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THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXV APRIL, 1963 No. 772

NOTES AND COMMENTS

U.K. 1962/63 campaign.

The last factory to close in Britain did so on the 4th February, owing to absence of supplies. At the time, all available beet had been processed although farmers still had about 350,000 tons to harvest. This had been too firmly gripped by the prolonged frost so that they could not be moved from the ground. The British Sugar Corporation subsequently announced that it was intended to consider the possibility of re-opening one or more factories if sufficient beet suitable for sugar manufacture could be made available when the thaw came.

Numerous tests have since been made in all the seventeen English factory areas; so prolonged has been the frost, however, that it was only recently that tests could be conducted on thawed-out beets. These tests have now been concluded and the results and observations from all areas have been collated and closely and sympathetically considered by the Corporation's technical and agricultural staff.

On the 13th March it was definitely concluded, with great regret, that an insufficient tonnage of beet which had remained in the ground unharvested could now be harvested and delivered in a condition suitable for sugar manufacture to warrant a factory re-opening. Letters to that effect were sent to the growers concerned.

Throughout the long frost and thaw the closest liaison was maintained between the sugar factories and growers' representatives both at national and local level. They were in fact present at the factories when the tests were conducted.

Representatives of the National Farmers' Union were also present at the Corporation's Head Office when the final decision was reached and thanks were expressed to the Corporation for the efforts made to help those growers who through early onset of inclement weather conditions had been unable to harvest and deliver their beet to factories during the campaign, and also for keeping certain factories in a state of readiness to enable them to make a quick start should that have been the decision reached.

As it was, deliveries totalled 5,312,888 tons, compared with 5,936,479 tons in 1961/62. Average sugar content was higher at 15·67% compared with 15·44%. The crop was the fifth highest ever grown in this country and represented an average yield per crop acre of 12·99 tons. Total production of sugar was 685,000 tons, white value. Dried molassed pulp production was 430,000 tons. Virus yellows attacks were light.

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U.S. 1963 sugar quotas.

On the 26th February the U.S. Dept. of Agriculture announced that the U.S. Global Quota was being increased from 1,100,000 short tons, raw value, to 1,300,000 tons, the additional 200,000 tons being for importation in the period up to 31st October 1963. In addition, the Department announced a deficit in the Puerto Rican quota of 220,000 tons and at the same time reallocated 11,173 tons previously withheld from net importing countries (Canada, the U.K., Hong Kong and the Netherlands). Of the 231,173 tons to be reallocated, 107,914 tons were assigned to the Philippines.

Two days later it was announced that all the additional global quota sugar had been allocated: Argentina receiving 28,797 short tons, Australia 49,190, Dominican Republic 3730, Ecuador 10,300, France 12,153, India 37,000, Mauritius 28,400, Peru 764, South Africa 18,788 and Southern Rhodesia 10,878 tons. The last is of interest since Southern Rhodesia is a newcomer to the U.S. market and has no regular quota.

Not all the reallocations have been filled, however, although 52,600 tons has gone to Mexico, 25,732 tons to the British West Indies and British Guiana, 6056 tons to Haiti and 1989 tons to El Salvador. This leaves 36,882 tons to be allocated.

In connexion with the global quota a U.S. Dept. of Agriculture spokesman was quoted as saying, at the end of the 3-weeks suspension reported earlier[1], that the Dept. planned to do nothing at the moment about the fee on imports of sugar on global quota. The question of restoring the import fee was "rather academic" in view of the present high world price of sugar, but the fact that it was not being reimposed at the end of the period of suspension did not mean that it would not be at a later date—"or even tomorrow".

[1] *I.S.J.*, 1963, **65**, 65.

Australian sugar industry results, 1962 season[1].

The 1962 Australian sugar season concluded with the cessation of crushing operations at Racecourse Mill on the 8th January. The 12,101,160 tons of cane crushed in Queensland were harvested from 387,331 acres, and yielded an estimated 1,770,331 tons of 94 n.t. sugar. On these figures, average yields of cane and sugar were respectively 31·24 tons and 4·57 tons, far in excess of the previous highest yields of 28·12 tons of cane and 4·06 tons of sugar per acre in the 1958 season. The ratio of tons of cane per ton of sugar is 6·84. The cane harvest was one-third higher than in 1961 when 9,020,734 tons were crushed to yield 1,315,393 tons of sugar.

The three New South Wales mills crushed a total of 637,411 tons of cane for an estimated outturn of 79,828 tons of 94 n.t. sugar, making the Australian figures 12,738,571 tons of cane crushed for the production of 1,850,159 tons of sugar.

* * *

Indian sugar stocks[2].

During the last year or so, when substantial surpluses of sugar have accumulated in India, the market has tended to think of supplies from that origin as almost inexhaustible and limited only by the available outlets and the willingness on the part of the Indian Government to provide the necessary finance to subsidize such exports. The pattern changes rapidly in India, however, and it seems likely that in the current campaign year, which ends in October next, consumption will rise above production, current estimates being that whilst domestic requirements will be in the region of 2·6 million tons of white sugar, output is unlikely to exceed 2·5 million tons. Stocks in existence at the beginning of November amounted to 1,018,000 tons, which has permitted substantial export sales to be made. The Indian Government has earmarked 500,000 tons for this purpose and statistics show that the greater part of this quantity has already changed hands. Whether further provision will be made for sugar to be sold for export out of this crop remains to be seen but, on the basis of current estimates, end campaign stocks will hardly be more than 400,000 tons, or some eight weeks' requirements, and supplies in some parts might be reduced to a dangerously low level if less than this quantity were retained in store.

The prospect of India maintaining her important position as an exporter to the world and U.S. markets in future years is open to considerable doubt. With no surplus stocks on which to draw, all sales next year both at home and abroad will have to be met from production in 1963/64. It is, of course, too early to attempt to forecast the level of output so far ahead; in the current season cane supplies have been depleted partly on account of the competing claims of gur and khandsari producers and the balance could conceivably be redressed before next November by fiscal measures. On the other hand domestic consumption has been expanding steadily and this, no doubt, is an encouraging sign of the effectiveness of the Indian Government's economic measures which must be supported since the per capita offtake is still extremely low. It is probable, nevertheless, that India will wish to maintain the outlet which has recently been secured in the Uhited States, if this is at all possible, and no doubt this market will receive first preference when the allocation of supplies is being considered. It is to be presumed that sugar can only be allotted for sale to the world market after domestic and U.S. needs have been catered for, and in these circumstances it would hardly be surprising if the tonnage available for free sale from India were to dwindle to quite small proportions.

* * *

The future of sugar prices.

Following the emphasis laid by the Statistical Committee of the International Sugar Council on the close balance of supply and demand in the world sugar situation, the free market price of sugar rose sharply and has been maintained, apart from one slight and short-lived fall, at steady or increasing levels for over four months. Since the beginning of March the London Terminal price has remained steady, up to the time of writing, at £53·50 per ton c.i.f. London.

