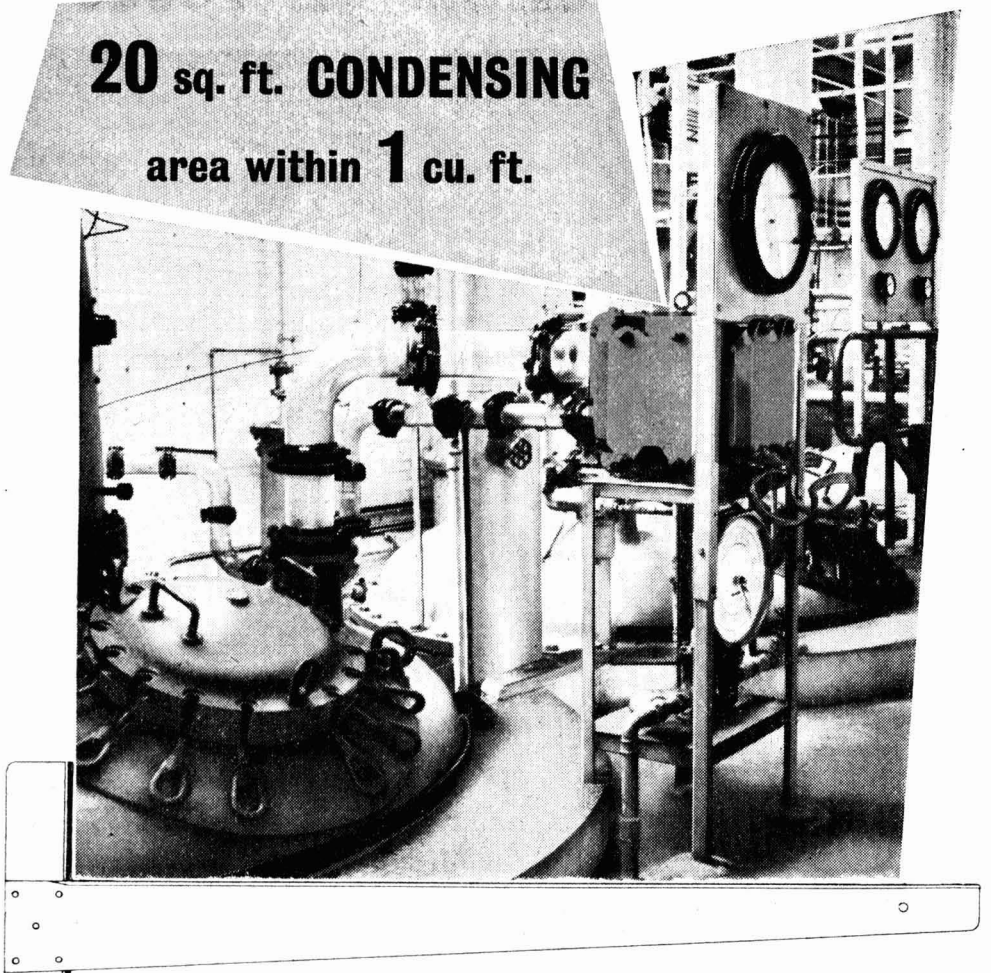
The Chemical Age

VOL LXIX 19 DECEMBER 1953 No 1797

20 sq. ft. CONDENSING area within 1 cu. ft.



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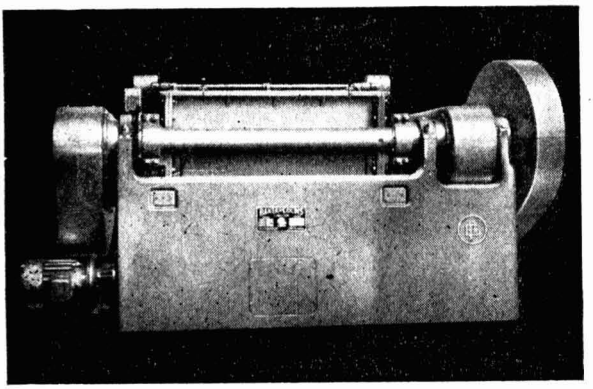
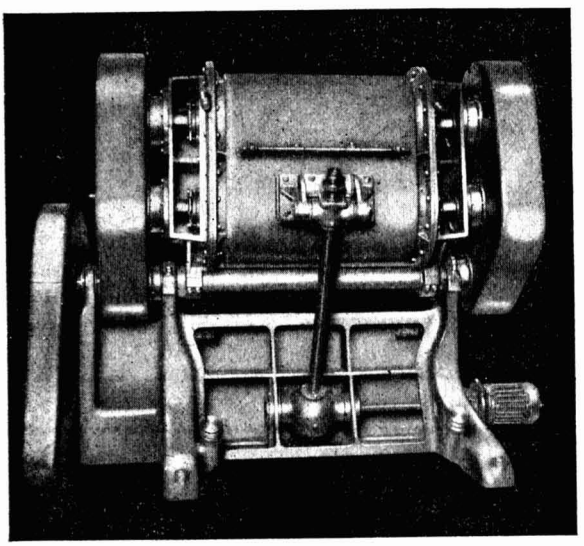


Above. Front view of a Size 17 Type VIII Class B.B. for 176 gallons per mix.

Below. Rear view of same machine tilted for emptying.



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Volume LXIX
Number 1797

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : CENTRAL 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

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The Tariff Tangle

IF the views of the US Manufacturing Chemists' Association (see THE CHEMICAL AGE, 1953, **69**, 1167-69) are meant to be taken at their fullest face value, all countries must possess or urgently develop complete chemical self-sufficiency. The argument is simple enough—imported chemicals endanger home chemical industry, and as the latter is vital in time of war this risk of peacetime discouragement cannot be afforded. This, of course, is not a novel line of thought but it is carried to the ultimate point of extremism when tariffs for protecting home industry are advocated because it is unwise to build up 'the chemical industries of our allies in areas much closer to the enemy, much more vulnerable to seizure, and much less able to supply the free world in a crisis.' As if to soften any harshness of interpretation, the MCA statement speedily expresses approval of the strong and growing chemical industries of Western Europe, 'appropriate' for defence and for the European share of the Mutual Security Programme. The snag—in American eyes—would seem to be that Europe's chemical industry has excess capacity.

History must nowadays be readily forgotten! The recovery of Britain and Western Germany should not include revivals of their traditional world rôles as substantial chemical exporters. With all respect to the great and modern chemical industry that the United States has built up in this century and particularly in its past 25 years, surely the quite limited competition of veterans should not be feared so deeply.

Frankly, we believe that American outlook today is unconsciously self-contradictory. From a military or defensive viewpoint, isolationism has been abandoned; America no longer believes in the illusion that a large country is safest alone. But in international economics the isolationist way of thought is still very dominant. It is difficult not to suspect that there are many industrialists in the United States who would much prefer a continuing policy of 'Aid Rather than Trade'; but loans of dollars, or gifts of goods, are impossible as permanent features of the free world's economy. Perpetually poor relations cannot make strong allies.

The gradually won dominance of the dollar has brought disadvantage as well as economic strength to the US. It is the scarcity of dollars that imbalances world trade. In 1952 America exported rather more than $15,000,000,000 worth of goods and imported a little less than $11,000,000,000 worth, thus in a single year adding $4,500,000,000 to the dollar gap. It is a small enough sum when set against the annual trade budget of a huge and prosperous country. The implications are obvious enough. Less protection and not more protection against foreign goods in the US home market is needed if balanced trade among allied nations is ever to be secured. With the arrival of a trading balance in terms of currency, i.e., if for two or three consecutive years US exports and imports both ran at $15,000,000,000 to $16,000,000,000, US sensitivity about protective tariffs might be more to the point. The MCA virtually concedes this argument as a recent factor but, after referring to the expanding production of other countries' chemical industries, says, 'the previous imbalance of trade between the US and the rest of the world is not a valid argument for further reducing US tariffs applicable to chemicals.' Cold comfort for countries still engaged in the nerve-racking task of trying to cross

the dollar gap on a slender tight-rope!

The MCA, like other American industrial organisations, justifies its own views on tariffs by pointing to the restrictions employed by other countries. This is a fair enough argument only so long as the greater problem of the post-war dollar gap is ignored. Countries that are critically short of dollars cannot avoid restrictions upon imports of dollar-goods, restrictions that must be far more retardant to US exports than any system of tariff rates. But unless non-dollar countries can earn more dollars by selling goods to the United States, licensing systems must continue to regulate their dollar purchases. It is, to say the least, specious that the recent MCA statement should introduce its reference to UK and Italy's import licensing system for chemical imports, Western Germany's exchange restrictions, and France's quota system, with this description of their purpose: 'In conformity with universally accepted principles of protecting industry essential to national defence, the industrial nations of Europe carefully limit imports of chemicals by tariff and absolute controls.' There surely might have been more appreciation that these restrictions have been far more painful to Europe than to America.

A strong feature of the MCA statement is its attack upon the high degree of concentration in the chemical industry outside America. Then follows, to justify the charge of rising 'concentration,' a comparison of figures that is invalidated by its own presentation. It is said that in the UK two companies control 85 per cent of the production of *organic chemicals*; in France, two companies produce 95 per cent of its output of *these materials*; in Italy, two firms account for 80 per cent *of capacity*; in Western Germany four companies produce substantially *all the chemicals*. By contrast, sales of the three largest American companies amount to only 15 per cent of *aggregate chemical industry sales*. We have italicised the respective terms of reference for each of these five statements so that their variation will be noted but first we would ask where, or how, the MCA arrived at its figures. The 85 per cent UK figure is absurd. The much greater size of the United States, and its ever-increasing home market for all classes of goods, also weakens this country-by-country comparison. The fairer comparison is to add up the chemical industries of the UK, France, Italy, and Western Germany, and compare them *collectively* with the chemical industry in the United States. Would there then be such striking differences in the degree of concentration? In view of the nature of many modern chemical processes, calling as they do for huge capital investment and minima of quantitative output for economic success, it is not possible in smaller countries for more than one, two, or three companies to produce certain chemicals. A large home market widens the possibilities for competition.

Our American friends believe in frankness, and are said to suspect the Englishman most when he is being non-informatively diplomatic. It is in any case so easy for the nations of Western Europe to put their cards on the table. They have goods to sell for dollars; if they cannot sell enough goods, they cannot buy from America other goods, even those that they vitally require. It is as simple as that. To quote from an article in the *Harvard Business Review* this year: 'Actually, imports improve our (the US) standard of living in three ways: 1. They allow us to buy some things cheaper than we could produce them ourselves. 2. They leave the American consumer more money to spend on other things. 3. They enlarge our marketing possibilities by giving foreigners dollar earnings with which to buy American goods—goods that American business and labour must produce.' We do not ourselves support to the full this quoted argument. There is a point at which particular and vital production in any country should receive protection. There is a point, too, at which employment and terms of employment should be protected from competition with products manufactured by grossly underpaid labour. But can these points be reached when trade between the United States and the rest of the world still creates an annual dollar deficit?

Notes & Comments

Sulphur Shapes

IT is something of a change to discuss the properties rather than the supply of elementary sulphur. A Dutch contribution to *Nature* (1953, **172,** 957) seems to throw new light upon the phenomenon of plastic sulphur. As has long been known, melted sulphur assumes a plastic state when quickly cooled, though this state is gradually lost after a few days. It is scarcely new to say that the formation of this allotropic form of the element is influenced by impurities. Indeed, it is facilitated by the addition of trivalent elements such as phosphorus or arsenic, which suggests that the nitrogen in the air may similarly induce the super-cooled plasticity. Indeed, there is more than suggestion here for if the melting takes place in a vacuum, rapid cooling, even when exposed to air, fails to produce plastic sulphur. The Dutch scientists put forward the view that long chains of sulphur atoms and not rings are present in molten sulphur, and these chains may be knitted together by trivalent elements at linking points. It is known that the presence of monovalent elements, e.g., bromine, reduces the rate of viscosity increase at 160° C. and over; this curiosity can be explained by the assumption that the monovalent element reacts with the terminal sulphur atoms at early stages of chain-growth, thus inhibiting the molecular changes that bring fluidity.

Crown Rights & Patents

IN a recent issue our distinguished contemporary, *The Pharmaceutical Journal* (1953, **171,** 429) has drawn protesting attention to the new Inventions and Designs (Crown Use) Bill, the second reading of which was adjourned in the House of Lords as a result of strong criticisms. The proffered reason for the adjournment was that consultations with industry had not been completed; the drug industry being one of those most likely to be affected, the comment of *The Pharmaceutical Journal*, that 'we were not aware that consultations had even begun' is not exactly irrelevant! Clearly the debate on the Bill has made the Government think again, and very rightly. There is no reasonable justification for the gross widening of sections 46-49 of the Patents Act, 1949, which cover the use of patented inventions for Crown services by a Government Department and also by a person authorised by a Government Department, including use for supply to a foreign government under inter-governmental agreement where articles are 'for defence.' However, the widening proposed in the new Bill makes 'the services of the Crown' include the manufacture of drugs, medicines, and appliances for National Health Services, Fire Services, and Civil Defence. The Bill would over-ride any existent contract conditions for use of an invention, replacing these with the requirement of 'such payment as may be just' by the Department using the invention.

Industry Must be Watchful

MORE than the rights of the pharmaceutical section of the chemical industry are at stake. Precedents once passed into law soon become precepts for more generalised action. A new drug often involves a long investment in research and a heavy capital investment in production facilities: will private industry carry these risks as readily as in the past when the principal section of the home market, the NHS, can conscript the process at its own price? Will foreign firms continue to enter into agreements with British firms for manufacturing here drugs that have been developed abroad? Even discounting the lack of principle in the new Bill, it is to be indicted for its lack of practical common sense. It would seem to have been drawn up by bureaucrats with singularly little knowledge of manufacturing conditions and needs. It calls upon the full resources of an industry and simultaneously takes away all incentive for that industry's continued development. By ruining the prospects of that industry's home market, it would inevitably and savagely reduce the very important export contributions also being made. The chemical industry as a whole must surely watch the further progress of this Bill whose discussion so far has only been adjourned.

New Sulphur Agreement

A PARTNERSHIP agreement for the exploitation of the sulphur resources of Iraq is expected to be signed in Baghdad soon between the Iraq Government and the Texas Gulf Sulphur Company. This brings two years of negotiation to an end. It is reliably learned that the agreement will give the company the right to seek and exploit the sulphur resources in all Iraq territory north of the 33rd parallel for 50 years. The profit will be shared on a fifty-fifty basis. The country's sulphur resources are believed to be considerable, and the agreement means setting up a new industry with a big dollar investment.

The company will pay the Iraq share of the profits in dollars and will provide sulphur for local use at a reduced rate. It is bound to hand back one-quarter of the total area every five years and this will be at the free disposal of the Government. At the end of 20 years the company will retain only 1,000 square kilometres. It is believed that the agreement will open a new source of sulphur to Britain, which now buys from the United States.

