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Sugar Drying in Belgium

After supplying a Turbo Tray Dryer/Cooler with Predryer for White Sugar to the Raffinerie Tirlemontoise, we received the following letter from this well-known Company:—

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THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXVI OCTOBER 1964 No. 790

NOTES AND COMMENTS

The "normal price of sugar"[1].

The view has frequently been voiced that no real break in the steady downward drift in values, which has continued with only temporary halts since November of last year, is likely to be encountered until "a more normal price level" is reached. Exactly what would in present circumstances be a normal price level is difficult to ascertain, but it may be instructive to examine the pattern established during recent years.

Buying pressure occasioned by political difficulties led to the establishment of a peak in the London Daily Price of £62·125 per ton during the first half of 1957. Thereafter values dwindled until they reached a low point of £30·125 in March of the following year. From that stage for a period of more than three years fluctuations were small compared with recent rapid price movements, the high point of £24·50 per ton being established in July 1958 and the lowest value of £23·625 per ton following just one year later. Eventually the coincidence of high crops in Europe and Cuba, combined with pressure on the part of holders of second-hand Cuban sugar to rid themselves of their holdings seemingly regardless of the financial return, led to a break in values and the London Price fell to below £20·00 per ton in January 1962. From that point there was a gradual recovery and values had approached close to £30·00 per ton before the onset of the dramatic rise which led on two occasions to prices in excess of £100·00 per ton.

If any period during these years from 1957 can be claimed to represent normal conditions, it must presumably be from March 1958 until mid-1961 when values at least had the virtue of comparative stability. Yet during the greater part of that time the world market price was below the minimum desirable level mentioned in the International Sugar Agreement and efforts were constantly being made to improve the market, so that no matter how normal those values may now appear in retrospect, it must not be forgotten that they were considered anything but satisfactory at the time.

Prices in those years also reflected very heavy surpluses which existed and, for all the current prospects of increased crops in many parts of the world, stocks are at a low level and it is hardly likely that surfeit conditions will be met with in the near future. Furthermore, although in the short term production costs do not necessarily have a bearing upon world market values, especially as some governments appear willing to subsidize exports to an astounding degree, there are many marginal producers to whom the relative costs of domestic production and world market sugar are a very relevant factor. It is also pertinent to recall that there has been a marked degree of inflation in the wage structures of many of the lower cost producers during recent years and what might well have been considered an adequate return in 1959 would now be considered most unsatisfactory.

The change in the market influence of Cuba must also be borne in mind. At the time when Cuba was entitled to supply more than 2·5 million tons to the U.S. domestic market the high price she received helped to subsidize her exports to the world market. The U.S.A. does not now purchase all its foreign imports at the full U.S. domestic price, and in any case the tonnage which formerly was forthcoming from Cuba is now purchased from many suppliers which considerably reduces the effect of this outlet on world market values.

Altogether, then, it would appear that even if there is a price bracket which can be said to represent "normality"—and at current quotations it can be said that this stratum has already been entered—there is little reason to believe that the lower points established five years ago are likely to be repeated within the foreseeable future, whilst there is evidence to suggest that the inflationary pressures of recent years will have their influence on market values.

* * *

Increase in U.K. sugar surcharge.

The Sugar Board surcharge of 3d per lb (28s 0d per cwt) was increased to 3½d per lb (32s 8d per cwt) from the 2nd September. This was the twenty-fourth change in surcharge and distribution payment made by the Sugar Board since the beginning of 1963, and was made in order to bring the Board's trading position more into line with the current level of world prices.

[1] C. Czarnikow Ltd., *Sugar Review*, 1964, (678), 159.

New marketing arrangements for South African and Swaziland sugar.

The Governments of Britain, South Africa and Swaziland and the Sugar Industries of South Africa and Swaziland have reviewed the present arrangements governing the marketing of South African sugar in Britain and the production and marketing of sugar in Swaziland.

The present arrangements were introduced at the end of 1961 when the South African Sugar Industry ceased to be a member of the Commonwealth Sugar Agreement.

The main features of the present arrangements are:

(*a*) The purchase by the British Government of 150,000 long tons (168,000 short tons) of South African sugar each year until the end of 1966 at a fixed price.

(*b*) That no other South African sugar should be exported to Britain without the consent of the British Government.

(*c*) The assurance of a market for Swaziland sugar by South Africa and the marketing of Swaziland sugar as part of the South African crop.

(*d*) The restriction of the production of sugar in Swaziland to 8½% of the total sales of South African and Swaziland sugar.

These arrangements were due to end on December 31st, 1966. The parties concerned have, however, decided now that it would be mutually convenient to bring them to an end at an earlier date and have decided to do so on December 31st, 1964. Thereafter the position will be as follows:—

(*i*) South African sugar will be sold to Britain on an ordinary commercial basis at ruling world prices. The British Government will no longer buy South African sugar at a fixed price, nor will the permission of the British Government be required for sales in Britain. (Upwards of 500,000 tons of sugar are imported each year by refiners in Britain in addition to imports under the Commonwealth Sugar Agreement.)

(*ii*) The Swaziland sugar industry will assume responsibility for the marketing of its own sugar outside South Africa. The effect will be that South Africa will no longer be required to provide in its local and export markets for the production of sugar in Swaziland which is estimated to be of the order of 140,000 short tons in 1965-66.

(*iii*) The British Government will propose to the other parties to the Commonwealth Sugar Agreement that the Swaziland sugar producers should become a member of the Agreement from 1st January, 1965.

(*iv*) The present restriction on the freedom of Swaziland to determine the desirable level of its sugar production will be removed.

The arrangements introduced at the end of 1961 were intended to give time for adjustment by the South African and Swaziland sugar industries. Developments in the world sugar situation have enabled this adjustment to be made more quickly than was originally expected. All the parties concerned believe that it would be in their mutual interests to move now to more permanent arrangements. It is the intention of the South African and Swaziland sugar industries to continue their close co-operation even though they will now have separate marketing organizations.

* * *

U.S. sugar import fees[1].

On the 13th August the U.S. Department of Agriculture established import fees applicable to foreign sugar to be subsequently authorized or approved for importation during 1964 as follows:

(*i*) 1·00 cent per pound on global quota raw sugar,
(*ii*) 0·30 cent per pound on basic quota raw sugar and prorations or allocations of quota deficits, and
(*iii*) 0·60 cent per pound on direct consumption sugar.

Sugar imported within the basic quota of 1,050,000 tons established for the Republic of the Philippines is not subject to the payment of an import fee.

All global quota sugar presently released has previously been authorized or approved for importation and accordingly is not subject to the import fee.

When import fees were first introduced in July 1962 the rate imposed was 2·40c per lb on global quota sugar and 10% of this rate for imports under statutory quotas of foreign countries other than the Philippines. The fee payable as a condition for the import of direct consumption sugar was 0·34c per lb. Import of direct consumption sugar is only permitted from statutory quota holding countries within defined tonnage limitations. The import fee applicable to the year 1963 was set initially at 1·40c per lb, but in January of that year the rapid increase in world market values made it necessary to suspend the fee altogether[2].

* * *

Central Azucarera de Tarlac Annual Report, 1963.

Milling at Central Azucarera de Tarlac, Philippines, began on November 28, 1962 and ended on May 8, 1963. During this period a total of 785,150 metric tons of cane were crushed, an increase of 33% over the previous year's tonnage. Sugar manufactured was a post-war record at 1,428,161 piculs (90,693 metric tons). Reduced extraction was slightly lower at 92·22% as was boiling house recovery at 89·47%. The increased supply of molasses available permitted a total alcohol production of 6,367,000 litres, an increase of 29·4% over that of 1961/62.

In anticipation of increased cane tonnage, the first phase of a three-year expansion programme was undertaken at a cost of 4,579,500 pesos. Among the equipment acquired during the year were two steam boilers, a vacuum pan and pre-evaporator, and additional juice heaters, clarifiers and mill motors. An additional 40,000-ton bulk sugar warehouse and a 4,000,000-gallon molasses tank were to be installed.

[1] *Lamborn*, 1964, **42**, 139.
[2] C. Czarnikow Ltd., *Sugar Review*, 1964, (675), 148.

SUGAR CANE AGRICULTURE IN HAWAII

Experiment Station of the Hawaiian Sugar Planters' Association, Annual Report 1963.

THIS comprehensive report contains much of interest within its 65 pages and is in effect a collection of reports of work carried out by the various departments of the station, viz.: basic plant physiology and biochemistry, climate and related studies, mechanical harvesting and related research, nutrition and fertilization research, plant protection research, sugar technology research and development, the varieties programme, water studies and irrigation programme, and the weed control programme.

In his introductory letter the Director remarks that the year under review had marked the culmination of the co-ordinated research in irrigation which was started in 1958. Much progress has been made in studying the basic water requirements of sugar cane in relation to plant, soil, and climate and in analysing the infield distribution of water. The new found knowledge is about to be applied to plantation operations. Good progress has also been made in developing facts that give a much clearer picture of the nutrient needs of the cane plant.

In the report on basic plant physiology and biochemistry an interesting sidelight is the discussion on the question "How long does it take a cane leaf to make one teaspoonful of sugar?" A few years ago the question could not have been answered but now, thanks to radioactive carbon, the question is answerable as follows: "using as our example a mature leaf of variety 50–7209, currently Hawaii's leading variety. Knowing (1) the number of grams of sucrose in a level teaspoon, (2) the rate at which a leaf of 50-7209 fixes carbon dioxide (i.e. photosynthetic rate), (3) how much carbohydrate a unit of dioxide represents, (4) what percentage of the carbohydrate is sucrose, and (5) the leaf surface area of the blade, we find that it would take 36 hours of sunlight for one cane blade to make one teaspoon of sucrose."

Translocation studies have suggested a new approach to ripening. It is thought chemicals might well be found which would selectively destroy the growing point in ripening cane and this would result in increased sucrose in the younger joints.

Several new compounds were found to inhibit flowering or floral initiation when applied either through the spindle or as a soil soak during the differentiation period.

In 1963 sixteen new herbicides were obtained for testing. The trend away from short-control contact (necrotic) herbicides has accelerated. Present emphasis is on repeated soil applications which will prolong the effective control of all seed-germinated weed species. Perennial weeds, especially grasses, are being treated to an increasing extent with spot applications of soil-residual chemicals. In most cases, either a surface-active agent or a contact herbicide has been included in the spot treatment. Of special interest are the triazine series—"Ametryne", "Simetryne" and "Prometryne". The ability of sugar cane to degrade these compounds rapidly makes them truly bioselective herbicides for sugar cane cultivation.

Methods of control that have proved successful with the following cane field weeds are described—Johnson grass (*Sorghum halepense*), Guinea grass (*Panicum maximum*), Bermuda grass (*Cynodon dactylon*), California grass (*Panicum pupurascens*), Aiea morning glory (*Ipomoea triloba*) and Wing-leaved passion flower (*Passiflora pulchella*).

In the varieties programme the work of predicting drought resistance of varieties is likely to be of special interest to many. It has been established that sugar cane varieties differ in salt tolerance and that there is similarity of the results of salt tolerance experiments to field observations of drought resistance. Many commercial cane varieties in Hawaii have now been classified according to their salt tolerance and placed in three categories—tolerant, intermediate and sensitive.

The Entomology Department concentrated much effort in attempting to establish two insects (1) a predator (*Hyperaspis trilineata*) on the pink and grey mealybugs of sugar cane and (2) an egg parasite (*Patasson calendrae*) of the two insects or "bill-bugs", *Sphenophorus venatus vestita* and *S. cariosa*, which frequently destroy lawns and also kill a proportion of bunch cane seedlings. Both importations have been multiplied at the station and their progeny released in selected areas. It would appear that *Potasson* may become a new factor in the control of the beetle borer, *Rhabdoscelus obscurus*, which is the most destructive sugar cane insect in Hawaii. It has parasatized the eggs of *Rhabdoscelus* in the laboratory and work is underway to determine whether it will do the same in cane fields.

Rats, notably the Hawaiian rat (*Rattus hawaiiensis*), rather than the black or brown rat, proved troublesome in some areas. Out of several baits tested one may have a useful future. It is a small "Endrin"-poisoned pellet, equally well accepted by all kinds of rats found in Hawaii. Another new rat poison tested was "Prolin". This is a modified formulation of "Warfarin", to which there is added 0·025% of sulphaquinoxaline. This destroys the bacterial sources of vitamin K in the rat's stomach and this accelerates the lethal action of "Warfarin".

Brown spot disease, due to a fungus (*Cercospora longipes*), is new to Hawaii, and has been carefully observed. Some of the newer varieties appear to be resistant although many of the present commercial varieties are susceptible. Among other diseases studied were eye spot (*Helminthosporium sacchari*), leaf scald (*Xanthomonas albilineans*), root rot (*Pythium graminicola*) red rot, mosaic and ratoon stunting disease.

F.N.H.

SUGAR CANE BREEDING IN INDIA

Annual Report of the Sugar Cane Breeding Institute, Coimbatore, 1961-1962.

THIS report of 62 pages gives a good idea of the many activities that take place at this well known institution in connexion with the constant urge to produce better varieties of sugar cane for the varied climatic and edaphic conditions of the Indian subcontinent. The delay in the appearance of the report is to be regretted. The following information, which gives a good idea of the scope of the Institute's work for the period under review, is abstracted from the Director's introductory remarks.

During the season a total of 535 crosses were carried out. One of the highlights of the programme was the use of varieties resistant to red rot as parental stalks. The varieties Co 980, Co 1227 and Co 1228, which proved highly resistant to the disease, were freely used in the work. The inbreeding programme for sucrose content, red rot resistance and resistance to waterlogging by use of clones of *Saccharum spontaneum* and "K" derivatives was successfully accomplished.

The two imported (American) varieties CP 34/79 and CP 49/50 which proved promising under subtropical conditions were the main parents utilized in the programme involving exotic canes, in addition to the two highly sugared Egyptian varieties 43G/47 and 43G/50. A number of crosses were carried out for disease and pest resistance.

A number of varieties (429) were raised to the status of new Co canes, selected from Coimbatore and Karnal. A new system of numbering varieties was started and the Co canes given the numbers Co 62001 to Co 62429, the first two digits representing the year and the next three the number of the seedling.

It was found that gibberellic acid promoted germination of pollen and accelerated pollen tube growth, the optimum concentration being 500 p.p.m. Studies on bunch planting showed that this method needs to be practised with care because of the possibility of losing seedlings of economic value.

Cytogenetical studies on the origin and affinities of species of *Saccharum* were continued. A number of crosses were made utilizing the various species of *Saccharum* and the allied genera *Erianthus*, *Sclerostachya* and *Narenga*. Repeated back-crossing of the hybrids between *S. officinarum* × *S. spontaneum* to the wild parent has revealed that even with 10 *officinarum* chromosomes, the hybrids morphologically show resemblance to *S. spontaneum*. Thus the presence of only a few *officinarum* chromosomes from out of the basic complement is not likely to express any *officinarum* character in the progeny.

An analysis of the flowering data on clones of *S. officinarum* in relation to meteorological factors showed that the trend of rainfall during the months of May, June and July, the crucial period for floral initiation, appears to govern flowering behaviour under Coimbatore conditions. A gradual increasing trend in rainfall and relative humidity during the three months appears to be essential for good flowering. The occurrence of phytosterol in the leaf appears to be a character of importance and useful in the separation of some species in *Saccharum* and the related genera.

Photoperiodic experiments for the induction and synchronization of flowering were continued and the results of the previous year confirmed. Preliminary studies were conducted on the two characters (1) Chlorophyll Stability Index (C.S.I.) and (2) the rate of loss of free water from detached leaves. This might provide a laboratory basis for the assessment of varieties for tolerance to drought.

During the year entomological studies were confined to studying the natural incidence of insect pests in varieties of cane. With regard to cane diseases the routine assessment of seedling varieties for resistance to red rot and smut was continued. The Chemistry Section dealt with the juice analysis of a large number of varieties and also studied the question of maturity in cane varieties.

At the Sugar Cane Substation at Karnal 200 seedlings were selected for release as new Co canes, the numbers being Co 62230 to Co 62429. The commercial potential of the variety C 842 for Punjab conditions was confirmed from trials conducted during the year.

F.N.H.

Agricultural Abstracts

Effect of boron on yield of sugar beet. N. I. KUZNETSOV. *Mikroelem. Zhivotn. Rast. Akad. Kirgiz S.S.R.*, 1962, (1), 121–129; through *Soils and Fertilizers*, 1964, **17**, 82.—Boron stimulated and increased the rate of absorption of N, P, K and Mn by plants, increased the chlorophyll content of leaves and the sugar content of the beet. Spraying or dusting sugar beet leaves or treating the seeds with boromanganese fertilizer or with boric acid was beneficial.

* * *

A study of the virus of sugar cane mosaic disease by means of the electron microscope. M. DE FATIMA DOS SANTOS. *Garcia de Orta* (Lisbon), 1962, **10**, 721–725. Reference is made to the first electron microscope studies of the disease by GOLD and MARTIN in 1955 and to further studies in 1957. Equipment normally employed in medical work was used. Details are given of the virus particles and the method or technique followed. Photographs and a bibliography are included.

Agricultural cane yield and industrial production of sugar. F. O. BRIEGER. *Brasil Açuc.*, 1963, **62,** 8–9. The phenomenon whereby the sucrose content and juice purity of a poor stand of cane may be higher than that from a good stand is noted and briefly discussed.

* * *

The main pests of sugar cane in Mexico. H. GONZÁLEZ SÁNCHEZ. *Bol. Azuc. Mex.*, 1963, (169), 3–6.—These are briefly described and recognised methods of control given. Rats are included.

* * *

Deterioration after cutting of certain commercial varieties of sugar cane. A. W. TURNER. *Bol. Azuc. Mex.*, 1963, (169), 10–12.—Nine varieties were tested over a period of 17 days from cutting. The variety Eros showed least deterioration and the two varieties Co 290 and Co 213 the most.

* * *

Rat damage. J. CARRASCO. *Bol. Azuc. Mex.*, 1963, (170), 3–6.—The extent of rat damage to sugar cane in various parts of Mexico is dealt with, also remedial measures that are in use or that have been tried.

* * *

Mexican sugar cane pest and its control. A. CORTÉS ITURBE and M. ABARCA RUANO. *Bol. Azuc. Mex.*, 1963, (170), 7–13.—The insect pest of sugar cane, "el salivazo" (*Aeneolamia postica*) is the second most important cane pest in Mexico. A map is given showing its distribution. Its general characteristics and chemical methods of control are discussed.