E. D. & F. Man, in their *General Remarks on the Sugar Situation* dated 28th February, have discussed future prospects as follows:

"At the moment two things are particularly apparent. Firstly, there is a scarcity of raw sugar offered, particularly for shipment May/August. Secondly, the price of sugar is extremely high and, therefore, dangerous, and this might produce a reduction of demand or an increase of availability. It may seem rash to forecast a further rise when the price is already above £50 per ton, but, considering the number of enquiries that still exist and observing the comparative shortage of sellers, it seems very probable that higher levels will come as new buyers pay advanced levels. Many of the enquiries continue to be for raw sugar which is most scarce and with the exception of France and possibly Cuba there seem to be no large sellers or potential sellers of sugar. The American increase of global quota hardly has any effect at this moment except possibly to announce a further buying interest to a market which has already too many buyers.

"We are looking, therefore, for an increase in price over the next four or five months, but feel that there could be a small easing in the October/December position even if it is from £60 per ton. We also believe that the World imbalance will not be corrected by this next beet crop and, therefore, prices might advance after the turn of the year and that it is quite possible that we shall not see anything lower than £35 for the next twelve or eighteen months. We expect the premiums of white sugar over raws also to be increased during the next six months."

[1] *Australian Sugar J.*, 1963, **54**, 721.
[2] C. Czarnikow Ltd., *Sugar Review*, 1963, (600), 47–48.

THE CULTIVATION AND PROCESSING OF KENAF (Hibiscus cannabinus)

by The Tongaat Sugar Company Limited, Natal, South Africa

by T. G. CLEASBY, Ph.D. and C. E. DENT, B.Sc.

PART I

IN an article entitled "Kenaf—Potential Rival of Jute" which appeared in the *Pakistani Observer* of 18th April 1959, Dr. S. D. CHOUDHURY, Director of Jute Research for the Central Jute Committee, predicted that within a few years, kenaf would be grown in the Western world to the extent of 50% of the jute consumption of that time. He went on to say that Pakistan's only means of combating this threat was to reduce the price of Pakistan jute and to improve its quality.

However, the major effort in the Western world has been directed towards finding a means of producing a usable kenaf fibre by direct decortication. Although there has been some progress in this direction, it is felt by the authors that the real answer to kenaf production lies in producing a top quality fibre for which there is a demand at a price which is a fair average of the widely fluctuating prices of jute. Only when this is done will locally grown kenaf begin to be a threat to Indian and Pakistan jute.

How can it be done? On the basis of experience at Tongaat and an extensive world tour of Western kenaf growing areas, the only way to do this is by fresh or green ribboning (removing the bark) followed by controlled bacteriological retting of these ribbons. It is a fact that short-cuts producing inferior kenaf fibre have failed so often and that efforts should now be directed towards the production of high quality fibre by mechanized means.

The Tongaat Sugar Company became interested in the cultivation of kenaf in 1960 when the South African Sugar Industry found itself producing more sugar than it could sell on the domestic and export markets. Seventy acres were planted in November, 1960, and harvested in March and April, 1961. Approximately 950 acres of kenaf were planted in October and November, 1961, and harvested from March until May, 1962. A canal system for retting kenaf ribbons was constructed during the latter half of 1961 and retting commenced in January, 1962.

The sugar industry of Natal stretches along the coast from Port Shepstone, which is 80 miles south of Durban, to an area approximately 200 miles north of Durban. It is a narrow strip and rarely stretches more than ten miles inland. Tongaat is 25 miles north of Durban and its latitude is 30° south. It was throught that kenaf could do well in the Natal sugar belt, which receives an average rainfall of 38 inches per year, the bulk of which falls during the months of September to May.

The soils of the sugar belt are very variable and include sands near to the coast, clayey loams in the central part and sandy-loams on the inland side of the belt. The weaker coastal sands have shown themselves to be unsuitable for the cultivation of kenaf, owing to infestations of parasitic nematodes, but good crops of kenaf have been grown on the more fertile coastal sands and on all other soil groups.

The general nature of the terrain is undulating, and both gentle and steep slopes are cultivated. The land rises from the coast to about 1500 feet where cane is grown inland. The undulating terrain poses many problems and never fails to amaze visitors from other

Table I

Mean meteorological data for sugar belt of Natal

			Temperature			Humidity %		
	Rainfall	*Evaporation*	*Max.*	*Min.*	*Soil 1 ft*			*Daylight*
Month	*in*	*in*	*°F*	*°F*	*°F*	*8 a.m.*	*2 p.m.*	*Hours*
January	4·15	5·6	81·0	67·2	78·7	75·7	67·3	187·4
February	4·76	4·8	81·6	67·7	79·5	78·3	68·9	183·1
March	5·26	4·4	80·3	66·0	78·1	80·4	68·7	199·8
April	2·66	3·4	78·3	62·2	74·9	79·9	66·2	208·8
May	2·12	2·8	75·9	57·1	69·4	74·1	60·0	221·2
June	1·45	2·4	72·9	52·6	64·1	68·8	54·0	217·0
July	1·07	2·6	72·5	51·9	62·7	69·3	47·0	226·0
August	1·40	2·9	73·2	53·9	64·5	72·7	58·1	218·2
September	2·59	3·6	74·3	57·2	67·6	72·0	61·5	190·6
October	3·54	4·1	75·8	60·9	70·7	72·9	66·0	171·0
November	4·23	4·8	77·7	63·4	73·5	72·8	67·5	164·7
December	4·70	5·4	80·0	65·7	76·4	73·6	67·8	176·2
Total or Mean	37·93	46·8	77·0	60·5	71·7	74·2	62·7	197·0

NOTE—The rainfall is the mean for the Industry, but all the other figures have been recorded at the Experiment Station, Mount Edgecombe.

sugar growing countries, where practically nothing but the flattest areas are worked. As a matter of interest Table I gives some basic meteorological data recorded near Tongaat.

It is not the policy of the Company to restrict the cultivation of kenaf to the sugar belt and all farmers within a reasonable distance of Tongaat are being encouraged to grow it. There are, however, a number of advantages in growing kenaf and sugar cane together, and they have been termed "complementary crops". For example, when kenaf is grown in between two crops of cane it solves the problem of rotation as kenaf will only be planted on the same land approximately once in eight to ten years. Furthermore, the old crop of cane is burnt and ploughed out in July or August and the land is prepared for kenaf to be planted in October. After planting and fertilization have been completed, the kenaf crop requires no further attention until it is harvested and ribboned in March and April, which is when the sugar factory is not working. It therefore does not detract from the cultivation of sugar cane and can lead to a better utilization of field labour during the factory off-crop. After kenaf has been harvested it is possible to put the land back to sugar cane with the minimum of land preparation before the beginning of the new cane season which is usually in May.

Preparation and Planting of Kenaf

When kenaf is grown in conjunction with sugar cane, the land is given a normal cane preparation consisting of a subsoiling, ploughing and heavy harrowing and then two light harrowings to produce a seed bed condition. As the last crop of cane is burnt before cutting, it is possible to do this in a relatively short time. Planting is done by broadcasting the seed either by hand, with a machine or with a small hand-operated distributor. Seed drills are difficult to operate on the undulating land and tend to gather a lot of the cane residue which remains from the previous cane crop. They can be used on the more level lands but at this stage they are not recommended unless the farmer actually owns a machine and is used to working with it.