Some Aspects of Molecular Distillation

A Neglected Technique of Chemical Importance

AT a meeting of the North-Western Branch of the Institution of Chemical Engineers held in Leeds on 12 December, Mr. G. Burrows, of the Research Department, Metropolitan-Vickers Electrical Co. Ltd., read a paper on 'Some Aspects of Molecular Distillation.'

The process of molecular distillation, he said, does not seem to have become established as a generally recognised method of investigation and treatment of liquids in the low vapour pressure range. A reason for this neglect may be that the technique belongs more to the domain of the physicist, whereas its advantages would probably be better appreciated by the chemist. Fortunately, the very low pressures needed for the operation of electronic apparatus are not required for molecular distillation processes, where a pressure of 10^{-4} mm. of mercury at the diffusion pump is usually found to be low enough.

The three main kinds of distillation may be compared in the following way. First, distillation by boiling, where bubbles of vapour are produced throughout the liquid at the rate necessary to use up the heat supplied. The only limit to the rate of evaporation is the rate at which heat can be transferred to the liquid, and is usually set by the practical requirements that it should boil quietly and without superheating.

Second, normal evaporative distillation, in which the rate of evaporation is controlled by the temperature of the liquid and the conditions above the liquid surface.

Evaporation Controlled

Third, molecular evaporative distillation, or molecular distillation, in which the rate of evaporation is controlled by the rate at which molecules can escape from the free surface of the liquid. The maximum rate of distillation occurs when these molecules can reach the condenser unhindered by molecules of gas or of returning vapour. This condition involves the concept of a 'mean free path,' which has been defined as 'the average distance travelled by a molecule between successive collisions,' and which will now be considered.

This distance, which is of fundamental importance in molecular distillation, can be calculated for mixtures of gases on the basis of kinetic theory, making allowance for the radii and masses of the molecules, and assuming a Maxwellian distribution of velocities. Under distillation conditions, however, the vapour molecules are not moving at random, but tend to have unidirectional motion in the gap from the evaporator to the condenser, leaving the liquid surface at all angles according to a cosine distribution law. A proportion of the vapour molecules must therefore traverse a considerably longer path than the actual width of the gap, so it is possible that with increasing evaporation rate, multiple collisions between vapour molecules in the gap will cause more of these molecules to be returned to the evaporating surface.

Essential Circumstances

For molecular distillation to be effective, the residual gas molecules must have a mean free path at least equal to, and preferably several times greater than, the width of the gap between the evaporator and condenser. Under these circumstances the residual gas molecules offer no effective obstruction to the vapour molecules, so that the maximum possible rate of distillation can be achieved.

In molecular stills it is often convenient to make the gap between the evaporator and the condenser about 2 cm. wide, and if this dimension is taken as being equal to the mean free path of the residual air molecules, it will be found that the coresponding pressure is 3 or 4 $\times$ 10^{-3} mm. of mercury at 20°. For safety, it is advisable to aim at a somewhat lower operating pressure than this, say 5 $\times$ 10^{-4} mm., and allow for a pressure of 10^{-4} mm. of mercury at the diffusion pump, the pipe between the pump and the still being short and wide so as to avoid any appreciable pressure gradient.

There is a clear distinction between rate of evaporation and rate of distillation. If the residual gas pressure has been sufficiently reduced, only collisions between the vapour molecules themselves need be considered. The result of such collisions is to return a fraction of the molecules to the evaporator, the remainder which reach the condenser

giving the true rate of distillation, which cannot exceed the rate of evaporation. The rate of distillation can therefore be conveniently expressed by multiplying the rate of evaporation by a suitable factor f.

This factor would, for example, approach the value $\frac{1}{2}$ if there were a large number of collisions between vapour molecules in the gap, since the motion could then be regarded as random, the vapour molecules having an equal chance of reaching either the evaporator or the condenser when these have equal areas. In general the value of the factor f will be between $\frac{1}{2}$ and unity, under the conditions which have been assumed.

Opposing Attributes

In practice, the optimum working temperature for a given mixture is that which effects the highest distilling speed and the best separation of the components. Unfortunately, these are opposing attributes, since better separation is obtained at lower temperatures. As the temperature is raised the vapour pressure rises rapidly, with a corresponding increase in the rate of evaporation, but at the same time the effective mean free path is reduced, causing more collisions in the gap.

In these circumstances the behaviour of the vapour molecules would be similar to those of gas molecules as described by Chapman and Cowling, 'for the encounter of heavy molecules with light molecules, the persistence-ratio for the heavy molecules is nearly unity and that for the light molecules nearly zero: this implies that, as might be expected, the heavy molecule continues its path nearly undisturbed, while the light molecule bounces off in a direction unrelated to that of its previous motion.' In general, therefore, the separation of a light component is best effected at the lowest permissible temperature.

As the molecular distillation process must be operated in a vacuum of the order of 10^{-3} to 10^{-4} mm. of mercury, it is essential that all joints and glands should be vacuum-tight. The joints may be exposed to comparatively high temperatures and the pipelines may contain oil, so that, for most purposes, the use of natural rubber is excluded. On the small laboratory stills the use of synthetic rubber 'O' rings in machined grooves in the flanges has been found satisfactory, the flanges being water-cooled where necessary. On the larger stills, water-cooled flanges become too complicated and would wastefully remove useful heat, so the flanges and unions are allowed to run hot, and oil-sealed metal gaskets are used.

Units such as feed and extraction pumps are conveniently sealed by immersing them in a liquid bath, the ordinary gland packing being removed and replaced by three or four silicone 'O' rings gently squeezed together by means of the gland nut. If proper precautions are taken, the maintenance of vacuum causes little or no trouble.

On laboratory stills, glow discharge tubes can be used to indicate the degree of vacuum; the one situated between the still and the diffusion pump should remain 'black' during distillation and the other, between diffusion pump and the rotary backing pump gives, by its appearance, an indication of the kind and quantity of gases or vapours which are being pumped. Where a continuous reading of the degree of vacuum is required, a Pirani gauge unit is situated on the backing side of the diffusion pumps and connected to an indicating instrument.

When operating continuous stills it is important that the feed rate to the evaporator should be maintained constant. If the feed rate increases, the thickness of the liquid film on the evaporator increases, and the rate of distillation is reduced with corresponding variations in the proportions of the fractions being collected. It is equally important that the heat input to each stage should be maintained at a constant value, since, at the usual operating temperatures, an increase in temperature of between 8° and 10° doubles the vapour pressure.

Maximum Separation

If the highest degree of separation is required it is necessary to have a comparatively thin liquid layer, which would also limit the throughput of a continuous still. If the layer is too thick there may be an undesirably high temperature gradient through it, and also a tendency for the outer portions to become deprived of the more volatile constituents, which will cause a reduction in the degree of separation of the components.

Another aspect of the process which must not be ignored is the thermal efficiency, which is limited by the close proximity of

the cold condenser and the hot evaporator. A typical heat balance analysis showed that of the total heat supplied to a vertical tube still, 60 per cent was lost by radiation, 10 per cent was lost by conduction through the metal parts, 15 per cent was employed in heating the oil to distillation temperature, and 15 per cent was utilised in providing the latent heat of evaporation. These figures are of course only an indication of the heat distribution; individual cases will depend on the throughput and material undergoing treatment, and on the design of the still.

A convenient form of still is the tray still. This still is usually operated at constant distilling speed, the temperature being progressively increased as the lighter fractions are distilled off.

The tray must be kept shallow to avoid too great a depth of liquid, with its attendant troubles of temperature gradients and variations in composition through depletion of the upper layers; the quantity of material which can be satisfactorily treated is therefore limited.

An apparatus with greater capacity is the circulating batch still. The initial charge, about 350 ml., is contained in a glass flask situated below the evaporator. The liquid is heated and degassed under vacuum while in the flask. When degassing is complete, a small gear pump, situated below the flask, pumps the liquid up through a vertical controllably-heated pipe and delivers it on to a distributor at the top of the evaporator. The distillate is condensed on the surrounding glass water-cooled condenser, and is collected, as required, in four receivers, each having a capacity of about 70 ml.

The Evaporator

The evaporator consists of a thick-walled nickel-plated copper tube heated internally by radiation from an electrical resistance element, the temperature being determined by a thermocouple attached to the wall of the evaporator. The still, degassing flask, gear pump, and receiver are all maintained continuously under vacuum by means of an oil diffusion pump.

Low-boiling volatiles in the liquid to be distilled can give rise to troublesome splashing and entrainment, leading to a direct transfer of distilland from the evaporator to the condenser. Before attempting a batch distillation with such a liquid it is sometimes advantageous to submit it to a separate preliminary degassing and de-volatilising treatment.

4-Stage Continuous Still

A still which has been constructed for continuous operation is provided with a first- and second-stage degassing unit before the feed liquid enters the first-stage still. The first-stage degasser consists of an evacuated vessel maintained at a pressure of about 1 mm. in which the incoming liquid can bubble and froth and so release a large proportion of its dissolved gas. Suitable baffles must be fitted so that only the released gas is allowed to enter the pipeline used for evacuation.

After passing through a liquid seal the second-stage degasser is reached, where the pressure is about 0.05 mm., and which is designed to break up the liquid as much as possible. This assists the release of gas by means of cone-shaped trays which cause the liquid to flow alternately from the centre to the outside and back again, the liquid falling in drops or thin streams from the lower edges of the trays.

From the second degasser the liquid flows down through each of the four stages, the residue from any one stage forming the feed for the next stage. Liquid seals are interposed between the various stages so that the pressure in each stage can vary, within limits, without affecting either the preceding or following stages. A temperature indicating instrument on the control cubicle is connected to thermocouples attached to the upper and lower portions of the evaporator of each stage.

With an experimental fractionating still, values of the relative volatility α exceeding the theoretical value for a single distillation have been obtained. The achievement of high values of α under conditions of total reflux gives useful information, but the quantity of material obtainable is an important feature from the practical viewpoint. Further work is therefore needed in order to determine the quantitative separation which can be effected under conditions of partial reflux.

Descriptions of various designs of centrifugal still have been given elsewhere. The inherent advantages of a thin film combined with a short heating time are of special benefit when treating heat-sensitive materials. Few facts are available to show

whether these features lead to higher rates and better separation than can be obtained with stationary stills. Before a comparative evaluation can be made, more information of a quantitative nature is required. Combined fractionating and centrifugal stills have been described.

In the foregoing discussions it has been assumed that re-evaporation from the condenser is negligible. If the condenser temperature is 20°, this implies that the vapour pressure of the condensed film at that temperature should not be much greater than 10^{-5} mm., a condition which sets a limit to the scope of the molecular distillation process. As a rough guide, liquids having molecular weights of 300 or more condense satisfactorily at 20°.

Substances which are usually readily amenable to treatment by molecular distillation include high-boiling petroleum derivatives such as lubricating oils and petroleum jellies. Animal and vegetable oils which may undergo polymerisation when heated, frequently give rise to a layer of gum or gel on the evaporator surface after a time. The extent and rate of formation of the layer can often be reduced by careful operation, but some materials in this class seem to be particularly liable to the trouble which occurs even when a centrifugal still is used. The removal of the layer from the evaporator by mechanical means appears to be a possible remedy.

From the descriptions of the uses of the process which are to be found in the technical literature, the following examples may serve to give an indication of the range of substances which may be treated, namely, petroleum oils, fish oils, triglyceride, soy bean and corn oils, and miscellaneous acetates, fatty acids and esters.

Company's New Branch

On 1 January next J. W. Towers & Co., Ltd., Victoria House, Widnes, are opening a new London area branch at Wallingford Road Industrial Estate, Uxbridge (tele.: Uxbridge 8461). The branch, which will be under the management of Mr. H. R. Whitehead, will serve London and the counties of Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Essex, Hertfordshire, Kent, Middlesex, Oxfordshire, Surrey and Sussex.

Mathieson Absorb Puritan

COMPLETION of negotiations by which all of the outstanding stock of Puritan Company, Inc., and its wholly owned subsidiary, Genesee Research Corporation, both of Rochester, N.Y., will be acquired by Mathieson Chemical Corporation, has been announced. The transaction will take place as an exchange of stock between the two companies on 6 January.

Puritan Company, through its operating subsidiary, Genesee Research, is a leading manufacturer and contract packager of antifreeze, hydraulic brake fluid, shock absorber oil, gasket seals, metal polishes, and special soaps. It is the second oldest soap manufacturing concern in the United States, having started in that field in 1823. The company is also engaged in research and development on rare organic chemicals and is an important producer of these materials for industrial and research use.

The management of Puritan will continue as a part of the Mathieson organisation, and present services and facilities available to Puritan customers will be continued and strengthened under the new ownership.

Steel-Vinyl Laminates

THE United States Rubber Company has developed a method of laminating plastic sheets with sheet steel and aluminium. The resultant material has the structural strength of steel or aluminium with the corrosion resistance and bright colours of vinyl plastic, the company claims.

Although price figures have yet to be set, officials estimate that the laminate will cost more than galvanised metal but only about a third as much as a comparable gauge of stainless steel.

The finished sheets resist high temperature, pressure and humidity, the company claims. To pull the plastic from the metal, pressure of more than 40 lb. per sq. in. or temperatures higher than 70° combined with 100 per cent humidity for 1,000 hours would be needed, a company spokesman says.

The material can be bent into 180 degree turns without splitting the metal from the plastic, and designs can be imprinted on the finished sheets. The abrasion resistance of the plastic surface is claimed to be higher than that of varnished, painted or baked enamel finishes.

Gyratory Vibration in Sieving

*by JUSTIN HURST**

IN the course of manufacture almost all consumer products have to be sieved, strained, or graded. When the processing of highly sensitive explosive materials became a problem of paramount importance during the war, it fell to the lot of the writer, among others, to investigate the problems that had arisen.

The primary object of this research was to reduce to a minimum the impactation of the material during the sieving process.

At this stage, it seemed obvious that in order to obtain the desired results, the sieving effect would have to be brought about by a rotative or cyclic motion rather than a reciprocating one, but, on the other hand, most rotary movements engender centrifugal forces which in this application might have had dangerous results. However, it was postulated that provided a rotary movement of sufficiently small amplitude could be used, the centrifugal forces involved would not be powerful enough to produce ill effects, and thus this problem was eventually solved by applying a gyratory motion in a horizontal plane to the screening surface.

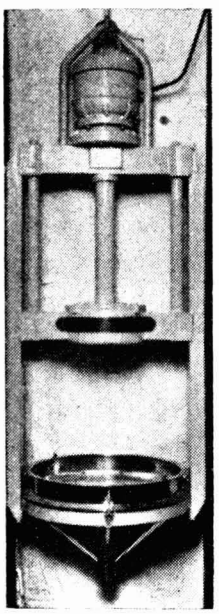


Fig. 1

Experiment showed that an out-of-balance flywheel, rotating in a horizontal plane and freely suspended from its vertical axis, would produce exactly the movement required. These desiderata were eventually epitomised in the suspension gyratory sieving machine shown in Fig. 1.