* * *

Chilling of sugar cane planting setts. R. CESNIK. *Brasil Açuc.*, 1963, **61,** (5 & 6), 6–11.—The effects of chilling on other planting material is referred to, e.g. *Gladiolus* and other bulbs. In these experiments planting setts of the commercial sugar cane variety CB 41–76 were subjected to a temperature of 5°C for 5, 10 and 15 days and subsequent germination studied. It was concluded that chilling was of no practical advantage.

* * *

Winter protection of piled sugar beet roots. S. T. DEXTER, M. G. FRAKES and D. L. SUNDERLAND. *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 455–461. Large piles of sugar beet were protected from wilting and freezing with plastic sheet. Costs in covering about 5000 tons were roughly 1½ cents per ton. Protected roots gave a slightly higher sugar recovery (8 lb per ton).

Marginal nitrogen deficiency of sugar beets and the problem of diagnosis. F. J. HILLS *et al. J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 476–484.—Results are given of the first of a series of field experiments designed to assay the degree of nitrogen deficiency in several Californian soils and to relate the degree of deficiency to diagnostic techniques. With the onset of nitrogen deficiency maximum sucrose contents were reached in from 4 to 6 weeks. They did not exceed 15·5%.

* * *

Cultural and pathogenic studies of an isolate of *Cercospora beticola* Sacc. F. R. FORSYTH *et al. J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 485–491.—All the sugar beet, mangel and table beet varieties tested were susceptible to the isolate of *Cercospora* leaf spot used. Certain weeds may also harbour the disease.

* * *

Growth rate of young sugar beet roots as a measure of resistance to virus yellows. J. M. FIFE. *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 497–502.—This paper reports greenhouse experiments which indicate that the reduction in growth of the roots of inoculated plants during an early period of development may be useful in evaluating resistance to virus yellows.

* * *

Yellows resistance in the sugar beet. J. S. MCFARLANE and C. W. BENNETT. *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 503–514.—Tests at Salinas, California, in 1957 and 1958 with more than 350 sugar beet varieties and breeding lines showed that a wide range of resistance to beet yellows exists within *Beta vulgaris*. Immune or highly resistant lines were not found.

* * *

Highly virulent strains of curly top virus in sugar beet in western United States. C. W. BENNETT. *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 515–520.—Curly top virus is a complex of strains that vary in virulence, at least 12 having been recorded. Tests from field beets in 1961 revealed the presence of strains capable of causing considerable damage to resistant varieties of sugar beet and emphasized the need for maintaining a high degree of resistance in new varieties.

* * *

Use of tetrazolium salts in determining viability of sugar beet pollen. R. J. HECKER. *J. Amer. Soc. Sugar Beet Tech.*, 1963, **12,** 521–528.—Eight tetrazolium salts were tested for their staining capacity with sugar beet pollen. Positive results were obtained with four, one of which was superior to the other three. With this, mature viable pollen grains were stained an easily distinguishable purple colour.

Time of nitrogen application on sugar cane ratoons in Puerto Rico. G. SAMUELS and S. ALERS ALERS. *Sugar y Azúcar*, 1963, **58,** (11), 66–67.—Experiment has shown that nitrogenous fertilizer should be applied to ratoon crops not later than 3 months after cutting and preferably before the cane is 2 months old if the percentage sucrose in the cane is not to decline.

* * *

Hawaiian research on irrigation. R. J. LEFFINGWELL. *Sugar y Azúcar*, 1963, **58,** (11), 78–80.—A brief account is given of the nature of the research work on cane irrigation now being carried out in Hawaii. The substitution of the expensive Bouyoucos blocks by pan evaporation measurement now taking place in Hawaii is explained.

* * *

Improvements in the handling of rooted stalks of sugar cane for controlled hybridization. R. NARASIMHAN, B. V. N. NATARAJAN and J. T. RAO. *Sugar J.* (La.), 1963, **26,** (5), 30–31.—Rooted stalks (marcotts) used for breeding purposes were potted in baskets which were embedded in sand mounds that were kept moist by frequent watering. Humidity near the tassels was kept at 70% or higher by watered cloth curtains, when survival reached 75·6% compared with 42·6% using the conventional marcotting technique.

* * *

Spacing and precision drilling of sugar beet monogerm seed. O. NEEB. *Zucker*, 1963, **16,** 619–627.—Experiments show that, in principle, with precision drilling, spacing may be increased to 15 cm so that singling may be omitted. With a row width of 50 cm an emergence of 55–60% is necessary in order to obtain 70,000–80,000 plants/ha. To apply this in practice would require better quality monogerm seed, better seedbed preparation and chemical weed control.

* * *

Herbicides and weeds in the San Cristóbal area. J. V. HERNÁNDEZ OROZCO. *Bol. Azuc. Mex.*, 1963, (171), 5–23.—A list of the commoner weeds arranged according to families is given, followed by a discussion on a large number of modern herbicides and their action.

* * *

Effect of gamma BHC and "Telodrin" on sugar cane pests and cane yield. O. P. SINGH and J. S. SANDHU. *Indian Sugar*, 1963, **13,** 319–320, 323.—Results are given of trials comparing "Telodrin" (Messrs. Burmah Shell) with "Heptachlor" and gamma-BHC. These were diluted and sprinkled (150 gal per acre) over planted setts in the furrows and immediately covered. One pound gamma BHC and one and two pounds of "Telodrin" per acre controlled termites and shoot borers. Three pounds gamma-BHC had a more prolonged effect.

* * *

Observations on morphological modifications caused by smut, *Ustilago scitaminea* Syd., in sugar cane. R. C. KULSHRESHTHA and A. S. DHILLON. *Indian Sugar*, 1963, **13,** 323.—This is a study in deviations in growth due to smut, such as reed type of growth and change in size and shape of leaf. In initial stages growth rate of infected plants exceeded the normal and they had an increased tendency to tiller. It is claimed this knowledge should make possible the locating of smut-infected plants in the field much earlier, before the appearance of whips, and thereby assist control.

* * *

Chemical control experiments with sugar beet nematode. A. DONA DALLE ROSE. *Ind. Sacc. Ital.*, 1963, **56,** 224–230.—Field trials with DD soil fumigation during the hot summer months gave negative results and did not decrease the number of nematode cysts (*Heterodera schachtii*). Spring treatment, 20–25 days before drilling, was more encouraging.

* * *

Gumming disease. G. M. THOMSON. *S. African Sugar J.*, 1963, **47,** 725–727.—An account is given of the past history of this disease (due to *Xanthomonas vasculorum*) in Natal, first recorded 7 years ago. Damp conditions favour the disease and have been responsible for a recent outbreak. The resistance of the different varieties grown is discussed.

* * *

A visit to the soils section. ANON. *S. African Sugar J.*, 1963, **47,** 732–735.—This is an illustrated popular account of the work that is carried out in the Soils Section of the South African Sugar Association's Experiment Station at Mount Edgecombe near Durban.

* * *

New machine demonstrated. ANON. *S. African Sugar J.*, 1963, **47,** 747.—A new fertilizer distributor for sugar cane is here described and illustrated, developed according to the ideas of Mr. G. VERNON CROOKES, Managing Director of Reynolds Bros. Ltd. in Natal. The machine is designed to be used with subsoilers on a crawler tractor. It has 5 bins or hoppers, 3 over cane rows distributing nitrogen as a top dressing, the other 2 over the 2 subsoiling furrows delivering superphosphate and potash, to be washed in during the first heavy rain.

* * *

Fertilizing of sugar beet when using monogerm seed. A. BUCHNER. *Zucker*, 1963, **16,** 682–686.—Fertilizers applied at sowing time can cause delayed emergence of seedlings, especially on light soils. This applies only when rates of application of N, P or K are high and is much less likely to occur when a compound fertilizer is used.

* * *

Specific cultural practices with sugar cane in Taiwan. W. C. HSU. *Sugar y Azúcar*, 1963, **58,** (12), 21–23, 33.—The writer, after visiting Central and South American cane-growing countries, describes the main characteristics of cane cultivation in Taiwan, which differs in many respects from cane cultivation in the New World.

Effects of severe freezing on quality of mill cane. J. E. IRVINE and L. G. DAVIDSON. *Sugar Bull.*, 1963, **42**, 54–58.—Results, some in tabulated form, of observations made after the 1961–62 and 1962–63 freezes are given. The data indicate that two factors determine the resistance of mill cane to damage by freezing, viz. the resistance of stalk tissue to freezing and the resistance of the juice to deterioration following freezing. Varietal differences are marked.

* * *

Nitrogen fertilization of sugar cane—a review. R. PRASAD and S. T. SEN. *Indian Sugar*, 1963, **13**, 369–378.—This review summarizes the results of experiments carried out in India during the period 1941–1961 with artificial nitrogenous fertilizers. Some work on organic sources of nitrogen is also included.

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Record of stalk borer in the Punjab. S. S. SINGH and O. P. SINGH. *Indian Sugar*, 1963, **13**, 391.—The stalk borer, *Chilotraea auricilia*, known to occur in other parts of India, is recorded from several areas of the Punjab for the first time. Steps for its control are expected to be taken shortly.

* * *

The rat problem in Mexican sugar cane fields. J. CARRASCO C. and M. ABARCA RUANO. *Bol. Azuc. Mex.*, 1963, (172), 3–7.—Seven species of rat occur in Mexico. Their scientific names are given. The worst enemy of the cane grower is *Sigmodon hispidus* ("ratón texano"). Damage and control measures are discussed.

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The cultivation of cane in new areas. ANON. *Bol. Azuc. Mex.*, 1963, (172), 8–13.—An account is given of the various considerations that need to be borne in mind in establishing new sugar cane plantations on virgin land, such as situation, soil preparation, planting, spacing, manuring, cultivation and choice of variety.

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Sugar industry in the Punjab. D. D. PURI. *Indian Sugar*, 1963, **13**, 421–423.—Reasons for the depressed state of the industry are given with emphasis on the diversion of cane supplies from factories to gur and khandsari makers. The development of improved cane varieties is considered to be of prime importance.

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Loss in yield due to pithiness in sugar cane. K. K. PRASADO RAO. *Indian Sugar*, 1963, **13**, 437–440. The pithiness in three varieties commonly grown in Andhra Pradesh (Co 419, Co 449 and Co 527) was investigated. They were grown under the same conditions, with irrigation. Co 527 contained most pith.

* * *

Five acres a day with home-made cane planter. ANON. *S. African Sugar J.*, 1963, **47**, 917.—A description, with photographs, is given of this home-made but apparently efficient cane planter. It weighs 400 lb and is coupled to the three point linkage of a tractor.

A study of sugar yield deterioration of cane varieties after being frozen. B. A. BOURNE. *Sugar J.* (La.), 1963, **26**, (7), 41–43.—This study was combined with the effect of heat treatment for ratoon stunting disease. Results showed that varieties differ considerably in their ability to remain little affected by freezing for a long time, as far as sugar content is concerned, several modern varieties being good in this respect. The importance of studying individual varieties as to their performance, after being heat treated, is emphasized.

* * *

Sugar cane variety tests at Fellsmere, Florida, 1957-1960. E. R. RICE and B. A. BELCHER. *Sugar J.* (La.), 1963, **26**, (7), 50–52.—On the sand and peat soils of Fellsmere, where freezing temperatures generally occur several times each winter, the varieties C.P. 50–28 and C.P. 52-68 gave outstanding performances. Both have erect growth and are suitable for machine harvesting.

* * *

Composting sugar cane bagasse. G. M. REYES. *Sugar News* (Philippines), 1963, **39**, 705–708.—What is claimed to be a quick and satisfactory method of composting sugar cane bagasse, developed in the Philippines, is here described. Cone shaped mounds of material weighing about a ton each are placed on stands, 4 m square, which allow of aeration and prevention of water accumulation. The mounds consist of alternative layers of bagasse and dung (10 to 1 ratio) or filter cake. Daily watering may be necessary. In making the mounds they are watered with a 1% solution of molasses. A shady site is preferred. In turning, the pile is watered with urea (5 kg in 10 gal water). Calcium cyanamide may be substituted for urea.

* * *

The progress of sugar cane breeding in the Philippines. A. R. APACIBLE. *Sugar News* (Philippines), 1963, **39**, 709–716.—The history of varieties in the Philippines is reviewed from the last century cultivation of well known noble canes, such as Luzon White, Zambales White, Pampanga Red and Negros or Cebu Purple, to varieties in use at the present time.

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Blackleg in sugar beets. G. MÖLLERSTRÖM and H. B. AF KLINTEBERG. *Socker Handl.* II, 1964, **19**, 1–15.—A detailed account of the disease in Sweden is given. With the increased use of segmented seed and precision sowing machines the need for treating seed against the disease becomes more urgent.

* * *

Translocation of carbohydrates in sugar cane plants. A. K. DOHARE and S. C. SEN. *Indian Sugar*, 1963, **13**, 493–495.—The results of soaking sugar cane setts in 35% molasses before planting are recorded. In most instances a slight increase in final yield resulted, compared with controls, but was not significant.

COMMONWEALTH SUGAR PRODUCTION[1]

THE largest sugar producer in the Commonwealth is Australia where, although the trend over several years had shown a gradual increase, a policy dictated by quota provisions had been followed of deliberately curtailing production and it had only reached 1,350,000 tons by 1961/62. In a tremendous step forward, however, it topped the 1·8 million ton mark during the following season and, whilst a temporary set-back occurred in 1963/64, it is anticipated that a new record will be established in 1964/65. Future plans call for a further expansion to around 2·5 million tons.

Production in the West Indian islands had also gradually increased over a period of several years. Output in 1962 amounted to 860,000 tons, and the following year expanded to 970,000 tons, an increase of almost 13%. Although it is not anticipated that this level will be maintained in 1964, the crop is expected to be well above the 1962 figure. Plans have been made for a marked expansion in British Guiana, but it now seems that as a direct result of the present political unrest production will fall short of the original target. The output in British Honduras has been fairly stable during recent years at just short of 30,000 tons. Agreement has now been reached whereby the present mill will be expanded and a new one erected. By these means it has been estimated that production will rise to some 70,000 tons by 1967.

In Fiji the trend during the past few years has been towards continued expansion. From a low point of 144,000 tons, established in 1961/62, there was a rapid increase the following year, and the crop reached just short of 250,000 tons. A further 50,000 tons in 1963/64 brought production to an all-time record level which may well be surpassed by the forthcoming crop. It is not to be expected, however, that production will continue to advance at this rate, a practical target within the present expansion programme being in the region of 300/350,000 tons.

Shortage of suitable land is necessarily a curb on expansion of the Mauritian sugar crop. Nevertheless it was possible in 1963 to achieve an output of 675,000 tons, compared with 545,000 tons and 524,000 tons in 1961 and 1962 respectively. Owing to adverse weather conditions it will not be possible to maintain last year's very high level of production, however, the most recent estimate of the forthcoming crop being 565,000 tons.

It has for some years been the aim of the East African producers to become net exporters, so that they may take advantage of their Commonwealth Agreement quota. Despite regular expansion this has not yet been possible, although some exports have now been effected. It is confidently expected, however, that by 1965 or, at the latest, the following year, production will have overtaken the expanding consumption and that East Africa may be able to take up her quota.

It is not only amongst the members of the Commonwealth Agreement that there has been a rapid increase in production; many of the newly independent nations have recently instituted measures for the establishment of industries aimed at meeting domestic demand, and to this end the establishment of a brand new Nigerian industry must be mentioned, whilst in other countries older established industries have been going through a period of marked growth.

Despite occasional set-backs, production in Pakistan had followed a generally expansionary course and by 1961/62 had reached 195,000 tons. A sharp increase has since taken place and the 1963/64 crop closed at some 300,000 tons. The President is reported recently to have stated that, in order to expand the availability to about 500,000 tons, 16 new mills are to be established. Already the necessary equipment for two of these is understood to have arrived in the country. There should be no difficulty in securing the necessary cane supplies as consumption of non-centrifugal sugar in Pakistan is reckoned to have increased in recent years until it is now running at an annual rate of more than one million tons.

Production and consumption trends in India vary considerably with changes in fiscal measures and, from a high point in excess of 3·2 million tons, raw value, reached in 1960/61, production fell by 1962/63 to just over 2·3 million tons. The Indian Government has recently undertaken measures designed to increase output and the current crop is expected to reach about 2·6 million tons. Here again there is a very large production and consumption of non-centrifugal sugar.

It is in Southern Rhodesia where the most marked expansion in the Commonwealth is to be noted. Although sugar was produced just before the war, progress was slow and as recently as 1961 production amounted only to 36,000 tons and the country did not become an exporter until 1963; development of the industry has since been very rapid, however. In 1962 some 80,000 tons were produced and the following year the figure of 128,000 tons was attained. This year output has been forecast at 183,000 tons, while by 1968 it is planned to produce more than 400,000 tons.

A gradual increase in production in Swaziland is to be noted: 67,000 tons in 1961/62 has risen to 73,000 tons in 1963/64. With the new arrangements which come into effect from next season, however, a more rapid rate of growth may be anticipated.

The indications of future expansion have been mentioned since it is most important to appreciate that successful increases in production are only achieved as a result of long-term planning. The ability of the Commonwealth to make its contribution to the world sugar supply in 1962/63 and 1963/64 stems from the development of stable, technically efficient, cost-conscious industries.

[1] C. Czarnikow Ltd., *Sugar Review*, 1964, (669), 123–124.

This achievement must in great measure be credited to the vision and flexibility enshrined in the Commonwealth Sugar Agreement—a combination of long-term Governmental commitment with an actively encouraged free market. From such a base it has been possible to promote an outward-looking attitude as can be amply illustrated by examining the pattern of trade that has emerged.

It must not be thought that the Commonwealth is an inward-looking community intent on filling its requirements from within its own boundaries. Total requirements of the net-importing members are some way in excess of the tonnage available from the exporting countries, despite the production expansion of recent years. A large proportion of Commonwealth supplies is shipped to the U.S.A., Japan and other non-Commonwealth destinations and the actual quantity the importers need to acquire from outside the Commonwealth is very much larger than might be judged from merely looking at overall totals of imports and exports.

Nor is there any great disposition on the part of importing countries to expand their domestic availabilities.

The main importers are the United Kingdom, Canada, Malaysia and New Zealand, and, whilst means whereby production might be started have been discussed in each of these countries, only in the two first-named have these resulted in any actual measures being put into operation and these have been limited to increases in the beet areas of only some 5% in each case.

THE COURSE OF THE NON-SUGARS FROM THICK JUICE TO WHITE SUGAR

with special attention to saponins

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PART I

IN the last few years several papers have been given at the Technical Conferences of the British Sugar Corporation which were concerned with the quality of white sugar. One of the subjects was how to obtain the highest possible quality sugar from a given massecuite[1,2]. However, the purity of the crystallized sugar—i.e. the quantity of non-sugars—can be influenced only to a limited extent in this way. To obtain essential differences in the quantity and composition of the non-sugars, the build-up of the massecuite must be changed. The question arises: what is the correlation between the composition of the massecuite and the quality of the white sugar? Once this relationship is known, we can consider what steps must be taken to improve or, if desired, to decrease the quality of the white sugar. The last thing is important for one cannot help but get the impression that nowadays, in some cases, the quality is increased unnecessarily.