The procedure is to broadcast the fertilizer and then the seed, at a rate of 25 lb/acre if the germination is over 80%. The fertilizer and seed are then harrowed under, using a light harrow without offsetting the discs, or a zig-zag harrow. A roller is pulled behind the harrow in order to give a good seal. Using this method, planting can be done fairly quickly when there is moisture in the top soil. The amounts of fertilizer which have been used are shown below but it must be pointed out that the optimum levels of fertilization still have to be determined from fertilizer trials on the different soil groups.

	lb N_2 *per acre*	*lb* P_2O_5 *per acre*	*lb* K_2O *per acre*
At Planting	10	60	60
Top Dressing	75	—	—

The reason for applying the bulk of the nitrogen fertilizer when the crop is 2–6 inches high is that it is considered a wise policy to be sure that the kenaf has germinated and established itself well before committing the bulk of the most expensive fertilizer. Also, the established crop will tend to prevent soil erosion, and consequent fertilizer erosion, should a very heavy storm be experienced immediately after applying the nitrogenous fertilizer.

Varieties

Four commercial varieties are available in South Africa—Cuba 108 and San Salvador which are green-stemmed varieties from imported seed and also Purja and Purfo which are locally developed varieties, both of which are red-stemmed. The advantage of growing kenaf outside the tropics is that it has a long growing season. Planting can begin from the end of September depending on the rainfall and flowering generally takes place in March or April. It is fortunate that Purja tends to be an early-maturing variety which flowers early in March, while Cuba 108 flowers at the end of March and early April, and according to last year's experience, San Salvador flowers late in April. A relatively high seeding rate is used in order to get a high plant population which will limit the individual stem thickness and therefore tend to produce a finer fibre. Planting 25 lb per acre of seed which has a germination of 80% represents a maximum population of 80 plants per square yard. A good population in the field is 50 plants per square yard.

Pests and Diseases of Kenaf

Kenaf grown at Tongaat has suffered from a number of diseases and pests. The most serious of these was an Anthracnosis type of infection which damaged the growing point and was particularly serious in late plantings of some seed which was discovered to be susceptible. The organism was identified as *Colletotrichum gloeosporioides* Penz (S nsu von Arx). Fortunately, Cuba 108, San Salvador and Purja showed a degree of resistance to this disease. The crop also developed a fungus disease which was originally thought to be a *Melanspora*, but proved on identification to be a fungus rust, *Aecidium Garckeanum* P. Henn. This fungus disease was not serious as it proved to be slow spreading and only attacked the older leaves. It did in fact form a useful function in defoliating the crop prior to harvesting.

Late in the crop the defoliation was also helped by an invasion of a small brown beetle-type insect which is known colloquially as the Earth or Flea Beetle and identified as *Podagrica Weisei* Jac. This pest has not yet been a serious menace, but it could be if it attacked the crop in its early stages. It can be controlled with either D.D.T. dust or spray, "Dieldrin" or "Sevin" insecticides.

Agricultural Experiments Carried Out With Kenaf

In 1961, a comprehensive series of kenaf experiments were planted on two soil types and some of

the results have been summarized below. It must be point d out, however, that the 1961–2 crop suffered from one of the driest summers on record. The crop received only 15·5 inches of rain and the yield fell well below what was anticipated. In the previous crop 25 acres of kenaf yielded 1500 lb of dry retted fibre per acre, compared with the average for 1961–62 of only 1000 lb per acre. As a matter of interest an area of 60 acres which received some irrigation yielded nearly 2000 lb of fibre per acre.

A. Variety Trials

Planted 13th November, 1961.

Crop: 170 days.

	Yield in Tons Dry Fibre per Acre		
Variety	*Clay loam*	*Sandy loam*	*Sand*
Purja	0·73	1·06	0·64
San Salvador	0·65	1·27	0·55
Cuba 108	0·68	1·06	0·45
Rhodesian	0·62	0·92	0·56

B. Population Trial

Planted 2nd November, 1961.

Crop: 184 days.

	Yield in Tons Dry Fibre per Acre	
Treatment	*Clay loams*	*Sandy loam*
Broadcast 8 lb/acre	0·62	0·97
,, 16 ,,	0·79	1·31
,, 32 ,,	0·81	1·49
Drilled 7-inch lines 8 lb/acre	0·79	1·65
,, ,, ,, 16 ,,	0·92	1·74
,, ,, ,, 32 ,,	0·96	1·65
Drilled 14-inch lines 8 lb/acre	0·90	1·78
,, ,, ,, 16 ,,	1·03	1·78
,, ,, ,, 32 ,,	0·87	1·69

C. Times of Planting.

Planted: Variety Cuba 108

Crop: 150 days

	Yield in Tons Dry Fibre per Acre		
Planting date	*Clay loams*	*Sandy loams*	*Sand*
23/10/61	0·65	1·25	1·09
7/11/61	0·54	1·42	0·80
20/11/61	0·34	0·61	0·65
7/12/61	0·35	0·94	0·59
*22/12/61	0·20	0·41	0·29
†4/1/62	0·21	0·31	0·21

* Actually cut at 136 days owing to drought.

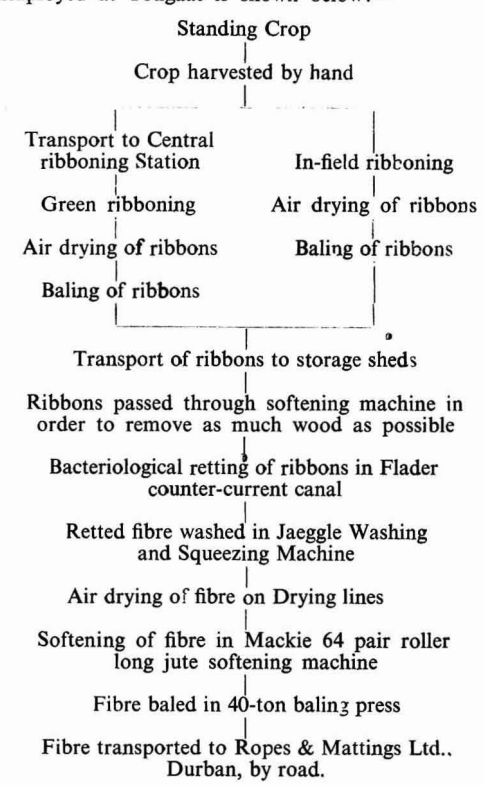
† Actually cut at 124 days owing to drought.

D. Observation Trial of New Kenaf Varieties

Variety in order of merit	*Maturity*
Salvador	Medium-late
International Kenaf Corporation E.947 Cubano	Medium-late
Egyptian 50-13N	Early
Stern 53-14N	Medium-late
Java 35-21N	Medium-early
El Salvadore 52-6N	Medium
Cubano (ex Guatemala)	Medium
Guatemala 48	Medium-late
Thailand F.A.O. 9478 E.1033	Medium-late
Guatemala 7	Medium
Guatemala 5	Medium
G.14 S.M.	Medium
Egyptian 53-8s	Early
Cuba 108	Medium-late
Giza II	Early
Cuba 2032	Medium-late

FIBRE RECOVERY

A flow sheet showing the method of fibre recovery employed at Tongaat is shown below:—



(*To be continued*)

AGRICULTURAL ABSTRACTS

Resistance of sugar cane varieties to mosaic in Louisiana. E. V. ABBOTT *et al. Sugar Bull.*, 1962, **40,** 282–284.—Following the appearance of a new strain (H^1) of mosaic virus, resistance tests have been conducted on commercial and unreleased varieties as also on parent or potential parent varieties. The conclusions are here listed.