Imbalance of the flywheel was effected by means of a pair of moveable weights, the relative adjustment of which controlled the amplitude of gyration and in effect imparted to the circular screen located at the base of the rectangular frame a range of excursion from zero to about 3/16 in. The flywheel was caused to rotate at about 1,000 rpm., at which speed a maximum of 1,050 lb. gyratory force was generated at the screen surface.

When this unit was operated and practical sieving tests were made, it became obvious that the results obtained were vastly superior to anything hitherto achieved.

At this stage the machine was taken over by the Royal Ordnance Factories for processing explosives ingredients, and particularly tracer bullet powder. The machine was then adopted as standard equipment for sieving fine powders, and ultimately several hundred machines were supplied for this purpose.

Mechanics of the Process

Meanwhile, research was being carried out with a view to improving still further the results obtained from this revolutionary approach to the problem of fine sieving, and here one may digress to study the actual mechanics involved in the operation of the gyratory screen as compared with the shaker sieve.

It is well known that if a powder is poured on to a static mesh surface, some will percolate through, but this throughput will soon cease because the subsiding material on the screen surface will pack, and some of the mesh apertures will be obstructed by oversize particles. The sieve must therefore be shaken to break down the packing of the particles and to shift the oversize material. A big disadvantage of this arrangement, however, is that the rapid reversal movement of the shaking motion makes the particles bounce on the mesh, so that an oversize particle resting in an aperture which it cannot penetrate will be firmly hammered home by another falling particle. With some materials this will happen hundreds of times a second, until every mesh aperture is obstructed and what is known as total blinding will have occurred. This is one of the greatest drawbacks of the shaker screen.

Now let us study the case of the gyratory screen. As already mentioned, the screen

* Managing director, Russell Constructions Ltd.

surface moves in a strictly horizontal plane in such a manner that any point on this plane will describe a small circle (usually about 3/16 in. dia.). Now if some powdered material is placed on a screen surface gyrating at a low speed (say 200 cycles per min.), the material will remain static, but as the speed increases, the friction holding the material to the screen surface will be broken down and some relative movement between the two will occur. As a result a curious but well-defined motion is imparted to each particle in contact with the screen surface. In effect each particle is impelled to rotate simultaneously on two separate axes, located at right angles to each other. Centrifugal forces cause one axis to be disposed to the centre of force of gyration (in this case the axis of rotation of the out-of-balance flywheel).

Thus it will be appreciated that when the translatory motion on this axis is imparted to all the particles they will roll round the circular screen in concentric paths. Herein lies the unique solution of the blinding problem, for should any oversize particle chance to roll into a mesh aperture that it cannot penetrate, it will roll out again, leaving the mesh clear. Furthermore, the rolling particles remain in close contact with the screen surface. To this feature is attributable the vastly increased throughputs attained on the gyratory sieve, amounting to as much as 14 to 18 times more than those obtained with a relevant mesh area on the shaker screen. Above all, the impacting of the particulate matter, so important in the handling of explosives, is reduced to its minimum. There are also many industrial applications where this effect is of great importance.

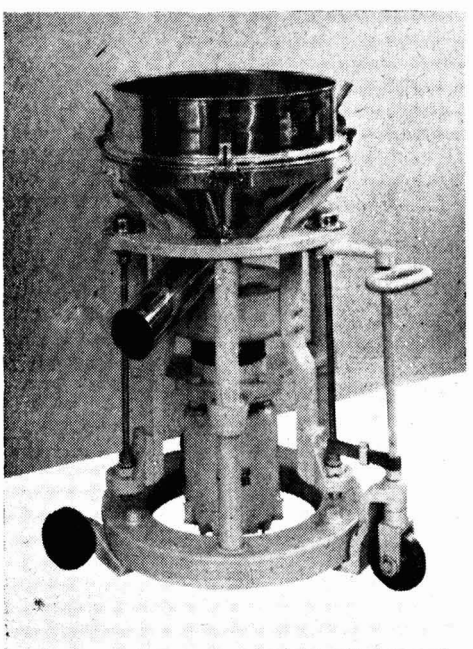


Fig. 2

Importance of Secondary Motion

As the particulate matter is kept in such close proximity to the screen surface it may be asked what happens to the upper layers of material when there is an appreciable depth of material working on the screen. It is here that the secondary motion of the particles referred to above plays an all-important part. We have seen how the particle rotating on its radial axis proceeds round the circular screen, but simultaneously a rotation occurs which has its axis at right angles to this and in the same plane. This causes the mass of material to rotate or turn over in an annular sense all round the screen, so that every particle must in due course be presented to the screen surface. Furthermore, in performing this annular movement, the smaller particles move with much greater energy than the large particles. Consequently the latter tend to remain at the top of the mass, leaving the fine material at mesh level.

It should be stated here that while the annular motion of the particulate mass plays such an important part in promoting efficient sieving on the circular screen, the vertical element in this movement can engender a small amount of blinding effect with certain difficult powders. Recently, however, by a unique re-arrangement of the sieving elements, even this defect has been eliminated. This machine will be dealt with later.

Requests for a machine which did not need overhead suspension led to the development of the stand model machine (Fig. 2). Here the out-of-balance flywheel in its cast-iron housing supported the sieving unit, and this assembly was freely suspended in a static frame mounted on trolley wheels, the electric motor forming part of the static frame and driving the flywheel through a special flexible coupling. This machine was constructed to operate at 1,450 rpm. and yielded correspondingly greater throughputs compared with the suspension type of unit.

The popularity of this machine was

greatly enhanced when it was found that apart from its function as a sieving unit it could be converted—with quite minor adjustments—into a mechanical strainer with a really phenomenal performance. As such, it was capable of dealing not only with liquid media, but also with materials having a high viscosity, such as the heavy syrups used in confectionery manufacture; even heavy thixotropic paints could be strained through an 80-mesh screen, yielding outputs of well over 100 gal. per hr.

Another unexpected effect was noted when the machine came to be widely used for straining molten chocolate. It was found that this particular straining process imbued the resultant product with a smoothness of texture hitherto unattainable in mass manufacture.

A very important feature of gyratory straining is that in no circumstances can the mesh become blinded or clogged. Even when the screening pan is full of foreign matter too dense to pass through the mesh, the liquid element will continue to strain without any falling off in throughput. Study of this apparently quite abnormal effect elicited interesting facts. It would appear that the rapid gyratory movement of the screen surface induces in each mesh aperture a minute but powerful vortex in the liquid. To this effect is accountable the high throughput attained. Here another important factor comes into play, however, inasmuch as the interaction of the apices of the vortices all over the mesh surface cause any solid body which cannot pass through the mesh to be forcibly repelled. Thus it is impossible for any clogging or binding to take place.

An Uncanny Effect

The experiments which brought to light the foregoing facts were carried out with a mixture of coarse sand suspended in water, producing the uncanny effect of the sand apparently floating on the surface of the water straining through the screen.

The sponsors of this plant soon realised that ideal though the stand model gyratory strainer might be for certain processes, wider and more important applications in this field required a machine which, during the straining process, would continuously reject the oversize material. This led to the development of the separator machine (Fig. 3). In this unit the gyratory motion is imparted to a rectangular screen about 4½ ft. long and

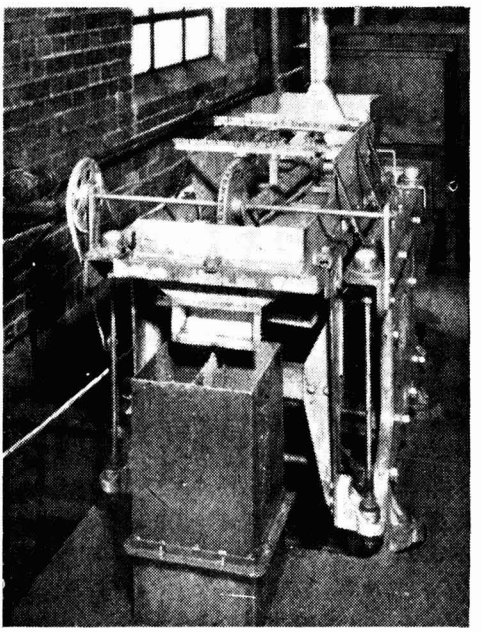


Fig. 3

having a mesh area of 6½ sq. ft. The screen is usually set level, with an opening at one end through which the oversize material passes with all all but the supernatant moisture removed, while the filtrate passing through the mesh surface is discharged from a suitable delivery pan.

By this time, owing to improvements in the mechanical construction of the machine, the applied out-of-balance force had been raised to well over 2,000 lb.

When the separator was put into operation, the results obtained exceeded all expectations. In some cases it was found that throughputs up to 18,000 gal. an hour through an 80 or 100 mesh could be obtained. This is equivalent to nearly 3,000 gal. an hour through 1 sq. ft. of mesh, a figure many times greater than that attainable by any other means, including many systems employing high pressure feed and vacuum take-off. In its particular field of function the separator was, and is, entirely without peer. Since its inception hundreds of these machines have been applied to widely varying processes.

More recently, the separator has been successfully applied in quite a new field—the de-watering of tar.

Experiments seemed to indicate that speeds of gyration higher than 1,450 per minute

would produce still greater working efficiency. It was, therefore, decided to construct a machine capable of operation at a rate of 3,500 cycles per minute.

Since the out-of-balance forces generated at this speed amount to more than 13,000 lb., a number of intricate mechanical problems nad to be surmounted to ensure that the machine should be safe to operate under the loads imposed by stresses of this order. This was eventually achieved, and, moreover, a torque converter was incorporated in the unit, providing an infinite variation of speed control between 1,000 and 3,500 cycles per minute. Thus the variable speed gyratory machine came into being.

The prognostications of the designers of this unit were more than fully realised. It was found that in the higher registers between 2,500 and 3,000 cycles per minute, fantastic throughputs were possible. Moreover, many materials hitherto regarded as entirely unsievable through fine meshes were found to be readily processed on the variable speed machine, provided that the unit was regulated to operate at the correct speed of gyration, for in the manipulation of the torque converter fitted to this machine a remarkable fact transpired, namely that these ultra high outputs—which in many cases were as much as 10 times as great as those obtained on previous machines—took place only at very critical speeds of gyration.

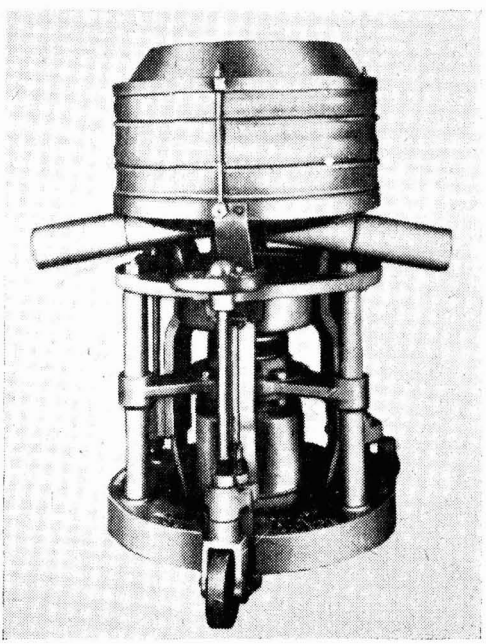


Fig. 4

Recently, the food hygiene authorities, conscious of the fact that undesirable organisms invariably find a breeding ground in stored flour, have urged the employment of a 30-mesh sieve in place of the 8-mesh at present used. In the circumstances the obvious solution of the problem lay in the application of gyratory sieving, and thus the writer was asked to devise a suitable machine for this purpose. In their existing form neither the stand nor the variable speed unit could be applied to this work, since they could not continuously reject oversize material when operating on large throughputs. Therefore, the problem of designing a suitable sieving element had to be approached from an entirely new angle, with the ultimate result that the cascade sieving machine was evolved (Fig. 4).

Cascade Sieving Machine

In order to accommodate the cascade sieving element (which is about three times as heavy as the ordinary sieve) a special stand machine was designed, which, while working at 1,450 cycles per minute, generated an out-of-balance force of 3,500 lb.

The sieving screen of the cascade consists of three superimposed annular mesh surfaces having a combined area of 6½ sq. ft. Each of the three stages of mesh is supported on a collecting pan having a central outlet and when assembled the three outlets form a continuous duct through which the screened material flows, to emerge eventually through a delivery spout. Between each pair of mesh pan assemblies is located a collector pan, which guides the material flowing off the edge of the mesh surface on to the centre of the mesh surface below, and so on until the material coming off the lowest mesh—which is, of course, the oversize material—is rejected from the machine. The whole assembly is housed in a dust-tight casing, measuring 22 in. in diameter and 10½ in. in height.

In practical operation, the stream of material is directed to the centre of the top screening surface and the dual translatory motion imparted to the particles causes them to precess in a spiral path across the mesh surface. The greater part of the material will pass through the mesh, but the remainder, passing over the edge of the mesh pan, will continue its spiral course down the

[continued on page 1278

Heavy Chemicals in Spain

Several Important Production Projects Under Way

THE return of more competitive conditions to the world market and the need to meet the lower prices of foreign chemicals may cause Spanish chemical producers to revise some of the projects for new plant to which publicity has been given in the past few years. There is no doubt, however, that the country's production capacity for heavy inorganic chemicals will be greatly increased in the near future.

Sulphuric acid production, which has been rising steadily since 1946 and last year reached 590,000 tons (in terms of H_2SO_4), is expected to advance to between 800,000 and 900,000 tons, partly in connection with plans to produce more ammonium sulphate. A sulphuric acid and ammonium sulphate plant sited at Tarragona is scheduled to start operations in 1956. When in full production at the planned rate of 95 tons a day, its nitrogenous fertiliser output will greatly contribute to reducing the present disparity between production and consumption. Current production covers only about one-third of the nitrogen consumption in Spanish agriculture, which was estimated at 100,000 tons (N) for 1952/53. The superphosphate industry, on the other hand, appears to suffer from excess capacity—last year's output of 1,240,000 tons could have been achieved with 70 per cent of the present plant.

State-owned Potash

Ambitious plans have been drawn up by the State-owned potash industry, which even now disposes in foreign markets of over two-thirds of its current output of about 180,000 tons (K_2O). While it is hoped to increase home market sales in the next two years from 55,000 to 75,000 tons, production may be more than doubled if, as planned, two new mines are brought into operation at Astrain and Esparca de Galar, in Navarra, and a potassium chloride factory is erected at nearby Pamplona. The bulk of their output of 200,000 tons, planned to be reached by 1960, would have to be marketed abroad in competition with the French and German producers.

The production of calcium carbide, which has risen to more than 40,000 tons, is also to be increased substantially—an annual target of 125,000 tons has been mentioned. To achieve this, however, it would be necessary not only to install additional carbide capacity, but to provide for a supplementary source of hydro-electric power, and it is doubtful whether the finance required could be provided. For the large sulphuric acid-ammonium sulphate project at Tarragona a dollar loan was obtained.

