory furniture, and Turner & Brown Ltd., chemical plant engineers, announce details of a new-type fume control cabinet they have co-operated in designing and producing. Called the Cygnamatic, its main feature is a PVC lining faced with $\frac{1}{8}$ in. white cobex rigid vinyl sheet which the makers claim would not be affected by radio-activity. It has been designed specially, say the makers, to handle aggressive chemicals and should interest chemists who are using the Kjeldahl digestion apparatus, as well as hydrofluoric, hydrochloric, perchloric, nitric, and sulphuric acids.

* * *

THE use of Armour aliphatic diamines as cross-linking agents for epoxy resins is the subject of Technical Bulletin No. C-3/L just issued by the chemical division of Armour & Co. The Duomeens are a series of diamines of the general formula $R.NH.C_3H_6NH_2$ where R represents an alkyl group derived from fatty acids. In Duomeen T, for instance, the alkyl group is derived from tallow and in Duomeen S from soya fatty acids. Duomeens are pale, paste-like materials with melting points ranging from 20°-48° C. A typical example described in the bulletin, Duomeen S is used with an epoxy resin at the rate of 69 parts Duomeen S to 100 parts resin. Mixing at 50° is recommended, and pot-lives ranging from 120 minutes at an ambient temperature of 25° C, to 30 minutes at 75° are claimed. Post-curing at 150° C will not affect the flexibility of the system. The flexibility of an unmodified epoxy/Duomeen S system is compared to that of plasticised vinyl polymers. Greater resistance to thermal shock and mechanical vibration is obtained and the resilience and flexibility of the system coupled with its electrical properties make it suited for the embedment of electronic parts.

* * *

THE British steel industry is the fifth largest user of sulphuric acid in the country. Last year 100,000 tons was used to remove millscale and rust from steel. How to dispose of this waste pickle liquor, consisting of a solution of iron sulphate in water together with a small amount of unused sulphuric acid, is a problem. How the steelmaker can deal with this liquid residue, and possibly recover from it something of value is discussed in an article 'Acid from Waste' in the 1955 issue of BISRA Survey which is now available.

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AN illustrated booklet, 'Nuclear Energy and Its Uses in Peace', has been published by HMSO, price 2s. 6d., for the United Nations Educational, Scientific & Cultural Organisation.

* * *

IN the autumn of last year 26 Willpute coke-ovens came into production at West Hartlepool, followed by a second battery of 26 last May. Next year Dorman Long will bring in a battery of 150 at their Cleveland works, and 20 at Consett. In 1957 the company will add a battery of 26 ovens at West Hartlepool. These are some of the facts revealed in the current issue of the *Monthly Statistical Bulletin*, a publication of the British Iron & Steel Federation, which features, 'Steel on the North East Coast' in its leading article. The publication not only covers all UK statistics, but iron and steel production figures all over the world.

PRACTICAL TEXTILE CHEMISTRY. By J. W. Bell. The National Trade Press Ltd., London. 1955. Pp. xv + 259. 30s.

Thirty years ago the constitution of natural fibres was largely unknown and knowledge of textile processes empirical. To-day, the constitution of the natural fibres is established, synthetic ones have been developed and the underlying principles of textile technology are well understood. It is therefore essential that text-books used in the training of the textile technologist should be based on scientific aspects of textile materials and processes. As far as wool is concerned, this book goes very far to meet such a demand and provides a very useful experimental background for the advanced textile student.

Apart from the consideration of fibre identification and the analysis of fibre blends, 'Practical Textile Chemistry' is concerned only with wool and wool processes. The term chemistry is interpreted broadly so that physical methods, such as the gravity separation of fibres, the use of load-extension curves, obtained using a simply constructed extensometer, and examination of the surface properties of fibres, are included. The book contains nearly 200 experiments, conveniently grouped into four sections. The first of these includes methods of purification and drying of wool and experiments illustrative of its morphology, chemical constitution and molecular structure. A second sections deals with methods used in the analysis and testing of material such as oils, soaps and water, which are used in the processing of wool. In addition to the more usual methods of analysis, modern developments, such as the estimation of water hardness by the EDTA method and the determination of surface active agents and synthetic detergents, are included. A third section contains experiments designed to illustrate the fundamental principles of such processes as scouring, carbonising, milling, felting, bleaching and finishing and also includes a useful chapter on the identification of faults in wool materials. The final section is concerned with fibre identification, quantitative analysis of fibre mixtures and analysis of reagents. An appendix containing some useful tables, together with author and subject indices, completes the book.

The experiments seem to have been chosen with care and require little apparatus other than that met with in the normal chemical laboratory. Experimental directions and diagrams are clear and methods of calculation explained. There are some plates illustrating apparatus and a number of photomicrographs of fibres. The underlying theory is concisely given before each experiment and in many cases references to the literature are given as a guide to further reading. The advanced textile student who works through this book should gain not only technique and a good knowledge of experimental methods but also a sound theoretical understanding of wool and wool processes. Textile technologists, as well as students and teachers of textile science, will find much of value in this book.—W. R. MOORE.

FORSCHUNGSBERICHTE DES WIRTSCHAFTS- UND VERKEHRSMINSTERIUMS NORDRHEIN-WESTFALEN. No. 100: Untersuchungen über den Druckverlauf bei der explosiblen Zersetzung von gasförmigem Azetylen. By P. Hölemann and R. Hasselmann. Pp. 40. DM.11. No. 139: Studien über die thermische Zersetzung der Kohle und die Kohlendestillatprodukte. By W. Fuchs. Pp. 48. DM.11.80. Westdeutscher Verlag, Cologne.

The first of these two research reports describes work carried out under the auspices of the Forschungsstelle für Azetylen in Düsseldorf-Dortmund. The pressure variations encountered in acetylene explosions have been studied, and were found to

depend on the size and shape of the container as well as on the initial pressure. The complex behaviour of a system consisting of two gas chambers connected by a tube is of special interest. The composition of the resulting gas mixtures has also been examined.

Considerable economic interest is attached to the possibility of increasing the yields of benzene and ethylene produced in the pyrolysis of coal. Investigations described in the second report show that addition to the coal of certain substances containing aliphatics and naphthenes (e.g. petroleum by-products) has a very favourable effect on the yields of these hydrocarbons. The yield of methane is also increased. The work indicates that pyrolysis in the presence of these additives gives cokes of decreased sulphur contents; the physical properties of these cokes have also been studied.

Both reports give full experimental details.—PETER SCHWARZ.

LEICHTMETALLANALYSE. By G. Ginsberg. Walter de Gruyter & Co., Berlin. 3rd edition. 1955. Pp. xix + 285. 79 illustrations. DM.24.80 (full cloth).

The two former editions of this book were published in 1940 (Berlin) and 1945 (Oslo). It is unlikely, therefore, considering these dates, that extensive knowledge of the publications will have reached English-speaking readers and, also, in the past 10-15 years analytical methods have undergone great and fundamental changes. On the basis of these facts alone, the present volume is justified and merits a close examination and appraisal.

The author has produced a book on light metal analysis, which is based on personal practical experience of the methods suggested. It is not intended as a text-book of analytical chemistry and is written principally for those, who, in the course of their work, are interested in detailed methods for the determination of the light metals. With these considerations in mind, the book can be regarded as a very useful publication.

Some rearrangement appears in the present edition. The chapter on fluxes, raw material and accessory substances has been omitted and the different separation processes for metals in alloys have also been excluded. The latter step is a recognition of the change undergone by analytical procedure; the aim now being the use of specific reagents for each metal, thus eliminating the necessity in the majority of cases for separations, by which process the speed of determination has increased and the accuracy improved.