* * *

Spread of mosaic in heat-treated and untreated sugar cane. N. ZUMMO. *Sugar Bull.*, 1962, **40,** 284–285.—Evidence is adduced that the spread of mosaic in heat-treated cane is greater than in untreated, the reason being attributed to apical physiological changes which induce early germination.

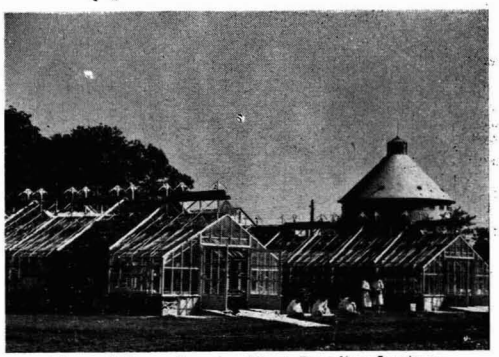
NEW SUGAR BEET STRAIN IN HUNGARY

A HUSBAND-AND-WIFE team of researchers in Hungary has evolved a new strain of sugar beet which may save millions of man-hours spent in hand singling young plants.

It is a triploid variety which, it is claimed, produces a 95% ratio of monogerm plants, thus permitting almost entirely mechanical cultivation.

The researchers are Mr. and Mrs. GYULA CSAPODY, of the Sopronhorpács Plant Breeding Institute, in Western Hungary. Mrs. CSAPODY has been engaged in plant breeding for 15 years, and her husband has been studying germination biology and sugar beet cultivation techniques.

It was at Sopronhorpács that the diploid and polyploid varieties at present in general use in Hungary were developed.



View of Sopronhorpács Plant Breeding Institute showing beehive-shaped beet storehouse

Two thirds of Hungary's present total sugar-beet area are under polyploid and the remaining one third still under diploid varieties. Though it is not a hereditary feature of polyploid strains that they should produce monogerm seeds, something like 50% of the abraded and calibrated seed balls nowadays bear one germ only.

Polyploids permit row-sowing, with the seeds spaced widely apart so that long-shafted instead of short-stemmed hoes can be used to single the young plants. Thus it was possible to speed up the harvest and most labour-consuming manual thinning process, with savings in man-power running to 25%. Several Hungarian farms have attained good results in sowing polyploids by precision drilling machines. During the 1961/62 crop season a total of 7000 acres were sown in this way, a figure which rose to 35,000 acres one season later.

But the application of polyploids was regarded only as an intermediate stage in facilitating and speeding up the work of singling. A further step forward to fully mechanized cultivation could clearly be achieved by the general use of new monogerm strains. It was at this point that Mr. and Mrs. CSAPODY began their current research.

Monogerm types, that is types with only a single germ in each seed, are of course known in most highly developed agricultural countries. What marks the new Hungarian strain is the very high monogerm ratio.

Tests in the Sopronhorpács experimental station covered hundreds of thousands of the Hungarian bred "Beta poly" varieties, involving the picking out of the genuine monogerm seeds, and the crossing of those of poor performance or low disease resistance with test-proven multigerm strains. This selection, accompanied by crossings with diploid and tetraploid types, led to the development of the new triploid monogerm hybrids—"Beta poly M/101" and "Beta poly M/102".

Breeding experiments carried on for 3 years have shown them to rank in crop yield and useful sugar yield on a level with the earlier Hungarian-bred triploid multigerms "Beta poly 1" and "Beta poly 3", which themselves came fully up to world standards.

The three years' trial period actually corresponded to 8 years of normal experimental growth, for the seeds were subjected to an acceleration process by artificial ice-house vernalization and green-house fertilization, with the consecutive generations changing yearly instead of biennially. Selection was by sixfold back-crossing.

"Beta poly M/102" was first tried out in 1962 in nation-wide experiments which confirmed the research breeding results and proved 95% of the self-polished and calibrated seeds to be monogerms. They can be sown everywhere by precision drilling machines. They grow one by one in stands, sufficiently widely apart to be thinned by long-shafted hoes or even machines, and require 50 to 60% less labour than other types.

As Hungary has at present 200,000 acres under sugar beet, the new monogerms would eventually save at least one million work hours per year, most of it during the overburdened vernal rush period.

Plans for the 1962/63 crop season included variety tests with the other new monogerm, "Beta poly M/101," but trials in the experimental stations of sugar factories have already confirmed its advantages.

Seed production on on a large scale of "Beta poly M/102" is probably to start this year and, provided that the results continue to be satisfactory, they will be generally used from 1966.

Mrs. CSAPODY and fellow workers at the Sopronhorpács Plant Breeding Institute have now started a new series of experiments with the pollen-sterile partners of the selected monogerm varieties, aiming at the production of 100% triploid monogerms which experience has shown to promise a further increase in yield.

Mrs. CSAPODY has published three papers in the Institute's *Proceedings* dealing with the breeding of monogerms, which are available on request from the Plant Breeding and Growing Research Institute of Sopronhorpács.

The monogerms involved in the experiments can be obtained from the National Institute for Agricultural Quality Testing (Országos Mezőgazdasági Minőségvizsgáló Intézet), Budapest II, Keleti Károly utca 24.

AGRICULTURAL ABSTRACTS

Q.63 in the Burdekin district. L. S. CHAPMAN. *Cane Growers' Quarterly Bull.*, 1962, **26,** 39, 40.—Eighty-five per cent of the Inkerman crop is Trojan of which the plant cane particularly has a low c.c.s. early in the season. Comparative c.c.s. weekly figures for Q.63 for the weeks ending 29th June, 1962 to 10th August, 1962 averaged 16·2, with an average for all varieties at the Invicta mill of 14·9. Individual c.c.s. figures in July have been as high as 18·4. It is a high yielding cane on the richer soils but prone to lodging and does not burn readily.

* * *

An experiment in cane fire control. H. E. YOUNG. *Cane Growers' Quarterly Bull.*, 1962, **26,** 46, 47.—In a trial with sodium bicarbonate sprayed at ¼ to ¾ lb per yard of the break row in a light crop, results proved no better than spraying with water.

* * *

Mechanical harvesting and clean cane. N. J. KING. *Cane Growers' Quarterly Bull.*, 1962, **26,** 48–50.—Hawaiian figures are quoted as showing a loss of 7–10% sugar as the price of mechanical harvesting—on the Australian crop, £A45–£A65 per acre or a total of some £A6·25m. Methods for securing clean mechanically-cut cane are discussed and include valuation of the individual farmer's cane on the fibre content of his particular delivery and not on the average fibre content of the particular variety.

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The displacement of CP 29-116. C. L. TOOHEY. *Cane Growers' Quarterly Bull.*, 1962, **26,** 51, 52.—In the early 1950's, CP 29-116 occupied 63·6% of the S. Queensland area; by 1961 this area was reduced to 12·7%. The reason for its rise and subsequent fall are explained. The primary factor is stated to be its late maturity. Its main rival is N:Co. 310 and other varieties, such as Q.69 and Q.71, are likely to follow.

* * *

Yellow spot disease. B. T. EGAN. *Cane Growers' Quarterly Bull.*, 1962, **26,** 62, 63.—This disease has caused much loss since 1950 in North Queensland. The remedy lies in breeding resistant varieties.