Caustic Soda & Chlorine

Other important expansion projects concern the soda plant at Santander which, with an output around 100,000 tons a year, meets most of the domestic production. It is proposed to extend this plant and also the caustic soda capacity at several plants which, with an output rate of more than 80,000 tons, now appears to be fully utilised. The production of chlorine, estimated at 14,000 tons, will increase likewise. A new potassium chloride electrolytic plant at Barcelona will export caustic potash and use chlorine for the production of several plastics. The plant at Flix (Ebro), formerly German-owned, now produces caustic soda and potash, chlorine and calcium chloride, synthetic ammonia and ammonium chloride, trichloroethylene, carbon tetrachloride, barium chloride and carbonate, sodium cyanide and peroxide, and synthetic detergents. The production of fluorides at Lejona-Lamiaco in Vizcaya is to be increased. Other new production projects concern hydrosulphites and phosphates.

While many of these projects are too small to attract much attention outside the country, there is no doubt that the expansion of the chemical industry, pursued with the encouragement of the Spanish Government, will, in due course, make itself felt in the international sphere. Spanish chemical producers hope to find outlets for future surplus output in the Mediterranean area and Latin America. They expect that the dependence on foreign supplies, which was causing some difficulties during the war and, especially, in the first post-war years, will be greatly reduced by current expansion projects, at least as far as heavy inorganic bulk chemicals are concerned.

Gyratory Vibration

continued from page 1276

collector funnel. In this way it is fed to the centre of the second mesh stage, where the same operation is repeated. This happens again on the third mesh stage and by that time all but the oversize will have passed through the mesh.

When the cascade machine was put into operation, it was found to be well able to cope with desired throughputs and embodied many outstanding advantages when compared with existing mechanisms applied to this purpose. Owing to the unique construction of the cascade, the maximum length of the unsupported mesh in the whole system is only 7½ in. Thus, despite the heavy loads imposed, silk or nylon fabric can be employed instead of the customary metal mesh, so that the hazard of particles of wire becoming absorbed in the resultant food products is entirely eliminated. Furthermore, the fact that the whole of the compact sieving element is enclosed in a dust-tight envelope precludes any chance of contamination from outside sources, while simply by loosening three nuts the complete sieving assembly can be detached from the unit and its constituent elements taken apart for cleaning and inspection.

The cascade unit has been acclaimed as the most efficient and versatile sieving machine available to industry. Particularly was this claim substantiated when its sponsors applied the unit to the task of sieving that small though important group of powders, the particles of which take the form of minute elongated carrots. A large number of powdered metallic ores and many plastic powders are included in this category. Such materials have always been considered as practically unsievable, since the wedge shaped particles rapidly clog the mesh and total blinding ensues.

It is, therefore, interesting to relate that in all such cases the cascade machine had given unexceptionable sieving results and at the same time yielded outputs of a very high order. This was to be expected, since the ideal conditions for perfect sieving have been achieved in the cascade machine. Each particle of material follows a predetermined spiral path throughout the system, while all vertical movement of the particulate matter has been completely eliminated.

Application of this system to straining and filtering processes is now being studied.

IN THE EDITOR'S POST

USA Formaldehyde Production

SIR,—I am a regular subscriber and reader and also an admirer of your journal. I have read with considerable interest the review of the 2nd edition of 'Formaldehyde' by J. F. Walker on page 919 of the 31 October issue of your journal.

There is a typographical error in this review and this pertains to the current American output of formaldehyde, which you have stated as 1,000,000 lb. a year. This figure should be 1,000,000,000 lb. I know personally several firms in the USA whose technical officers are my dear friends. Some of these firms are producing more than 1,000,000 lb. of formaldehyde per month. The total production of formaldehyde in the USA during 1952 was 1,022,366,000 lb. (37 per cent commercial solution). I am sure by the time this letter reaches you, some other friends of THE CHEMICAL AGE must have brought to your attention this typographical error.—Yours truly,

DR. M. S. PATEL.

Bombay.

Synthetic Milk Progress

AMERICAN research into the possibility of producing synthetic milk was referred to by Dr. E. G. Woodroofe, technical director of British Oil & Cake Mills Ltd., in a paper which he presented at a meeting of the Royal Society in London last week.

Milk and cheese-like products from a variety of plant proteins, he said, had featured prominently in the research work of some of the American universities and laboratories. Although complete success had not yet been achieved in producing a synthetic milk which would satisfy all the requirements for infant feeding in those countries where supplies of milk were inadequate or unsatisfactory, remarkable progress had been made and many of the outstanding problems had been solved.

Dr. Woodroofe, who was dealing with the growth of the seed crushing industry, said the world had recovered from the acute scarcity of oils and fats, which prevailed during the post-war years. Supplies of oilseeds to the United Kingdom in the immediate future were reasonably well assured, except for any temporary setback, such as a major crop failure in West Africa.

Canadian Chemical Industry Grows

Prospects for Continuous Development Analysed

FOR the past 25 years the chemical industry in North America has been growing more rapidly than any other major industry —since 1925 it has been expanding at an average rate of about 10 per cent a year—and an article in a recent issue of *Foreign Trade* attempts to answer the question: 'How long will the spectacular growth of the chemical industry in Canada continue?'

It points out that the industry's rise to prominence has been due in large part to two quite different market phenomena, both of which will undoubtedly continue to play an important rôle. One is 'replacement markets,' typical among which are those for synthetic fibres, plastics, rubber, and surface active agents such as detergents. These products are expanding at the expense of older commodities, usually natural in origin. The other consists of 'new markets'—for example, medicinal chemicals, insecticides, new-type fertilisers and the anti-knock agents used in gasoline. These products owe their popularity to the development and expansion of new outlets where their growth is rarely at the expense of other commodities.

Both categories of demand have influenced the industry's growth, but the 'replacement market' has so far been the more important. In the future it may be different. The 'new market' category of chemical products may go on expanding indefinitely, but the 'replacement market' will eventually have to slow down as these products eliminate the commodities they are replacing.

Detergents & Fibres

For example, if the present rate of growth of the synthetic chemicals used in fibre production were to continue, they would fill the entire projected demand for fibres by about 1970. Another example is synthetic detergents. Their sales have been expanding so rapidly that, if they were to continue, synthetic detergents would completely replace soap within a relatively few years—ten at the outside.

Synthetic rubber is making headway against rubber from natural sources, but only strategic considerations will entirely eliminate competition from plantations in the Far East. Plastics are also largely replacement products, but because they tend to replace such large-volume items as steel, non-ferrous metals, glass, ceramics, leather and paper, there appears to be no foreseeable ceiling on their consumption. Neither do upper limits in the markets for medicinal chemicals, fertilisers or insecticides appear to be in the offing.

New Markets Visible

In looking to the future, account must be taken of new chemical products and entirely new markets, some of which are already appearing on the horizon.

One consists of linking inorganics to organic compounds. The new hybrids, although unlikely to be as numerous as the organics, have many possibilities. Among the oldest of these products are the chlorinated compounds, now used largely as solvents, refrigerants and degreasing agents. Among the newest and most promising are the organo-silicones or silicone plastics, which are finding applications as heat-resistant fluids, greases, resins and rubber-like materials. Then there are the fluor-carbons making up some of the most stable plastics known today. Each of these product families is still in the early, high-cost stage of development, but they promise to generate markets for themselves by making possible new inventions, some of which previously failed for lack of suitable materials.

There are, too, many indications that, eventually, numerous organic chemicals will be made from coal by hydrogenation. Another probability is the building of still more complex molecules beyond the scale now referred to as 'polymerisation.' This means expanding into the fields of protein chemistry and biochemistry, with the practical application of photo-synthesis just around the corner. Another growing province is enzyme chemistry, bringing in its wake a whole new range of natural catalysts. All this may apply a revolutionary force to food processing and the preparation of pharmaceutical and medicinal chemicals.

On the borderland and still difficult to appraise are likely developments in nuclear chemistry.

An overall projection of Canadian chemical requirements indicates that they will increase by at least 50 per cent between now and 1960. North American consumption trends indicate that during the next decade plastics may well surpass synthetic fibres in terms of sales value. Medicinals will probably extend their recent lead over fertilisers. North American demand for synthetic detergent also has considerable room for expansion. The same is true of insecticides and miscellaneous chemicals like solvents, paint pigments, and anti-knock agents. Synthetic rubber, in fact, is the only one which may show a levelling-off in sales over the next few years.

Rapid Increase Likely

If the pattern of production more closely approximates Canadian consumption, categories like plastics and synthetic fibres are bound to show a rapid rate of increase. There is also considerable room for expansion in synthetic detergents. The future of synthetic rubber, fertilisers and, to a lesser extent, insecticides, will be affected more by export considerations.

Keeping abreast of these new and mounting demands will tax the industry's resources of capital and 'know-how,' but it will not place anything like the same burden on raw materials. For one thing, it can draw on Canada's abundant reserves of coal, oil, natural gas, salt, limestone, pyrites, wood, wood pulp wastes and hydro-electric power. The coal could be of better quality and both the coal and petroleum more advantageously located, but the increasing number of raw material options which these and other industries afford, provides at least a partial solution to these difficulties. They may be offset entirely by the fact that many other raw materials are becoming available in considerable quantity as by-products of other industrial operations. Only phosphate rock and potash in commercial quantities now appear to be lacking. Otherwise the picture would be complete.

But it takes more than raw materials to make an industry. Properly financed, well-organised companies with abundant technical skill are also needed. This the Canadian industry has through its connections in other parts of the world and its ability to attract foreign capital when Canadian knowledge and financial support appear to be lacking. The mounting world-wide demand for Canadian materials and the fact that it is becoming increasingly economic to process them initially in that country (it is said) will help to give Canadian chemical producers much of the support they need.

The article concludes by pointing out that soon the struggle for world markets may again be on in earnest and Canadian producers may not be able to secure sales abroad with the same facility as they have over the past decade. The United Kingdom is said to be becoming a much more important exporter of chemicals, and many Western European countries, including Germany, have built their production rates up to, and in many cases above, those of 1938. Not only are they making determined efforts to become independent of North American sources of supply, but they are also presenting a serious threat to dollar country producers in other parts of the world. With their lower real wage rates, their great technical competence and their prewar connections, they certainly cannot be ignored, states the article.

The rôle which the United States will play is considered perhaps even more important. The US is potentially an attractive market for many Canadian chemicals. However, with the exception of agricultural chemicals, the US duties imposed on Canadian chemicals are still prohibitive. Moreover, American producers, periodically selling their surplus production elsewhere, are formidable competitors both at home and abroad.

Taking all these factors into account, the author believes that domestic production will, in future, increase much more rapidly than Canadian imports. The further growth and diversification of Canadian industry will largely account for that. On the other hand exports, other than fertilisers, may not grow as rapidly.

Markets Expanding Rapidly

'Chemical industry markets in Canada have increased by over 60 per cent since 1945 and show every indication of continuing this rapid growth,' according to Douglas D. Stokes, general sales manager of Monsanto Canada, Limited. The company began manufacturing in Canada in 1945 and because of the growth of the Canadian market, it has just established a department of market research, headed by D. Keith Johnson.

New Plant at Aycliffe

Bakelite Limited Complete Vinyl Resin Factory

ALTHOUGH Bakelite Limited is best known for its phenolic and urea thermosetting products — moulding materials, laminated sheet and resins—the company has, since the early days of the last war, been active in the thermoplastics field. It was in 1943 that they started the manufacture of vinyl resin compounds for cable covering at their dispersal plant at Feniscowles, Lancashire.

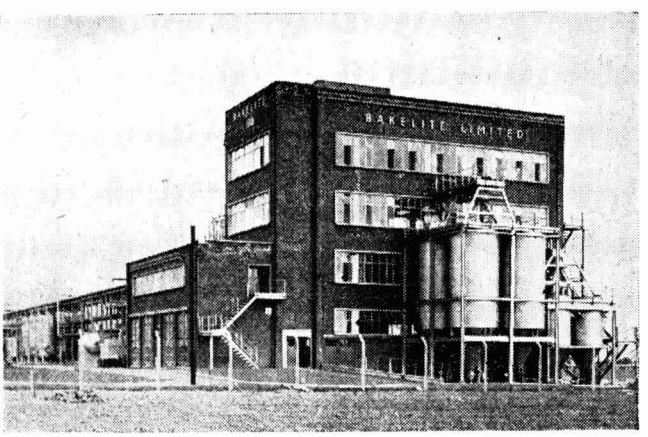
At the end of the war the company closed down their several dispersal factories, returning to the main works at Tyseley, Birmingham, such plant as could be accommodated there. Expansion at Tyseley was limited by a number of factors, and after consultation with the Board of Trade it was decided to develop a site at Aycliffe, Co. Durham, primarily for the production of thermoplastic products.

A 35-acre site was selected, and a building programme was immediately put in hand. The first phase was completed in 1948 and the new buildings comprised a unit for the manufacture of phenolic moulding materials which is probably the largest and most up-to-date in the world, plant for the production of urea moulding materials and for compounding, calendering and press polishing PVC.

The second phase of the building programme was a new resin plant, and this plant has now come into operation. It occupies part of a 47-acre site which the company has purchased immediately adjoining the original 35-acre site. It is a polymer plant, and consists essentially of low temperature storage and mixing tanks for monomers, polymerising equipment, drying, grinding and screening plant and weighing and storage facilities to handle the final product.

This new plant is designed to produce different types of polyvinyl and copolymer resins. Initial production is of a vinyl chloride-acetate copolymer which will be sold under the company's registered trade mark as Vybak 'VYNW.' It is an excellent general-purpose resin, giving easier working, fluxing and plasticisation than straight PVC resins without sacrifice of mechanical and electrical properties. Present output is at the rate of thousands of tons per annum, and in addition to supplying the company's own requirements will be sold to other compounders, and so go some way towards meeting increasing demands of industry for vinyl materials.

The services, which are integral with the plant, comprise circulating water equipment and water storage, fire-fighting equipment, refrigeration and nitrogen units. The largest user of cooling water is the refrigeration plant. Nitrogen is required as an inert blanket in all pieces of equipment in which vinyl chloride is either stored or polmerised, and to keep free of vinyl chloride instruments such as pressure gauges and containers where blockage by the polymer would result if the monomer was not excluded.



A general view of the vinyl resin plant at Bakelite's works at Aycliffe, Co. Durham, showing the storage and weighing bins

While normal operation of essential services and operating equipment depends on electric motors, steam driven standby plant, as well as diesel-driven generator equipment, will automatically take over in the event of failure of the mains power supply.

Raw materials arrive on the site in road tankers and are off-loaded by pumps or gas pressure into the storage tanks which are grouped together in a tank area. From the storage tanks they are pumped to weigh tanks to make up feed mixtures of varying compositions corresponding to the type of resin being made, and these fed to the polymerisation system as required.