After a general introduction, which includes, sampling and preparation of the sample for analysis, solution of the sample, and an outline of the principles of gravimetric analysis, electrolytic processes, polarography, colorimetry, flame photometry and spectrography, the following sections are discussed under the heading of a particular element, aluminium, beryllium, magnesium and titanium, and methods for the determination of the main impurities or constituents in the pure metal or alloy are covered in detail. For each element under consideration the reagents required and the procedure are clearly stated and fully described in a very satisfactory manner; almost too thoroughly, as the photometric determination of iron with *o*-phenanthroline, for example, is detailed in almost every case where iron is a constituent for determination.

The author recognises that there are other methods available for the determination of the metals, but as already mentioned, it is not his intention to produce a text-book, so only tried and proven procedures are included. A section is devoted to quick methods for the detection of the metals in an alloy, and, at the end of the book very useful information of the structural formula of the organic reagents used is given.

The great advances of recent years, especially in the development of instrumental analysis would seem to make the analyst more a physicist than a chemist, and it may even be claimed by some that the old art of the analyst has disappeared. A perusal of this book, however, will show that this is not the case—the old art and the new are reflected in almost every page, where classical methods mix freely with complexones and instrumental methods; old and new combining to make this book an excellent production. As a reference book for the practical worker on the modern methods of analysis of light metal and light metal alloys, it could scarcely be bettered. To the analyst generally or the advanced student it could teach much and is worthy of wide circulation.—R. J. MAGEE.

HOME

Telegraphic Address

Q.V.F. Ltd., of Stone, Staffs, have a new telegraphic address: Glassplant Stone.

Extensions Begun

Work has started on additions to the factory of Abbott Laboratories Ltd., Bede Trading Estate, Jarrow. An extension covering about 20,000 sq. ft. is being built.

Metal Industries

Metal Industries Ltd., of Universal House, 60 Buckingham Palace Road, London S.W.1, announce changes in their telephone numbers which are now: Sloane 7192-3-4 and Sloane 5814 and 5618.

Institute of Welding Meeting

At the autumn meeting of the Institute of Welding to be held in London from 2 to 4 November there will be four technical sessions devoted to papers on varying aspects of inert-gas arc welding.

Chemical Display in Barracks

Among the 30 exhibitors with display stands at the Plymouth Productivity Exhibition all last week at the RN barracks were three chemical companies: North British Chemicals, Andrewertha Ltd., and Acheson Colloids Ltd.

New Reactor at Harwell

The full scale, low-power model of the Dounreay fast reactor which has been built at Harwell should be operating by the end of this year. Named Zeus (zero energy uranium system), it will provide data relating to the design and operation of the Dounreay experimental plant which is designed to produce electricity.

Potassium Chlorate Danger

At an inquest at Sunderland on Mr. C. Barrow who died from burns received in an explosion in a dry-cleaning department of a laundry, Mr. S. Mitchell, a chemist employed by the Dyers and Cleaners' Research Organisation, said it had been found that explosions could be caused in dry-cleaning machines by potassium chlorate pellets sold as throat pastilles in chemists' shops. If such a pellet was left in a garment being cleaned it could cause the inflammable white spirit used in dry-cleaning to explode.

New Number

New telephone number of Sunvic Controls Ltd.'s accounts and sales departments is—Harlow 25271.

To Utilise Fly Ash

The Cementation Company is to take the whole of the fly ash produced by pulverised fuel boilers at London's Battersea power station. Each year the power station dumps 65,000 tons of fly ash.

Separating Pump

G. & A. Firkins, manufacturers of automatic valves and filters for the oil and chemical industries, have produced a new-type automatic pump for separating oil from water. The company is to move to new premises at Bromsgrove, Worcester, to meet demands which are beyond the capacity of their Wolverhampton factory.

Objection Removed

Objections by the Department of Scientific & Industrial Research to extensions to a factory six miles from Manchester University's Jodrell Bank research station in Cheshire have been withdrawn. The DSIR opposed all big-scale housing and industrial development for fear of interference with reception on the new £500,000 radio telescope now being erected.

Dunlop Polimul

At the International Handicrafts Exhibition at Earl's Court, London, from 22 September to 1 October, Dunlop Special Products Ltd. will display Dunlop Polimul, a polymeric emulsion based on polyvinyl acetate, which is supplied in varying concentrations and plasticiser proportions to the paint industry for the manufacture of emulsion paints.

Silicones Exhibition

An exhibition, entitled 'Silicones for Industry', on the history, production and application of silicones is to be held in Leeds in the Large Hall, Leeds Church Institute, 5 Albion Place, from Monday, 26 September to Friday, 30 September. Invitations to the exhibition can be obtained on request from Midland Silicones Ltd., 19 Upper Brook Street, London W.1.

• OVERSEAS •

German Chemical Exports Up

German industrial chemical exports in the first five months of this year rose by nine per cent to the value of DM.341,000,000. They accounted for 25 per cent of the total German chemical exports.

Pakistan Plastics

A factory for manufacturing plastic sheets with a yearly capacity of 600,000 is about to start production at Karachi. Pakistan is now producing a wide range of plastic products, and at the Karachi factory provisions are being made for the production of plastic fountain pens.

Co & Zn in the US

Consumption of cobalt in the US in May was 764,958 lb., about the same as in April, says the Bureau of Mines, US Department of the Interior. On the other hand the consumption of zinc, 94,900 tons, was an increase of four per cent over the previous month and only two per cent below the record of 96,400 tons consumed in March.

Fertiliser Projects

The ammonium sulphate plant being built at Daudkhel, Pakistan, is making good progress and recent reports state that the plant will be in operation before the end of next year. It is planned to produce 50,000 tons of fertiliser a year there. Similar plants may be built at Sind and Baluchistan where there is an abundant supply of Sui gas.

Greek Furfurol Plan

A German company co-operating with Greek industrialists to establish a factory on the island of Crete for manufacturing furfurol has been granted permission to invest the equivalent of S.3,160,000 in German capital. It is estimated that exports of furfurol would earn Greece foreign exchange to the value of S.1,000,000 a year.

Chemical Transport Problems

To help solve chemical transport problems in the US the Manufacturing Chemists' Association is co-operating with the National Tank Truck Carriers Inc. to teach chemical trucking technique to producers, transport operators, and truck manufacturers at the Illinois Institute of Technology from 29 August to 1 September.

Methyl Isobutyl Ketone

Canadian Chemical Co. Ltd. announce that the aldol unit at its Edmonton, Alberta, plant is now in operation and that the first of a series of new products, methyl isobutyl ketone, is being produced in Canada for the first time.

Sodium for Reduction Process

Sodium to be used in the reduction process for the titanium sponge plant of Electro Metallurgical Co., a division of Union Carbide & Carbon Corp., which is now being built at Ashtabula, Ohio, will be bought from US Industrial Chemicals Co., a division of National Distillers Products Corp.

Eire Superphosphates Factory

Shamrock Superphosphate Industries Ltd., a new company registered in Eire with a nominal capital of £300,000, plans to build a factory for the manufacture of superphosphates. The location and output of the factory have not been disclosed, but it is understood that it will provide employment for 200-250 workers.

Australian Wool Conference

Among members of the Textiles Institute who are attending and delivering lectures at the International Wool Textile Research Conference to be held at Sydney, Geelong and Melbourne from 22 August to 9 September are Professors J. B. Speakman and W. T. Astbury from the University of Leeds, and Dr. J. G. Martindale of the Scottish Woollen Technical College.

Standard Chemical Ltd.