Because the quality of the white sugar cannot be specified by the purity alone, it is done by analysing as much as possible the various non-sugars. Consequently it is impossible to correlate the properties of the white sugar with the purity of the massecuite, and therefore we must find a correlation with the various non-sugars of the white sugar. The quantities of the different non-sugars in the liquors from which the massecuite is produced must also be known. It is impossible and also unnecessary to consider all the non-sugars separately. We choose representative non-sugars, analytical determination of which gives results as exact as possible or which are at least reproducible.

The following non-sugars have been chosen:

(a) *Potassium*; this is a well defined criterion for the ash content.

(b) SO_2; this is representative of an inorganic anion.

(c) *Lactic acid*; this represents a small organic molecule.

(d) *Saponins*; these represent larger organic molecules which are found only in traces in the white sugar but nevertheless have influence on its quality.

(e) *Colour*; although this is defined only by the analytical method used, in many cases it is the most important factor, and further it is representative of the group of condensation products and polymers.

Our investigations on the partition of these non-sugars between the sugar and mother liquor have been extended over the six factories of the Centrale Suiker Maatschappij. As an example white sugar boiling data from a factory which delivers a sugar of normal composition are provided in Table I. On the basis of this data we can consider what can be done to improve the quality of the white sugar

[1] GÉNIE: *I.S.J.*, 1962, **64**, 232, 260, 298.

[2] RODGERS and LEWIS: *I.S.J.*, 1962, **64**, 359; 1963, **65**, 12, 43, 80, 261, 293, 324.

Table I

	Thick juice	*White A-syrup**	*Remelts*	*Sum*	*Massecuite analysis*		*White sugar*	
					calculated†	*found*	*total‡*	*as such*
Grams dry substance on a basis of 100 grams d.s. in thick juice	100	16	49	165				
Brix	64·7	79·5	99			91·8		
K	9769 × 10^{-6}g	986 × 10^{-6}g	558 × 10^{-6}g	11313 × 10^{-6}g	6294 p.p.m.	6250 p.p.m.	48 × 10^{-6}g	59 p.p.m.
SO_2	363 ,,	40 ,,	7 ,,	410 ,,	228 ,,	240 ,,	3 ,,	4 ,,
Lactic acid	4659 ,,	460 ,,	221 ,,	5340 ,,	2971 ,,	2710 ,,	19 ,,	24 ,,
Saponins	63 ,,	6 ,,	6 ,,	75 ,,	42 ,,	37 ,,	0·86 ,,	1·05 ,,
Colour	1·23	0·185	0·14 ,,	1·52	0·85	1·07	0·012	0·015

* The contribution of the non-sugar considered is calculated by multiplying the concentration of the component in question (p.p.m.) by the absolute amount of dry substance in the compound ÷ Brix, e.g. the contribution of K in the white syrup to the total dry substance amounts to $\frac{4930 \times 16,}{79{\cdot}5}$, in which 4930 is the quantity of K found by analysis in p.p.m. on syrup.

† To get the calculated analysis of the massecuite, each total amount of the non-sugar considered must be multiplied by $\frac{91{\cdot}8}{165}$.

‡ The value under total is the amount of the non-sugar considered which goes to the white sugar. The data is calculated by multiplying the white sugar analysis by 0·82, this factor being the proportion of thick juice dry substance which ends in white sugar.

from the point of view of the process. Economics are left out of consideration; they depend too much on the local circumstances. The data in the table give the absolute amounts of the examined non-sugars which are present in the total amount of dry substance. To calculate from the sum of these non-sugars the analysis of the ultimate massecuite, the sum must be multiplied by

$$\frac{\text{Brix massecuite}}{\text{total amount of dry substance}}.$$

A comparison between the calculated values for the massecuite and the experimentally-obtained analysis shows excellent agreement. This is a very good point in favour of the method applied to calculate the quantities[3,4], the sampling and the analytical technique.

As is shown in the last column of Table I, the white sugar obtained is a very reasonable one. Elimination factors derived from Table I for the various non-sugars for the white sugar are presented in Table II together with those for the intermediate boilings. By "elimination factor" we understand the percentage of the non-sugars which goes to the total of white and green syrups.

Table II

Elimination factors of non-sugars in the different boilings

	white	*intermediates*
K	99·6	94
SO_2	99·2	98
Lactic acid	99·6	95
Saponins	98·9	90
"Colour"	99·5	89

The elimination factors for the white product are calculated from the composition of the white sugar and the corresponding massecuite, while the factors for the intermediate crops are calculated from the amount of non-sugars which are introduced with the thick juice, and the non-sugars of the intermediate sugars.

From Table I and Table II we can decide what may be done to improve the white sugar quality. We cannot gain much quality by purging more in the centrifugals in this case. The elimination factors are already very high so that, in the absolute sense, not much improvement can be made by better working in the centrifugal station.

There is not much difference, in the absolute sense, in the elimination factors for the several non-sugars in the white sugar massecuite. Therefore we can conclude that in the first instance the quality of the white sugar is fixed by the quantity of adhering mother liquor. That is why it is so important that as few conglomerates as possible are present, so that the mother liquor can be washed off well and efficiently[2].

The quality of the white sugar is controlled completely by the thick juice. There is no use taking steps to improve the intermediate products as long as all the thick juice goes to the first product.

In the example given the purging is rightly dominated by the wish to work as cheaply as possible. The elimination factors in the intermediate product are low in comparison with those in the first product and, among other things, the factors for colour and saponins are poor. This is not only caused by colour formation during the boiling. Nevertheless the factors in the intermediate products need not be worse than in the first product. By thorough purging in the centrifugals it is possible to obtain the data in Table III which are the elimination factors in the intermediate products for a factory which produces remelted sugars of very high standard. This factory, in fact, introduces part of the thick juice into the second product.

Table III

Elimination factors of non-sugars in the intermediate product by good centrifugal work

K	99·7
SO_2	99·6
Lactic acid	99·7
Saponins	99·0
"Colour"	99·4

[3] HATTINK: *Archief Suikerind. in Ned. Indie Bijlage*, 1928, p. 127.

[4] GOUDRIAAN: *Sugar*, 1954, **49**, (11), 38–41.

Comparing Tables II and III it is seen that the elimination factors are independent of the purity of the massecuite. Also there is not much difference between the several non-sugars.

From these data one thing is certain: recrystallization is a method for general purification. Over the whole series elimination factors lie between 99·0 and 99·7%. Therefore, it is sensible to compare this ancient method with the use of several adsorbents which are at our disposal nowadays.

Three different types of activated carbons and one decolorization resin have been tested in the laboratory. The percolations were carried out in four columns, each 1½ m long and 2 cm diameter, connected in series. All were enclosed in a thermostatically regulated water bath. Each adsorbent was used with the temperature and percolation velocity which were described as optimal by the supplier. In most cases work was continued for 50 hours for one experiment.

None of the examined adsorbents took up ash (K, Na or Ca) or anions (lactic acid). Adsorption of colloidal matter which can be precipitated by alcohol did not occur. The use of these materials is limited to the removal of specific components, which means that they are only adequate to polish the juices and syrups, the purpose for which they are generally used in practice. Two characteristic components which are, in fact, taken up by these adsorbents are colour and floc. Many papers have been published about floc in recent years, but its exact nature is still unknown[5]. The floc is the precipitate which appears on acidifying white sugar solutions. In Dutch white sugar we have never been able to detect floc in this manner. For our experiments we have used the hyamine test of JOHNSON & DIEHL[6,7]. Beet saponins made from raw juice have also been used as a reference. This method with hyamine is, in principle, the same as the method using silver salts[8]. Although one cannot determine floc in white sugar accurately with hyamine, the floc in thick juice and remelts can be analysed fairly well.

Lines A and B of Fig. 1 show the decolorization of thick juice with the granular activated carbons 1 and 2. There is not much difference between these two. Both have the attractive property of decolorizing thick juice.

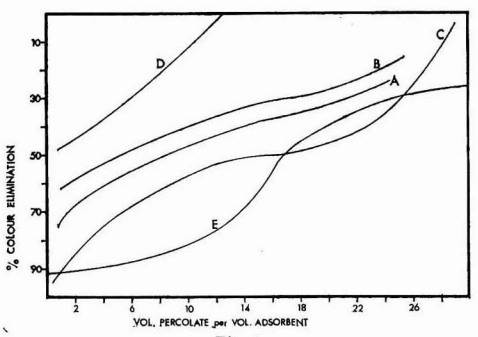

Fig. 1

Line C shows the decolorization by carbons 1 and 2 and line D shows that of carbon 3 on percolating remelted and filtered sugar. As for thick juice, there is no difference between carbon 1 and 2; carbon 3 is not so good.

The absolute quantity of colour which can be taken up depends on the concentration of the colour in the input (Freundlich's law). This is the reason that much more can be adsorbed from thick juice than from remelts, and consequently that the adsorbents can be used first for treating remelts and then afterwards for thick juice.

Line E of Fig. 1 gives the decoloration of a remelt by a weakly basic resin. The resin is better than the carbon, but the volume which can be percolated to a certain break-through is about the same.

Lines A and B of Fig. 2 give the removal of the floc from thick juice by carbons 1 and 2, and lines C, D and E from remelts by carbons 1 and 2 and the resin.

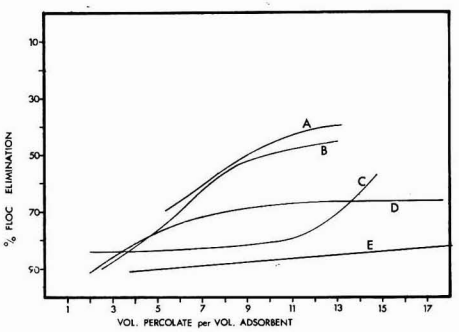

Fig. 2

Comparing the elimination factors of the adsorbents and those obtained by recrystallization, we see that from the process point of view recrystallization is much better.

One consideration is that, by the use of adsorbents, the crystallization rate is increased. Fig. 3 shows the crystallization rate of thick juice from the first volumes of the effluent from carbon 1 and from the fourth, fifth and sixth volumes. Initially, carbon treatment produces an increase, but the crystallization rate of the effluent very quickly returns to that of the intake.

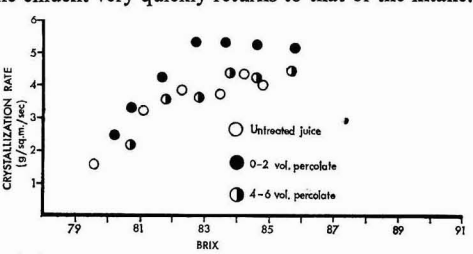

Fig. 3

[5] CARRUTHERS *et al.*: *I.S.J.*, 1961, **63**, 285.
[6] *J. Amer. Soc. Sugar Beet Tech.*, 1956, **9**, 223; *I.S.J.*, 1957, **59**, 257.
[7] *Proc. 12th Session ICUMSA*, 1958, 68.
[8] ROTHER: *Zucker*, 1962, **15**, 186.

(To be continued).

THE DETACHED CATCH-ALL

By L. A. TROMP, A.M.I.Mech.E.

ORIGINALLY the catch-alls did not form an integral part of evaporators or vacuum pans, but were arranged in the vapour pipes to the condenser or between consecutive evaporator bodies.

Although nowadays most vapour-producing apparatus have their catch-alls incorporated in their construction, it nevertheless may be necessary, owing to lack of head room, to fit the detached type.

Among the numerous designs it is possible here to describe only a limited selection, although this should be sufficient to explain the principles involved.

The Hodek Type

This design, shown in Fig. 1, is one of the oldest and its principle is based on deflecting the vapour flow in a zig-zag fashion as indicated. In a cast iron cylindrical shell are arranged three deflector plates and a number of combing baffles, spaced in such a way that drippings can collect in the bottom of the shell.

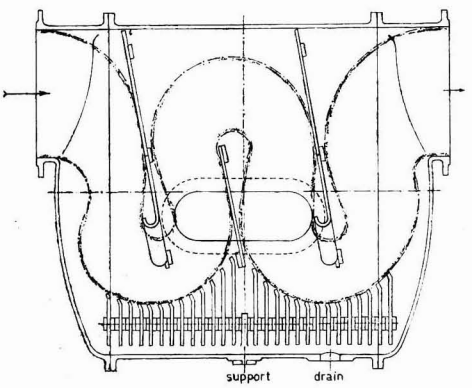

Fig. 1. Hodek type

To start with, it must be stated that the vapour flow does not fill the total area of the passages, but stream-line flow prevails and vapour velocities may be considerably larger than those calculated from the corresponding passage areas.

Moreover, by diverting the direction of flow, the vapour velocities on the convex side will be higher than on the concave side and droplets thus will be thrown out on the former.

On striking the deflectors or combing baffles droplets are collected and drained to the bottom of the body.

These apparatus were not provided with sprays inside the shell and, as a result of evaporation on the wetted surface, the deflectors and especially the space between the combing baffles filled with incrustation.

So as not to allow the collected drippings on the deflector plates to be entrained again by the vapour flow, sloping drain channels discharge them at the periphery of the shell.

This design has been abandoned; apart from its other defects, the heavy weight is of great inconvenience for erection high above the operating platform of the apparatus to which the catch-all was connected.

Grid Type

As a safety collector of entrainment in front of a central condenser, the type as shown in Fig. 2 has been applied with good results. It is composed of a shell, made of steel plate, with three rows of channels, vertically arranged so as to split up the volume of vapour passing through the apparatus, into a number of narrow currents. Owing to contraction between the channels at a the total area of the passage should be about 1·6 times the area of the vapour pipe. So as to avoid short-circuiting, the distance a must be smaller than the width w of the channels and the distance b between the rows of channels should be equal to a to achieve proper deflection of the split vapour flow. Normally the shell diameter $D = 1{\cdot}5d$, where d is the vapour pipe diameter.

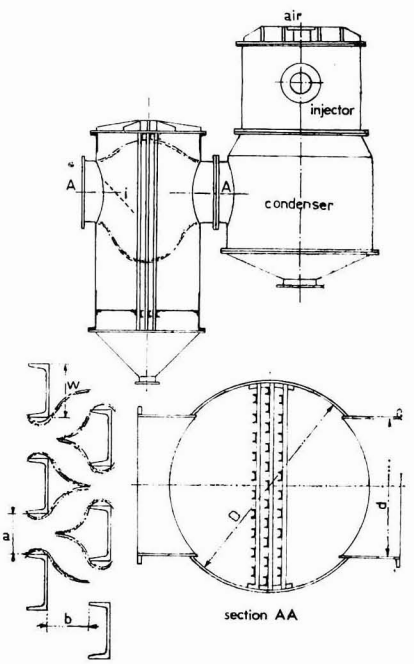

Fig. 2. Grid type

Droplets are skimmed off by the flange corners of the channels. By fixing an inclined baffle *i*, guiding about 60% of the vapour flow downwards, the efficiency of the apparatus is increased, not only since the vapour covers a larger slot area, but also since droplets accumulate on striking the baffle.

The catch-all is supported by a barometric tail pipe for the discharge of the accumulated liquid.

As to the resistance to flow, this could not be measured by the standard type of vacuum meters, it being too small to have any effect on the operation of the linked boiling apparatus.

Nozzle Type

For a horizontal vapour duct, the design as shown in Fig. 3 can be applied in the same way as the previous designs. Its characteristic consists in dispersing the vapour flow to a much higher degree than possible with the grid type, the resistance of flow therefore being somewhat higher, but still to no practical detriment. In the surrounding shell of plate steel are arranged three tube sheets, each with a relatively large number of short pieces of tube. These tubes are located in staggered or alternated fashion, in such a way that short-circuiting is avoided. The vapour flow thus is divided into small sections and, through the deflection of these, there is less danger that droplets will be carried along.

Generally pieces of tubes from 2 to 3 inches in diameter are used, since smaller tubes will increase the cost of the catch-all as well as the resistance to flow without a marked increase in separating efficiency. Contraction is larger than with the grid type and the total nozzle area therefore must be about 1·8 times the vapour pipe area. The distance *s* between the nozzle ends is generally equal to the tube diameter, while the nozzle length should protrude about 1 in on both sides of the tube sheet.

With 3-in tubes at a pitch *p* of 3½ in, the clear tube sheet diameter *D* will lie approximately between 2·5*d* and 2·75*d*.

By arranging a truncated cone *c* at the vapour entrance, a better distribution of the vapour flow is obtained, with the cone inlet $dm = 0{\cdot}7d$ and outlet $Dm = 1{\cdot}4D$.

Sprays of hot water on the entrance sides of the tube sheets will conveniently clean the inside of the apparatus. Steaming-out can also be practised.

Centrifugal Type

The centrifugal catch-all in its first form was developed by KESTNER more than half a century ago as a deflector or spray catcher for his long tube evaporators. On the European continent manufacturers of sugar machinery have applied this design as detached or integral catch-alls for many years, while in the Western hemisphere it has lately been given increasing attention. Principally the design is made up of a stationary impeller, more or less like that used in centrifugal pumps and arranged within an enveloping shell. Droplets are thrown out tangentially and accumulate on the inside of the shell.

The advantage of this design as seen in Fig. 4 lies in the fact that vapour velocities can easily be obtained as demanded and moreover, by decreasing the outlet angle α, the whirl effect can be increased. With a small outlet angle, which requires a longer length of the vanes or blades, a larger striking effect on these is obtained through the centrifugal force, whereas the larger outlet angle with shorter blades has an increased striking effect against the inside shell periphery. On the right hand side of Fig. 4 10 blades are chosen with a passage *c* between these. When *H* is the height between top and bottom plates (see Fig. 5), it easily follows that the total exit area of the impeller will be $A_{total} = 10 \times c \times H$. Because *c* as well as *H* can be chosen as required, great flexibility in designing is available.