A remarkable feature of all this section of the equipment is that, for the first time in this country, it is out of doors, though the final drying of the resin, its grinding, screening, blending and packing are carried out indoors. The equipment is entirely British made, and extensive use is made of stainless steel to ensure a clean product and freedom from corrosion.

Manufacture is controlled at all stages by the most modern servo-control mechanisms available, and extensive use of these has enabled the plant to be operated with a small labour force. Control of raw materials and intermediate products is covered by a qualified technical staff. The laboratories devoted to the aspect of manufacturing control are fully equipped with the chemical and physical equipment necessary to do the complete evaluation considered necessary by the company.

South African Platinum

The demand for platinum in South Africa has been maintained, and the price has remained steady. The provision of plant and machinery for an expanded rate of production at both the Rustenburg and Union Mines has been virtually completed, and Rustenburg Platinum Mines is reaching the position where full advantage can be taken of the demand for the metals produced by this company. Satisfactory progress is being made with the erection of the plant which is being constructed at Rustenburg for the treatment of matte. This plant will be owned jointly by Rustenburg Platinum Mines and Johnson, Matthey & Co., through the medium of a company called Matte Smelters (Pty.), Limited. It is expected that it will be completed by the middle of 1954.

Search for Natural Gas

A START has been made on the extensive investigation organised by the Gas Council with a view to finding natural gas in Great Britain in quantities sufficient to be of commercial value. The survey is likely to cost £1,000,000 and, as reported in THE CHEMICAL AGE on 7 November (p. 967), will probably be spread over five years.

The underground rock formation of an area of the East Riding of Yorkshire is at present being explored by a seismic survey party, following a report by geologists that the area stretching from Aldbrough on the coast to the village of Hayton on the Market Weighton-York road, is a promising prospecting line.

Mr. John Shelley, who is in charge of the seismic survey party, informed a Press representative that the results of the survey would be examined by geologists of the D'Arcy Exploration Company, who have undertaken the work on behalf of the Gas Council. If conditions were considered favourable, drilling sites would be selected and wells sunk. He added that although the exploration was primarily for natural gas, there was always the chance that oil might be found.

County Council & Analysts

SUBJECT to the approval of the Ministry of Food, Durham County Council have decided to dispense with the services of Mr. C. J. H. Stock, county analyst, and Dr. W. F. Elvidge, his assistant, the former to receive three months' notice and the latter dismissed immediately. At a meeting of the Council last week, Councillor J. A. Hall, chairman of the Local Government Committee, reported that when Mr. Stock and Dr. Elvidge were interviewed the committee were unable to get a satisfactory explanation of differences in analyses of samples of ice cream taken at two towns in north-west Durham. When the Council discussed the matter at an earlier meeting they agreed to ask Mr. Stock and Dr. Elvidge to resign. The chairman, Councillor J. W. Ainsley, explained that the decision was taken following the withdrawal of intended legal proceedings against several ice cream manufacturers. The two analysts were subsequently reported to be unwilling to resign—hence the Council's latest decision.

Technological Education

'Government Mean Business'

ASKED in the House of Commons last week whether the Government would establish a college of technology, the Chancellor of the Exchequer (Mr. R. A. Butler) said it had already been announced that the Government proposed to develop higher technological education in London by building up the Imperial College of Science and Technology.

With regard to outside London, he continued, the University Grants Committee had invited universities and colleges on their grant list, which were concerned with higher technological education, to submit their plans for development.

University Status for College?

Mr. Frank Lee, who put the first question, asked the Chancellor further whether he would not agree that the recent Government announcement of the restoration of the cuts made upon the DSIR could not really succeed unless they could wed science more closely to industry; and that it would, therefore, be the correct policy to give university status to some college so that more technologists and scientists could be produced to assist in that process. He also inquired whether the Minister could agree that Manchester would be an ideal centre for such a university.

Mr. Butler: It is quite clear that the Government intend to go forward with higher technological education and to afford status to the institutions thereby endowed. The first one to be mentioned here is London, but it is quite clear that Manchester is well in the running for a further place. There is also a certain institution in Scotland envisaged. Therefore, I hope that the House will realise that the Government mean business in this matter.

Mr. A. Woodburn: Is the Chancellor aware that a good deal of the scientific discovery, which is very great in this country, is not being developed in this country because of the lack of facilities for bringing it to production level, and that many of our best ideas are exploited in other countries? Can something be done through these technological institutions to find some way of developing them in our own industry?

Mr. Butler: Yes, and through the technical colleges.

C

Calcium Lactate in India

THE Indian Government has accepted all the recommendations of the Tariff Commission regarding the extension of production to the calcium lactate industry and will take steps to implement them as far as possible. The Tariff Commission's recommendations are as follows:—

(i) Protection should be continued for a further period of three years from 31 December, 1953, at the existing rates of 27.3 per cent *ad valorem* (preferential) and 37.8 per cent *ad valorem* (standard). If during the period of protection the quantum of cif. prices of imported calcium lactate jeopardise the position of the domestic industry, the industry may apply for a review of the scheme of protection.

(ii) The Central and the State Governments should purchase indigenous calcium lactate to meet their entire requirements, provided the producers maintain the necessary standard of quality and charge reasonable prices.

(iii) The indigenous manufacturers should try to improve their process of production still further so as to conform fully to the new Indian Pharmacopœia specifications for calcium lactate.

Aden Refinery Taking Shape

IN just more than a year the site of the 5,000,000 tons a year Aden Refinery of the Anglo-Iranian Oil Co., Ltd., has been transformed from a sandy waste into a scene of remarkable constructional achievement.

Most of the towers of the two distillation units have risen; the SO_2 plant is half-completed; tank erection has started and the foundations of the power station are nearly finished. Accommodation for 2,500 British, American and European workers and 10,000 local workers has been built, as well as recreation halls, open-air cinemas, a bakery, butchery, laundry and police and fire stations.

At the oil port, 2,500,000 cu. yd. of sand have been dredged and pumped ashore in the reclamation area. Nearly 1,000,000 cu. yd. of rock have been quarried from the hills surrounding the site for construction of the breakwater, which now extends 3,700 ft. into the sea. Its total length will be 4,000 ft. Piling of the first of the three jetties is well advanced.

Expansion of DSIR Work

More Staff & Increased Finance

FURTHER information regarding the general understanding' recently reached between the Treasury and the Department of Scientific and Industrial Research, providing for the gradual expansion of the department's activities over the next five years (see THE CHEMICAL AGE, 5 December, p. 1189), was given in the House of Commons last week by the Parliamentary Secretary to the Ministry of Works (Mr. J. R. Bevins), in reply to questions.

For a variety of reasons, said Mr. Bevins, the expansion which had so far taken place was less than was envisaged in the annual report of the Department for 1947-48. On the basis of the programme provided for by the recent understanding, however, the total resources of the Department should by 1959 be adequate to cover some 95 per cent of the activities projected in the plans covered by that report, together with some additional responsibilities which it had since taken over from other Departments.

Principal provisions of the programme were for an increase of staff over five years of 1,000 (bringing the total in 1959 to about 5,100); for an increase of about £900,000, or about 20 per cent, in the annual net vote of the Department over that period (exclusive of provisions now made or to be made for certain services which were not a permanent part of the Department's activities or which might be added thereto as additional liabilities); and for a building programme (the cost of which would be borne on the vote of the Ministry of Works) of about £6,000,000.

The financial provisions were, of course, subject to the necessary funds being voted annually by Parliament and must be subject, also, to review in the event of a marked change in the economic situation or of major changes in costs.

Trace Elements Help Growers

DESPITE the use of fertilisers, vegetable crops have been becoming smaller and smaller in the Terranora district of the Tweed River Valley, New South Wales, and in some instances have failed.

The local young farmers' club undertook the study of this problem and trials conducted for the past two seasons on plots laid out to grow all crops under varying conditions have proved that the use of trace elements, particularly molybdenum and zinc sulphate, can solve the problem of declining fertility.

As well as being used for fertiliser, molybdenum was sprayed on the foliage in some plots, and the results, according to agricultural experts, were startling, particularly with marrows, pumpkins and cucumbers. Growth was five or six times as rapid as with zinc and copper and ten times as rapid as in the untreated check plot in which only superphosphate had been used.

A notable result was obtained with radishes, which for some years had been growing forky, flabby roots. All those treated were straight and crisp. With beans the results were equally good, and now the farmers of Terranora are using trace elements as a matter of course.

Private Trading in Sulphur

AN announcement that private trading in sulphur and pyrites would be restored with effect from 1 January next was made in the House of Lords last week by Lord Woolton, Minister of Materials.

Lord Woolton added:—'The arrangements for this, which have been fully discussed with the trade, enable me to remove the remaining statutory controls on sulphur, pyrites and sulphuric acid. I have therefore made the orders necessary to revoke these controls at the end of this year. The Board of Trade will issue shortly a notice about the licensing of private imports of sulphur and pyrites.

'I should like to take this opportunity of acknowledging the co-operation of the trades concerned, and in particular of the National Sulphuric Acid Association Ltd., which throughout the 13 years of public trading in sulphur and pyrites has acted for the Ministry as its trading agent.'

The orders referred to by Lord Woolton are The Control of Pyrites (Revocation) Order, 1953 (SI.1953, No. 1811) and The Control of Sulphur and Sulphuric Acid (Revocation) Order, 1953 (SI.1953, No. 1812). Copies may be obtained from HM Stationery Office or through any bookseller (price 2d.).

Use of Detergents

Manufacturers Criticised by LCC Chemists

CRITICISM of manufacturers of detergents was expressed at a meeting of the Royal Sanitary Institute in London last week by Dr. F. G. Burgess, the London County Council deputy chemist, who was presenting the findings of himself and Mr. D. Burns and Mr. C. W. Tidy (also of the LCC) following an investigation into the use of detergents.

After mentioning that the LCC spent at least £35,000 a year on detergents, he continued:—'Two very important points have not been clarified by statements of manufacturers. First, synthetic detergents differ so vastly in their composition that any statement of properties of the class in general cannot be accepted without considerable study; and, second, synthetic detergents are generally very soluble in water and most manufacturers do not give instructions for the amount which should be used for normal household cleaning tasks.'

The council had used to date more than 1,000 tons of synthetic detergents of three different types, and detailed instructions had always been given for their use.

No Complaints Reported

'No complaints or instances of dermatitis have been reported,' Dr. Burgess said. 'Wide experience with these compounds has shown the great importance of instructions for use and it is felt that many housewives' complaints are due to the extravagant use of these detergents.'

Other conclusions reached were that synthetic detergents were superior to soap for hand washing of kitchen articles in hard London water; and tarnishing of cutlery by a detergent solution could in most instances be avoided by drying the washed cutlery quickly. Aluminium foil (clean milk-bottle tops) in the rinsing water assisted in preventing this staining.

Dr. C. F. White, medical officer of health to the City of London, said that as he was not a specialist he could not say whether dermatitis could result from the use of detergents, but in his area some women thought it could.

Mr. R. C. Tarring, representing manufacturers, said a Government committee was inquiring into that question, but the manufacturers were sufficiently satisfied to be planning plant extensions.

A test on rats with small regular doses of detergent produced no ill-effects. Those treated actually gained weight. One staff member drank half a pint of detergent, by mistake, with no ill-effects.

More Sulphuric Acid

Demand Grows in South Africa

A LARGE demand for sulphuric acid has been created in South Africa by the establishment of uranium extraction plants at various gold mines. The acid is used in dilute form for dissolving uranium compounds present in residues from the gold extraction process. Already more than 20 mines have been given authority to produce uranium and further names are likely to be added to the list.

To meet this increased demand for sulphuric acid, new plants are being installed on the Reef and in the Free State goldfields at strategic points. Fortunately, the raw material for acid production is readily available on the spot in the form of iron pyrites contained in the same reef that carries the gold and uranium. So far, three acid plants have reached production stage at various mines and at least two more large plants are now being built. Of the large plants already operating, two each have capacities of 200 metric tons per day at Daggafontein and Western Reef mines respectively, while the third unit—the pioneer of its type—has a capacity of 25 tons per day at West Rand.

Varying Content of Pyrites

Acid plants have been located at suitable sites so that each can serve several uranium extraction plants. As the pyrites content of the ore at various mines differs greatly, this factor had also to be taken into account in determining at which mines the acid plants were to be installed. Values of up to 4 per cent or so pyrites are obtained in some cases and where economic, the iron pyrites is recovered from the ore by a normal method of flotation concentration.

Conversion of pyrites to sulphur dioxide is effected in a Fluo-Solids roaster, which is the first application of this unit in a contact sulphuric acid plant. Subsequent oxidation of the sulphur dioxide to trioxide is by means of the standard contact method—using vanadium oxide as the catalyst.

New Exhaust Equipment

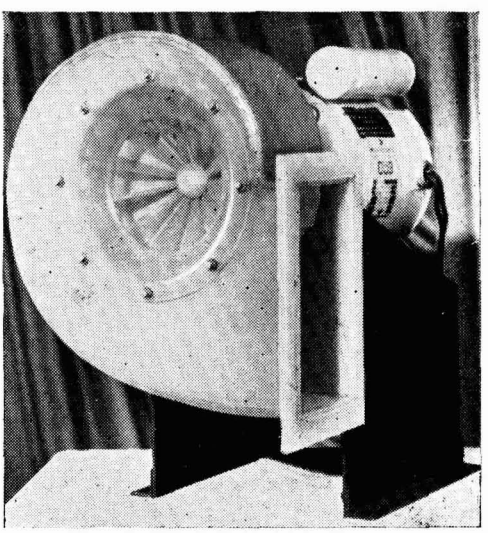
Corrosion-Proof Fans

WITH chemical plant being erected in many parts of the country and established installations requiring renovation, a new design of exhaust equipment recently introduced by the Bolton firm of Turner & Brown Ltd. should be of considerable interest.

This company has been engaged in chemical plant fabrication for a considerable period and, as a result of experience gained in this field, has now brought out a new series of exhaust fans coupled with a new form of ducting, which are calculated to provide many advantages.

Known as the 'Turbo' range of centrifugal fans, they and the ducting are almost entirely constructed from a recently developed grade of rigid plastic industrial sheet (Vybak VR.215) based upon polyvinyl chloride and supplied by Bakelite Limited. This material has high impact and tensile strength, good dimensional stability and exceptional resistance to chemical attack or weathering. As a result, the life of any installation fabricated from it is said to greatly exceed that of 'protected metals.'

The fans range from the 'Turbo' Junior with an extraction capacity of 300-330 cu. ft./min. and intended for use with fume cupboards, small laboratories, etc., through a variety of sizes to suit individual requirements up to a maximum displacement of 15,000 cu. ft./min.



The 'Turbo' Junior exhaust fan is one of a range especially designed for laboratories and chemical plant

In these fans the casing, impellor and impellor shaft are made entirely from 'Vybak' Rigid Sheet, and the whole is so designed that no metallic parts are in contact with corrosive fumes. The casing itself conforms to existing principles but is bolted to an outside frame of metal, and this arrangement allows the outlet to have no less than 16 equi-arc positions as well as permitting the fan to be easily coupled with existing ducting or fitted into small, enclosed areas. The impellor has twelve blades round a central boss, all made from the same material, and a hollow shaft to allow the introduction of the keyed steel shaft from the motor.