A multi-million modernisation and expansion programme has been launched by Standard Chemical Ltd., at its chlorine and caustic soda producing plant at Beauharnois, Que. The programme, scheduled for completion in 1956, will boost plant capacity by 25 per cent. There will be no interruption in normal manufacturing operations. Standard Chemical was organised in January 1955, by Columbia-Southern Chemical Corp. of Pittsburg (majority owner) and Dominion Tar and Chemical Co. The plant had been owned and operated by Dominion Tar and Chemical.

• PERSONAL •

MR. K. D. ROGERS, UK trade commissioner, Grade I, in Ottawa, left Canada on 10 August to return to duty in this country. He will be succeeded in Ottawa by MR. C. G. CRUICKSHANK, formerly a UK trade commissioner at Colombo. Mr. Cruickshank leaves for Canada by air on 22 August. Other changes are: MR. M. R. GARNER, a UK trade commissioner, Grade II, at Ottawa, leaves Canada on 30 September on completion of his tour of duty and will be replaced by MR. D. SIMPSON at present serving in Industries & Manufactures Division of the Board of Trade. Mr. Simpson leaves for Canada on 16 September. MR. N. L. HIBBS, a UK trade commissioner, Grade II, in Toronto, leaves Canada on 23 September. He will be succeeded by MR. G. BOOTH at present serving in Commercial Relations & Exports Department of the Board of Trade.

MR. FRED L. SHANKLIN has been appointed vice-president and general manager of the ore division of Union Carbide & Carbon Corp. Mr. Shanklin joined Union Carbide in 1934 as head of the stores department of Carbide & Carbon Chemicals Co., at Whiting, Indiana. He was appointed secretary and treasurer of Pyrofax Gas Corp. in 1954, and in March this year became manager of administration of the ore division of Union Carbide & Carbon Corp.

MR. J. W. CRAGGS, managing director of R. Bowran & Co. Ltd., paint manufacturers, Pelaw-on-Tyne, has retired, but is retaining his position as chairman of the firm. MR. W. J. CRAGGS and MR. T. S. SCOTT, formerly the secretary, have been appointed joint managing directors. MR. J. B. CRAGGS has been appointed secretary, and MR. J. R. S. BOWRAN is the new vice-chairman.

MR. DAVID SWAN has been appointed director of research of metals research laboratories, Electro Metallurgical Company, a division of Union Carbide & Carbon Corp. Mr. Swan joined Union Carbide in 1946. In 1947 he was transferred to the New York offices of Electro Metallurgical Company as research engineer. Mr. Swan was born in Rutherford, NJ, in 1920. He was graduated from Rensselaer Polytechnic Institute in 1940 where he received the degree of Bachelor of Science in Metallurgical Engineering.

MR. C. M. SPIELMAN has been appointed chairman of Whessoe in succession to MR. H. G. JUDD who is retiring after 35 years in office. Mr. Judd is to remain on the board.

DR. JOHN R. NORBURY, B.Sc., Ph.D., of Walkden, has been elected a Fellow of the Institute of Physics. He is now chief physicist and head of the Physics Department at R.T.S.C. Laboratories, Whitchurch, Aylesbury. Dr. Norbury is also a Fellow of the Physical Society, and a member of the Faraday Society and the Society of Instrument Technology.

MR. EDWARD C. PEET and MR. ARNOLD HOFLAND have been made directors of North Caucasian Oil Fields and the Ural Caspian Oil Corporation. SIR FRANCIS HOPWOOD and MR. GORDON KERR have resigned from the boards.

MR. JOHN F. HARRIES, of Middlesbrough, manager of the Casebourne cement department of Imperial Chemical Industries Ltd., Billingham-on-Tees, has been appointed a magistrate for Middlesbrough.

MR. WILLIAM HOLYOAK, who began work at Fort Dunlop 26 years ago, has been appointed production manager in succession to the late MR. T. S. GARDNER.

MR. WILLIAM PAYNTER has joined Mervyn Instruments, of Woking, as works manager after nearly 30 years with E. K. Cole Ltd.

DR. G. TUGENDHAT has been appointed deputy-chairman of Manchester Oil Refinery (Holdings).

MR. R. W. H. BERRY, of Walkden, Lancs, has been awarded the Society of Dyers and Colourists 1954-5 Knecht Memorial Prize. He is 22. This award follows closely that of the degree of B.Sc. Tech. with honours in applied chemistry which he won at Manchester University. Mr. Berry will return to Manchester to do research in organic chemistry when he leaves the University.

Obituary

MR. JOHN WILLIAM MILNE, deputy chairman of W. & H. M. Goulding Ltd., chemical manure manufacturers, of Dublin, Cork and Waterford, Eire. He joined the firm in 1889, was appointed secretary of the company in 1914, and became assistant general manager in 1925. He was appointed general manager on the retirement of his father in 1930, and, in 1935, became deputy chairman and managing director following the death of Sir Lingard Goulding, Bart. Mr. Milne was also a director of Irish Metal Industries Ltd., Dublin.

MAJOR-GENENRAL SIR CLIVE STEELE died in Melbourne on 5 August after a long illness. He was 62. He served on the boards of many companies including the Commonwealth Oil Refineries.

MR. HENRY WILSON, chairman of Cole & Wilson Ltd., died on 12 August, the eve of his 80th birthday.

MR. E. M. MAY, a senior representative of Gloy & Empire Adhesives died on 1 August.

MR. R. LESLIE COLLETT, M.B.E., M.A., F.R.I.C., formerly Registrar of the Royal Institute of Chemistry, died in London on Monday after a short illness. He was 69.

Wills

MR. ERIC JENKINSON BOSTON, of Tay-a-Villa, Camelon, Falkirk, Scotland, deputy chairman of Scottish Tar Distillers, left £23,140 personal estate in England and Scotland.

DR. GWYN WILLIAMS, of Cae Ffynon, Llandudno Junction, and St. James Court, Buckingham Gate, London, Professor of Chemistry, Royal Holloway College, and previously lecturer in chemistry at King's College, London, and research worker in the department of colloid science at Cambridge, left £45,175 (£44,627 net).

MR. OSWALD HELMSING SISSONS, of Milborne Port, Somerset, former chairman of Sissons Brothers & Co. Ltd., paint and varnish manufacturers, left £56,269, duty paid, £25,311.

Welding Meetings

WITH the object of increasing productivity by the use of welding, the British Welding Research Association is arranging a number of meetings to be held at various centres throughout Great Britain.

The first meeting will be held in Glasgow on 20 and 21 September, and the programme will be as follows:

Tuesday 20 September

9.30-10 a.m. Opening Addresses.

10-11 a.m. 'Recent Developments in Welding Steels', by A. R. Muir, B.Sc.

11.30-12.30 p.m. 'Recent Developments in Non-Ferrous Resistance Welding', by P. T. Houdcroft, B.Sc.

2-3 p.m. 'Improving Quality and Reducing Costs by Resistance Welding', by J. E. Roberts, M.Eng., A.I.M.

3.30-4.30 p.m. 'Recent Developments' in Non-Destructive Testing', by H. L. Carson, B.Sc., A.Inst.P.

Wednesday 21 September

10-11 a.m. 'A New Method of Designing Structures', by G. M. Moir, B.Sc., Ph.D., M.I.Struct.E., A.M.I.C.E.

11.30-12.30 p.m. 'What Can be Done to Reduce the Possibilities of Fatigue Failure and Brittle Failure', by A. A. Wells, B.Sc., Ph.D.

2-3 p.m. Study Groups to discuss research ideas of immediate practical value.

3.30-4 p.m. Final statement of conclusions.

Admission is free and tickets may be obtained from: The Organiser, Glasgow Meeting, Welding Productivity, 8 Northumberland Street, Edinburgh 3.