Just as with centrifugal pumps, the involute shape of the blades is the natural one for the continuity of flow and the producing diameter Δ_2 with a blade thickness of *x*, can be easily derived from the following equation:

$$\Delta_2 \times \pi = 10 \times (c + x).$$

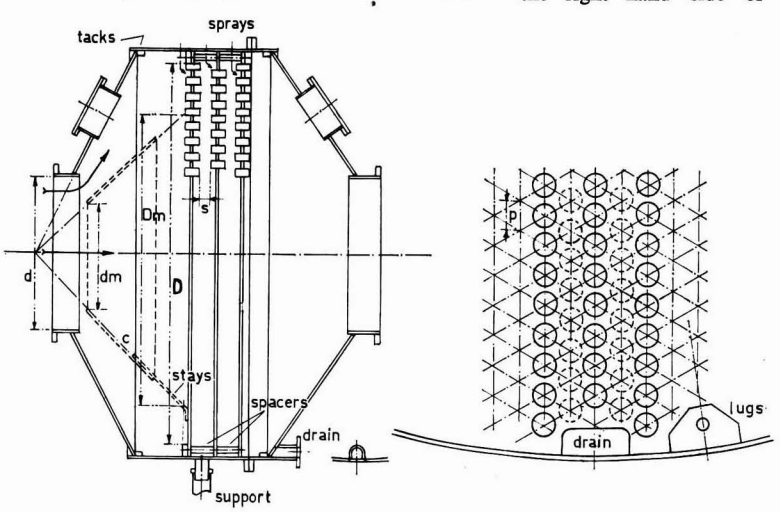

Fig. 3. Nozzle type

The inlet diameter d normally is chosen equal to the vapour pipe diameter, but can be taken differently as conditions of space may require. From Fig. 4 it is easily seen that the inlet angle β is obtained from $\sin \beta = \frac{\Delta_2}{d}$.

Obviously the outlet diameter D_1 is the sum of the inlet diameter d plus the passage c plus the thickness x of the blades, thus $D_1 = d + c + x$ and considering parallel passages, the producing diameter Δ_2 of the involute for the outlet is the same as for the inlet, but the outlet angle α is derived from $\sin \alpha = \frac{\Delta_2}{D_1}$.

The involute can be drawn from e to f, but for convenience is replaced by approximate circular lines.

If it is desired to accelerate the vapour velocity towards the outlet of the passage, the latter can be narrowed, e.g. from c to c_1, as shown by the shaded blades.

For the sake of clarity in the drawing, the involute is developed from the radius O–j, but when c has its centre on the line g–h, the diameter D_2 will amount to: $D_2 = d + \frac{1}{2} c + x + \frac{1}{2} C_1$ from which the outlet angle α_1 can be calculated as: $\sin \alpha_1 = \frac{\sin \beta \times D_2}{d}$.

This angle α_1 differs only slightly from α, but when an increased outlet angle is desired, then the centre of c_1 can be located on the radius O–j, giving a diameter of the producing angle $\Delta = D_2 \times \sin \alpha_1$. Between y and z a diverging circular line must be drawn. The blades will have a greater length and the diameter of the propeller proper as well as the surrounding shell will be increased. When a reduced diameter of impeller and shell is aimed at, the number of blades can be increased as shown on the left hand side of Fig. 4 for 20 instead of 10 blades.

In this way the outlet area of the impeller is doubled, but the blades are shorter, thus giving less skin friction than with the longer blades. Regarding the resistance to the vapour flow, the centrifugal type occupies a favourable position amongst the different designs of catch-alls, even when the vapour velocity is accelerated by narrowing passages. Fig. 5

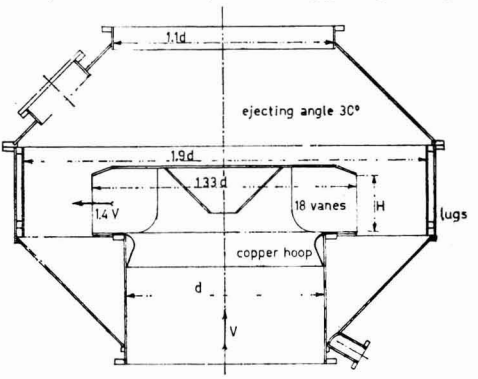

Fig. 5. Centrifugal type—vertical arrangement

shows a centrifugal type catch-all, designed in 1938 and attached to a last body of an evaporating plant. It is of plain construction for vertical vapour pipe arrangement.

With an ejecting angle of 30° a good whirl effect is obtained, whereas vapour velocities when leaving the impeller are normally between 100 and 200 ft/sec.

On the inside of the shell periphery a perforated plate is provided, spaced about 1 inch from the shell, so as to increase the skin friction there and possibly to prevent excessive rebounding of the droplets thrown out.

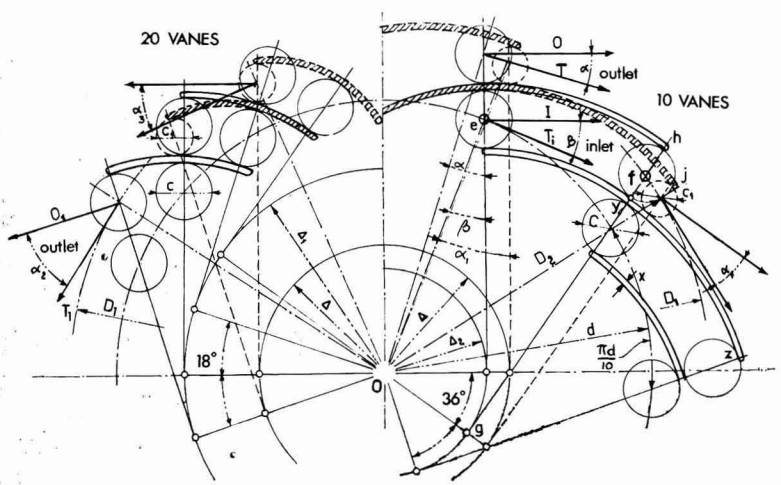

Fig. 4. Involute centrifugal design

Because incrustation may become serious, the perforated ring is often left out and to improve guidance of vapour flow a copper hoop is arranged at the entrance.

When the centrifugal catch-all must be arranged horizontally, the design of Fig. 6 is to be preferred, the impeller being of the cone type. The developed shape of the blades in this case is rather troublesome and requires a projective layout on the drawing board.

With the horizontal arrangement (Fig. 6) the small difference in absolute pressure between the vapour inlet and the outlet must divert the tan-

gential flow towards the outlet pipe. In the cone type the diversion is already initiated within the impeller. This has the advantage that the vapour currents will act more easily as parallel layers which revolve spirally towards the outlet, as shown on the left hand side of Fig. 6. Moreover the drainage of the cone type is improved through its horizontal position.

Whirl Type

When massecuite from the vacuum pans is discharged by gravity through the equipment below, the platform level will be high above the floor and the outlet of the vacuum pan may be above the vapour entrance of the condenser. For this condition a very efficient arrangement is shown in Fig. 7, composed of an inverted cone type centrifugal impeller, surrounded by a double shell.

The ejecting vapour velocity from the impeller may reach 250 ft/sec. or sometimes even more at an ejecting (outlet) angle of the impeller of about 20°. Because the centrifugal force which throws out any droplets of liquid is caused by the vapour velocity V according to the formula: $C = M \times V^2$, in which M is the mass of the liquid-carrying vapour, it follows that the centrifugal effect is increased by smaller diameters of the impeller and the surrounding shell. The vertical component of the vapour velocity at about 120 ft/sec can be used to determine the shell diameters D_1 and D_2 with good results. Through the spiral and helical flow, good protection is obtained against so-called "gushers", i.e. the spouting of sugar-laden liquid when a drink of low density is given to a filled vacuum pan having only a small vapour space above the massecuite level.

Safety Vessel

In some instances the design of the catch-all of a vacuum pan does not give sufficient protection against entrainment, owing to the low level condenser and too small a vapour space for fast boiling. A safety vessel as shown in Fig. 8 is justified in such a case and for the relatively small distance between the vacuum pan and the condenser, the outside shell diameter can be dimensioned at $D = 2d$, where d is the vapour pipe diameter.

The vapour pipe is cut for half its diameter over a length h = approx. $1{\cdot}2d$ and baffles g are also provided so as to throw out any liquid towards the inner shell periphery.

Owing to the venturi effect, there is only a tiny loss in absolute vapour pressure when the passages x have the same area as the vapour pipe.

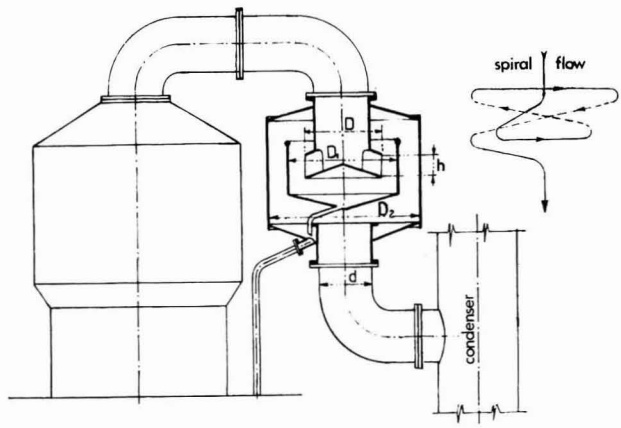

Fig. 7. Whirl type

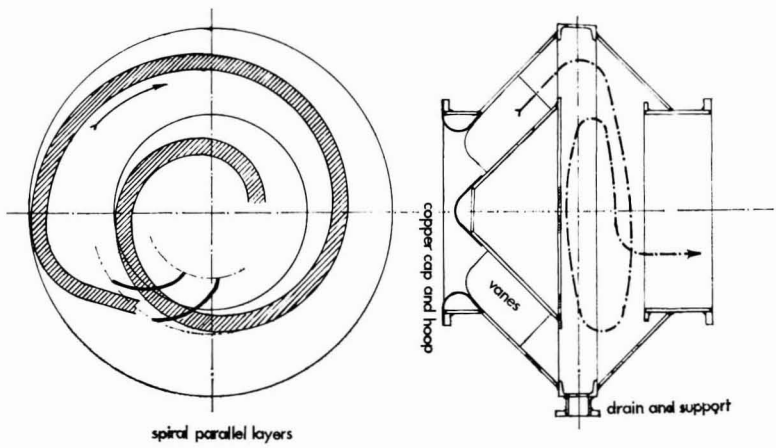

Fig. 6. Centrifugal type—horizontal arrangement

For observing the flow of the entrained liquid an observation vessel *T* with bilateral sight glasses and a capped overflow pipe inside can be conveniently arranged, allowing samples to be drawn off and analysed for sugar.

Because the entrained liquid may be returned to process, the outlet of the observation vessel should be connected to a cylindrical tank under vacuum, which can be emptied periodically.

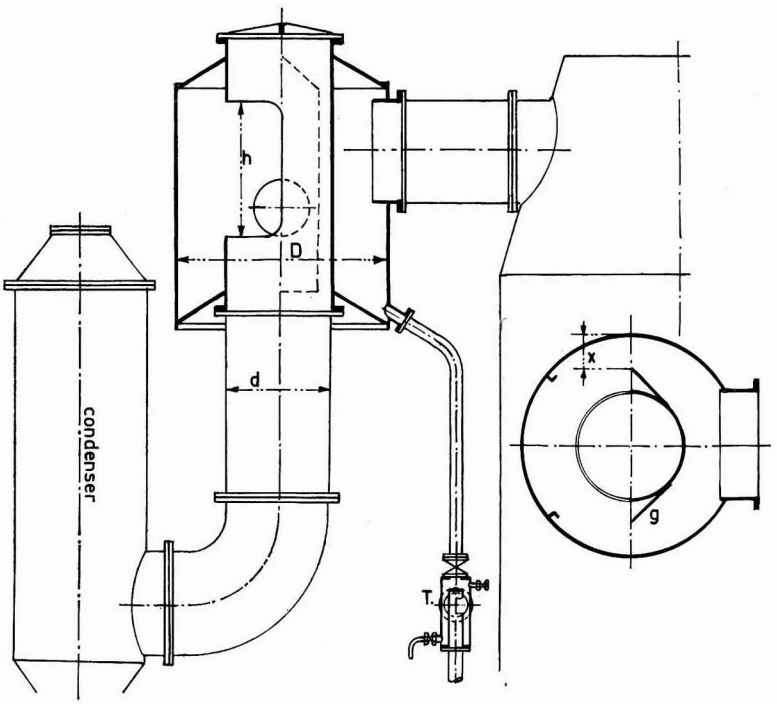

Fig. 8. Safety vessel

ATOMIC ENERGY IN AGRICULTURE[1]

THE first international conference on the peaceful application of atomic energy took place in Geneva in 1955 and resulted in a committee being set up in Holland the following year to investigate the possibility of using atomic energy in agriculture. This committee advised the establishment of a special institute at Wageningen in Holland—to be known as the Institute for Atomic Sciences in Agriculture (I.T.A.L.) now nearing completion. It consists of the main building, an isotope wing, a radiation building and a complex of glass houses. The reactor, the pump house and a few other additional buildings stand apart.

This reactor is the first in the world to be specially designed for agricultural application. Under the reactor is space where plants and animals can be exposed to adjustable quantities of neutrons per time limit, or if so desired for several consecutive months. Temperature, light and humidity may be controlled, simulating tropical conditions if need be.

In the isotope wing plants and animals may be treated with many kinds of radio-isotopes. This may be used as an internal radiation source or as a tracer which makes it possible to trace processes in animals or plants.

It may well be that as these facilities are developed and perhaps applied to such plants as sugar cane and sugar beet great advances in fundamental knowledge of these plants and their physiology will be obtained.

[1] *Nederlands Information Bureau.*

SUGAR HOUSE PRACTICE

R3½m. expansion project for Sezela factory. ANON. *S. African Sugar J.*, 1964, **48**, 109–111.—Among the new equipment to be installed as part of an expansion programme to raise the sugar production to 125,000 tons per annum is a 5-mill tandem designed by Walkers Ltd. of Australia and partly manufactured in South Africa. Each mill will have a two-roller pressure feeder with a hydraulically-loaded delivery roller. Two sets of electrically-driven cane knives and a Searby shredder will also be incorporated. The turbine-driven tandem will be remote controlled and will, with an existing tandem, raise the factory capacity to 330 t.c.h. The remainder of the new equipment includes boilers, a steam accumulator, electric plant for the boiler house, juice heaters, a Dorr clarifier, evaporator and vapour cell, four vacuum pans with semi-floating calandrias, sixteen crystallizers, sugar dryers and two batteries of Broadbent automatic centrifugals—four each for *A* and *B* massecuites.

* * *

Modernization and expansion of Pongola factory. ANON. *S. African Sugar J.*, 1964, **48**, 113.—Details are given of the extensions and new equipment planned for the 1965/66 season. The automatic bagasse handling plant will be the first of its kind in South Africa. Also included in the list are two new Broadbent automatic centrifugals, juice heaters, a 20 tons/hr sugar dryer, crystallizers, a vapour cell and a boiler.

* * *

Progress and development in melt-sulphitation refining at Umfolozi. J. D. THUMANN. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 38–41.—Information is given on the continuous sulphitation unit in the refinery section. SO_2 and milk-of-lime are added to the 69°Bx raw sugar melt in the first of two vessels to give a pH of 8·9, while further amounts are added in the second vessel where the pH is adjusted to 6·9–7·0. Some mechanical difficulties and their remedies are noted.

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Steam consumption tests on vacuum pans. G. N. ALLAN. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 42–46.—At Umfolozi the steam consumption in the *A* and *C* massecuite and refinery massecuite pans was determined by a specially sited condensate level recorder. The results are given in graph form and are discussed.

* * *

Electrically driven cane carriers. D. L. HUGHES. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 59–61.—A slipring motor controlled by a six-notch contactor panel which is regulated by a killer plate sensing the blanket of cane entering the crusher is used as main carrier drive, a similar drive being used for the auxiliary carrier but controlled by the requirements of the main carrier feeding the main cane knives and crusher. Cane on the auxiliary carrier passes through equalizer knives, overloading of which is prevented by load sensing relays, and onto the main carrier which travels at the same speed as the auxiliary carrier. The cane depth is sensed by a killer plate which stops the auxiliary carrier when sufficient cane is on the main carrier. A gap is allowed behind the cane at each operation of the killer plate to allow the cane to spread out on entering the cane knives. If a gap occurs in the cane on the auxiliary carrier, a photo-cell speeds up the carrier.

* * *

The bulk sugar terminal being constructed at Maydon Wharf, Durban, for South African Sugar Terminals (Proprietary) Limited. J. DE K. BOSCH. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 49–58.—See *I.S.J.*, 1964, **66**, 156.

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Mutual Milling Control Project. Progress report No. 2. E. J. BUCHANAN, K. DOUWES DEKKER and A. VAN HENGEL. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 62–70.—Average milling data from Natal factories for the 1962/63 season are discussed. The best performance was obtained where two knives followed by a shredder preceded the first mill. The larger mills achieved high efficiencies. While efficient imbibition is important, high rates are not necessary. First mill efficiency should be high and the final bagasse moisture low. Mill ratios of about 2 and feeder ratios of about 6 help raise milling efficiency. The average lost absolute juice % fibre is claimed to be nearly the lowest in the world.

* * *

Report on a tour of the Queensland sugar industry. A. VAN HENGEL and F. A. KRAMER. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 71–100. Certain aspects of Queensland factory practices, particularly milling, are described in detail and discussed following a tour of Queensland factories by the authors. The techniques are compared with those used in South Africa.

* * *

Calculation of mill settings. G. G. ASHE. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 101–107. A simple method of calculating approximate mill settings is described with the aid of a worked example and a summary of required data. The method assumes a fibre s.g. and sucrose s.g. of 1·35 and 1·55, respectively, and is based on calculation of cane and bagasse volumes from the sucrose, fibre and water percentages. The author assumes a set opening 75% of the calculated opening, this compensating for reabsorption. In a subsequent discussion the method is criticized and preference generally shown for the S.M.R.I. formula.

Improving the cane knives. D. J. L. HULETT. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 108–112.—Difficulties encountered with the cane knives at Triangle sugar factory were caused by the type of cane peculiar to Triangle Estates. After some attempts to remedy the situation, a new heavy duty set of primary knives was designed and installed. Details of the primary and secondary knives are given and factors affecting the performance are considered.

* * *

Continuous centrifugals at Central Guánica. R. R. NAZARIO. *Sugar J.* (La.), 1964, **26,** (9), 26–30.—At Central Guánica conventional centrifugals were replaced with Silver-Hein, Lehmann conical continuous centrifugals for *C*-massecuite curing. Comparative results (in graph form) show that although final molasses purity was slightly higher with the conical centrifugals, the sucrose losses to molasses were slightly lower.

* * *

Investigations into the cause of filtration difficulties (excess of mud). G. H. M. SPORIDI. *Zeitsch. Zuckerind.*, 1964, **89,** 121–131.—Filtration difficulties at Wonji sugar factory (Ethiopia) were investigated. No relationship was established between filter-press efficiency and cane lipoid content and only a very slight one between filter mud lipoid content and filtration rate at 87·4°C. No improvement was observed in the size and structure of the mud particles nor in conglomeration of the smaller particles nor in filtration rate when flocculants were added. No relationship was found between raw juice phosphate content and filtrability while the effect of the P_2O_5 content on clarification and settling was limited. No connexion was found between total acidity and filtrability. Analysis of filter mud samples showed that filtration was not governed by the lipoids, SiO_2, Fe_2O_3, CaO and MgO contents at the concentrations studied. Some connexion was, however, established between juice protein content and filtrability, but on the basis of differences in mud protein content over two campaigns it is assumed that only one or more specific groups of proteins cause mud excess and impair filtration.