* * *

Sterilization of cane knives. J. H. BUZACOTT. *Cane Growers' Quarterly Bull.*, 1962, **26,** 70.—Canned fuel, similar to that used by the army, is recommended for heat-sterilization of cane knives as being cheap, easily transported and involving less risk of fire.

Effect of phosphorus deficiency on growth of sugar cane and uptake of mineral nutrients. J. N. SINGH. *Fiziol. Rast.*, 1962, **9,** 289–296. (R.e.) (Univ. Benares, India); through *Soils and Fertilizers*, 1962, **25,** (5), 2980.—In sand cultures P deficiency did not affect the N content (dry-weight basis) of the plant or the P content, except that in complete nutrient solution the P content was greatest in 135-day-old plants whereas in P-deficient plants it was greatest in 90-day-old plants. P deficiency did not affect the K, Ca, Mg and S contents of the plant. The N content of the plant was greatest in 45-day-old plants. The K content (dry-weight basis) of the plant decreased continually with age, but the absolute amount of K in the plant increased as the dry weight increased. The contents of Ca, Mg and S tended to decrease with age, but their absolute amounts increased with increasing dry weight. Actively growing leaves and roots contained more N than did the stems. The stems were richer in K than the leaves and roots. The roots were richer in S, Mg and Ca than the stems and leaves. The leaves contained more Ca than the stems and the stems more Mg than the leaves.

* * *

A generous supply of nitrogen is one of the major needs for high yield. A. JACOB and H. VON VEXKULL. *La Ind. Azuc.*, 1962, **68,** 237–242.—This conclusion is drawn from a review of fertilizer practices in many countries as indicated by foliar diagnoses.

* * *

Defecation muds—a valuable fertilizer reserve. F. LEHEIS. *Zuckererzeugung*, 1962, **6,** 176.—Soil analyses have revealed the high fertilizer quality of defecation muds, which contain lime, organic substances, phosphoric acid, nitrogen and potassium. Details are given of a scheme for transporting and handling muds containing 40–50% water.

* * *

The effect of summer and fall planting on yields. T. J. STAFFORD and R. J. MATHERNE. *Sugar Bull.*, 1962, **41,** 10–22.—In view of the generally low yields of plant cane relative to stubble cane, early planting (August) was tried. Though the statistical figures were hardly significant, the evidence favours early planting, for many factors such as improved labour use and higher sucrose content must be taken into account.

SUGAR CANE AGRICULTURE IN THE PHILIPPINES

Proceedings, 8th Annual Convention, Philipppines Sugar Technologists, 1960

TWO of the sessions of the Conference were devoted to agricultural topics and the majority of the papers deal with varietal aspects. Records of the comparative performance of five varieties, POJ 3016, Co 440, N: Co 310, Phil. 49-4 and Phil. 49-22, are given by O. G. SANTOS. The only significant difference, and that a high one, was in piculs/ton of cane, with POJ 3016 leading, but this is, unfortunately, associated with the lowest yield. In piculs/hectare Phil. 49-22 led with Phil. 49-4 a close second.

F. T. TABAYOYONG records his recommendations for varietal commercial planting as the result of three years' trials with fifty-one commercial varieties. Besides yield and quality of juice, such factors as resistance to disease, pests and wind are taken into account. The recommendations include diversifying the area under POJ 3016 and H 37-1933 to be reduced, and an increased acreage under CP 29/116, Co 440 and Co 449.

Profits come mainly from ratoons, and R. A. CRUZ *et al.* discuss the ratooning capacity of five varieties. In these tests, H 37-1933 and POJ 3016 outyielded all other varieties.

In checking the effect of topping seedlings at, or one week before, transplanting, M. T. ILAGA *et al.* obtained best tillering results from the untopped plants. The same group of authors compare the relative tillering performance of single bud (one bud in centre of two internodes), single point (four bud) and double point (eight bud) setts from mature seedlings. Using the single bud tiller number as a basis (100), the surviving tiller number of the single point setts is 36·2 and the double point setts 23·2.

A comparison is given by V. C. CALMA and M. T. ILAGA of the plant and ratoon performance of twenty seedling clones raised at the College of Agriculture, Laguna, using POJ 3016 and H 37-1933 as standards. In the result, forty of these are recommended for further testing.

The remaining papers are mainly concerned with cultural problems, in particular fertilization. F. T. TABAYOYONG *et al.* analyse the results of the plant crop of a complex experiment, involving ten varieties and five fertilizer treatments carried out in the Victorias Milling District, and these results are given in considerable detail in nine tabular statements. F. T. TABAYOYONG also described the yield response to P and K dressings, two nutrients of which there is a deficiency in the Victorias District. Increases of yield due to lime appear to be offset by reduced quality of juice.

From analyses of two hundred and eighty soil samples collected on the Canlubang Estate, L. A. VELASCO draws the conclusion that continuous application of nitrogenous fertilizer and lime is needed, but that the level of P and K is high.

T. R. ESCOBER and F. T. TABAYOYONG give a preliminary report on the influence of the fineness of grinding of rock phosphate on the availability of P as indicated by pot experiments. Significant increases in available P were obtained from finer grinding but the problem is rendered complex by the interaction with lime.

H. M.-L.

Preparation of supercompost in sugar cane areas in Maharashtra. A. K. B. CAZI. *Fertilizer News*, 1962, **7**, (10), 29–31.—The supercompost here referred to and of which the preparation is described is a normal compost reinforced with superphosphate.

* * *

Mechanizing sugar cane harvesting. D. S. BOYCE. *World Crops*, 1963, **15**, 9–16, 27.—A useful account is given of mechanical harvesting in the different cane growing regions of the world and the virtues and limitations of the various machines that are in use. Owing to the increasing difficulty in obtaining manual labour for harvesting and its high cost much time and thought has been given to the subject of mechanical harvesting in the major cane growing countries. Figures are given illustrating the financial advantages to be expected where successful mechanical harvesting can be carried out. Two of the main drawbacks are the inability of most machines to deal with lodged cane and the large amount of extraneous matter liable to become mixed with the cane, especially soil or mud picked up when the cane is loaded from the ground. It is pointed out that, as yet, there is no complete harvesting system (cutting, cleaning, loading) in one operation which is satisfactory mechanically and economically acceptable, especially with only partly erect cane: also that this is a challenge to agricultural engineers in many parts of the world. Fourteen references to literature are given.

* * *

Correct way of cutting and planting cane. ANON. *Victorias Milling Co. Expt. Sta. Bull.*, 1962, **9**, 3–4, 6. An illustrated account is given of the correct way to cut and plant setts so as to secure the maximum number of tillers.

* * *

Effect of organic matter on soil fertility. Z. STELMACH. *Compost Sci.*, 1962, **3**, (1), 36–39; (2), 27–32.—This account, with a bibliography of 126 items, describes the various reactions in the decomposition of organic matter in the soil and the beneficial physical and chemical effects derived from the application of such organic material.