COMPANY MEETING

The Distillers Company Limited

THE following is an excerpt from the Chairman's Statement issued with the Report by the Directors and Accounts for year ended 31st March 1955:—

As you will have noted from the Directors' Report, three new appointments have been made to the Board since our last General Meeting, Mr. E. G. Gross, Mr. A. F. McDonald and Mr. G. W. Scott. Both Mr. Gross and Mr. McDonald have acquired valuable experience of the Company's interests, and I am sure their election merits your approval. Following upon the retiral of Sir Michael Kroyer-Kielberg, we invited his successor as Chairman of the United Molasses Company Limited, Mr. Scott, to join our Board, confident that he will maintain the valuable and constructive relationship between our two Companies which has existed for many years.

I have also to report the retirement from executive office of Mr. S. H. Hastie, the Managing Director of Scottish Malt Distillers Limited and a Director of various other Associated Companies. His knowledge and experience of malt whisky production has been invaluable to the Company during his many years of service, and he will remain on the Board of this Company in a consultative capacity for a further three years.

Active Year

As you will observe from the detailed reports of the various divisions, the year has been an active one, and you will see from the Accounts that the trading profit after depreciation, for the year ended 31 March 1955, is much the same as last year at £18,069,073, constituting a very satisfactory achievement. But for the lower profits shown by our Scotch Whisky Blending Companies, this would have been higher. There was, however, an appreciable reduction in these by comparison with last year, in spite of the fact that sales actually showed a marked increase, particularly exports, and thus from the national point of view, our dollar earnings and other currency receipts were higher. It should be made clear, however, that we are exhausting the whiskies laid down before the war and are moving into a higher cost range of whiskies produced after the war. This is bound to reflect itself in our profits although if, as we hope, the strong sales position is maintained, the effect should be largely offset as the result of increased sales.

Balance Sheet

A further factor, of particular significance in the accounts now before you, is that in order to increase our sales beyond the limits imposed by the quantity of matured whisky available at this stage from our own stocks, we have purchased quite substantial quantities of whisky in the open market. The relatively high price of these purchases has, to an appreciable extent, been charged in the accounts now under review.

Income from Trade Investments is considerably higher than last year, at £431,517, mainly owing to the receipt of a dividend for the first time on our investment in British Petroleum Chemicals Limited. Interest payable on loan capital is lower at £556,995, so that our net profit before taxation amounted to £17,956,109, compared with £17,632,289 for the previous year. Taxation absorbs £9,451,347, and of the balance remaining £631,353 is attributable to other shareholders in certain Subsidiary Companies.

The net profit attributable to the Group is accordingly £7,873,409 compared with £7,316,549 last year.

The Consolidated Balance Sheet discloses further expenditure on fixed assets of approximately £4,000,000. This has been widely spread throughout the various sections of our business and, in so far as the developments involved call for comment, will be dealt with later in these remarks. Our stocks have again increased—this time by some £5,000,000, and once more this is mainly due to the building up of our stocks of maturing Scotch Whisky. It is inevitable, therefore, that our cash resources should be lower than last year, and you will notice that they are down by over £4,000,000. The net excess of current assets other than stocks, over current liabilities, is now roughly £10,000,000, compared with £13,500,000 last year.

Reverting to the Profit & Loss Account,

the net profit attributable to the Group is £7,873,409. You will notice that provisions for taxation made in previous years, amounting to £1,029,782, are not now required. In view of the size of this figure, I should explain that it arises mainly from the conversion of the businesses of certain subsidiaries into divisions, which I mentioned last year. At that time we could not ascertain accurately the taxation liabilities which would arise from these changes, but the reserves set up have proved to be more than adequate, to the extent of nearly £700,000. In addition, the position of the Group in relation to Excess Profits Levy has been brought to a stage which enables us to release provisions made on this account, amounting to over £200,000.

After providing for the cost of certain additional pension benefits which the Board have authorised, and writing off some minor items, the amount available for appropriation is £8,467,350. Of this the subsidiaries have retained £2,800,851 and there is £5,666,499 to be disposed of in the Accounts of The Distillers Company. Your Board proposes to increase the General Revenue Reserve to £3,250,000 by a transfer of £1,620,069.

Our capital investment programme has been heavy, but although major projects are only adopted after careful assessment of their value to the Company as well as to the national interest, such developments are perforce regulated by the extent of our current liquid resources. Taxation in various forms still takes too high a toll of industry's earnings to enable opportunities to be seized at the rate our expanding economy demands, and your Directors are therefore faced with a difficult task each year in deciding how much of the Company's earnings must be retained in the long-term interests of the business.

In view, however, of the satisfactory results for the year, it is considered that our shareholders are entitled to the modest increase in dividend which is suggested. It is accordingly proposed to pay a final dividend of eight and two-fifths pence per share (10½ per cent), which, with the interim paid of four and four-fifths pence per share, is equivalent to 16½ per cent for the year on the revised capital. On the same basis, this compares with 15 per cent for the previous year. The proposed dividend will require £2,518,706 and leave a small balance of £76,790 to be added to the amount brought in. If these appropriations are approved, the Revenue Reserves of the Group will have been strengthened by the retention of £4,497,710.

With the assistance derived from the acquisition of stocks of matured whiskies, our Group Blending Companies were able during the year under review to increase the distribution of their brands both in the Home Market and Overseas. Despite this, we are still unable to match demand with supply. I would again like to emphasise that maintenance of quality remains the keynote of our sales policy. The curtailment during the war years of our distilling activities has had a long range effect, and it is regrettable that there still remains a considerable degree of unfilled consumer demand for our brands in practically all markets.

The United States of America continues to be our principal overseas market and shipments showed an increase over 1953. Here, as elsewhere, our various importers, while recognising our difficulties, urge the need for a greater volume of shipments.

The calendar year 1954 was one of outstanding progress for the Scotch Whisky Industry as a whole. Shipments to overseas markets reached the record figure of 13,690,000 proof gallons, an increase of approximately 500,000 gallons over the preceding 12 months and 60 per cent over pre war. In this great achievement your Company played a notable part.

Gin

I am glad to report that our Gin Companies have had a most satisfactory year and sales both at home and in the export field have shown good increases. Beyond this brief but encouraging statement, I have no further comment to offer except perhaps to underline once again the fact that the short supply of Scotch Whisky during recent years has favourably affected the gin industry. The upward trend in sales may therefore be reversed or modified in due course.

In my last statement, I indicated that steady recovery had then been made in most of our divisions. I am glad now to report that further marked progress has been achieved during the past year, resulting in increased sales and profits.

Our Industrial Group is largely concerned with the bulk production of chemical intermediates and basic plastics, which are the raw materials for firms who produce finished

goods. Our business, therefore, is to anticipate and meet the requirements of those industries which supply the needs of the public. The plants required are highly mechanised and instrumented, and involve heavy capital expenditure. Obviously, our industry should seek to supply a substantial proportion of the new capital out of its internal savings, but as I have indicated earlier, with present rates of taxation, the amount available in this way is limited and quite inadequate in relation to the rate of development necessary to enable this country to maintain its position in this field.

The use of industrial alcohol has steadily increased and the distilleries concerned have been operating at maximum capacity. Fortunately the price of molasses has remained stable.

The demand for our synthetic resins and moulding powders has increased substantially, despite strong competition. The new polystyrene plant should come into operation shortly and its product Styron should find ready acceptance in home and export markets. Polyvinyl chloride—Geon—is still in strong demand. The first part of the new extension to which I referred last year has been brought into operation and the second stage should be completed by December next. Our total capacity will then be 27,000 tons per annum, whereas the original unit designed in 1945 was of 3,000 tons capacity.