* * *

Analysis of the modern three-massecuite system. J. A. CLARK GARCÍA and F. GARCÍA LOPEZ. *Nuestra Industria Rev. Tecnol.* (Cuba), 1962, **1,** (3), 21–24; through *S.I.A.*, 1964, **26,** Abs. 5.—A flow diagram of the modern (Webre-Mayoral) system is shown for apparent purities of syrup and molasses of 85 and 33 respectively. The main features are (a) slurry seeding and graining to produce sufficient footing for 3–9 final massecuites, which is stored in graining crystallizers or pans, (b) boiling 1st and 2nd massecuites on a magma of 3rd sugar, (c) feeding the final massecuite with syrups of decreasing purity. Results of calculations are tabulated comparing the performances of modern systems and the classical system. The modern system is significantly superior in total massecuite volume (~10% less), dilution water volume (~26% less) and steam consumption (~8% less), and improves in efficiency with the number of final massecuites per seeding. A system in which six final massecuites are developed in three stages is recommended[1].

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Affination of cane raw sugar at low temperatures. I. F. ZELIKMAN and D. M. LEIBOVICH. *Izv. Vysshikh Ucheb. Zaved., Pishch. Tekhnol.*, 1963, (3), 50–53; through *S.I.A.*, 1964, **26,** Abs. 26.—Affination experiments were carried out on 100 g portions of a raw sugar (98·7 purity, 0·2% moisture) which were mixed with varying amounts of 1st or 2nd recovery massecuite run-off syrup of 68–80°Brix. The magma was stirred at 30 or 40°C for 30–60 min and was then centrifuged and washed. Yields of affined sugar of up to 150% on raw (before washing) or 137% (after washing) were obtained when highly supersaturated syrups were used in the magma, in amounts of up to 150% on raw. The quality of the affined sugars obtained in high yield was not greatly different from that normally obtained. The following procedure is recommended to obtain a 100% yield of affined sugar (after washing with 3% of water on magma): add 1st product green syrup at 74°Brix, pre-heated to 80°C, to bring the magma to 87–89°Brix, and affine at 30°C. Second product green syrup, contain- a higher proportion of reducing sugars, is suitable for affining yellow recovery sugars.

* * *

A modified defecation process for making plantation white sugar. R. H. TSENG. *Taiwan Sugar Quarterly*, 1963, **10,** (4), 12–16.—The modified process consists in heating mixed juice to 103°C, liming to pH 7·5–8·5, adding phosphate where necessary, and 1–3 p.p.m. "Separan AP-30" settling agent. After clarification and evaporation the syrup is boiled to a 1st massecuite which is cured, giving a high purity raw sugar. This is affined and melted to give a 65°Bx remelt syrup which is sulphited to pH 5·5–5·8, filtered and the syrup boiled to give a white sugar. The molasses from the centrifugals is boiled as 2nd massecuite to provide seed for the 1st massecuite, the molasses from this product being boiled as 3rd massecuite to give a 3rd sugar used as seed for 2nd massecuite. The white sugar pol is 99·8 compared with 99·5–99·9 in a carbonatation factory and 99·4–99·6 in a sulphitation factory.

* * *

Efficient operation of a quadruple evaporator. M. N. RAO. *Indian Sugar*, 1964, **13,** 605–607.—The need to maintain optimum juice levels in evaporator effects is emphasized and the effects of too low or too high a juice level are discussed. At one sugar factory difficulties connected with irregular juice levels, etc. were overcome by filling only 3 of the 4 compartments of a Graver clarifier with juice, using the 4th compartment as a buffer in the event of stoppages or limited juice withdrawal. The average Brix was maintained at 63–65° with an occasional rise to 70° and a saving in steam and fuel was achieved.

[1] CLARK & GARCÍA: *Bol. Ofic. A.T.A.C.*, 1960, **19,** 339–340.

Power transmission trends. D. E. MOSELY. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 17–21.—The fundamentals of power transmission are considered from the point of view of belt drives and dealing with such factors as load life, horsepower-torque relationship, belt strength, arc of contact and the flexing factor.

* * *

The computer as an industrial engineering tool. A. E. STORY. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 59–61.—Possible applications of computers in the sugar industry are suggested with mention of examples in the industry where monetary savings have resulted.

* * *

Pan control survey. W. S. HAINES. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 66–70.—In 1963 a rather lengthy questionnaire was sent to each Hawaiian factory and all but one were returned giving details of the pan station and boiling techniques and the instrumentation and automatic controls used. The data have been summarized and are presented in two tables.

* * *

Silver continuous centrifugal tests—Puunene 1962–63. W. S. HAINES. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 91–101.—Details are given of tests with a Silver-Hein, Lehmann continuous centrifugal used for low-grade massecuite curing. The molasses and sugar purities obtained were slightly lower than those obtained in a batch machine. It is suggested that the lower molasses purity results from passage of fine crystal·KCl into the molasses compartment, although on the same basis there is need for attention to grain size uniformity to avoid sugar losses in the same way. While steaming of the molasses compartment had indicated the possibility of reducing molasses purity, it also caused corrosion of the austenitic stainless steel basket and monel baskets are to be provided by the manufacturers. Problems concerned with screen openings and basket slopes and with charging are discussed.

* * *

The steam cleaner as a maintenance tool. W. F. MALSBARY. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 102–107.—The mode of operation of the vapour type and hydraulic pressure type of steam cleaner is described and applications of both types are discussed.

* * *

Hodag CB-6 evaluation. E. L. LUI. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 125–132.—In tests at Hutchinson Sugar Co. Ltd. Hodag "CB-6" surface-active agent[1] reduced the pan boiling time for *A*, *B* and low-grade strikes, giving better circulation and heat transfer and increasing massecuite fluidity. It reduced the raw sugar colour and raised the filtration rate, reduced scale formation in the pans and generally permitted easier boiling. The moisture and ash content of the raw sugar was reduced and the pol raised slightly.

* * *

Cyclone separation of solids from washer water at Oahu Sugar Company Ltd. R. W. PETERSEN. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 168–169. Hydro-separators proved more efficient than cyclones in the removal of solids from cane cleaner water, but the difference did not outweigh the extra cost (double that of the cyclones) since the particles in the cyclone effluent were of such a size that they would not settle out if the carrying fluid were kept moving. Moreover, the cyclone installations were much more compact and there was no obnoxious odour. Details are given of the Krebs D10B cyclones installed which have an efficiency of 70–75% mud removal.

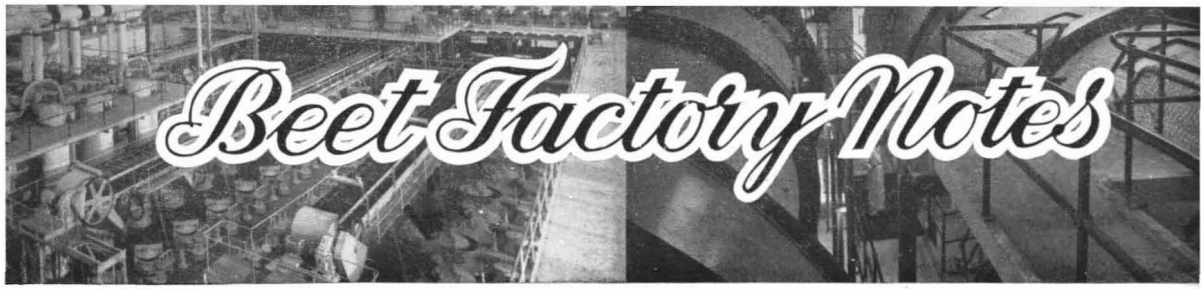
* * *

Automatic controls on the cleaning plant at Hamakua Mill Company. W. E. BLOCKLEY. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 170–172.—The cascader supplying cane to the cleaner has a two-speed motor, the automatic control system of which is described. It includes two jets of water placed a certain horizontal distance apart and crossing from one side wall of the cascader to the other, the water striking two screens through which it passes into two compartments and down through ports in the conical bottom to small conical-bottomed open-ended tanks. These are attached to rocker arms to which are also fixed mercury tilting switches. If either jet is interrupted by cane for 5-15 sec the arms pivot so that the switch reduces the cascader speed and if both jets are interrupted the motor will stop after the cane in the velocity bath has been removed. After a jet has been restored for 2–3 sec the cascader re-starts. The water is supplied from a constant level tank connected to the cleaner water supply near the top of the cascader. If the water supply fails, the controls stop the unit. Uniform feed to the cascader is maintained by interconnecting a two-speed drive on the cleaner carrier so that it follows the cascader speed changes. Installation of the above controls has raised cleaner efficiency.

* * *

Cane cleaner automation in the Hawaiian sugar industry. A. S. LLOYD. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 173–177.—Automatic start-stop controls on cane cleaners in Hawaiian factories are discussed and a description is given of the Westinghouse COD relay which ignores momentary peaks and responds only to continuous loads of significant duration. Modifications to control systems involving the COD relay and the carding drum motor, whereby the carrier is not stopped but runs at low speed for a set time, are described. Other devices for automatic control systems are briefly mentioned and the advantages of the water jet scheme described in the previous abstract are discussed.

[1] Manufactured by Hodag Chemical Corp., Skokie, Ill., U.S.A.



Fundamental principles and technical processes of the extraction of sugar from pulped beet. F. SCHNEIDER, E. REINEFELD and D. SCHLIEPHAKE. *Chem. Ing. Tech.*, 1963, **35**, 567–576; through *J. Sci. Food Agric. Abs.*, 1964, **15**, i–98.—The theoretical aspects of sugar extraction from beet pulp and the essential design features of the various types of plant are discussed in detail with 32 references to the literature. Characteristic functions are derived for different extractors and referred to a common extraction formula so that various processes can be compared. Mode of operation, efficiency, yield and costs are considered.

* * *

Removal of coloured substances in the sugar industry. V. VALTER. *Sborn. Praz. Vys. Skol. Chem. Technol. Potravin. Technol.*, 1962 (1964), **6**, (1), 339–349; through *J. Sci. Food Agric. Abs.*, 1964, **15**, i–202.—The use of ion-exchange resins was investigated. Removal of coloured substances (based on *m*-phenylenediamine) by "Wofatit E" was 30% higher than that attained by "Ionex 1A" or "5A", which were equally active. "Centranol W 291" was unsuitable as it required intense acid activation. On the plant scale, sugar juices were successfully decolorized and deodorized; the product was of good quality.

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Formation of coloured substances and its prevention in sugar production. K. Čížˇ. *Sborn. Praz. Vys. Skol. Chem. Technol. Potravin. Technol.*, 1962 (1964), **6**, (1), 349–355; through *J. Sci. Food Agric. Abs.*, 1964, **15**, i–202.—Contents of coloured substances in sugar juice resulting from tower diffusion, drum diffusion and the Robert diffusion battery were compared. Tower diffusion yielded the best quality juice. More pronounced darkening resulted from pressure and vacuum pan concentration when decreased amounts of lime were used in clarification.

* * *

Effect of the number of crystals on the exhaustibility of final product massecuite intercrystalline molasses. I. N. AKINDINOV. *Sakhar. Prom.*, 1964, **38**, 250–253. Artificial low-grade massecuites of 35% and 28% crystal content were made up from sugar of known grist and intercrystalline molasses of known composition and were subjected to crystallization in thermostatically-controlled vessels in a rotating rack for 30 hr during which the temperature dropped from 79° to 40°C. Comparison of composition data for the two massecuites shows that increasing the crystal content by 8·5% at the start of crystallization reduced the intercrystalline run-off-purity (at the end of crystallization) by 1·49 units (from 57·66 to 56·17) and the true supersaturation by 0·08 from 1·11 to 1·03. To reduce the viscosity when the crystal content is increased, the massecuite should be centrifuged when the crystal content reaches 42–48% in the crystallizer to remove only the excess crystal.

* * *

Reconstruction of elevated beet bins. A. A. BORISOVICH and L. P. SOFRONYUK. *Sakhar. Prom.*, 1964, **38**, 255–256.—The sloping sides of beet bins at a sugar factory were made vertical and the water nozzles on the floor of the bins re-arranged. The flume cross-section was modified so that the upper part was wider, thus reducing silting.

* * *

Mechanical devices for collecting impurities from flume and wash waters. B. M. SHAKHNOVICH. *Sakhar. Prom.*, 1964, **38**, 257–259.—Two devices for pre-treatment of flume-wash water before hydrocyclone purification are described. One is a rotary screen which has worked satisfactorily despite certain defects which are listed; the other, already described[1], is considered to have no defects. A further screen device with mechanical rakes has proved unsuccessful.

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Complete automation of carbonatation. V. P. LYSIKOV and A. G. RUDENOK. *Sakhar. Prom.*, 1964, **38**, 260–264.—The juice level in a tank adjacent to the 1st carbonatation vessel is automatically maintained at an optimum (one-third of its height) and the empty portion is used for pre-limed juice when juice withdrawal (1st carbonatation juice and limed juice for recirculation) is interrupted. Milk-of-lime flows through the bottom of a constant head chamber and is split into two parts by a deflection plate, the angle of which is regulated by an electric impulse of an intensity proportional to raw juice flow and inversely proportional to the milk-of-lime CaO content. One part of the milk-of-lime is thereby returned to the lime station, while the remainder flows via a chamber where the level is regulated by a diaphragm with a weir to a density meter (differential pressure type) which maintains the s.g. within the limits 1·10–1·22. The juice level in the 1st and 2nd carbonatation vessels is controlled by a simple overflow tank for each vessel, the 1st carbonatation overflow tank also housing a pH control which actuates a gate valve in the CO_2 pipeline to the 1st carbonatation vessel. The control is supplemented by an optico-acoustic gas analyser for determining the CO_2 concentration.

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The effect of foaming of low-product massecuite on molasses viscosity and exhaustibility. K. WAGNEROWSKI, D. DABROWSKA and C. DABROWSKI. *Gaz. Cukr.*, 1964, **72**, 33–38.—See *I.S.J.*, 1964, **66**, 196.

[1] NEVEDROV *et al.*: *I.S.J.*, 1962, **64**, 273.

Cleaning beet on unloading-piling machines. V. A. NOVIKOV, N. M. KICHIGIN and V. S. YATSENKO. *Sakhar. Prom.*, 1964, **38**, 266–271.—Details are given of tests carried out with six different beet pilers, the cleaning equipment of which falls into four categories (roller conveyors, rotary disc conveyors, side wheel conveyor having a horizontal section followed by a sloping section, and a combined roller and side wheel conveyor). Apart from the removal of dirt adhering to the beet, the tests also determined the removal of free dirt, trash and other impurities and the extent of damage to beet, as well as optimum speeds of the cleaners and the amount of beet removed with the impurities. The results are discussed in full with the aid of graphs.

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Saving electric power at sugar factories. B. I. BULGAKOV. *Sakhar. Prom.*, 1964, **38**, 274–276.—A sugar factory power distribution scheme in which live steam is added to the turbine exhaust steam used to heat an evaporator is compared with, and found to be more efficient than, a scheme in which the exhaust steam is fed to a condenser system in which circulation water fed to the condenser is cooled by a surface cooler. A reducing-cooling unit is used to prevent any fall in the amount of exhaust steam below the factory steam requirements. The calorific values of various fuels and their effect on the fuel consumption of a power plant are discussed.

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The physical condition of the environment during sugar beet storage in piles. M. Z. KHELEMSKII and N. T. POEDINOK. *Sakhar. Prom.*, 1964, **38**, 283–287. Tests were carried out to determine the effects of temperature, relative humidity and CO_2 content on piled beet. Without forced ventilation, differences between temperature throughout the height of a pile increased with the height, no variations being found in small piles. With protective layers of low-porosity material the temperatures in various zones differed radically. Trash and leaves increased the temperature considerably. The relative humidity increased with height, although at the bottom of a pile there was little difference. Soil and green material caused considerable increase in R.H. The CO_2 content in beet piles also increased with storage of leaves and trash, but was fairly uniform throughout the pile height, as was O_2, while atmospheric conditions had a marked effect, the initial CO_2 content falling by 25–30% in a strong wind. The CO_2 content was considerably increased by a protective layer of ice.

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Cleaning filter-presses. L. P. SOFRONYUK. *Sakhar. Prom.*, 1964, **38**, 293.—Scale formation on plates and frames is inhibited by applying a permanent coat of a mixture made up from 1 part natural drying oil, 3 parts cup grease and 1—2 parts pulverized graphite. Any scale that does form is easily removed. Scale is removed quickly from the nipples by applying a flame.

* * *

Beet sugar refining with ion exchange. B. N. DICKINSON. *Sugar y Azúcar*, 1964, **59**, (4), 61–62.—The economics of ion-exchange treatment of 2nd carbonatation juice are discussed and compared with those of conventional treatment, and the overall gains possible are given according to the net price of refined sugar and the net value of molasses. Details are given of a multi-bed ion-exchange plant in which 2nd carbonatation juice at 95°C is cooled in a four-stage evaporator to 8°C while the vapour from the first three stages is used to heat deionized juice from 15°C to 65–67°C. The untreated juice is then fed at 10°C to a system comprising three beds of "Duolite C-25" and four beds of "Duolite A-7" resin. The apparent purity is thus raised from 88·72 to 98·00 and the colour reduced from 24 to 0·8°St, 92% of the nitrogen being removed. Application of the scheme to dilute molasses (21–22°Bx) and cane juice is mentioned.