THE FATE OF CANE JUICE SIMPLE SUGARS DURING MOLASSES FORMATION

IV. Probable Conversion of D-Fructose to D-Psicose

By W. W. BINKLEY

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HEXOSE interconversions are promoted by both acid and base catalysis[1]. In the production of raw cane sugar the environment most favourable to the base-catalysed interconversions exists during juice defecation. Often at this stage of the processing the limed juice is maintained for 5 to 6 hours near 100°C while its pH shifts gradually from 8 to 7. Syrups produced in subsequent stages are more acidic, with the pH of the final molasses usually in the range of 5 to 6; interconversions occurring here may result from acid catalysis. Our preliminary studies of the action of heat at 95–97°C on limed cane juice with added carbon-14 labelled sugars showed the easy interchange of its principal consistuent hexoses, D-glucose and D-fructose, under these conditions[2]. Subsequent investigations of this system revealed the probable formation in small amounts of D-mannose from these hexoses[3]. Continued research on the reactions of simple sugars during molasses formation now indicates the probable conversion of D-fructose to D-psicose during the processing of limed cane juice. Carbon-14 tracer and paper chromatographic techniques facilitated this finding.

EXPERIMENTAL

The cane juice used in this work was reconstituted from lyophilized whole mixed raw juice as described previously[4].

The D-psicose reference solution for the paper chromatography herein employed was obtained by the action of aqueous calcium hydroxide on D-altrose at 30°C[5].

Model System—Limed Cane Juice with added D-Fructose-1,6-^{14}C

Subjection to Heat at 95–97°C.—The reconstituted raw cane juice was prepared by dissolving 18 g of cane juice solids in 132 g of distilled water and the resulting mixture was defecated with lime as reported previously[4]. Thirty microcuries of D-fructose-1,6-^{14}C (U.S. National Bureau of Standards, Washington, D.C., U.S.A.) were added to the clarified juice which was then heated at 95–97°C for 48 hr.

Fractionation of Reaction Solution by Membrane Diffusion.—The reaction solution was cooled to 25°C, adjusted with distilled water to 500 ml, dialysed against 1800 ml of distilled water for 24 hr at 25°C, and the non-volatile diffusate solids isolated by the procedure published[2]. The yield was 8·3 g.

Yeast Fermentation of Reaction Solution Diffusates. A portion (5·5 g) of the non-volatile diffusate solids was dissolved in 200 ml of demineralized water and was allowed to react for 48 hr at 30°C with 7·5 g of dried yeast (Fleischmann's Active Dry Yeast, Standard Brands Inc., New York, N.Y., U.S.A.). Some slow evolution of carbon dioxide was noted at the end of this period. The yeast was removed by centrifugation and the supernatant liquor was passed through Whatman No. 1 filter paper under reduced pressure. The filtrate was allowed to percolate through a column of mixed anion- and cation-exchange resins. The non-volatile fermentation products were obtained from the column effluent by solvent removal at 60°C under reduced pressure, yield 0·61 g.

Examination of Non-Volatile Unfermented Substances

(*a*) *Paper Chromatography.*—One to three additions of a 10% solution of these unfermented substances in methanol were made at the designated positions on a 15 × 53 cm sheet of Whatman No. 1 filter paper. The developer and conditioning solvents were the upper and lower layers, respectively, obtained from the mixing of ethyl acetate, pyridine and water (250/70/85 v/v/v) at 20°C. The layers were separated as soon as they had formed. The lower layer was placed at the bottom of the chromatographic tank and was allowed to remain there throughout the conditioning and developing of the chromatogram. The prepared paper was positioned for descending solvent movement and was conditioned for 48 hr at 20°C by the atmosphere in the tank. The chromatogram was developed with the upper solvent layer for 30 hr at 20°C and was dried in air at 25°C. A portion (A) of the chromatogram was sprayed with sodium metaperiodate-potassium permanganate reagent[6]. The results are shown in Fig. 1. The separation of the concerned known hexoses was less marked when a freshly prepared upper solvent layer was used as the developer.

(b) *Radioautogram.*—The remaining portion (B) of the chromatogram was allowed to remain in contact with Type KK x-ray film (Eastman Kodak Co., Rochester, N.Y., U.S.A.) for 10–14 weeks.

[1] SPECK: *Advances in Carbohydrate Chem.*, 1958, **13**, 63.
[2] BINKLEY: *I.S.J.*, 1961, **63**, 75.
[3] BINKLEY: *I.S.J.*, 1962, **64**, 365–366.
[4] BINKLEY: *I.S.J.*, 1959, **61**, 173.
[5] ZERBAN *et al.*: *Sugar*, 1952, **47**, (2), 33.
[6] LEMIEUX & BAUER: *Anal. Chem.*, 1954, **26**, 920.

Development of the film revealed the results depicted in Fig. 1.

Discussion

The conversion of the principal reducing sugars of cane juice, D-glucose and D-fructose, to all the known straight-chain aldo- and keto-hexoses is possible through the Lobry de Bruyn—Alberda van Ekenstein[7] transformations. Even though the pH range of cane mill limed juices and syrups, 5·0 to 8·0, is conducive to glucose-fructose interchange[2,8] and glucose-fructose-mannose isomerization[3,8], extensive further transformations of these hexoses does not appear to be favoured under the conditions of the manufacture of raw cane sugar. The constituent cane juice hexoses can participate in competing reactions. D-Fructose undergoes fragmentations[4,9]; this sugar can condense to form several difructose dianhydrides[10]. Carbon-14 tracer studies pointed to the probable formation of such condensation products in heated limed cane juice[2]. The hexoses and amino acids of this juice can combine and polymerize then to yield complex polymers, namely "browning" products[11]. While the amount of D-mannose formed in heated juice was then found to be small[3], the concentration of this sugar has now been determined to be as high as 1% in several final molasses[12]. In many of these molasses the range of concentration of the reducing sugars is 20–25% and these higher yields of mannose from the glucose-fructose-mannose isomerization would be expected. Without the participation of one of these sugar in other isomerizations, only trace quantities of additional hexoses would be formed.

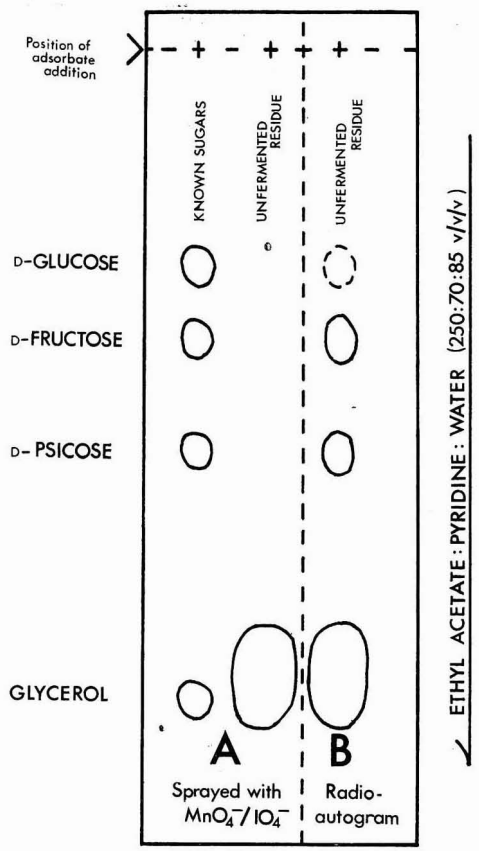

Fig. 1

The action of aqueous ammonia on D-glucose produced in minute quantities D-psicose which was properly characterized as its 1:2, 3:4 diisopropylidene derivative[13]. The gentle refluxing of aqueous D-fructose yielded a substance with the same mobility on paper as D-psicose[14]. The reported presence of D-psicose in cane molasses distillery slop was based on a crystalline phenylosazone which could have originated from D-allose, D-altrose and D-psicose. A ketose other than D-fructose was estimated colorimetrically to be present in Australian molasses in about 0·5% concentration[15]. Recent findings[12] have indicated the probable presence of D-psicose in cane molasses. Limed cane juice with added D-fructose-1,6-^{14}C was subjected to heat in the present work and a portion of the simple reaction components was isolated (as diffusates) by membrane diffusion. The radioautogram of the non-volatile yeast fermentation residue from these diffusates showed the probable presence of D-psicose in the heated juice (Fig. 1). The limited epimerization of constituent D-fructose during the processing of limed cane juice is thus strongly suggested. The D-psicose formed in cane molasses is then considered to be a product of this reaction.