Research

In the highly technical and competitive fields in which we operate, research has become an indispensable part of our organisation. Quite apart from the value of new processes or developments, the contribution made by our Research Department to the successful development of the Company's diverse operations is most important, though often unspectacular, and I am glad to say that a high degree of efficiency has been attained in the organisation of this work and its co-ordination with production and sales effort throughout the Group.

The favourable conditions of last year have so far been maintained in the current period and the outlook appears encouraging. Subject, therefore, to any major unforeseen setback, I think we can look forward with confidence to making further progress.

Plastics Fair

1955 Exhibition at Dusseldorf

MANY of the leading German and other manufacturers of plastics and plastics fabricating machinery will be showing at the Plastics Industry's Trade Fair to be held at Dusseldorf from 8 to 16 October.

Walter Aulfes GmbH, Munich, will be showing articles made by the high frequency fusion process. It is claimed that this is the only way of joining thermoplastic materials without weakening the sheet or detracting from its value.

On show for the first time in Germany will be the galvanoplastic hard nickel moulds made by London & Scandinavian Metallurgical Co. Ltd., of London. These moulds are already being made under licence in the US, France and Spain. They are claimed to be just as good and often cheaper than hardened steel moulds for injection moulding.

A filler, Omya BSH, which has important characteristics, will be shown by Omya-Mahlwerk GmbH, Cologne. In the case of PVC this filler has within certain limits no effect on the mechanical properties of the mixture, and actually improves the injection moulding rate. Claims are also made for its advantageous use in butyl rubber, neoprene and polyester.

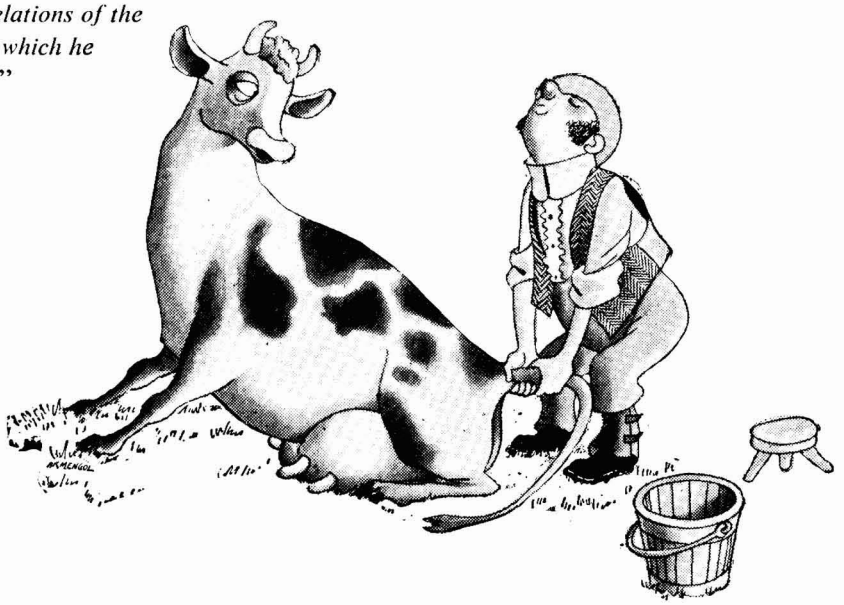
Among other organisations exhibiting may be mentioned Ankerwerk Gebr. Gölle, Nurembourg, makers of a new type of injection moulding machine and Wilhelm Engel, Schalksmühle, Westphalia, who manufacture purely technical articles, attaching special importance to shock proof and impact-proof pressed substances.

Test appliances for plastics will be shown by Karl Frank GmbH, Weinheim-Birkenau. These include a new adhesive strength tester for synthetic materials and a micro-hardness tester for very thin foil.

Institute of Metals

Organised by the metal physics committee of The Institute of Metals, a one-day symposium on The Mechanism of Phase Transformations in Metals will be held at the Royal Institution, Albemarle Street, London W.1, on Wednesday, 9 November 1955, at 10 a.m.

"Many difficulties occur in the pursuits of the dairy farmer which render his occupation precarious. Such difficulties arise entirely from an ignorance of the scientific relations of the practice in which he is engaged."



Such difficulties arise

Evidently the scientific approach to dairy farming was already an active force 112 years ago, for the sentences quoted come from a paper 'On the Changes in Composition of the Milk of a Cow according to its Exercise and Food' delivered by Dr. Lyon Playfair in January 1843 and recorded in the first issue of the Journal of the Chemical Society. Modern dairy physiologists prefer to use a herd, or identical twin cattle, in their feeding tests, rather than the one cow of Dr. Playfair. Dairy analysts also seek greater accuracy in their control methods and find it by using B.D.H. reagents specifically prepared for milk testing purposes :—

STANDARD METHYLENE BLUE TABLETS
RESAZURIN TABLETS
RINGER'S SOLUTION TABLETS
BUFFER SUBSTRATE TABLETS FOR THE PHOSPHATASE TEST
FOLIN & CIOCALTEU'S REAGENT
SODIUM PHENYL PHOSPHATE
SODIUM *p*-NITROPHENYL PHOSPHATE

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LABORATORY CHEMICALS

THE BRITISH DRUG HOUSES LTD. B.D.H. LABORATORY CHEMICALS GROUP POOLE DORSET
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Law & Company News

Commercial Intelligence

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

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, 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 or 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.)

AGRICULTURAL CHEMISTS (MIDLANDS) LTD., Priors Marston.—4 July, £1,783 10s. debenture to Metallurgical Chemists Ltd.; general charge.

Satisfactions

BRITISH VITAMIN PRODUCTS LTD., London E.C.—Satisfaction, 9 July of charge registered 7 November, 1949.

HOWARDS & SONS LTD., Ilford.—Satisfaction, 8 July, that certain land at Ilford comprised in a Trust Deed registered 5 August, 1952, has been released from the charge.

HOWARDS & SONS LTD., Ilford.—Satisfaction, 8 July, that certain land at Ilford comprised in a Trust Deed registered 22 April, 1953, has been released from the charge.

New Registrations

Abbey Perfumerie Co. Ltd.

Private company (553,083.) Capital £100. To carry on the business of manufacturers and distillers of and dealers in perfumes and essences, soaps, salves, ointments, powders, cosmetics, etc. Directors: Henry Perlow and Mrs. Elka Sheila Perlow. Reg. office: 66/7 Newman Street, London W.1.

J. Busby (Hatfield) Ltd.

Private company (553,094.) Capital £1,000. To carry on the business of wholesale and retail chemists and druggists, chemical engineers, sterilizers, makers of chemical plant and materials, etc. Directors: John S. Mills, Wilfred J. Busby and Wilfred F. D. Sweet. Reg. office: 97 St. Albans Road, Hatfield.

Niobium Ltd.

Private company (552,998.) Registered 5 August. Capital £100 in £1 shares. To establish, provide, maintain and conduct research laboratories and experimental workshops for metallurgical, scientific, chemical and technical research and experiments, etc. Subscribers: George Conrad and Cyril J. Pollard. Solicitors: Clifford-Turner & Co., 11 Old Jewry, London E.C.2.

Forcylor Ltd.

Private company (552,339.) Capital £3,000. To adopt an agreement between Compagnie Internationale Pour Le Traitement des Textiles Societe a Responsabilite Limitee, of 9 Rue Ambroise Thomas, Paris 9, and Joseph Hajdu of the same address of the one part, and Reginald G. Wharry, for and on behalf of the company of the other part, to exploit the exclusive right and licence to sell and otherwise exploit in the United Kingdom of Great Britain and Northern Ireland an invention relating to a process and substance which increases the resistance of textiles and fabrics generally to wear and tear, to manufacture and deal in the said process and all substances, chemical, machinery, etc. Directors: Reginald G. Wharry, John C. Wharry, Ralph H. W. Atkins, Robert G. S. Dilly and Joseph Hajdu. Reg. office: 14 Arlington Street, London S.W.1.