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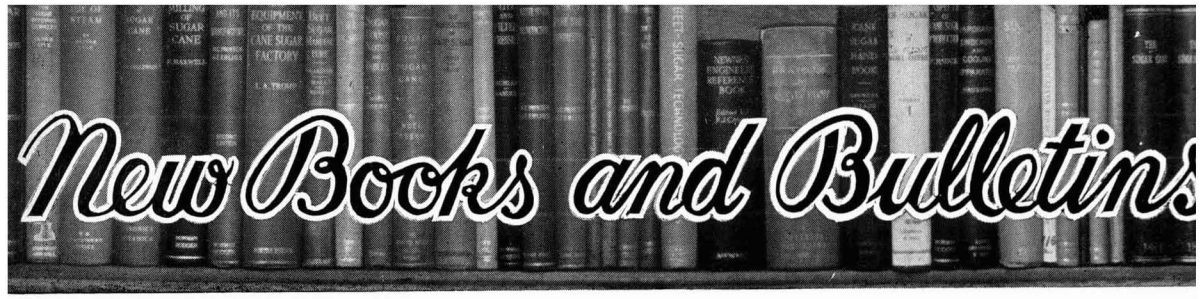
Dependence of the coefficient of diffusion of sugar in beet on temperature and concentration. V. M. LYSYANSKII. *Sakhar. Prom.*, 1964, **38**, 328–335. Diffusion tests without extraction liquor were carried out in which two laminar cossettes of different pol and Brix, previously cut into 0·7–1·0 mm slices, were pressed together in a special compartment after heating to a given temperature. The initial concentrations were adjusted by heating *in vacuo* at 65–70°C in juice or water of suitable concentration. After diffusion, the cossettes were squeezed in a special press to yield residual juice. The diffusion coefficient was found to depend on three factors: tissue structure, concentration and temperature, the last having the greatest influence. The relationship between diffusion coefficient and temperature was found to be linear over the range 20–80°C. The values obtained approach more closely the values given by the Einstein formula for diffusion in pure sugar solutions than do values given by BRÜNICHE-OLSEN and other workers. Deviations between the data in the literature and present values are attributed to further possible intensification of diffusion under factory conditions. In tests to determine the effect of concentration on the diffusion coefficient, it was found that the coefficient had a greater value in the region of low concentration than in the high concentration region; but this difference became substantial only above 50°C. At 65–80°C there was no noticeable change in the diffusion coefficient in the high concentration regions. Thus, in the tail section of a diffuser the temperature factor may have a considerable effect on performance, while in the head section, after the cells have been denatured, a high temperature may have a greater effect in reducing juice purity than in intensifying the diffusion process.



Sugar Year Book 1963. 298 pp.; $3\frac{1}{2} \times 5\frac{1}{4}$ in. (The International Sugar Council, 28 Haymarket, London S.W.1.) 1964. Price: 20s 0d.

This is the 17th edition (not the 16th as given in the introduction) of this extremely useful pocket-size handbook of sugar statistics. The collection of data seems to be growing annually as witness the gradual increase in the number of pages over the last few years. The values for world centrifugal sugar production are given in metric tons and are expressed, where possible, as 96 pol raw sugar. After these statistics, tabulated by countries, come tables of more general information, covering world sugar production, imports and exports, sugar stocks and consumption (absolute and per caput) during 1957–1963, world sugar prices 1961–1963, British Commonwealth Sugar Agreement export quotas 1963 and 1964, United States sugar quotas 1962 and 1963, retail sugar prices 1963 and 1964 and equivalent weights and measures. It would be difficult to conceive of a more convenient form in which these figures could be available.

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Commercial Methods of Analysis. F. D. SNELL and F. M. BIFFEN. 753 pp; 6 × 9 in. (Chemical Publishing Co. Inc., 212 Fifth Avenue, New York, N.Y., 10010 U.S.A.) 1964. Price: $12.00.

This book is a revised edition of the standard work introduced in 1944. During the interval, commercial analytical procedures have varied more in respect of techniques and apparatus than of the basis of the methods, and the authors have therefore reviewed each topic carefully, amending the presentation and illustrations as required, to bring them up to date.

Many of the initial chapters are of general application, covering tools of the analyst, general procedures and preliminaries, micro- and spot tests, pH determination, elemental analysis, etc., while succeeding chapters are of more specialized interest. Those of the most interest to sugar industry chemists are perhaps the chapters on water analysis, coal analysis, and that entitled "Sugar and Sugar Products". This occupies only eight pages, however, and gives the simpler and more common methods, i.e. qualitative detection of sucrose and invert sugar with Fehling's solution, hydrometric, pycnometric and refractometric Brix determination, polarization (with a note on clarification and mutarotation), sucrose determination by polarization and by reducing sugars analysis before and after inversion, and finally approximate polarimetric methods for analysis of commercial glucose. For more detailed methods the reader is referred to the "Official Methods of the A.O.A.C."

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Commodity Agreements and EEC Farm Policy. E. M. H. LLOYD, E. H. WHETHAM, R. M. CAMPBELL and M. G. FORSYTH. 61 pp; $5\frac{1}{2} \times 8\frac{1}{2}$ in. (Political and Economic Planning, 12 Upper Belgrave St., London S.W.1.) 1964. 6s 0d.

This booklet—No. 480 in the series "Planning"—is a study on the contribution which international commodity agreements can make toward reconciling different national policies concerning trade in temperate agricultural products. It is in three sections, the first examining international agreements which have been developed for three commodities—wheat, sugar and tin—and it is concluded that the main difficulties relate to fixing a common price or price range, harmonizing production policies, and reconciling the conflicting claims of economic efficiency with social and political demands of existing producers in states with widely different conditions.

In the second, third and fourth sections are more detailed examinations of three crops, the middle one being sugar, with considerations of the present state of the world market and the development of E.E.C. policies including the recent proposals and their implications. In the fifth section the general problem of agricultural surplus disposal is discussed as is the inappropriateness of considering such surpluses to be disposable by being given to feed the "hungry millions" instead of planned programmes of production "in a coordinated world food plan which would provide for a limited amount of food aid on the basis of what recipient countries can absorb and at the same time maintain sufficient reserve stocks as an insurance against famine and natural disaster."

As regards a new International Sugar Agreement, "it is to be hoped that it will also make some progress towards unifying the price levels at present obtaining in the international and regional markets for sugar. Other aims would be to oblige those member countries whose national producer prices are highest to restrict their own output to its present level, to lower gradually their internal prices, to stop dumping their seasonal or periodic surpluses, and to allow a slow rise in imports from lower-priced sources."

LABORATORY METHODS AND CHEMICAL REPORTS

Method of determining potassium in molasses. L. G. NOTKINA, M. G. GOLUBCHIK and L. M. BALYBERDINA. *Khlebopekar. Konditer. Prom.*, 1963, (8), 17–19; through *S.I.A.*, 1964, **26**, Abs. 54.—The most commonly used gravimetric cobaltinitrite method is known to give results 13–17% too high. The method of L. V. WILCOX, which uses a nitric acid medium instead of acetic acid, has been adapted as follows: dilute 3–4 g of molasses to 100 ml, filter, take 10 ml and add 1·1 ml of 1N HNO_3 and 5 ml of 20% sodium cobaltinitrite (freshly prepared), stir, and leave for 2 hr; filter on a weighed sintered-glass filter, transferring the residue with 0·01N HNO_3, wash 10 times with 2 ml lots of this acid and then 5 times with 2 ml lots of 95–96% ethanol, dry at 105–110°C for 1 hr, cool and weigh. The precipitate contains 17·22% of K. The method was tested and was accurate to $\pm$ 2·5%.

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Salt distribution within a sucrose concentration gradient. K. ONNA and S. GOYA. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 9–16.—The effect of sucrose concentration gradients on the concentration of salts during sucrose crystallization and dissolution was studied using a refined sugar solution (2 g sucrose/100 ml water) and various salt solutions (2 g/100 ml water). Sucrose concentration gradients were produced by three methods: (1) partial mixing of a high density sucrose-salt solution with a low density solution of the same salt:water ratio and subsequent standing of the mixed solutions for 16–20 hr at 30°C; (2) growing Confectioner's Sanding crystals bonded to the inner wall of a 500 ml Erlenmeyer flask and adding a sucrose-salt solution before sealing and standing at constant temperature for a given time; and (3) partially dissolving 50 g Confectioner's A crystals in a salt solution and taking samples on both sides of and close to the diffused boundary formed between the resultant syrup layer and the low density solution. It was found that at 30 and 40°C the amount of NaCl, KCl, $CaCl_2$, $CaSO_4$ and $Ca(H_2PO_4)_2$ per g of water tends to be greater in the region of low sucrose concentration than in the region of high sucrose concentration, whereas at 50°C this pattern was less consistent for Ca sulphate and monophosphate. The apparent non-redistribution of KCl and $CaCl_2$ with very rapid formation of a sucrose gradient may be attributable to a reduction in mobility of the ions with increased viscosity of the syrup systems, so that movement of the salt through a 10-in column as used in the tests could take some time.

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Progress in investigation of colour and filtrability of Hawaiian commercial sugars. C. C. TU. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 22–25.—Two types of colouring matter were found in commercial sugar crystals: that resulting from thermal degradation of reducing sugars (pH sensitive) and that formed by reaction of amino acids with reducing sugars (pH insensitive). More than 80% of the colouring matter in large crystals was removed by washing with methyl alcohol followed by saturated syrup after the crystals had been pulverized, demonstrating that it had been included during crystal growth. Light scattering photometer measurements of the colloidal particles suspended or dispersed in four sugar samples in solutions of 60% solids showed that, for all, the ratios of scattered to incident light at smaller incident angles are much higher than those at larger angles. The ratios for the two sugars from Hawaii were much higher than those from Oahu, especially at the smaller angles, indicating that these sugars contained more colloidal particles. The ratios were reduced by high-speed centrifuging but the Hawaiian sugars still had higher ratios than the Oahu sugars. While filtrability was thus improved, that of the Hawaiian sugars was improved only from sub-standard to standard. A quantitative relationship has been established between the number of suspended particles and filtrability.

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Composition of sugar cane mill juice. L. F. MARTIN. *Rpts.* 1963 *Meeting Hawaiian Sugar Tech.*, 1963, 110–119.—A survey is presented of work carried out in the quantitative determination of cane juice constituents. The value of lyophilization or freeze-drying for juice solids analysis is discussed. Tables are given showing the concentration ranges and average concentrations of salts, proteins, silica, gums, starch, lipids and undetermined constituents. It is shown that about one-third of the non-sugar juice solids comprises substances shown only qualitatively to be present, and not determined quantitatively. The importance of knowledge of juice composition for evaluation of clarification efficiency is emphasized.

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The rheological properties of carbonatation mud. J. CIBOROWSKI, R. RYCHLICKI and S. SIENIUTYCZ. *Gaz. Cukr.*, 1964, **72**, 64–68.—Results of tests are discussed in which carbonatation mud in a tank was forced through a heated tubular extension and the pressure drop across the tube and weight of the mud determined. The effects of such factors as temperature and density on viscous flow are shown in graph form.

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Decomposition reaction of monosaccharides in acid medium. S. E. KHARIN and R. A. KOLCHEVA. *Sakhar. Prom.*, 1964, **38**, 253–255.—On the assumption that the extent of monosaccharide decomposition in acid media depends on the catalytic effect of hydrogen and hydroxyl ions, an equation is developed for calculation of the rate constant K for different pH values. Comparison of curves of log K *vs.* pH obtained for glucose from calculated values and

from experimental data obtained by SMIRNOV[1] shows good agreement, differences being attributed to the dependence of K also on the concentration of water, non-dissociated acid molecules and ions formed on acid dissociation, this being taken into consideration in SMIRNOV's work. Similar agreement was obtained for galactose and arabinose.

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Coloration and colouring matter in sugar juices. H. DAVID. *Zucker*, 1964, **17**, 18–21, 67–73, 90–95. A number of papers read at the 12th General Assembly of the C.I.T.S. in 1963 on the above subject are abstracted and many tables and graphs from the original papers reproduced to give a comprehensive survey of the latest knowledge in this field.

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The effect of the thickness of a layer of solution and concentration of the colouring matter on colour perception. M. KADLECOVÁ and V. VALTER. *Listy Cukr.*, 1964, **80**, 51–58.—Spectral transmittance curves were converted to CIE colour co-ordinates to characterize colour perception. Total attenuation was used as photometric quantity, being defined as $-\log_{10}\frac{Y}{100}$, where Y is the spacial coordinate. This is directly proportional to the thickness of a layer of solution and almost directly proportional to the concentration of the colouring matter. Deviations are connected with the specific properties of sugar colouring bodies, which may undergo structural changes when diluted, and with the spectral transmittance. The compensating wavelength is a linear function of attenuation. The lower the temperature of the light source the redder will be the solution and the smaller will be the increase in the compensating wavelength with total attenuation. The compensating wavelength of Stammer glasses is lower at a given attenuation than that of the solutions measured. Colour perception of sugar solutions is generally different from that given by Stammer glasses. In many cases this difference is attributable to differences in the ability of the observer. Thus, with Stammer glasses it is not possible always to equate the trichromatic coefficients of the glasses and solutions.

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Automatic electronic saccharimeter. M. GRIMBERG. *Zucker*, 1964, **17**, 218–220.—Light from the monochromatic source passes through lenses, a prism, a further lens and a filter to the polarizer and light modulator, for which a Faraday cell is recommended. After the modulator is the sugar cell followed by an electrically-driven rotary plate carrying an analyser. After passage through another lens, the light falls on a photocell (secondary electron multiplier). This is connected to a selective amplifier which receives a sinusoidal signal of modulator frequency and transmits it to the electronic counting device. The reading device consists of light source, converging lens, screen and microscope. The screen is made up of alternately transparent and opaque bands of equal width. The screen image is projected onto a sector, connected to the rotary plate, the bands coinciding with bands on the sector, the number of which equals the number of divisions on the sugar scale. A second microscope projects the screen image onto a photo-cell feeding the electronic counter via an amplifier. Rotation of the plate will result in stronger or weaker light falling on the photo-cell depending on whether the opaque or transparent bands overlap. With each rotation, corresponding to a band width, the counter receives an impulse and indicates one unit on the scale. Counting is continued until the plate reaches a balanced position. A recorder can be attached to the counter. The sugar scale is not standard and corresponds to a sugar solution of 20 g sucrose/100 c.c. water. The instrument has been patented[2].

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Ion-exchange separation and determination of cations in sucrose crystal. K. M. ONNA, G. AKATSUKA and C. C. TU. *J. Agric. Food Chem.*, 1963, **11**, 332–334; through *J. Sci. Food Agric. Abs.*, 1964, **15**, i–100. The Na, K, Mg, Ca, Fe and Al in sugar crystals were determined in the ash by separation on a column of "Dowex 50W X-12" (H form) ion exchange resin. Results are presented for five samples of sugar from different sources.

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The determination of betaine in the vinasses of beet molasses. S. GÖRÖG and E. EZER. *Analyst*, 1964, **89**, 282–285.—Five ml of methanol is added to 0·4–0·5 g of vinasse followed by a further 15 ml after thorough mixing. The solution is filtered and the residue washed with two 5-ml portions of ethanol. The filtrate plus washings are evaporated to dryness and the product dissolved in 15 ml of water. To this solution is added 1·5 ml of 1% acetic acid, followed by 25 ml of 2% sodium tetraphenylboron solution, and the resultant precipitate flocculated by adding 2 ml of 1% aluminium chloride solution. After 5 min the precipitate is filtered off and washed with three 3-ml portions of water. The filtrate plus washings are washed into a 100-ml beaker and 2 ml of saturated oxalic acid added dropwise with vigorous stirring. After agitation and standing for 30 min, the precipitate is washed with three 5-ml portions of 1% acetic acid, dried for 3 hr at 80°C and the residue weighed. The betaine content is given by $26{\cdot}8\,\frac{W}{B}$, where $W =$ weight of the precipitate and $B =$ weight of the sample. Adjustment of the pH is necessary to counteract the precipitation of other compounds with the sodium tetraphenylboron. The method is accurate to $\pm$ 0·5%.

[1] *Trudy Leningrad. Tekhnol. Inst. Pishch. Prom.*, 1958, **14**, 176.

[2] French Patent 1,283,310.

BY-PRODUCTS

The feeding value of molasses. T. G. CLEASBY. *Proc. 37th Congr. S. African Sugar Tech. Assoc.*, 1963, 113–117.—The use of molasses as fodder for ruminants is discussed with reference to work in the U.S. Tests at Tongaat have shown that pig rations can be improved by incorporating up to 10% molasses in the growth ration, 20% in the fattening ration and up to 7½% in the creep feed. Mixing fodder molasses with bagasse pith is also discussed.

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Effect of the addition of small quantities of sucrose to the mixing water of Portland cement concretes. A. LÓPEZ RUIZ. *Quím. e Ind.* (Bilbao), 1963, **10,** 154–158; through *S.I.A.*, 1964, **26,** Abs. 34.—Sucrose (0·06–0·25% on dry mix) was added to the water used for preparing a standard concrete from four cements of varying origin. The properties of the concrete were measured and compared with corresponding values for concrete prepared without sucrose. The sucrose prolonged the setting time of the concrete from <18 hr to 1–4 days. However, the resistance to compression of the concrete containing sucrose after 28 days was up to 50% greater that than of controls. The addition of potassium chlorate (e.g. 0·09% of sucrose and 0·04% of $KClO_3$) shortened the setting time to 20–30 hr without significant reduction in compressive strength. A saving of ~15% of cement is therefore possible. The sucrose is believed to have a "deflocculating" effect on the cement which improves its dispersion.

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Industrial chemicals by fermentation. W. R. D. LEIGH. *Austral. Chem. Processing*, 1963, **16,** (10), 12–16; through *S.I.A.*, 1964, **26,** Abs. 39.—The development and present range of Australian fermentation products, most of which are based on sugar cane molasses, are reviewed. Production figures for industrial alcohol and CO_2 are tabulated. The tendency for fermentation process to be replaced by methods of synthesis from petrochemicals, except where cheap, waste carbohydrate materials are available, is discussed. The acids, solvents, sugars, antibiotics, enzymes, vitamins, growth factors and steroids produced by fermentation in the U.S.A. are listed.

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Cellulose, fodder and yeast industries as plants combined with the sugar factory. J. DE J. URRIBE J. *Bol. Azuc. Mex.*, 1964, (176), 22–25.—Social and economic factors concerned in the establishment of by-product industries—particularly molasses and bagasse and yeast production—are briefly considered.

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Methane gas production. S.S. KUAN and J. C. CHOU. *Taiwan Sugar Quarterly*, 1963, **10,** (4), 17–20.—Anaerobic fermentation of pig manure, cane trash, straw and bagasse on Taiwan Sugar Corp. plantations has yielded 60–65, 160–180, 130–150, and 240–260 cubic metres of methane, respectively, per ton of raw material. Optimum temperature is 40°C and optimum pH 7·0–7·5. The two organisms used are *Bacillus methanica* and *Micrococcus methanica*, the latter producing methane at a very high rate.

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Evaluation of sugar beet molasses of the 1962 campaign, designated for citric acid manufacture. A. ČEJKOVÁ, M. VOJKOVSKÁ and J. RYBÁŘOVÁ. *Kvasny prumysl*, 1963, **9,** 259–262; through *J. Sci. Food Agric. Abs.*, 1964, **15,** i–202.—Samples of sugar beet molasses collected from 24 sugar mills in Czechoslovakia were tested for quality and behaviour in citric fermentation, the testing organism being *Aspergillus niger* K 10. The yields of citric acid amounted to 34·73–72·93% of the sugar introduced.