Food Science Courses

SPECIAL courses to begin in the week 11-15 January, 1954, are announced from the Department of Food Technology of the Borough Polytechnic. Each course will consist of 11 weekly lectures (or laboratory classes). Details are as follow:—

(i) 'Human nutrition—amino-acid and protein requirements.' Mondays, 6.30-8.30 p.m. The panel of lecturers will include Dr. H. E. Magee, Senior Medical Officer (Nutrition), Ministry of Health.

(ii) 'Introduction to nutrition.' Wednesdays, 6.30-8.30 p.m., by Mr. D. S. Papworth, M.Sc.

(iii) 'The chemistry of polysaccarides and related substances.' Tuesdays, 6-7.15 p.m., Dr. I. G. Anderson.

(iv) 'The chemistry of phosphatides and wax components.' Tuesday, 7.15-8.30 p.m., Dr. R. J. Bridgwater.

(v) 'Laboratory course on sugars and related compounds.' Tuesdays, 6-9 p.m., Mr. M. Spencer, B.Sc., A.R.I.C.

Fuller details may be obtained by applying to the Department of Food Technology, Borough Polytechnic, London, S.E.1.

Institute of Fuel

At a London meeting of the Institute of Fuel next Tuesday, 22 December, to be held at the Institution of Mechanical Engineers, Storeys Gate, beginning at 5.30 p.m., Mr. P. E. Montagnon will present a paper entitled: 'The Festival Hall Heat Pump.'

The Chemist's Bookshelf

ION EXCHANGERS IN ANALYTICAL CHEMISTRY. By O. Samuelson. Wiley and Sons, Inc., New York; Almqvist and Wiksell, Stockholm; Chapman & Hall, Ltd., London. 1953. Pp. xviii + 291: Figs. 47. 52s.

Because of the rapid development, over the past few years, in the application of the principles of ion exchange in many fields, much isolated material has accumulated in the literature, even since the appearance of the most recent monographs on the subject of ion exchange resins. It is therefore valuable to have at hand yet a further co-ordination of the available information. This is more particularly true for analytical chemists, for whom the applications of ion exchange have been many and diverse, and all too often have been completely empirical.

The present book should therefore help to meet a widespread demand, although it may not do completely. In the first place, the scope of the book as implied by the title—'Ion Exchangers'—is limited by confining the discussion very largely to ion exchange resins. Secondly, no serious attempt has been made to include cellulose in the various discussions, although it is openly admitted that this was one of the earliest organic ion exchangers to be utilised, and it is abundantly clear that nowadays its ion exchanging properties have in many cases a fundamental bearing on its application to so-called paper partition chromatography, at least when applied to the inorganic field.

It is, of course, quite legitimate to take the view that because of our very considerable lack of fundamental knowledge, these present simplifications, by discarding part of the problem, are at this stage desirable, or even necessary, for a comprehensible account.

In any case, within the self-imposed limits the book will provide inside one cover a mass of useful information for the analytical chemist. The equilibria and kinetics involved in ion exchange phenomena are discussed—perhaps not as fully as one could have desired—but there are ample references to the original literature. General techniques are described at some length; and more than half the book is then devoted to specific applications ranging from simple determinations of salt content to applications in the analysis of complex organic and inorganic materials. It is a pity that although the use of ion exchange resins in the standardisation of salt solutions is described, their interesting application in the preparation of standard alkali from standard salt solutions apparently was published too recently to receive mention.

An appendix collates the characteristics of a range of commercially available resins, although the sources quoted are unfortunately all outside this country. There are full author and subject indexes, and, as already suggested, the work is well documented. The production of the book is of a high standard, and the book can be recommended as a very useful addition to the analytical, and probably also to the general chemical library.—CECIL L. WILSON.

BRITISH INDUSTRIES: OIL. Cassell & Co., Ltd., London. 1953. Pp. 120. 7s. 6d. (in cloth 9s. 6d.)

This is the first of a projected series describing the beginning and development of the major British industries in simple non-technical language, and it is hoped that it will provide a valuable introduction for 'tens of thousands of young men and women on the threshold of a career.'

It certainly seems a very good first book on the oil industry, covering surveying, drilling, transportation, refining and cracking, as well as social and economic effects. The author has had the full co-operation of the Shell Petroleum Co., but although this means that the authoritative nature of the book is unquestionable, it is perhaps a pity that all the illustrations of refining plant

are of Shell designs, since significant differences occur between these and those of other refiners.

Nevertheless, this is an attractively laid out book, easy to read, stimulating, and a persuasive recruiting appeal for the industry it describes.—B.I.

STARCH AND ITS DERIVATIVES. Volume 2. Third Edition. By J. A. Radley. Chapman and Hall, Ltd., London. 1953. Pp. xii + 466. 65s. net.

In the third edition of his well-known treatise on starch, the author has found it necessary to divide the work into two volumes. Volume 1, published recently, dealt with the structure and reactions of starch, and with the amylases. Volume 2, which has a more industrial flavour, is concerned with the manufacture, industrial applications, examination and analysis of starches and starch products. Most of the book is written by J. A. Radley himself, but there are contributions from R. W. Kerr, L. M. Christensen and L. A. Underkofler, C. W. Bice and W. F. Geddes, C. C. Kesler and W. G. Bechtel. An appendix, compiled by C. Paine, is concerned with the significance of patent references. In addition, there is a useful collection of 49 photomicrographs of starch granules, contributed by E. Young.

One of the most valuable features of the book is the liberal use of references, but after having read in the preface of the author's hope that 'the present edition is as up to date a review of the accumulated knowledge on the chemistry and technology of starch and its derivatives as possible,' it was rather disappointing to find that some chapters were virtually devoid of references later than 1945. A more comprehensive subject index would have been advantageous; for example, the index implies that amylose and amylopectin are mentioned only twice in the text, which is not the case.

It is a sad commentary on the degree of collaboration which exists generally between academic and industrial workers that it was not necessary in the author index to include such names as K. Freudenberg, E. L. Hirst, S. Peat and M. Stacey. In the one reference to W. N. Haworth one of his initials is incorrectly given; some other workers appear to have no initials at all.

The author has obviously devoted a great deal of time to the book, which will certainly prove useful to all who work with starch, but the above suggestions are made in the belief that, if they were incorporated in future editions, the value of the book would be enhanced considerably.—E.J.B.

ABOUT WATER. A Yearbook of the Chemistry of Water and Water-purification Technique. Vol. 19. Verlag Chemie GmbH, Weinheim Bergstr. 1952. In German. Pp. 394. DM. 29.80.

The German Society of Chemists' subsection on the Chemistry of Water issues a book annually; the one now under review being Vol. 19. Although there is a certain sequence, nevertheless each volume can be taken on its own merits, and it can be said that the 1952 issue is of particular value, considering the extensive range of knowledge and research that it covers. A congress on Water was held in Essen in 1951 while a sub-section of water-chemists held a meeting at Bad-Homburg in September, 1952. Lectures and papers from both meetings are included in the present volume. There are also a number of special contributions. In this manner the present issue can be regarded as being one of the most encompassing works on the subject.

Water is the most used of all 'engineering materials.' There can hardly be a chemical works that does not use it in vast quantities. Being a natural product it varies from place to place, season to season, often from hour to hour, so the purification of water, with the different methods used, in itself constitutes a veritable industry. Other problems arise from the quantities used, which also have to be disposed of again in due course. One specific aspect has been dealt with by Sierp who discusses 'the loading of the Ruhr by household and industrial effluents' but many another stream suffers similarly. D. Wiegmann deals with the purification of water in this country.

Altogether, divers problems from all over the world are touched upon. Thus, among those places brought into the picture are included the whole of Central Europe, Switzerland and Egypt. Water in relation to coal and iron, water for the production of power, and distribution of water, agriculture, fisheries, afforestation, health and hygiene are all given their due share.

Vol. 19 can be recommended to all who are interested in this most essential of materials.—FELIX SINGER.

• HOME •

Change of Address

On Monday, 14 December, Gelpke & Bate, Ltd., industrial chemists, 1 Leadenhall Street, London, E.C.3, changed their address to Queen Street, London, E.C.4. Their new telephone number is City 1751-3.

Employment of 'Over 60s'

A scheme to provide employment for people over 60 years old, also for disabled folk, is being operated by the Greengate & Irwell Rubber Co., Salford. Men with no previous experience will be trained in a special department to make plastic raincoats.

Bengers' Christmas Closing

Benger Laboratories Ltd. announce that their works and offices at Holmes Chapel will be closed for the Christmas holidays from Thursday, 24 December, to Monday, 28 December, inclusive. Arrangements have been made for emergency orders received by telephone, or telegram, to be dealt with during this period.

Methane Discovery

During boring operations to find water, methane gas was discovered recently on a site near the main Ilkley-Otley road. The quantity and quality of the gas have not yet been ascertained, but it is expected that research will be carried out by the North Eastern Gas Board, to whom the find has been reported.

John Dalton's Grave

An article in a recent issue of the *Manchester Guardian* drew attention to the fact that in order to reach the tomb of John Dalton in Ardwick Cemetery it is now necessary to walk over a pavement of gravestones, some buried under grass and weeds, and past monuments, one or two of which lie splintered on the ground.

Soil Research in Scotland

The annual report of the Macaulay Institute for Soil Research, Aberdeen, states that the study of soil organic matter and its transformations, using chemical and microbiological methods, had been advanced during the past year. Methods of fertiliser application and the phosphate relationship in soils had been further studied.

International Conference on Oil Pollution

In the House of Commons last week the Minister of Transport, Mr. A. T. Lennox-Boyd, announced that invitations were being sent to about 40 countries to send representatives to an international conference in London next April on the problem of oil pollution.

Chair in Industrial Administration

A Chair in Industrial Administration is to be created at Manchester College of Technology. Although the college has had a department of industrial administration since 1918, which has done valuable work, the department has never had a professor at its head and its scope has therefore been limited.

Iron & Steel Production

Statistics issued by the British Iron & Steel Federation show that the output of steel ingots and castings in November was at the record level of 363,000 tons a week, compared with 345,200 tons a week in November, 1952. Pig iron production was also at a record level, averaging 228,500 tons a week, compared with 206,800 tons a week in November last year.

Materials Handling

The course of lectures in industrial materials handling which the College of Production Technology has already run in London and elsewhere is to be extended early next year to Liverpool, Leeds, Bradford, Birmingham, Manchester, Glasgow, Nottingham, Leicester, Reading, and other parts of the country. Details are obtainable from the college secretary at Swinford Old Manor, nr. Ashford, Kent.

Duty on Sulphuric Acid

The Import Duties (Exemptions) (No. 5) Order, 1953 (SI, 1953, No. 1696), by which the 10 per cent *ad valorem* Customs duty was reimposed on imports of sulphuric acid and oleum with effect from 25 November last (see THE CHEMICAL AGE, 28 November, p. 1116), was formally approved in the House of Commons last week. The Minister of State, Board of Trade (Mr. Heathcoat Amory), stated that no representations had been received that UK supplies were inadequate, or that reimposition of the duty would burden producers.

• OVERSEAS •

Chilean Copper for Germany

A Hamburg message states that as a result of recent trade talks, Western Germany is to buy copper from Chile to the value of $1,500,000 a month.

Canadian Petrol Production

Crude petroleum production for all Canada amounted to 8,277,152 barrels in August, compared with 8,057,507 barrels in July, and 38 per cent above the output for August of last year.

Indian Pharmaceutical Code

The first volume of the Indian Pharmaceutical Code—first of its kind in the country—has been produced by the Indian Council of Scientific & Industrial Research. The Code gives analytical information on indigenous drugs useful to doctors, drug manufacturers, research workers and laymen.

South African Pyrites

A pyrite recovery plant is in course of erection by South African Government Gold Mining Areas (Modderfontein) Consolidated Limited, and it is anticipated that this will be producing in the first quarter of 1954. The pyrites will be disposed of under long-term selling agreements.

Improved Grade of Petrol

One of South Africa's oil companies has announced that an improved grade of petrol would be introduced in January, without any increase in price. Recently, the company stated, there had been a small reduction in freight rates on petrol, and there were indications that world prices of improved petrol might be reduced slightly.

International Detergent Congress

The 'Chambre Syndicale Tramagras' of Paris, is arranging an international congress on detergents, to be held at the Sorbonne, 30 August-5 September, 1954, under the presidency of Professor Trefouel. A provisional agenda has been prepared, embracing the physico-chemistry, analysis and testing of detergents; their industrial production; their applications in industry; and their economic significance. Those interested are invited to send suggestions concerning the programme to the association at 70 Champs-Elysées, Paris VIII.

Acid Kills Fish

Carbolic acid, believed to have been 'dumped' in the River Moselle, is stated by Luxembourg Health Department to have been the cause of fish and animal life vanishing along a 50-mile stretch of the river.

Shawinigan Resins Corporation

Plans have been made by Shawinigan Resins Corporation to expand its production of polyvinyl butyral by about 20 per cent. The president, Mr. R. K. Mueller, in announcing this said the capacity increase will enable the plant to meet the demand anticipated for the next three years.

Persian Oil Problem

The Prime Minister of Persia, General Zahedi, is quoted as saying that he was optimistic about reaching an oil agreement with Britain, but he was unable to predict when this would be achieved. He said his country would need outside financial aid for at least two years after oil production was resumed.

Australian Petro-chemical Industry

A plant for the treatment of petroleum oil—the first of its kind in Australia—is to be established by a new company at Silverwater, Sydney. The petro-chemical industry has had phenomenal growth in the USA in recent years and British investors are reported to have spent more than £A30,000,000 on the industry.

Better Business

Shareholders of one of the Canadian chemical companies—Shawinigan Chemicals Ltd.—have received with their latest dividend cheques a note which states:—'Business for the first nine months has been better than in 1952. The associated companies, BA-Shawinigan Ltd. and St. Maurice Chemicals Ltd., are both in production. Sales of Canadian Resins and Chemicals Ltd., another associated company, have been maintained in the domestic market at a higher level than in 1952, but in the export market sales volume has been below last year's level. The plant additions at Shawinigan Falls have been completed and are in operation.'

PERSONAL

PROFESSOR JAMES W. COOK, who has been Regius Professor of Chemistry at Glasgow University since 1939, has been appointed principal of the University College of the South West at Exeter, but will not take up his new duties until September next year. Internationally known for his cancer research work, Professor Cook was formerly research chemist at the Reseach Institute of the Royal Cancer Hospital. In 1936 he was awarded jointly with Professor E. J. Kennaway, the prize of the Union Internationale Contre le Cancer, and in 1937 was invested with the insignia of 'Officier de l'Ordre de Leopold,' conferred by the King of the Belgians. Three years later he shared with four other scientists at the Research Institute, the £7,500 award made by the trustees of the Anna Fuller Fund, New Haven, Connecticut, for contributions on the subject of cancer.