Company News

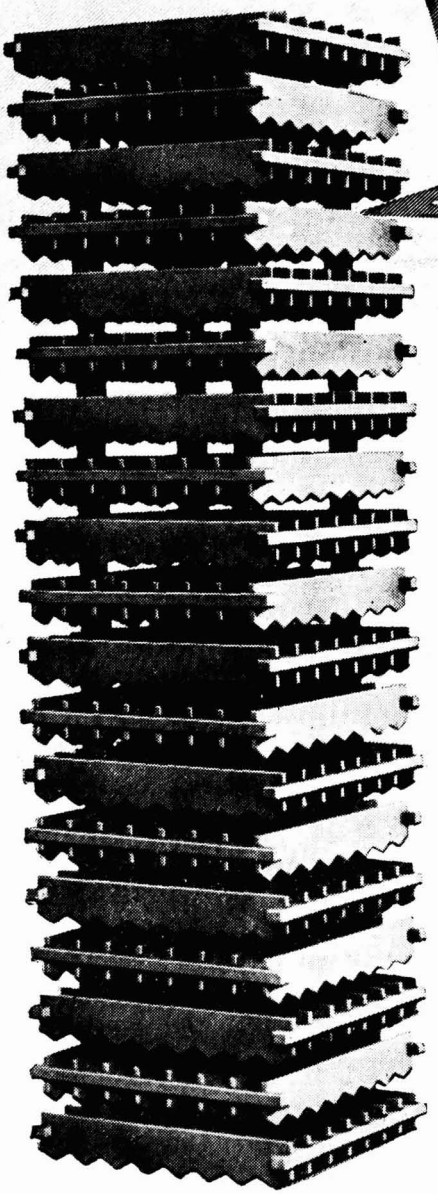
Farbenfabriken Bayer

Farbenfabriken Bayer reports that home market sales for the year just ended rose by 13 per cent. Exports rose by 27 per cent, reaching the equivalent of £38,000,000, or 37 per cent of the total turnover. This ratio, the company reports, was double the proportion attained by the West German chemical industry as a whole. The company is now engaged on a new plant in Argentina.

Petroleum & Chemical Corp. (Australia)

Petroleum & Chemical Corp. (Australia) is to raise £A830,375 new capital by a one-for-two issue of £A1 shares at a premium of 5s. per share. The money will be used for installing a new petroleum spirit plant, and for completing the Silverwater plant due to begin operating by October. The

continued on page 394



A NEW TOWER PACKING FOR THE CHEMICAL INDUSTRY

CARBON PARAGRID PACKING

Carbon "PARAGRID" packing will handle all corrosive liquids and gases and is designed to give a performance far superior to all existing types of random packings.

Its special advantages are :—

1. **Complete chemical inertness (acid, alkali, solvent).**
2. **Resistance to Thermal Shock.**
3. **Reduced Tower Cross-Section ($\frac{1}{4}$ of equivalent for random packing).**
4. **Reduced Pressure Drop.**
5. **Complete Wetting at low liquid rates.**
6. **Easily Cleaned.**

In most cases, the introduction of "PARAGRID" packing will effect a valuable reduction in the operating cost of the process concerned. P.D. Chemical Engineers will be pleased to discuss the characteristics of "PARAGRID" and its application to your particular problem.

COMPARATIVE DATA WITH OTHER PACKINGS

PACKING	"PARAGRID"	1" DIA. RASCHIG RINGS	1" DIA. RASCHIG RINGS
GAS RATE lbs / hr. sq. ft.	2500	700	500
LIQUID RATE lbs / hrs. sq. ft.	2500	700	500
(H.T.U.) $_{oG}$ feet	1.75	1.6	1.6
PRESSURE DROP lbs / sq. ft. FT.	0.52	3.1	1.55
FIGURES OF MERIT			
$\frac{\text{PRESSURE DROP}}{\text{H.T.U.}}$	1.0	5.0	2.5
$\frac{\text{GAS RATE}}{\text{H.T.U.}}$	1430	435	310

POWELL DUFFRYN CARBON PRODUCTS LTD

Springfield Road, Hayes, Middlesex. Telephone : Hayes 3994/8

Company News

continued from page 392

new installation will be a Udex plant developed by Universal Oil Products and Dow Chemical Corp. of America. It will manufacture benzine, toluene and xylene, petroleum spirits used in the chemical, paint, varnish, and plastics industries.

Australasian Oil Exploration Co.

The Australasian Oil Exploration Co. has received an offer from Rio Tinto to purchase immediately 50,000 shares of 2s. at a premium of 6d. with an option to buy a further 450,000 shares at premiums ranging from 1s. at the end of November to 8s. at the end of September, 1956.

Market Reports

LONDON.—A steady demand has been reported during the past week for most of the routine products and conditions generally remain quiet but not more than is usual for the period. The price of white lead has been reduced by £1 15s. per ton, the revised basis price being £138 15s. per ton. Both red lead and litharge are £2 5s. per ton lower at £133 5s. and £135 5s. per ton respectively. Prices elsewhere show no important alterations and the tone is firm. The demand for the coal tar products is fairly well maintained with most items having an assured market.

MANCHESTER.—Due allowance being made for continued holiday influences, which, however, are not expected to last many weeks longer, trade in chemical products on the Manchester market during the past week has been on reasonably steady lines, with the soda and potash compounds, as well as the ammonia and magnesia products and a wide range of miscellaneous chemicals, being taken up in good quantities. New buying interest has been fair.

GLASGOW.—A very brisk week's trading has to be reported from the Scottish market. Orders have been well maintained both for spot and contract deliveries and have covered a wide range of chemicals. Some prices are, however, still showing a tendency to increase, due as already reported to increased production costs. The export market is still showing improvement and there is a steady flow of inquiries.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

UNIVERSITY OF MANCHESTER
THE NEXT SESSION COMMENCES ON THURSDAY, 6TH OCTOBER, 1955

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

CHEMICAL ENGINEERS.
THE ASSOCIATED ETHYL COMPANY LIMITED has vacancies for
CHEMICAL ENGINEERS
for work concerned with the development, co-ordination and commissioning of modifications and new engineering projects.
Experience in Chlorine would be an advantage for one of the posts.
Applicants should have at least three years' experience in Chemical Plants and should possess qualifications equivalent to Corporate Membership of the Institution of Chemical Engineers.
Applications, giving full details of the above, should be made to :
THE DEPUTY MANAGER—PERSONNEL, THE ASSOCIATED ETHYL COMPANY LIMITED, ELLESMERE PORT, CHESHIRE.

SENIOR SCIENTIFIC OFFICERS; SCIENTIFIC OFFICERS. The Civil Service Commissioners invite applications for pensionable appointments. Applications may be accepted up to 31st December, 1955 but early application is advised as an earlier closing date may be announced. Interview Boards will sit at frequent intervals. The Scientific posts cover a wide range o scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small: individual vacancies exist for candidates who have special knowledge of, or who are interested in palaeobotany, and recent and pleistocene mammals.

Candidates must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in Mathematics, or an equivalent qualification; or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' post-graduate or other approved experience.

Candidates taking their degrees in 1955 may apply before the result of their degree examination is known.