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Production of lactic acid from sucrose. I. V. KRUMPHANZL and J. DYR. *Sborn. Praz. Vys. Skol. Chem. Technol. Potravin. Technol.*, 1962 (1964), **6,** (1), 111–124; through *J. Sci. Food Agric. Abs.*, 1964, **15,** i–202. Conditions such as pH for obtaining the optimum yield of lactic acid by fermentation with malt sprout or yeast autolysate were investigated. The cost of using pure raw materials was balanced by small losses, minimum use of raw materials and reagents, and simplicity of procedure, 40–50% lactic acid being obtained on treating the Ca lactate with H_2SO_4 to pH 2·2, adding active carbon, filtering, then distilling in vacuum. The yield was 95%.

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Equipment for the manufacture of citric acid. V. NĚMEC. *Czechoslovak Heavy Ind.*, 1964, (5), 11–15. Various aspects of citric acid fermentation of molasses are discussed and equipment manufactured in Czechoslovakia, particularly by the Královopolská works in Brno, is described. Among the equipment is an EON electrostatic precipitator for air treatment and the NOVA filter paper element for use with the precipitator. Purification of the citric acid solution by rotary vacuum pre-coat filters using waste gypsum pre-coat is preferred to centrifuging, the main advantages being reduced water consumption and higher efficiency. Centrifuging, while being cheap, also suffers from fluctuations in sludge volume and losses of citric acid in the thickened sludge. The purified solution is neutralized and the calcium citrate suspension separated on a rotary vacuum filter with string discharge. Difficulties with disposal of the filtrate have been overcome by separating it from wash waters and treating the effluents separately. The concentrated filtrate is thickened to about 40°Bé in evaporators and may then be burnt without additional fuel. The wash waters may be purified chemically and biologically. Mycelium and waste gypsum recovery (the former for use in fodder and fertilizers) is also discussed.

UNITED STATES

(Continuous) Centrifugal. W. DIETZEL and H. HILLEBRAND, *assrs.* BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT A.G., of Braunschweig, Germany. **3,108,067.** 13th September 1961; 22nd October 1963.

The acceleration bowl of the continuous cone-type centrifugal is provided with a screen for separation of molasses while sugar crystals separated continue onto the conical basket which may be in a number of stages of varying angle. The perforated bowl is instrumental in reducing abrasion and damage to crystals which slide on a solid-bowl acceleration chamber.

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Preserving sugar juices. J. CAPDEVILA CUCULLU, of Mayaguez, Puerto Rico. **3,108,907.** 8th January 1962; 29th October 1963.—Cane or beet juice may be preserved for as long as four years after mixing with 0·02 g/gal of salicylic acid (in aqueous or alcoholic solution), filtering if necessary to remove particles, adding volatile essential mustard oil in a proportion of 1·6 g/gal, and sealing the mixture to prevent evaporation of the mustard oil.

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Centrifugal separator. J. JISKRA, *assr.* MASCHINENFABRIK BUCKAU R. WOLF A.G., of Grevenbroich, Germany. **3,114,655.** 16th November 1961; 17th December 1963.—See U.K.P. 943,296[1].

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Citric acid production. D. S. CLARK, *assr.* NATIONAL RESEARCH COUNCIL, of Ottawa, Ont., Canada. **3,118,821.** 10th April 1961; 21st January 1964.

Beet or cane molasses is diluted (maintained at pH 5–8) and a water-soluble ferrocyanide added in excess of that required for complete purification of the seed mash. This excess is brought (by addition of Zn, Cu or Cd) to 10–200 (5–80) p.p.m., the mash inoculated with spores of *Aspergillus niger* and incubated with aeration. A main mash is made by diluting beet or cane molasses, (maintained at pH 5–9,) purified and an excess of ferrocyanide maintained at 10–200 p.p.m. (10–40 p.p.m., <20 p.p.m. for beet molasses; 30–150 p.p.m., > 20 p.p.m. for cane molasses) while inoculating with the seed mash. The mash is aerated for rapid mycelial growth and then oxygenated (at a pressure of 1–1·8 atm) to retard mycelial growth and produce citric acid.

Multiple-stage production of yeast. M. C. H. DELOFFRE, of Luxembourg, Luxembourg. **3,120,473.** 2nd October 1961; 4th February 1964.

The process includes phases A, B and C; phase A comprises preparing a wort containing water, sugar-containing material (e.g. beet molasses) and nutrients, inoculating this with a selected yeast culture and aerating during 11 hr fermentation. In phase B the wort is run into a fermentation tank either with or after approximately the same volume of water to achieve the desired dilution, and diluted sugar-containing material added during about 7 (6, 6½) hr, allowing the yeast to grow as the alcohol content rises and thereafter recedes to about the initial alcohol content at the start of phase B. About 25% of the fermentable sugar is converted to alcohol in phase B until the 4th or 5th hour, when no more alcohol is formed and that present starts to disappear, the final amount being 20–30% of the amount of sugar added in phase B. In phase C sugar-containing material about equal to the total added in phases A and B is added during about 10 hr during which the yeast continues to grow and the alcohol present is substantially completely consumed.

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Manufacturing lump sugar. F. MAGNUSSON, *assr.* AB. SVENSKA FLÄKTFABRIKEN and S. H. MONTÉUS, *assr.* AB. LANDSVERK. **3,122,107.** 28th November 1960; 25th February 1964.—See U.K.Patent 947,600[2].

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Purification of sugar solutions by means of spongy ion exchangers. E. MEIER, *assr.* FARBENFABRIKEN BAYER AG., of Leverkusen, Germany. **3,122,456.** 8th February 1960; 25th February 1964.

Colour is removed from sugar solutions by treating first with a spongy cation exchanger in the H form, followed by a spongy anion exchanger. Both are synthetic heterogeneous cross-linked copolymers, the cation exchanger having sulphonic and/or carboxylic groups attached to a matrix formed by copolymerizing monoethylenic and diethylenic unsaturated monomers in an inert aliphatic hydrocarbon (90:10 styrene: divinyl benzene in white spirit or *n*-heptane; 95:5 methyl acrylate:divinyl benzene in *n*-octane). The anion exchanger carries tertiary amino groups on a similar matrix (90:10 vinyl toluene: ethylene glycol dimethacrylate in *n*-decanol copolymerized, chloromethylated and aminated; 90:10 styrene:divinyl benzene copolymerized in white spirit,

[1] *I.S.J.*, 1964, **66**, 167.
[2] *I.S.J.*, 1964, **66**, 203.

amino-methylated and alkylated). The exhausted anion exchanger is regenerated with alkali metal hydroxide and this then used to treat the cation exchanger which is subsequently regenerated with aqueous mineral acid.

* * *

L-Glutamic acid fermentation. G. M. MIESCHER, *assr.* COMMERCIAL SOLVENTS CORP., of New York, N.Y., U.S.A. **3,123,537.** 25th January 1963; 3rd March 1964.

A L-glutamic acid producing strain of *Brevibacterium divaricatum* (NRRL B-2620) is grown in an aqueous nutrient medium containing a carbohydrate source (e.g. sucrose, molasses, etc.), a K source, a N source and a growth promoter, maintaining a pH of 6–8. The temperature is maintained at 28–33°C until maximum growth of the organism is obtained and then at 36–40°C (38°C) for the rest of the fermentation.

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Sugar recovery process and products. G. SERBIA, *assr.* CENTRAL AGUIRRE SUGAR CO., of Aguirre, Puerto Rico. **3,130,082.** 9th November 1959; 21st April 1964.

Cane juice, syrup or molasses is treated with a cation exchange resin in the ammonium form whereby the Na, K, Ca and Mg cations are exchanged for NH_4. The treated liquor is then processed as usual to give sugar in a greater yield than with untreated liquor, together with a molasses rich in NH_4 ions which may be used as an animal feed ingredient. The resin is regenerated with an ammonium salt solution which produces an effluent containing virtually all the K of the original liquor, and this is of value as a fertilizer.

* * *

Beet thinner. A. H. CASTON, of Calipatria, Calif., U.S.A. and D. COX, of Brawley, Calif., U.S.A. **3,130,795.** 21st August 1961; 28th April 1964.

* * *

Continuous process for extracting pentoses (xylose) from substances containing hemicelluloses (bagasse). L. NOBILE, R. ALLEGRINI and A. POMA, *assrs.* LEDOGA S.p.A., of Milan, Italy. **3,132,051.** 31st May 1961; 5th May 1964.

Vegetable material containing hemicellulose (bagasse) is treated with a solution of SO_2 in a quantity not greater than can be completely absorbed by the material, in a closed vessel, at 60–130°C, for 1–6 hr, whereby the digestion occurs in the substantial absence of a liquid phase. After digestion the material is pressed to yield a concentrated solution of xylose of high purity.

* * *

Process of recovering sugar from plant products containing the same (beet and cane). W. H. STECKEL, of Berlin-Charlottenburg 9, Germany. **3,133,835.** 13th November 1961; 19th May 1964.

The plant products are comminuted to small particles having substantially unaltered cell structures within their interiors and are then contacted with water at 90–100°C, during a series of successive mixing and separating operations carried out for period of 3½–4 min in a counter-current manner with the comminuted material, being initially mixed with fresh water in the last of these operations and then through successive operations, the water being removed after the first separation in the form of a sugar solution. This last separation is by filtration, the pectic substances and solid materials aiding in the formation of a filter-cake. The comminuted material is pressed during this last separation to a thickness of 3½–4 mm and removed in the form of "flakes" containing 25–28% of water and held together by the binding action of the pectic substances present.

* * *

Sugar extraction. E. V. GULBARAN, of Ankara, Turkey. **3,135,631.** 5th February 1962; 2nd June 1964.

Sugar-containing material is reduced to a thickness not greater than 5 mm (beet to 1–½ mm slices or cane to a powder), subjected to (an intermittently varying) pressure of (from atmospheric to) 350–380 mm of mercury (or subatmospheric) for 2–5 (2–3) min, immersed for 2–5 min in water under (subatmospheric) (atmospheric to) 350–380 mm Hg (varying) pressure and at 75–85°C (80°C). The sugar-containing solution is separated from the residue which is treated with more water (at pH 5), percolated through a bed [<20 cm (<15 cm) deep] of the residue, at 75–85°C (80°C) and under (atmospheric to) 35–380 mm Hg pressure, until the residual sugar content is at most 0·4% (0·1%). The sugar-containing liquor is collected (and adjusted to pH 7–8).

* * *

Producing L-glutamic acid. S. OKOMURA, R. TSUGAWA, T. TSUNODA and K. KONO, *assrs.* AJINOMOTO CO. INC. and SANRAKU DISTILLERS CO. INC., of Tokyo, Japan. **3,136,702.** 19th July 1962; 9th June 1964.

Micro-organisms from the group *Saccharomyces bisporus* ATCC No. 14749, *Torula sp.* ATCC No. 14750 and *Brevibacterium lactofermentum* ATCC Nos. 13655, 13869, capable of removing excess biotin from a saccharide material (sugar, molasses, etc.) until the biotin is reduced to 6γ/100 g, are contacted with the material at pH 4–12 and 20–50°C and then micro-organisms capable of producing L-glutamic acid (the same micro-organisms) cultured with the saccharide material and an assimilable N source while agitating under aerobic conditions, thereafter recovering the glutamic acid.

* * *

Cane harvester. J. K. GAUNT and P. C. STEPHENS, *assrs.* MASSEY-FERGUSON (AUSTRALIA) LTD., of Sunshine, Victoria, Australia. **3,141,281.** 28th December 1959; 21st July 1964.

TRADE NOTICES

Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

Babcock bagasse-fired boilers in South Africa. Babcock & Wilcox Ltd., 209 Euston Rd., London N.W.1.

Spreader firing combined with a travelling or dumping grate can be used with the correct furnace to enable full steam load to be obtained when firing with bagasse, coal, wood or oil.

The usual Babcock & Wilcox Ltd. method of handling bagasse (or vegetable waste such as wood refuse) into the furnace is via metering conveyors. An even spread of fuel over the grate is obtained by means of high-pressure air introduced by specially-designed air-swept spouts located low down in the front wall.

When coal is the supplementary fuel, special Babcock-Detroit type feeders for distributing this into the furnace are located close to the grate level. For the bagasse, metering conveyors and pulsating-air swept spouts are placed above, in the front wall. With this arrangement of feeders any reasonable load can be met with varying quantities of either fuel.

If, on the other hand, oil is to be considered as the alternative fuel, the necessary burners can be installed in the side walls, with which arrangement full load output can be obtained.

An alternative method for combined firing of coal and bagasse, utilising the spreader stoker, has been developed by Babcock & Wilcox of Africa (Pty.) Ltd. and applied to a total of eight boilers, with ratings between 50,000 and 100,000 lb/hr, now in operation in South Africa. These boilers are designed for full-load duty, fired either with local coal (c.v.11,500 B.Th.U./lb) or bagasse (c.v. 4120 B.Th.U./lb). Combined feeder hoppers convey coal and bagasse to the feeder mechanism from which either fuel is fed on to the revolving blades of the rotor. The smaller boilers have dumping grates; the larger, a travelling grate which secures continuous ash discharge for either fuel.

Successful operation of these boilers has been followed by contracts for ten more, generally similar, for South Africa including an order from Huletts & Sons for three 100,000 lb/hr boilers and four for 80,000 lb/hr to be installed in four of that Company's mills. Of the ten boilers now ordered, nine will have travelling grates.

* * *

Tramp iron removal from bagasse. Eriez Magnetics, Erie, Pennsylvania, U.S.A.

A suspended magnet, supplied to Oahu Sugar Co., Hawaii, by the International Division of Eriez Magnetics, comprises a highly efficient, electro-magnetic separator situated between two pulleys. A rubber belt revolves around the pulleys and passes over the face of the magnet. This entire system is suspended over the discharge end of the bagasse conveyor belt. It is an "in-line" operation, with the two belts paralleling each other.

As bagasse reaches the discharge end of the conveyor it enters the separator's magnetic field so that tramp iron is picked out magnetically. Tramp iron clings to the moving belt of the magnet for automatic discharge into a separate bin. The removal of tramp iron from the shredded fibres eliminates jamming of the feeder and damage to boiler tubes.

The magnet itself employs an advanced type of oil-cooling. Its coils are space-wound and it is completely filled with transformer oil, making possible the necessary constant operating wattage and providing great magnetic strength without danger of coil failure or burn-out.

* * *

New "High Accuracy" Rotameters. Rotameter Manufacturing Co. Ltd., 330 Purley Way, Croydon, Surrey.

The "High Accuracy" series of individually calibrated glass tube Rotameters have an extremely high accuracy of performance and are particularly appropriate for laboratories and other test purposes. They provide flow measurement within the limits 0·5 cc/min to 3000 gal/hr of water at 20°C and 2 cc/min to 6000 cu. ft./hr of air at N.T.P. Tubes are manufactured from borosilicate glass, which has high resistance to thermal shock and chemical attack. The calibration scale, normally 400 mm in length, is of ceramic enamel fired on to the tube. Bore sizes of the tube vary from a few mm in diameter to about 70 mm.

* * *

Automatic control system for cranes. E.M.I. Electronics Ltd., Hayes, Middx.

Cranes can be automatically positioned in three axes to any number of predetermined positions, with an accuracy of a fraction of an inch, by a new crane control system developed by EMI Electronics Ltd. Operation can be entirely automatic in response to electrical signals from other equipment or a device such as a punched card reader. Alternatively, the system can be controlled by an operator who sits at a stationary console fitted with a series of key switches and selects the desired destination for the crane. It then moves under automatic control directly from its previous position to the new position. Zero setting is not involved, so there is no need to return to a starting position between movements.

An electrical conductor is laid along the axes of movement of the crane and magnetic pick-up coils are suitably positioned on the crane. Signals from the conductor are detected by the coils, amplified and used to control the motors through a crane-mounted

control box. No slip rings, brushes or sliding contacts are employed. The control box operates the normal Fast/Slow/Stop contactors of the crane motors and stops the motors when the crane is accurately located at the selected point in the conductor. The conductor is laid along the ground or track for horizontal movement and can be buried for protection if necessary. For vertical movement of a stacker-type crane, a second conductor is fixed to the vertical column and connexions made through the usual A.C. supply cable and reel system.

Accuracy of positioning is dependent on the types of crane and motors fitted. Using the conventional two-speed motor, positioning of the order of $\pm\frac{3}{8}$ in is typical, with maximum speeds of 3 feet per second. Improved accuracy can be obtained by using more expensive types of motor. Existing cranes can be adapted to accept the EMI control system if space can be found for the coils and control box.

* * *

Heavy duty commercial blender. Waring Products Co., 105 Duane Street, New York, N.Y., 10008 U.S.A.

The Waring CB-4 Commercial Blender is engineered especially for use in industrial laboratories and pilot plant operations. The CB-4 container features the Waring "Cloverleaf" design, hydrodynamically engineered for perfect blending action. The two-piece

lid incorporates a moulded vinyl gasket, assuring a perfect seal when the lid is clamped onto the container. The centre section of the lid is removable for sampling or adding ingredients. The entire container unit is constructed of 302 stainless steel for long service under any conditions. Capacity is one U.S. gallon, and the motor operates on 115 V, 60 c/s single phase A.C., using 15 amps.

This blender is widely used for such operations as emulsifying, homogenizing, macerating, shredding, blending and mixing a wide range of materials. A 4-page technical bulletin is available on request.

* * *

"Tektor TT6" level controller. Fielden Electronics Ltd., Wythenshawe, Manchester.

This instrument is a solid state capacity-sensitive level controller designed to give high stability with excellent discrimination, in a compact, robust and inexpensive form.

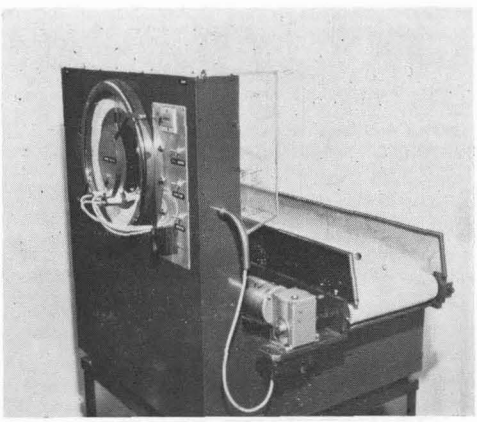
The transistorized "switch", which is moulded in silicone rubber, is designed to fit in the head of the extensive range of Fielden Type 40 electrodes. The TT6 has exceptional stability against mains voltage and temperature variations. It is relatively insensitive to any resistive changes in the electrode system and once set at works will require no adjustment on installation or in use.

Single and double channel kits are available to provide power with control relays and indication lamps.

* * *

Continuous weigher. Herbert & Sons Ltd., Angel Road, Edmonton, London N.18.