Summary

The probable formation of D-psicose in trace amounts by the epimerization of D-fructose during the heating of limed cane juice was established by carbon-14 and paper chromatographic techniques.

Acknowledgment

The writer wishes to thank Mr. E. J. Roberts, Chemist, for the lyophilized cane juice and Dr. L. F. Martin, Head, for his assistance with the manuscript, both of the Sugarcane Investigations, United States Department of Agriculture.

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[8] Mathews & Jackson: *J. Research* (Nat. Bureau Standards), 1933, **11**, 619.
[9] Sattler & Zerban: *Ind. Eng. Chem.*, 1949, **41**, 1401.
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[11] Binkley: *I.S.J.*, 1959, **61**, 364.
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DETERMINATION OF SUCROSE

in the impure products of the cane sugar manufacturing process by the action of boron salts

By JOSÉ A. LÓPEZ HERNÁNDEZ

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PART III

Action of borax on pure solutions of dextrose, levulose and sucrose

Work was carried out using 13% sucrose solutions and 0·5% dextrose and levulose solutions in an attempt to reproduce the concentrations of the sugars in a cane juice.

I—*Action of borax on glucose*

(1) Solution of 0·5 g of dextrose in 100 ml of solution: pol = + 1·9

(2) Solution of 0·5 g of dextrose plus 25 ml of 2% borax, made up to 100 ml: pol = 0·1

As is noted, with the addition of the borax solution the positive value of rotation (1·9) is nullified. The difference of 0·1 observed is due to the phenomenon of mutarotation since, on heating the solution slightly and polarizing again after cooling, as is advised[17] to avoid this, the reading is zero.

II—*Action of borax on levulose*

(1) Solution of 0·5 g of levulose in 100 ml of solution: pol = —3·0

(2) Solution of 0·5 g of levulose plus 25 ml of borax solution, made up to 100 ml and heated to accelerate mutarotation: pol = 0·0

III—*Action of borax on a mixture of sucrose and dextrose*

(1) Solution of 13 g of sucrose and 0·5 g of dextrose made up to 100 ml: pol = 52·0

(2) Solution of 13 g of sucrose and 0·5 g of dextrose plus 25 ml of borax solution, made up to 100 ml: pol = 50·1

(3) Pol corresponding to the sucrose alone: 50·1

(4) ,, ,, ,, ,, dextrose ,, 1·9

IV—*Action of borax on a mixture of sucrose and levulose*

(1) Solution of 13 g of sucrose and 0·5 g of levulose, made up to 100 ml: pol = 46·5

(2) Solution of 13 g of sucrose and 0·5 g of levulose plus 25 ml of borax solution, made up to 100 ml: pol = 49·5

(3) Pol corresponding to the sucrose alone: 49·5

(4) Pol corresponding to the levulose alone: —3·0

V—*Action of borax on a mixture of sucrose, dextrose and levulose*

(1) Solution of 13 g of sucrose, 0·5 g of dextrose and 0·5 g of levulose, made up to 100 ml: pol = 48·4

(2) Solution of 13 g of sucrose, 0·5 g of dextrose, 0·5 g of levulose and 25 ml of borax solution, made up to 100 ml: pol = 49·0

(3) Solution of 13 g of sucrose in 100 ml: pol = 49·0

VI—*Action of borax on sucrose*

(1) Solution of 13 g of sucrose in 100 ml: pol = 49·0

(2) Solution of 13 g of sucrose plus 25 ml of 2% borax solution, made up to 100 ml: pol = 49·0

The first two experiments show that the borax solution has the property of nullifying the optical deviation produced by the hexoses dextrose and levulose; but no modification is produced in the optical deviation of the sucrose.

In experiment III it is seen that while the borax nullifies the rotatory effect of the dextrose alone, in a mixture of sucrose with a combined pol of 52·0, this is formed by 50·1 pol corresponding to the sucrose plus 1·9 pol corresponding to the dextrose as was seen in experiment I. It may be seen that by adding borax solutions to the mixture the value 52·0 is reduced to 50·1, i.e. the value of 1·9 corresponding to the dextrose is nullified.

From experiment IV it is seen that the borax solution nullifies the deviation produced by levulose alone in a sucrose-levulose mixture. In effect, the pol 46·5 of the mixture, increased to 49·5 by means of the borax is due to the value —3·0 pol corresponding to the levulose as seen in II which diminishes by 3 points the pol 49·5 corresponding to the sucrose.

In experiment V it is seen that the borax solution nullifies the rotatory effect of the dextrose and levulose in a mixture of sucrose, dextrose and levulose. The value of 49·0 corresponding to the sucrose alone is reduced to 48·4 by the effect of the dextrose and levulose but, adding the borax solution, the pol of 49·0 is obtained again; i.e. it appears to be the deviation produced by the sucrose alone.

In experiment VI is shown how the borax solution has no effect on the deviation produced by sucrose.

Action of Borax on Impure Sugar Solutions

On the basis of the results obtained when studying the action of borax on pure sucrose, dextrose and levulose solutions and their mixtures, which demonstrated that the action of borax on the mixture seemed only to be on the dextrose and levulose and not on the sucrose, this observation was applied in a method for determining by direct polarization of the sucrose contained in a mixture with dextrose and levulose, nullifying the optimal deviation of these sugars by means of a borax solution.

This possibility has been demonstrated, working with pure solutions, in experiment V since the reading obtained for the mixture with borax is the same as that with the pure sucrose.

The following experiments were to see if this principle applies in solutions of the three sugars but

accompanied by other impurities, as in the case of cane juice and other products of the manufacturing process.

The results indicated below confirm those obtained with mixtures of pure solutions. Work was carried out varying:

(a) the amount of juice taken for the determination,
(b) the concentration of the borax solution,
(c) the amount of borax solution used,
(d) repeating the experiments (a), (b) and (c) using boric acid and other boron salts.

From all of these the following conclusions were drawn:

(a) borax is the most effective salt,
(b) the optimum concentration of the borax solution is 2%,
(c) the suitable quantity of 2% borax solution is 25 ml for 100 ml of solution,
(d) in the case of cane juice, the amount of juice necessary is 52 g (double normal weight) in a 100 ml graduated flask, and
(e) in the case of green syrups, massecuites or molasses, the proper quantity is a half-normal weight of the 1:1 solution in 100 ml of solution.