AGE LIMITS : Senior Scientific Officers, between 26 and 31, but specially suitable candidates under 26 may be admitted; for Scientific Officers between 21 and 28 during 1955 (up to 31 for permanent members of the Experimental Officer class). Salary (London) Senior Scientific Officers: (men) £1,010—£1,185; (women) £893 — £1,077. Scientific Officers : (men) £492 — £885; (women) £492—£795. Women's scales subject to improvement under equal pay scheme. Somewhat lower rates in the provinces.

Further particulars from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, 30 OLD BURLINGTON STREET, LONDON, W.1.,** quoting No. S.53/55 for Senior Scientific Officers and S.52/55 for Scientific Officers. 6964/60/7/55/JS.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications may be accepted up to 31st December, 1955, but forms should be returned as soon as possible as an earlier closing date may be announced either for the competition as a whole or in one or more subjects. No more applications from meteorologists can be accepted. Interview Boards will sit at frequent intervals.

The posts are divided between following main groups and subjects (*a*) Mathematical and Physical Sciences, (*b*) Chemistry and Metallurgy, (*c*) Biological Sciences, (*d*) Engineering subjects and (*e*) Miscellaneous (including *e.g.* Geology, Library and Technical Information Services).

AGE LIMITS : For Experimental Officers, at least 26 and under 31 on 31st December, 1955 ; for Assistant Experimental Officers at least 18 and under 28 on 31st December, 1955. Extension for regular service in H.M. Forces. Candidates aged 31 or over with specialised experience for Experimental Officer posts may be admitted.

Candidates must have at least one of a number of specified qualifications. Examples are Higher School Certificate, General Certificate of Education, Scottish Leaving Certificate, Scottish Universities Preliminary Examination, Northern Ireland Senior Certificate (all in appropriate subjects and at appropriate levels), Higher National Certificate, University degree. Candidates taking their examinations in 1955 may be admitted. Candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. In general a higher standard of qualification will be looked for in the older candidates than in the younger ones.

SALARY (London) :—
Experimental Officer £750-£920 (men) ; £663-£808 (women).
Assistant Experimental Officer. £302 (at age 18) to £670 (men), £584 (women). Starting pay up to £545 (men) or £516 (women) at 26. Somewhat lower outside London. Promotion prospects. Women's scale subject to improvement under equal pay scheme.

Further particulars from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, 30, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S94-95/55. 6645/A/80/WP/6/55.

GRADUATES in **MECHANICAL** and **CHEMICAL ENGINEERING** required for progressive positions in the Research, Design and Production Divisions of THE POWER-GAS CORPORATION LIMITED. Training given to men without previous industrial experience. Apply to :—**STAFF PERSONNEL MANAGER, PARKFIELD WORKS, STOCKTON-ON-TEES.**

MINISTRY OF SUPPLY requires Senior Examiners at Harefield, Middlesex, for chemical analysis and physical testing of aero materials, involving high precision laboratory work and development of improved methods. **QUALIFICATIONS.** British of British parents. O.N.C. in Chemistry or equivalent. Practical experience with one of following essential : Metals, paints, petroleum, rubber, plastics. **SALARY.** Within £660 (age 30) to £772. Not established but opportunities to compete for establishment may arise. Application forms from A.B.1131, Ministry of Labour and National Service, London Appointments Office, 1-6, Tavistock Square, London, W.C.1.

REPRESENTATIVE, with prospect of Sales Managership, required by expanding small firm of Consultants and Specialists in Distillation Packings, Ceramics, Special Bricks, etc. Age 25-30. Some commercial or D.O. experience, and/or contacts in Chemical Industry desirable. Keenness; intelligence; willingness to travel and meet people; and good personality; more important than qualifications. Apply **WEINREB & RANDALL LTD., 70 NEW OXFORD ST. LONDON, W.C.1.**

NORTH THAMES GAS BOARD

CHEMISTS and **PHYSICISTS** holding University degrees are required in the Laboratories at Watson House, Fulham, S.W.6., to undertake research work on the utilisation and design of domestic and industrial gas and coke appliances, particularly on cookers, water heaters, gas and coke fires, refrigerators and industrial apparatus.

The Laboratories have recently been modernised and extended and are responsible for research work for the Gas Industry throughout the country.

The appointments will be permanent and pensionable and the starting salary will be within the range £635 to £850 per annum, according to age, qualifications and experience.

Applications should be sent to the **STAFF CONTROLLER, NORTH THAMES GAS BOARD, 30, KENSINGTON CHURCH STREET, W.8.**, quoting reference No. 666/280, to reach him within ten days of the appearance of this advertisement.

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE: 3285 EAST.

ECONOMIC BOILERS. Two 8 ft. diam., 220 lb. w.p., 5,000 lb. evaporation; three 7 ft. 6 in. diam., 160 lb. w.p., 4,500 lb. evaporation; 400 other boilers in stock.

TWO Broadbent **WATER-DRIVEN CENTRIFUGES**, 30 in. diam., 12 in. deep, 1,150 r.p.m.

SIX Aluminium **CONDENSERS**, 14 ft. long by 2 ft. 3 in. diam. 386 Tubes, ⅞ in. o.d.

FORTY Riveted **RECEIVERS**, 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lb. w.p. Numerous other sizes.

Solid Drawn **STEEL PIPES**, 6 in., 8 in., 10 in., 12 in., 14 in., thousands of feet in stock, plain and flanged.

CAST-IRON PIPES, 1,200 yds. 10 in. and 400 yds. 8 in., **NEW.** Also most other sizes, up to 24 in. bore.

VALVES in Stainless, Gunmetal, Enamel Lined.

CAST-IRON TANK PLATES, 2 ft. square. 500 in stock.

FRED WATKINS (BOILERS), LTD.
COLEFORD, GLOS.

SACK AND BAG MERCHANTS AND MANUFACTURERS. New and reconditioned for Home and Export. (Use **JUTEX** for sack repairing). **ALTRINCHAM JUTE LTD., WRIGHT STREET, BROADHEATH, ALTRINCHAM, CHESHIRE.** ALTrincham 4360.

TWO BRAND NEW STERILISING VESSELS—7 ft. long by 3 ft. diameter.

One S. J. WERNER MIXER with pan approx. 2 ft. by 2 ft. of the tilting type.

Two steam jacketed CAST-IRON FILTER PRESSES—each with 38 s.j. plates and 39 frames, cake size 2 ft. 4 in. square.

Several JOHNSON CAST-IRON FILTER PRESSES—various sizes and types.

GARDNER MIXERS and Mixers and Sifters combined, sizes "E," "G," "H" and experimental.

HYDRO EXTRACTORS—24 in., 30 in. and 36 in.

Two Gardner "H" size Steam-jacketed MIXERS.

Two 18 in. KEK PLATE MILLS—with feeders delivery bins, motors and entablature.

Two No. 4 SUPER MIRACLE MILLS with motors and starters.

Three Single-effect EVAPORATORS by Scott with pumps and motors.

RICHARD SIZER, LTD.
ENGINEERS,
HULL.
Telephone: 31743.

600

5 NEW TWIN ROLL SPRAY DRIERS. Chilled cast-iron rolls 40 in. long by 32 in. diam. 74 lb. sq. in. w.p., fitted air-cooled doctor blades, rotary disc distribution trough, air spray jets and worm discharge conveyors. Fitted stainless steel feed pump, jacketed feed tank and powder dresser.

DOUBLE-DRUM DRIER—by John Brown. Two main steam-heated cylinders 10 ft. by 32 in. diam. Material to be dried is fed through rollers, removed by doctor knives, under which are two water-cooled rolls for cooling, producing flaky material. Material then collected in two motorised worm conveyors. Pressure, 90 lb. sq. in. in main cylinder. Capacity with soap, 9/12 cwt. per hr. reducing from 30 per cent to 10 per cent.