A self-contained motor driven conveyor is fitted to the lever system of the weighing machine which is connected to a sensitive dial mechanism. Mounted on the back of the dial is an electronic sensing device which converts the dial reading into electrical impulses operating an electro-magnetic six-figure counter. The amount passing over the conveyor at any moment can be monitored from the dial counter and the totalized amount read from the indicator. The counter can be zeroed at any time by mechanical or electrical reset.



The machine's present range extends from $\frac{1}{2}$ to 10 tons per hour and it is accurate to within $\frac{1}{2}\%$ according to the products being weighed. The counter and control unit can be remote from the

weighing unit, and the totalized weight can be printed-out. The machine can control feed conveyors or storage hoppers and batch weighing can be arranged so that the conveyors stop automatically after a set amount.

* * *

"All-metal" flux. I. & C.D. Ltd., 30 Notting Hill Gate, London W.11.

"Sal-Met" flux enables the soldering not only of aluminium to aluminium but also to copper or brass, no special solder being required. Almost any metal can be soldered, with the added advantage that, if the flux is left on the joint, it appears to counteract the electrolytic action of two dissimilar metals. "Sal-Met" flux is non-corrosive and non-toxic and is economical in use since very little is required to ensure a perfect joint.

* * *

PUBLICATIONS RECEIVED

ENDECOTT TEST SIEVE SHAKER. Endecotts (Filters) Ltd., Lombard Rd., London S.W.19.

This new machine is described in a recent leaflet; its unique mechanical action combines a circular motion of the material on the sieve with a rapid vertical movement which continually clears apertures through which the material passes. It is consequently rapid-acting and is completely silent. An independent time switch can be incorporated and the machine is available in two sizes to carry different numbers and sizes of sieve.

* * *

THE LOW LOAD CUTTER DIP PLANTER. Wyper Bros. Ltd., Bundaberg, Queensland, Australia.

The new leaflet of this title describes and illustrates the Don H.2.D machine which has been developed to give the cane farmer a planter with every essential feature, based on years of practical experience in the cane industry. Setts are conveyed by a vaned disc through a mercurial solution to be discharged by gravity into the furrow. Advantages of the design are described, two of the principal ones being simplicity and ease of control.

* * *

PLANNING AN IRRIGATION PROJECT. Wright Rain Ltd., Crowe, Ringwood, Hampshire.

A great deal of information is necessary in order to plan a project for irrigation, and a questionnaire has been developed by Wright Rain Ltd. in order to secure this. It covers geography and topography, crops, climate and altitude, soil, and availability resources—water, power, labour and existing equipment.

* * *

EVERYWHERE WITH THE WIDEST RANGE. Renold Chains Ltd., Wythenshawe, Manchester.

This new folder, No. 316/640, briefly surveys over 1000 Renold standard products including the BS series roller chains, stock chainwheels, Coventry Mark 5 chains, attachments and wheels, Renold conveying chains, etc., coupling and sprag clutches, as well as tools for chain servicing. It provides illustrations, dimensions and load data as well as the appropriate catalogue numbers.

DERBY WORKS. International Combustion Ltd., 19 Woburn Place, London, W.C.1.

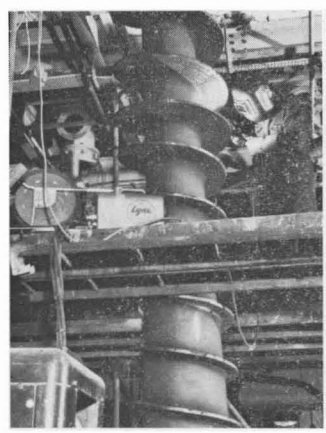
This attractive booklet, ICW 6414, provides a large number of photographs illustrating the facilities and work of the Derby plant for the design and manufacture of steam generating and fuel burning equipment as well as other specialized products for materials processing and handling, including pumps, rotary vacuum filters, vibratory feeders, control panels, gear-boxes, etc.

* * *

Los Mochis factory expansion.—Cía. Azucarera Los Mochis S.A. are expanding their factory, increasing its capacity from 8000 to 15,000 tons of cane per day. The new plant includes three 30-ft dia. "RapiDorr" clarifiers and four 8-ft dia. × 16ft Oliver-Campbell cane mud filters. The factory is expected to be in operation during the 1965 campaign.

* * *

Automatic stainless cladding.—British Oxygen Lynx I semi-automatic welding equipment has been used at the British Sugar Corporation Ltd. factory at Ely to clad surfaces of mild steel beet pulp press worms with stainless steel. Using British



Oxygen 18/8/1 welding wire, a $\frac{1}{8}$ in-thick stainless steel layer was deposited on the surfaces of the 3-ton, 26-in diameter worms, the Lynx equipment proving to be much faster than manual welding.

* * *

U.S. coolers, dryers and kilns licence for British firm.—Ashmore, Benson, Pease & Company Ltd., a member of the Davy-Ashmore Group, has concluded an agreement with Bartlett-Snow-Pacific Inc., of U.S.A., whereby Ashmores will engineer and manufacture dryers, coolers, rotary kilns, indirect heat calciners, batch dryers and multiple hearth furnaces to B-S-P designs. Ashmores will also offer an installation and commissioning service. B-S-P have some 60 years experience in designing and fabricating these units for the treatment of such materials as chemicals, ores, carbon black, etc., and the equipment can be used in a wide range of industries. B-S-P plant and equipment include direct heat, indirect heat and indirect-direct heat dryers fabricated of mild steel, stainless-clad or solid stainless steel; gas- or oil-fired or electrically heated calciners with or without integral cooling sections for processing at temperatures up to 2200°F using an inert, oxidizing or reducing atmosphere; air-cooled and water-jacketed coolers; continuous and batch kilns for processing at temperatures up to 3000°F and also batch dryers. Ashmores will have an exclusive licence to sell B-S-P plant in the U.K. and many parts of the world including several African, West Indian and Far Eastern territories.

WEST INDIES SUGAR PRODUCTION[1]

	Production		
	Estimate 1964	1963	1962
Antigua	21,074*	26,269	20,536
Barbados†.....	161,499*	190,697	158,458
British Guiana ..	307,000	317,137	326,023
Jamaica	474,279	484,147	433,990
St. Kitts.....	43,219*	39,566	42,863
St. Lucia§	—	2,516	3,894
Trinidad	226,346	227,346	201,091
	1,233,601	1,287,678	1,186,855

Territory	*Estimated sugar available for export* 1964	*Local & neighbouring consumption* *Estimate* 1964	1963	1962
Antigua	18,796	2,278	1,645	1,566
Barbados†....	151,924‡	12,000	11,553	11,032
British Guiana	300,494‡	22,500	22,612	23,064
Jamaica	429,118‡	69,633	66,805	64,613
St. Kitts.....	38,819	4,400	4,398	4,122
St. Lucia§ ..	—	—	2,206	1,888
Trinidad	186,231	40,300	37,826	32,350
	1,125,382	151,111	147,045	138,635

† production and export figures include fancy molasses.
‡ includes stock at end of 1963.
§ Sugar production ceased in St. Lucia at end of 1963 crop and St. Lucia is now an importer.
* Final, subject to store out-turn.

Brevities

Bagasse board studies by Tate & Lyle Ltd.[2]—Plaistow Wharf will shortly be taking in plant for the manufacture on pilot plant scale of pressed bagasse board which, it is hoped, will find a wide market in the building and other industries. It is planned to produce sufficient at Plaistow Wharf in the next year or so for appropriate long term trials in various likely places. If successful, the pressed board will ultimately be manufactured in the West Indies and shipped to this country.

* * *

U.K. sugar refiners publicity bureau.—The British Sugar Bureau has been formed by four British sugar refiners in order to encourage sugar consumption and inform the public about the commodity and related topics—whether or not sugar is a significant cause of overweight, what differences there are between beet and cane sugar, and how sugar compares with artificial sweeteners. The refiners are Westburn Sugar Refinery Ltd., the Manbré & Garton group, Tate & Lyle Ltd. and the British Sugar Corporation Ltd. The chairman of the bureau will be Sir PETER RUNGE, chairman of Tate & Lyle Ltd.

* * *

I.S.S.C.T. instructions to authors.—Owing to protests received from many quarters claiming that the deadline of 15th August 1964 for the submission of papers to be presented before the 12th Congress was too early, the Executive Committee have decided to postpone the deadline to 1st December 1964. It may prove impossible, as a consequence, to supply proofs by the date specified in paragraph 7 of the original instructions[3].

* * *

Australian interest in cane diffusion[4].—The Director of the Sugar Research Institute, Dr. J. R. ALLEN, recently stated that by the end of the year the Institute should be able to say whether the diffusion process in sugar milling is suitable for the Queensland industry. Recently the Institute's chief chemist, Mr. D. H. FOSTER, went to Egypt and saw diffusion equipment working there. "We don't know how our canes are going to behave when they are treated in the same fashion. This year we have a full scale factory experiment to tell us how our canes behave when they are finely prepared and macerated... It would then be up to the individual mills to make a decision on what they should do", Dr. ALLEN said.

SOUTH AFRICAN SUGAR EXPORTS[5]

(*Metric tons—tel quel*)

Countries of destination	*Calendar year* 1961	1962	1963
Canada	38,396	48,982	94,638
Chile	0	0	10,098
Congo (Leopoldville)	2,763	16	0
Iran	0	29,645	0
Japan	46	111,282	179,976
Kenya, Tanganyika, Uganda	118	1,811	1,715
Korea (South)	0	5,334	0
Mauritius	254	0	0
Malawi	9,843	8,351	2,975
Seychelles	61	560	890
Southern Rhodesia	28,155	18,400	0
Spain	0	0	5,898
United Kingdom.....	217,179	152,407	191,347
U.S.A.	0	117,415	108,970
Other Countries	0	158	6,051
Total	296,815	494,361	602,558

Brevities

Beet payment in Spain[6].—In the 1965/66 campaign, beet will be paid for in Spain on a basis of the sugar content instead of merely the tonnage as at present.

* * *

British loan for Afghan sugar factory[7].—The British Government has agreed to provide a loan of £220,000 to cover the purchase of equipment in the United Kingdom to modernize and expand the Baghlan sugar factory in Afghanistan. The equipment will include new boiler plant and sugar processing machinery which will enable the factory to process about 800 tons of sugar beet per day and also improve the quality of the product.

* * *

Russian cane harvesters for Cuba.—It has previously been reported[8] that the U.S.S.R. was to supply cane harvesters to Cuba, and the newspaper *Sovetskaya Rossiya* has now announced that 85 Cuban mechanics have arrived in Moscow to study assembly and operation of the new Russian-designed machines, which are said to be able to cut cane, remove leaves and chop the stalks into pieces[9].

* * *

Evaporator scale removal by abrasion.—A Czech patent[10] has been granted to Ing. VLADIMIR ZAPLETAL for a process of cleaning evaporator and heating elements by abrasion. Juice to be heated or evaporated is mixed with a suitable number of balls of inert plastic material such as "Teflon" (polytetrafluoroethylene) having their surfaces covered with abrasive material such as sand, filings, etc The specific gravity and shape of the materials are chosen so as to permit their safe passage through the heating and evaporating system without settling or accumulation in dead spaces. The abrasive bodies travel with the juice through the system, keeping the tubes clean and thereby benefiting the heat transfer coefficient. After passing through the system the bodies are separated from the concentrated liquid and returned to the juice to be evaporated.

[1] British West Indies Sugar Association (Inc.), through F. O. Licht, *International Sugar Rpt.*, 1964, **96**, (25), 17.
[2] *Tate & Lyle Times*. September 1964, p. 3.
[3] *I.S.J.*, 1964, **66**, 207.
[4] *Producers' Review*, 1964, **54**, 83.
[5] *Int. Sugar Council Stat. Bull.*, 1964 **23**. (7). 90.
[6] *Bol. Inf. Sind. Nac. Azúcar*, 1964, (184), 58.
[7] *The Times*, 29th July 1964.
[8] *I.S.J.*, 1963, **65**, 190.
[9] *The Times*, 30th July 1964.
[10] No. 109,654 (1963).

BREVITIES

Fire protection at Queensland bulk terminals[1].—More than £A1,000,000 is to be spent in fire protection for Queensland bulk sugar terminals by the end of this year. By mid-1965 between two and three million pounds will be spent to increase Townsville, Mackay and Bundaberg terminals' storage by 280,000 tons. Pre-cast concrete walkways supported by steel brackets will give firemen easy access to terminals in an emergency, while removable plastic sheeting will also be used so that by smashing them in an emergency easy access would be given to the inside. Reticulated water would be available and sprinklers and smoke detectors would be installed in the terminals. Standby pumps would be available in case water pressure failed. Smoking has been banned from the terminals and admission of the public greatly restricted.

* * *

New sugar factory for South Africa[2].—In June, building contractors started work on the 1200-acre site at Jaagbaan, near Dalton, Natal, where the new R.9,000,000 (£4,500,000) sugar mill is being built for Illovo Sugar Estates Ltd. The mill is to be operated by Noodsberg Sugar Co. (Pty.) Ltd., a subsidiary of Illovo, and it will be one of the largest in South Africa, with a capacity of 150,000 tons of sugar per year. The layout is arranged so that capacity may be doubled by adding a second mill tandem alongside the first. while ancillary plant would not need to be moved. The plant is designed so that automation devices can be introduced as required, a start being made with push-button operation of a tippler for rail car unloading of cane. Cane supplied by road will be trans-shipped for transport to the mill. The mill is expected to be in operation in 1967.

* * *

Tanning extract factory to mill cane[3].—The Union Co-operative Wattle Bark Milling Co. Ltd. of Dalton, Natal, has obtained official approval for the erection of a sugar cane mill in conjunction with the existing tanning extract factory. Arrangements have been completed for financing the project which involves a cost of R. 2 million (£1,000,000). The initial capacity of the sugar mill is set at about 25,000 tons of sugar per year.

* * *

New tyre for cane farmers[4].—The "Stabilia" tyre developed by Dunlop Rubber Australia Ltd. has been primarily introduced for the sugar industry where it can be fitted to harvester outrigger wheels, trailer wheels, etc. for operation in prolonged wet weather conditions. It features low air pressure but can carry the same load as the two standard tyres which it replaces without any increase in axle height.

* * *

Hawaiian cane harvester[5].—The latest design of the "Mighty Midget" cane harvester has been simplified during development by the H.S.P.A. Experiment Station. No adjustments are now necessary to maintain the cutter head position in rolling cane fields, and a flight conveyor with 45° elevation has replaced the rubber belt at 55°. It can now operate at 2½ m.p.h. in 80-ton cane compared with 1·1 m.p.h. in previous models. Future developments are expected in 1965 to include use of only one engine, with fluid drives on all cutter head elements to provide quick reverse when cane jams occur. Detrashing equipment is being eliminated from the machine.

* * *

New mill for Venezuela[6].—A $9,000,000 sugar factory is being planned for erection in the state of Portuguesa. It will have a capacity of 2750 tons of cane per day.

* * *

U.S.S.R. sugar imports, 1961-1963[7].—Russian sugar imports in 1963 amounted to 1,136,504 metric tons, raw value, including 994,783 tons from Cuba, 138,036 tons from Czechoslovakia, 1,383 tons from Hungary and 2,302 tons from Poland, This compares with a total of 2,485,874 tons in 1962 of which 2,233,175 tons were from Cuba, 83,622 tons from Czechoslovakia, 1,123 tons from Hungary and 167,954 tons from Poland. In 1961, the total of 3,596,890 tons included 3,345,000 tons from Cuba, 129,707 tons from Czechoslovakia, 758 tons from Hungary and 121,425 tons from Poland.

Argentina sugar exports, 1963[8].—Exports of sugar from Argentina amounted to 398,415 metric tons, white value (442,683 tons, raw value), compared with only 30,579 tons in 1962. The 1963 total included 123,373 tons for Italy and 195,340 tons for the U.S.A.

* * *

Pakistan sugar expansion[9].—It has been reported that sixteen new sugar factories are to be built during the course of the next four years which, it is anticipated, will raise sugar production from 300,000 tons to 500,000 tons per annum. An East German manufacturing consortium has completed the delivery of equipment for two new cane sugar factories to be built at Bannu and Badin in West Pakistan.

* * *

Peru sugar crop, 1963[10].—The Sociedad Nacional Agraria reports that production of sugar in 1963 reached 836,240 tons, compared with 788,429 tons in 1962.

Stock Exchange Quotations

CLOSING MIDDLE

London Stocks (*at 17th September* 1964)	s d
Anglo-Ceylon (5s)	7/–
Antigua Sugar Factory (£1)	13/1½
Booker Bros. (10s)	18/7½
British Sugar Corp. Ltd. (£1)	33/1½
Caroni Ord. (2s)	3/4½
Caroni 6% Cum. Pref. (£1)	15/1½
Demerara Co. (Holdings) Ltd.	5/3
Distillers Co. Ltd. (10s units)	26/1½*
Gledhow Chaka's Kraal (R1)	23/–
Hulett & Sons (R1)	39/6
Jamaica Sugar Estates Ltd. (5s units)	5/–
Leach's Argentine (10s units)	17/9
Manbré & Garton Ltd. (10s)	39/4½*
Reynolds Bros. (R1)	23/–
St. Kitts (London) Ltd. (£1)	18/9
Sena Sugar Estates Ltd. (5s)	7/7½
Tate & Lyle Ltd. (£1)	37 –
Trinidad Sugar (5s stock units)	3/1½
United Molasses (10s stock units)	31/6
West Indies Sugar Co. Ltd. (£1)	16/–

CLOSING MIDDLE

New York Stocks (*at 16th September* 1964)	$
American Crystal ($5)	17⅝
Amer. Sugar Ref. Co. ($12.50)	19⅜
Central Aguirre ($5)	25⅜
Great Western Sugar Co.	14⅛
North American Ind. ($10)	34¾
South P.R. Sugar Co.	33
United Fruit Co.	21½

* *ex-dividend*

[1] *Australian Sugar J.*, 1964, **56**, 205.
[2] *S. African Sugar J.*, 1964, **48**, 436–437.
[3] *S. African Sugar J.*, 1964, **48**, 439.
[4] *Producers' Review*, 1964, **54**, 73.
[5] *Sugar y Azúcar*, 1964, **59**, (7), 12.
[6] *Sugar y Azúcar*, 1964, **59**, (7), 50.
[7] *Lamborn*, 1964, **42**, 107.
[8] F. O. Licht, *International Sugar Rpt.*, 1964, **96**, (18), 13.
[9] C. Czarnikow Ltd., *Sugar Review*, 1964, (668), 121, (669), 125.
[10] *Fortnightly Review* (Bank of London & S. America Ltd.), 1964, **29**, 565.