Last year Professor Cook was appointed a regional scientific adviser for Civil Defence in Scotland, and accepted an invitation to join the committee appointed by the Government to inquire into the National Health Service.

Professor Cook was educated at the Sloane School, Chelsea, and University College, London. His appointments have included those of Lecturer in Organic Chemistry at the Sir John Cass Technical Institute, London; chemist at the Chemical Research Laboratory of the Department of Scientific and Industrial Research, and Professor of Chemistry at London University. He is a D.Sc. and Ph.D. of London University, an honorary Sc.D. of Dublin, F.R.I.C. and F.R.S.E. In 1938 he was made a Fellow of the Royal Society.

MR. P. A. SINGLETON, managing director of Monsanto Chemicals Limited, last week announced the following appointments, effective 1 January:—MR. D. R. MACKIE, director, and at present also general manager of sales, to be commercial director of the company. The position of general manager of sales is to be discontinued, and the responsibilities of that office transferred to three sales controllers: MR. E. L. PIXTON, MR. D. C. M. SALT, MR. J. S. HUNTER. MR. W. M. THOMPSON is to be director of purchases.

The following have been elected officers and council of the Royal Society for the ensuing year:—*President*, DR. E. D. ADRIAN, OM.; *treasurer and vice-president*, SIR THOMAS MERTON; *secretaries and vice-presidents*, SIR EDWARD SALISBURY, C.B.E., and SIR DAVID BRUNT; *foreign secretary*, SIR CYRIL HINSHELWOOD; *other members of council*: DR. F. P. BOWDEN, PROFESSOR F. DICKENS, PROFESSOR H. J. EMELEUS, MR. A. E. INGHAM, DR. G. M. LEES, PROFESSOR E. G. T. LIDDELL, PROFESSOR R. A. MCCANCE, C.B.E., PROFESSOR P. B. MEDAWAR, SIR EDWARD MELLANBY, G.B.E., K.C.B. (also *vice-president*), PROFESSOR P. B. MOON, PROFESSOR W. H. PEARSALL, PROFESSOR R. O. REDMAN, PROFESSOR ALEXANDER ROBERTSON, DR. C. SYKES, PROFESSOR G. TEMPLE and PROFESSOR C. M. YONGE.

DR. P. H. SYKES has been appointed a director of the British Oxygen Co. Ltd.

MR. GEORGE W. P. PAGE, who is retiring at the end of the year from the publicity staff of the British Thomson-Houston Co., Ltd., joined the company in 1923 and has been chiefly responsible for preparing Press articles.

In recognition of their having completed 25 years' service with the company, three employees of the Geo. H. Gascoigne Co., Ltd., Reading — MR. BRUCE BEDFORD, MR. A. E. STAGG and MR. E. J. SHOCK—have been presented with 17th century period reproduction clocks.

Obituary

We regret to announce the death at his London home on 13 December of MR. ROBERT STEWART WHIPPLE, aged 82, the chairman of the Cambridge Scientific Instrument Co., from 1939-49. For over 20 years Mr. Whipple was on the board of the Institute of Physics. In 1944 he presented a collection of historical scientific books and instruments to Cambridge University and this formed the nucleus of the Whipple Museum of the History of Science which was inaugurated in 1951.

Publications & Announcements

THE many ways in which Muirhead instruments play an important but often unseen part in everday life is the subject of the latest issue of 'Muirhead Technique.' The use of Magslips in weighing-machines; synchronous link elements in the Sperry gyropilot; and a low-frequency standard for photo-electric timing serve as illustrations of their uses. 'Technique' is published quarterly by Muirhead & Co. Ltd., Beckenham, Kent.

* * *

A NEW publication entitled 'Silicones in Motor Windings' has been issued by Midland Silicones Limited. This leaflet has been prepared for the motor user and deals, in a general way, with the advantages gained by the introduction of silicone insulation. The risks of insulation breakdown in electrical equipment subjected to arduous service may be practically eliminated in many cases by the use of silicone materials, and a description is given of their application in the repair of equipment. Copies of this publication, Silicone Notes C 17-1, are available on request from Midland Silicones Limited, 19 Upper Brook Street, London, W.1.

* * *

THE National Bureau of Standards, US Department of Commerce, has just published 'A Table of Natural Logarithms for Arguments between Zero and Five to Sixteen Decimal Places.' This table has been made available to meet a continuing demand for 16 place tables of logarithms of numbers from 0.0001 to 5 at intervals of 0.0001. It is a reissue of Volume III of a four-volume table of logarithms published in 1941. Since four-figure arguments are often sufficient in practice, the practical computer in mathematics, physics, and engineering should find this table very labour-saving in view of the fine interval. Whenever the logarithm of a number given to more than four places is needed, linear interpolation is usually satisfactory because it gives approximately nine decimal place accuracy over the range of the table. Copies may be ordered from the Government Printing Office, Washington 25, D.C., at $3.25 each. Foreign remittances must be in US exchange and should include an additional one-third of the publication price to cover mailing costs.

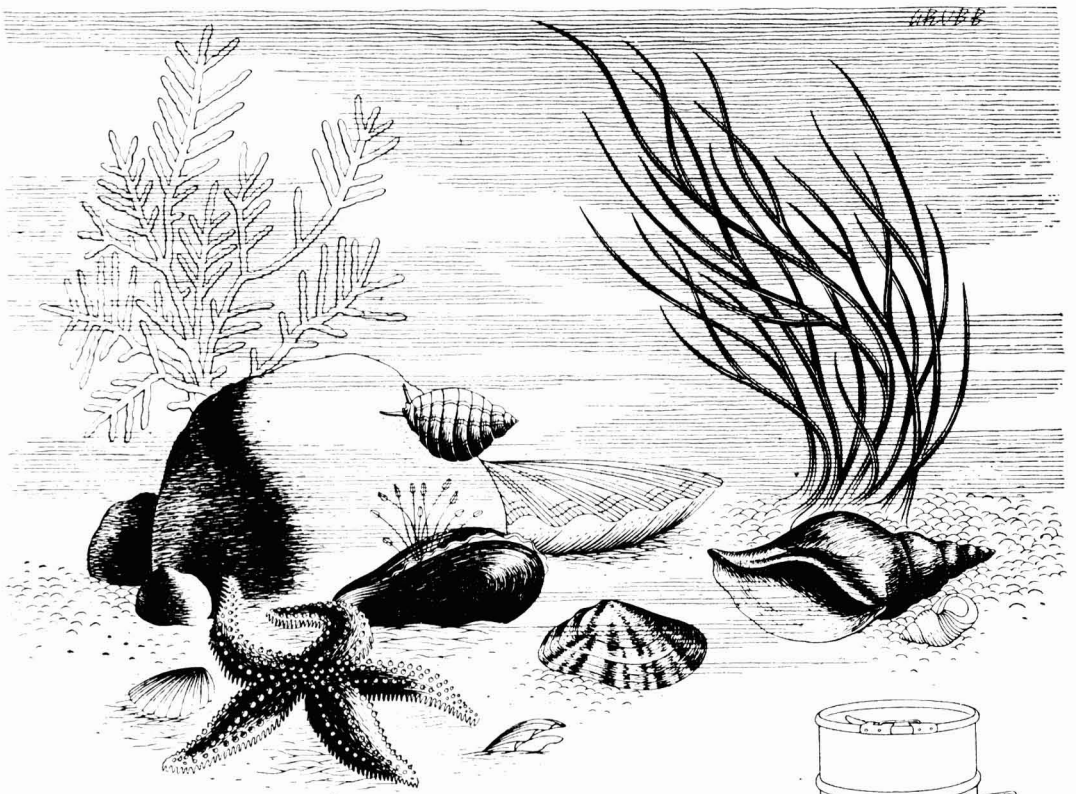
NUMBER 100 of the 'Ciba Review' devotes forty pages to a report on the micro-organic attack of textiles and leather. Articles describe the identification and preventive treatment of the decay of wool and other animal fibres, vegetable fibres, leather, fishing nets, and paper. The review is fully illustrated with photographs of microbiological deterioration of the different materials, and of the attacking agents, and there is a select bibliography. Details are given of new Ciba dyes and textile chemicals. Inquiries should be made to Ciba Ltd., Basle, Switzerland.

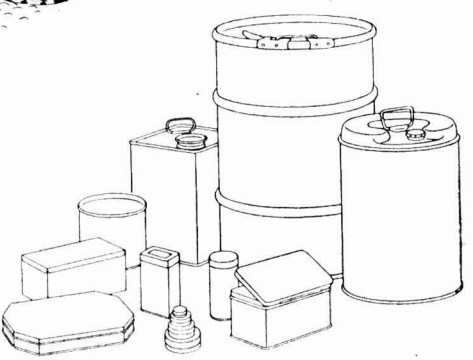
* * *

AN announcement has been made by Londex Ltd., Anerley Works, 207 Anerley Road, London, S.E.20, that their range of LQA mercury switch relays has been extended to include a new heavy duty 60-amp. triple pole unit. By using an economy resistor in series with the relay coil, the current consumption is limited to 9 VA, and the contactor can thus be controlled by a thermostat or other low-power device. The totally enclosed contactor can handle up to 500 volts. It is claimed that the contactor has a wide application in industry, particularly in chemical works, hazardous locations, and where space is limited. It is, for example, suitable for controlling pump motors, and heating and lighting loads.

* * *

THE Manufacturing Chemists' Association has announced the publication of Chapter 10 of its Air Pollution Abatement Manual. This instalment, prepared by R. J. Jenny, of the American Cyanimid Company, deals with gas and vapour abatement. In the early sections of the chapter, methods of abatement of gases and vapours are treated. Some of these are: waste dispersal by the use of stacks; employing absorbers or scrubbers; incineration; catalytic combustion and adsorption. Several of the fundamentals involved in such abatement devices as packed towers and plate towers are described and illustrated with cutaway drawings. The booklet is available from the Manufacturing Chemists' Association, Woodward Building, 15th and H Streets, N.W., Washington, D.C. The charge is 60c. including postage.





A GREAT RANGE-

Leagues beneath the sea, in the rock bound pools and on the sands of the shore are countless varieties of sea shells — each one in this great range being a fine example of a container superbly suited to the particular needs of its contents. We at Reads have also managed to find satisfactory answers to many difficult container problems in the last 84 years (though you never find us peering into pools for inspiration). Thanks to constant developments based upon this long experience, our normal range now includes most types of containers in common use, and new problems are being solved every day. If *you* are planning to introduce new lines, or to re-introduce old ones in more attractive forms, the long experience of Reads of Liverpool is at your service.

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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.

Satisfactions

ASSOCIATED CLAY INDUSTRIES LTD., Horwich. Satisfaction, 19 November, that properties (2 and 4 and 6/14 Holman Road, Battersea, S.W.), comprised in a trust deed registered 2 December, 1948, have been released from the charge.

BRITANNIA LEAD CO. LTD., London, E.C. Satisfaction, 20 November, of letter of credit registered 22 October, 1952.

LEDA CHEMICALS LTD., London, W. Satisfaction, 19 November, that factory at Wharf Road, Ponders End, part of the property, comprised in a mortgage registered 26 July, 1948, has been released from the charge.

Increases of Capital

The following increases of capital have been announced:—BASOL LTD., from £2,000 to £10,000; ROUSSEL LABORATORIES, LTD., from £30,000 to £100,000.

New Registrations

Lionel G. Burton Ltd.

Private company. (525,951.) Capital £3,000. Consulting, analytical, manufacturing pharmaceutical and general chemists, etc. Directors: L. G. Burton, G. V. Burton. Reg. office: 8 Queen Street, E.C.4.

Santonin Marketing Co. Ltd.

Private company. (526,028.) Capital £100. Pharmaceutical, manufacturing and general chemists and druggists, etc. Directors: Denys L. T. Oppe and Stanley N. Dawkins. Reg. office: 4 Grafton Street, W.1.

Minelec Ltd.

Private company. (526,471.) Capital £100. Manufacturers of and dealers in all kinds of mineral and chemical substances and materials used in the electrical industry or for electronic purposes, etc. Directors: Bernard Richardson and Zbigniew M. Banks. Reg. office: 38/9 Bruton Street, London, W.1.

Theakrock Pharmaceuticals Ltd.

Private company. (526,023.) Capital £1,000. Wholesale and retail chemists, druggists, drysalters, etc. Directors: D. B. Theaker and J. R. Bames. Solicitors: Percy Walker & Co., Hastings.

Portasilo Ltd.

Private company. (525,808.) Capital £100. Designers, manufacturers and merchants of and dealers in equipment, machinery and materials for storage, handling and measuring materials of all types, including chemicals in industry, etc. Directors: Fdk. W. Shepherd, Peter M. Shepherd and Donald W. Shepherd. Reg. office: Blue Bridge Lane, York.

Gel-Plastics Specialities Ltd.

Private company. (526,415.) Capital £100. Manufacturers and processors of all manner of plastics, gel substances, hydrocarbons, petroleum products, refinery by-products, oils, ores, minerals and other chemical derivatives, etc. First directors to be appointed by the subscribers. Reg. office: 42 Brook Street, London, W.1.

Hirst's Irrigation Co. Ltd.

Private company. (526,357.) Capital £10,000. Manufacturers of and dealers in machinery and apparatus for overhead and other irrigation and spraying, chemical substances used in agriculture and horticulture, etc. Directors: Leonard B. Hirst, Reresby B. Hirst and Douglas H. F. Carter. Reg. Office: Upper Halliford Road, Upper Halliford, Shepperton, Mdx.

Melville, Donaldson & Co. Ltd.

Private company. (29,709.) Capital £100. Agents for manufacturers of chemical goods, gases, drugs, etc. Directors: L. R. D. Melville, R. S. Strachan, and J. C. Donaldson. Reg. office: 11 North Claremont Street, Glasgow, C.3.

CAM (Altrincham) Ltd.

Private company. (526,639.) Capital £500. Objects: To undertake and carry out all operations including grinding, pulverising, screening, drying and reconstituting and blending in relation to the manufacture in powdered form of metals, alloys and other substances, including colours, etc. The

[continued on page 1296

directors are: Geoffrey G. Cooper and Ernest Meredith, directors of Ullman Hirschhorn & Co. Ltd., etc., and Frank Ashton. Secretary: G. G. Cooper. Reg. office: 2 Manor Road, Altrincham, Cheshire.

Company News

South African Druggists Ltd.

Group trading profit of South African Druggists Ltd. for the year ended 30 June last, was £321,597, as against £278,020 for the previous year. After tax of £78,632 (£67,673), minority interests £2,846 (£2,367), etc., there is a net balance of £181,466 (£154,986). The ordinary distribution of 12½ per cent compares with 10 per cent for the previous year.

Aspro Ltd.