3 NEW VACUUM DRYING OVENS. Welded mild steel construction. 7 ft. long by 42 in. wide by 42 in. deep, fitted 9 steam-heated shelves to carry 36 acid-resisting trays 36 in. by 16 in. by 1¼ in. Davit-swung door each end, hand wheel closing. Motorised horizontal wet vacuum pump, gauges, metal trays, etc.

13 Totally Enclosed **SOLUTION MIXERS**—12 ft. long by 6 ft. 6 in. diam. Capacity 10,000 litres. Construction, mild steel plate, with dished ends and heavy glanded spiral-type agitators motorised 400/3/50. Mounted on mild steel stands. Vessels have top manway 18 in. diam. and 7 in. by 2 in. diam. bottom outlet. W.P., 70 lb.

80 qt. Peerless **MIXER**—4-speed type, with sun and planet type agitator, 400/3/50. Fitted whisk and 80 and 50 qt. bowls.

Mild steel Silex-lined **PEBBLE MILL**—by Boulton. 54 in. by 54 in. diam. Motorised 415/3/50. Grinding media.

NEW PORCELAIN AND SILEX-LINED BALL MILLS. Capacities ranging from 9 gallons to 260 gallons.

NEW STAINLESS STEEL STORAGE VESSELS AND TANKS. Capacities ranging from 8 gallons to 1,000 gallons.

GEORGE COHEN, SONS & CO., LTD.,
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Tel.: Shepherds Bush 2070, and
STANNINGLEY, NR. LEEDS.
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PHONE 98 STAINES

TWO JACKETED PRODOR-GLAS, LINED VERTICAL TANKS—2,000 & 500 gallons. 30 lb. w.p. & 15 lb. w.p. in the jacket.

72 ft. **BELT CONVEYOR**—36 in. wide, with troughed loading section one end, 400/3/50.

"Carter" **HEAVY TWIN SPIKED ROLL CRUSHER**—18 in. by 12 in.

BALL MILLS—4 ft. 6 in. by 4 ft. 6 in. & 3 ft. by 3 ft.

Two 1,700 gal. (Lined) **BRAITHWAITE SECTIONAL TANKS.**

ALUMINIUM VEHICLE TANKS—2,000, 1,000 & 250 gallons.

100-gal. Stainless Steel **JACKETED PANS**—2,000, 25 & 35 gallons.

Stainless Steel **MIXING ARMS OR EMULSIFIERS**—¼, ½, 1 & 2 h.p. A.C.

PUMPS, PANS, HYDROS, STILLS, AUTOCLAVES, CONDENSERS, BOILERS, REFINERS, DISINTEGRATORS, "Z", FIN, "U" TROUGH & CYLINDRICAL MIXERS, etc.

HARRY H. GARDAM & CO., LTD.,
STAINES.

POWDER MIXER BY BARRON—trough 30 in. by 18 in. by 18 in., driven through Vee-belts to 2 h.p. motor.

STEEL TROUGH MIXER—48 in. by 24 in. by 30 in deep. Fast and loose pulley drive.

Good condition.

THOMPSON & SON (MILLWALL), LTD.,
LONDON, E.14.
Tel.: East 1844.

For Sale—*continued*

SELWOOD FOR PLANT
STORAGE TANKS FOR SALE
SECTIONAL TYPE
1,200 gallons to 24,000 gallons.
HORIZONTAL CYLINDRICAL
500 gallons to 12,000 gallons, new and second-hand.
VERTICAL CYLINDRICAL
250 gallons T.V.O. to 9,000 gallons.
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100 gallons to 1,200 gallons, new and second-hand
OVAL LORRY MOUNTING
200 gallons to 4,000 gallons, all types.
FULL LIST ON REQUEST
WILLIAM R. SELWOOD, LTD., CHANDLER'S FORD, Hants. 'Phone 2275.

MORTON, SON & WARD LIMITED,
invite inquiries for
"MORWARD" MIXERS

NEW Stainless Steel or Mild Steel Mixing Vessels made to requirements, jacketed or unjacketed, with or without mixing gear.
PROCESS and **STORAGE** Tanks in stainless steel or mild steel to requirements.
High- or Slow-Speed **STIRRERS** made and fitted to existing vessels.

JACKETED PANS
100g., 150g., and 200g. **NEW** in mild steel, for 100 lb. w.p., with or without mixing gear.
Structural and General **FABRICATION** requirements catered for.
SECOND-HAND EQUIPMENT
MIXERS, JACKETED PANS, etc., available from stock — all in good condition.

PUMPS
Selection of New **MONO** and other Second-hand Pumps in stock, 2 in. to 5 in.
MORTON, SON & WARD, LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
LANCS.
'Phone: Saddleworth 437.

RUDEKA 501 DOUBLE-ACTING CENTRIFUGAL GRINDING & PULVERISING MACHINE for sale. For any degree of fineness suiting materials such as salts, resins, spices, carbon, graphite, phosphates, etc. Motor driven, 3-phase. Output, 231 lb. pepper per hour. Photo. **F. J. EDWARDS, LTD., 359, EUSTON ROAD, LONDON, N.W.1.**

WANTED

PROCESS SALVAGE, LTD., offer the highest prices obtainable in this country for 40/45-gallon bung type and full aperture **STEEL DRUMS.** We are interested in purchasing any quantities of either type you may have available for disposal and can arrange for cash payments and immediate collections.— Please ring Advance 1676 (four lines) or write **PURCHASING DEPARTMENT, PROCESS SALVAGE, LTD., 79/83 COBORN RD., BOW, LONDON, E.3.**

REQUIRED.—Pascall No. 1 Pin-disc Mill or Reddrop Periflo Mill—quote number on nameplate to **BOX No. C.A. 3425. THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD
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FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

PULVERISING of every description of chemical and other materials for the trade with improved mills, wharfage, and storage facilities. **THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE: 3285 EAST.**

PATENTS & TRADE MARKS

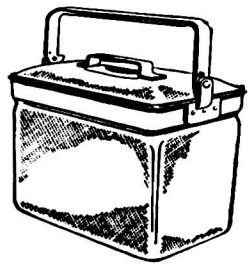
KINGS PATENT AGENCY, LTD., (B. T. King A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone: City 6161.

THE Proprietor of British Patent No. 674710, entitled **"A METHOD OF PREPARING ALIPHATIC ACYLHYDROXYPOLYCARBOXYLIC ACID ANHYDRIDES,"** offers same for licence or otherwise, to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BLVD. CHICAGO 4 ILLINOIS U.S.A.**

THE Proprietors of British Patent No. 676227 for **"AN IMPROVED PROCESS AND APPARATUS FOR THE PRODUCTION OF AQUEOUS DISPERSIONS OF FINELY DIVIDED SULPHUR AND DICHLORODIPHENYL-TRICHLORETHANE,"** desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from **MARKS & CLARK, 57 & 58, LINCOLN'S INN FIELDS, LONDON, W.C.2.**

STAINLESS STEEL VESSELS

Capacity 6 gallons **16" x 11" x 11"**



Complete with lid *as illustrated* PLUS inner anti-splash lid, handle swivels flat, locks lids, thus ensuring complete security in transit.

57/6 each carriage paid
or
£30 for one dozen carriage paid

Todays replacement cost **£8** each

Ex M.o.S., radius corners, sturdy construction 20 gauge, 18/8 stainless steel.
Suitable for most industrial uses and already supplied to many leading chemical plants.
1500 in stock available for immediate despatch.
Export orders welcomed at small additional charges to cover packing and freight.

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