An interim ordinary dividend of 17½ per cent—an increase of 2½ per cent compared with last year—has been announced by Aspro Ltd. in respect of the year ending 31 March next. In each of the four previous years interim dividends of 15 per cent were followed by final dividends of 20 per cent. Through a subsidiary, the company has acquired the whole of the issued capital of Advance Industries Ltd., manufacturers of 'Dispel' and 'Dip.'

United Match Industries Ltd.

Trading profit of £10,088 is reported by United Match Industries Ltd. for the year ended 30 June last. This is after allowing £5,871 for depreciation and compares with £12,877 for the previous year, when £5,643 was allowed for depreciation. After tax amounting to £7,346 (£8,660 last year), net profit is shown as £2,742 (£4,217), plus £1,189 (£1,753) tax adjustment. The preferred ordinary dividend of 8 per cent compares with 9½ per cent for the previous year. No dividend is recommended on the deferred ordinary, whereas 33⅓ per cent was paid the previous year.

British Visqueen Ltd.

British Visqueen Ltd., the joint company to manufacture polythene film formed by Imperial Chemical Industries Ltd. and the Visking Corporation of Chicago, Illinois, will commence trading during February, 1954. Its products will include 'Visqueen C,' a special film which overcomes the problem of ink adhesion on polythene film. British Visqueen's new plant and offices being built at Stevenage will not be completed until July or August of 1954. In the meantime, the company's headquarters will be at 94 Tewin Road, Welwyn Garden City, and plant is being installed in temporary premises at Hillhouse in Lancashire. The formation of British Visqueen Ltd. was announced in July, 1953. The company's authorised capital is £240,000, two-thirds of which is held by I.C.I. and one-third by the Visking Corporation.

Market Reports

LONDON.—There have been no outstanding changes on the industrial chemicals market during the past week and most sections report a steady movement on home account with the supply position adequate for current needs. There has been a good inquiry for the soda products and so far there has been no notification of any price changes.

Firm values continue to be maintained for the barium compounds and hydrogen peroxide, while borax and boric acid are enjoying a fair inquiry at the recently reduced rates.

Export trade in chemicals has been reasonably good and rather more inquiry has been received for Commonwealth destinations, particularly Australia where consumers' stocks are believed to have reached a low level. Orders for shipment in some instances are difficult to place notably the barium salts, sodium sulphide and caustic potash.

An active demand persists in the coal tar products market particularly for xylol and toluol which are none too plentiful for current requirements. Solvent naphtha is also in good request as are phenol and meta-cresol. Prices throughout this market are steady at recent levels.

GLASGOW.—Another extremely busy week is reported by all sections of the trade. Prices have remained steady and indications for some of the basic materials for next year are unchanged. This has probably resulted in the somewhat heavy buying which has taken place for delivery January/February, 1954.

CLASSIFIED ADVERTISEMENTS

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.

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS in various Government Departments. The Civil Service Commissioners invite applications for pensionable posts. Applications will be accepted up to 31 December, 1953.

The posts are divided between the 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 31 December, 1953 ; for Assistant Experimental Officers, at least 18 and under 28 on 31 December, 1953. Extension for regular service in H.M. Forces.

Candidates must have at least one of a number of specified qualifications. Examples are : High 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 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.

INCLUSIVE LONDON SALARY SCALES :—
Experimental Officer—£681-£838 (men) ; £586-£707 (women).
Assistant Experimental Officer—£274-£607 (men) ; £274-£511 (women).

Starting pay according to age up to 26 :—At 18, £274 ; at 26, £495 (men), £467 (women). Somewhat lower in provinces.

Further particulars and application forms from **CIVIL SERVICE COMMISSION, SCIENTIFIC BRANCH, TRINIDAD HOUSE, OLD BURLINGTON STREET, LONDON, W.1,** quoting No. S94-95/53. **21283/176/EH/a.**

ENGINEER or **CHEMIST** required by Chemica Engineering Firm in London. Qualifications are :—Age about 30 ; experience in pickling and chemical treatment of metals ; experience of general office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications, coupled with a keen business outlook. Write, stating fullest possible particulars, including age, qualifications and salary required, to **BOX No. C.A. 3282, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

JOHNSON MATTHEY & CO., LIMITED, Refiners of Precious and Rare Metals, have vacancies for **PRODUCTION CHEMISTS** in their works in the North London area. Candidates should be between the ages of 25 and 35, have an Honours Degree in Chemistry, Chemical Engineering or Metallurgy, or equivalent qualification, and preferably five years' works experience. Write, giving full particulars of age, qualifications and experience and salary required, to the **SECRETARY** at **78, HATTON GARDEN, LONDON, E.C.1.**

SITUATIONS VACANT

JOHNSON, MATTHEY & CO., LIMITED, Refiners and Engineers in Precious and Special Metals, offer a **SENIOR APPOINTMENT.** Candidate must be between the ages of 30 and 40 and be technically highly qualified, preferably in extraction metallurgy and have proven ability as an organiser and works experience, both technical and administrative. He should possess strong commercial sense and cost consciousness, be able to develop processes and plant from experimental and pilot stages, design and supervise construction of commercial working units, and have ability to recognise potential commercial value of ideas and to develop and exploit them. This post offers wide scope to man of established worth. Write giving full particulars of career to date, present salary, and reasons for application to **SECRETARY, JOHNSON, MATTHEY & CO., LIMITED, 78, HATTON GARDEN, LONDON, E.C.1.**

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.**

600

COCHRAN BOILERS

SIZE No. 22 **BOILER,** Vertical, 18 ft. 6 in. by 8 ft. 6 in. diam. Evap., 4,960/6,600 lb. at 150 lb. w.p. Hand fired.

Size No. 22 **BOILER,** Vertical. 18 ft. 6 in. by 8 ft. 6 in. diam., for 130 lb. w.p. Hand fired.

Size No. 22 **BOILER,** Vertical. 18 ft. 6 in. by 8 ft. 6 in. diam., for 125 lb. w.p. Hand fired.

Size No. 19 **BOILER,** Vertical. 15 ft. by 7 ft. diam. Evap., 3,000/4,000 lb. for 100 lb. w.p. Hand fired.

Two Size No. 7 **BOILERS,** Vertical. 10 ft. 3 in. by 4 ft. 9 in. diam. Evap., 1,030/1,370 lb. for 100 lb. w.p. One fitted mechanical stoker, one hand fired.

Size No. 5 **BOILER,** Vertical. 9 ft. 6 in. by 4 ft. 3 in. diam. Evap., 750/1,000 lb. for 100 lb. w.p. Hand fired.

Size No. 3 **BOILER,** Vertical. 8 ft. 6 in. by 3 ft. 9 in. diam. Evap., 540/700 lb. for 100 lb. w.p. Hand fired.

Size No. 2 **BOILER,** Vertical. 7 ft. 6 in. by 3 ft. 3 in. diam. Evap., 340/450 lb. for 100 lb. w.p. Hand fired.

Sinuflo **BOILER,** Horizontal. 21 ft. 7 in. overall by 7 ft. 6 in. diam. Evap., 7,600/9,100 lb. for 130 lb. w.p. Fitted with Hodgkinson automatic stoker.

Four Cochran Kirke Sinuflo Vertical **GAS-FIRED BOILERS,** Size 12D, each 6 ft. 9 in. by 6 ft. diam. These are new hot water boilers each rated 2,620,000 B.Th.U.'s hr. on 36.4 therms per hr. Tested to 100 lb. sq. in. hydraulic pressure. Never used.

GEORGE COHEN, SONS & CO., LTD.,
WOOD LANE, LONDON, W.12.
Tel. : Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel. : Pudsey 2241.

FOR SALE

C. BARBER, LTD.

C.I. **FILTER PRESS,** 25½ in. square, by **MANLOVE ALLIOTT,** plate and frame type, 13 chambers, arranged for washing. Excellent condition.

TWO HYDRO EXTRACTORS, 72 in., by **BROADBENT.** (One new and unused.)

TWO "HORMANN" 30 cm. Stainless Steel **FILTER PRESSES.**

STORAGE BINS in stainless steel, cylindrical, with covers. 40/12/14/10 gallons capacity.

CANNON STEAM-JACKETED ENAMEL-LINED PANS, 10 and 25 gallons. All new and unused.

DOULTON 25-gallon **COPPERS** with lids. **NEW** and unused.

WELDED VESSELS of all types, in mild steel or stainless. Fabricated to customer's specifications.

HYDRO-EXTRACTOR, 26 in., by **CHERRYTREE.**

C. BARBER LTD.
SILVERDALE GARDENS
HAYES MIDDLESEX
Telephone—Hayes 2735/6

8 brand new jacketed **STERILIZING VESSELS,** 7 ft. long by 3 ft. diam., complete with fittings.

2—18 in. **KEK PLATE MILLS,** complete with feeders delivery bins, motors and entablature.

9 Worssam **ROTARY PRESSES.**

POWDER DRESSING or **SIFTING MACHINES,** various sizes.

1 Johnson **FILTER PRESS,** 36 in. square, plate and frame type, double inlet and enclosed delivery ports.

1 Johnson **FILTER PRESS,** 47 plates, 32 in. square, centre feed, bottom corner open delivery.

Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

24 in., 30 in. and 36 in. **HYDRO EXTRACTORS,** self-balancing, swan-neck type, self-emptying bottom, belt and motor driven.

Heavy cake **CRUSHING MILL,** 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam. bottom with finer teeth 12 in. diam.

Bennett Copper-built **EVAPORATOR,** 4 ft. diam. by 4 ft. 6 in. high, steam jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt driven vacuum pump.

"U" shaped horizontal jacketed **MIXER,** 7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven.

3—5 roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam. belt and gear driven, with clutch drive suitable for motor, by Baker Perkins, Ltd.

1 No. 1A water-cooled **CIRCULATOR MILL.**

6—Excellent Nickel-lined Jacketed **TILTING PANS,** 60 gallons capacity and for 40 lb. working pressure.

2—Brand New Enclosed Aluminium **TANKS,** approximately 11 ft. long by 4 ft. 9 in. wide by 7 ft. 3 in. deep.

5—Excellent Porcelain **DISC MILLS.**

1—Aluminium **STILL,** steam jacketed, dished top and bottom; approximately 4 ft. 8 in. diameter by 6 ft. deep.

1—Very fine **GARDNER SIFTER** and **MIXER.** Internal dimensions of trough, 5 ft. 9 in. by 24 in. by 28 in. deep, complete with wood-built hopper, elevator, A.C. motor and starter, all in first-class condition.

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

MONEL METAL-LINED STEAM JACKETED PAN, 75 gallons capacity; also **COPPER STEAM JACKETED PAN,** 40 in. diam. by 12½ in. deep. **HAROLD POTTER & CO., LTD., CANAL STREET, NOTTINGHAM.**

FOR SALE

MORTON, SON & WARD, LIMITED
offer

"MORWARD" "U"-shaped Trough POWDER MIXERS, any size up to 3 tons.

MIXERS—Horizontal or Vertical, jacketed or unjacketed. Several in stock.

JACKETED PANS in stainless steel or mild steel, with or without mixing gear.

TROUGH MIXER by **CHALMERS,** 3 cwt., stainless steel lined tilting trough.

TROUGH MIXERS by **GARDNER,** 3 cwt., stainless steel lined troughs.

ONE 500g. **JACKETED AUTOCLAVE** with detachable cover, 150 lb. in jacket.

500g., 300g. and 200g. **AUTOCLAVES** in mild steel riveted construction, with detachable covers.

HYDRO EXTRACTORS

Large selection in stock, 72 in. to 36 in., by **BROADBENT,** and 42 in. by **WATSON LAIDLAW,** all electric, underdriven, thoroughly reconditioned, complete with starters and guranteed.

PUMPS: A range of new **MONO** Pumps and several other 2 in. to 6 in. in stock. New and second-hand.

INQUIRIES INVITED.
MORTON, SON & WARD, LIMITED,
WALK MILL,
DOBCROSS, NR. OLDHAM,
LANCS.
Phone: Saddleworth 437.

TANKS
FOR STORAGE

12—30 ft. × 8 ft. diam.
4—14 ft. × 7 ft. **(TILE LINED).**
80—3 ft. to 5 ft. × 3 ft. to 5 ft. diam. **(CYLINDRICAL)**
40—6 ft. × 5 ft. **(CYLINDRICAL, CONED AND STONEWARE LINED).**
20—6 ft. × 5 ft. **(CYLINDRICAL, UNLINED).**
50—2 ft. 9 in. × 3 ft. 9 in. **(CYLINDRICAL, STONEWARE LINED).**

ALSO

8—**STAINLESS STEEL SEPARATORS,** 4 ft. 4 in. × 20 in. diam.
35—6 in. **STAINLESS STEEL BENDS.**

MADEN & McKEE, LTD.,
317, PRESCOT ROAD,
LIVERPOOL, 13.

CLASS "A" INFLAMMABLE LIQUID TANK, built 1912. Registered carrying capacity, 14 tons; wheel-base, 9 ft. 6 in.; size of shell, 17 ft.; total height, 11 ft. 6 in; G.R. plated December, 1949. May be inspected at Wakefield. **BROTHERTON & CO., LTD., CITY CHAMBERS, LEEDS, 1.**

ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.

TWO DE LAVAL SEPARATORS, VEE-BELT DRIVE. Good condition.

THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET, LONDON, E.14. TEL. EAST 1844.

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.**

FOR SALE

SURPLUS STORES
ALL NEW

STAINLESS STEEL TUBING, ⅜ in. to 3½ in. diam.
STAINLESS STEEL SHEETS, 26 Ga. up to ¼ in. TK.
STAINLESS STEEL VALVES, ¼ in. to 6 in.
ALUMINIUM TUBING, 1⅝ in., 2 in. and 3 in. diam.
COPPER TUBING, ¼ in. to 4 in. diam.
VALVES, STEEL, CAST IRON, BRONZE, ¾ in. to 6 in. diaphragm, globe and gate.
RELIEF VALVES for various pressures, 2½ lb. to 60 lb.
REDUCING VALVES.
CAST-IRON PIPE, 6 in., 8 in., 9 in. and 12 in. flanges and fittings.
STEEL PIPE, 1¼ in. to 6 in. and fittings.
PIPE FLANGES, ¾ in. to 6 in.
PRESSURE GAUGES, 4 in. dial 0-20 up to 100 lb.
Full particulars upon request to:
NELSONS LANCASTER ESTATE CO.,
CATON ROAD,
LANCASTER.

PHONE 98 STAINES

THREE 12,000 gall. **CYL ENC. TANKS,** 30 ft. by 9 ft. diam.
1,000 and 2,000 gall. **ALUMINIUM VEHICLE TANKS.**
7,000 gall. **CYL. ENC. GLASS LINED TANKS,** 18 ft. by 9 ft. diam.
850 gall. **ENC. CYL. RUBBER LINED TANKS,** 8 ft. 6 in. by 4 ft. 6 in. diam.
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