Technique for cane juices: In a 100 ml flask is placed 52 g of juice; to this is added 25 ml of 2% borax solution; it is made up to volume and clarified with Horne's dry lead subacetate in the usual way, filtered and the clear filtrate polarized. The polarimetric reading divided by 2 corresponds to the sucrose contained in 100 ml.

The value of the direct polarization (apparent sucrose or pol) is obtained in the same way but omitting the 25 ml of 2% borax.

Experimental values for cane juices

(The results are compared with Clerget sucrose obtained similarly using a portion of the same sample.)

Juice No.	*Pol (Apparent sucrose)*	*Clerget sucrose*	*Sucrose (Borax)*
1	2·25	2·80	2·88
2	8·00	8·65	8·60
3	9·00	9·90	10·00
4	5·20	6·20	6·00
5	12·02	12·89	12·50
6	13·00	13·37	13·95
7	8·60	9·59	9·50
8	14·80	15·30	15·00
9	13·08	14·77	14·45
10	11·40	12·63	12·45
11	7·00	8·83	8·45
12	10·00	11·88	12·00

The above values are for cane juices chosen deliberately for their markedly different characteristics, thus: *Juice No.* 1 corresponds to a juice from immature cane with a high (2·24%) content of reducing matter and low Brix (7·36°); *Juice No.* 4 corresponds to a mixture of five different juices of poor quality (1·43% reducing sugars, 10·19°Brix); *Juices Nos.* 5 *and* 6 were from perfectly mature cane (0·88 and 0·79% reducing sugars and 15·86° and 16·94°Bx respectively).

In view of the good results obtained with cane juices including those with high reducing sugars, it was decided to try the action of borax on a product with very high reducing sugars, such as syrup. After testing all the variables possible, the following was established:

Technique for syrup: To a 100 ml graduated flask is added 13 g of syrup (half-normal weight), 25 ml of 2% borax solution, and the solution made up to 100 ml. It is clarified with Horne's dry lead subacetate in the usual way, filtered and the clear filtrate polarized. The reading multiplied by 2 gives the true sucrose % syrup. The pol (apparent sucrose) is obtained in the same way but omitting the borax solution. Below are some values obtained with syrup.

Syrup No.	*Pol (Apparent sucrose)*	*Sucrose (Borax)*	*Clerget sucrose*	*Reducing sugars (%)*
1	43·6	44·60	44·64	6·67
2	32·0	32·60	32·53	2·08
3	38·0	38·20	38·20	

Tests with green syrups

Tests were made with various grades of green syrups from the manufacturing process, varying the factors indicated and establishing the following:
Technique for green syrups: In a 100 ml flask is placed 13 g (half-normal weight) of a 1:1 green syrup solution, 25 ml of 2% borax solution added, the solution made up to 100 ml, clarified with Horne's dry lead subacetate in the usual way, filtered and polarized in a 200 mm tube. The polarimeter reading, multiplied by 4 gives the (true) sucrose % green syrup. Repeating this technique but without adding the 25 ml of borax solution gives the pol % (apparent sucrose).

Results obtained with green syrups

Type of green syrup	*Pol (Apparent sucrose)*	*Sucrose (Borax)*	*Sucrose (Munson-Walker)*
High 1st	61·20	61·60	61·58
Low 1st	51·02	52·00	51·99
High 2nd	48·80	51·20	50·41
High 2nd	48·80	49·60	50·10
Low 2nd	48·00	50·60	50·32

Technique for massecuites: In a 100 ml flask is placed 13 g of a 1:1 solution of the massecuite, 25 ml of 2% borax solution is added and the volume made up. It is clarified with Horne's dry lead subacetate in the usual way, filtered and polarized in an 200 mm tube. The polarimeter reading, multiplied by 4, gives the (true) sucrose % massecuite. Repeating the technique without adding the borax solution gives the pol % massecuite.

Values obtained with massecuites

Massecuite	*Pol (Apparent sucrose)*	*Sucrose (Borax)*	*Sucrose (Clerget)*
Refined	84·80	84·80	85·10
1st	73·60	76·00	75·22
2nd	72·00	72·80	72·80
3rd	58·80	60·80	62·60

Experiments with molasses

Experiments were made with molasses in order to study the action of borax on the product with the highest content of reducing substances. After studying the different variables we established the following:
Technique for molasses: In a 100 ml flask is placed

13 g (half-normal weight) of a 1:1 solution of molasses, preferably prepared with hot water, 25 ml of 2% borax is added and the volume made up to 100 ml. It is clarified with Horne's dry lead subacetate, filtered and the clear filtrate polarized. The polarimeter reading multiplied by 4 gives the (true) sucrose % molasses. To obtain pol (apparent sucrose) the same procedure is followed but without adding the borax solution.

Values obtained with molasses

Molasses No.	*Pol (Apparent sucrose)*	*Sucrose (Borax)*	*Sucrose (Munson-Walker)*	*Reducing Sugars (%)*
1	36·0	38·8	38·17	14·55
2	42·0	44·8	44·35	11·08
3	36·4	40·4	40·9	15·4

The comparative values were obtained following the method recommended for molasses by R. PEDROSA PUERTAS in his work "Manual para el Laboratorio Azucarero", page 244, but titrating the permanganate solution with a known quantity of pure glucose (200 mg) and obtaining a factor which, multiplied by the volume of permanganate used, gives directly the sucrose % molasses. It is not advisable to use the Clerget method on molasses because it gives abnormal values, for example, Molasses No. 1 which gave 38·8 and 38·17 with the borax and Munson-Walker methods respectively, gave a Clerget sucrose of 43·2.

CONCLUSIONS

Guided by the results obtained, we arrive at the conclusion that in impure sugar productions in which there are sucrose, dextrose and levulose, 2% borax solutions nullify the rotatory effect of the dextrose and levulose but not the sucrose in such a way that the polarimeter reading obtained when a mixture of the three sugars, to which borax has been added, is polarized is the same as that which would be given by the sucrose if it were alone.

It is considered that, because of this, applying this principle, a rapid method may be developed for determining *true* sucrose since the time necessary is the same as that required for determining pol (apparent sucrose). We consider the application of this method of great practical importance since, among others, it presents the following advantage: it permits the sucrose entering a factory in the juice to be known rapidly, as well as that leaving in molasses and other products, making it possible to have the factory efficiency data daily or by shift, which is not done at the moment because of the long time needed for the current analytical methods for true sucrose.

The possibility of determining *true* sucrose rapidly in these products is of great importance, because, together with the juice entering and the molasses, it permits the factory balance to be made daily if so wished and on a *true* sucrose basis.

In general, all determinations currently made on a pol basis may be made by this method on a sucrose basis.

NOTE: We consider it necessary to point out that the quantities of borax solution recommended are not absolute since they result from experiments made with local samples. It is possible that to work with products of composition very different from those used by us, it may be necessary to use more suitable quantities.

THE DETERMINATION OF SUGAR IN SUGAR BEETS

By N. H. BRINTON, B.Sc.
Chief Chemist, British Sugar Corporation Limited

IN a previous series of articles[1], WM. H. PARKER described the procedure adopted by the British Sugar Corporation to assess the sugar content of beet samples, and the present article outlines the improvements which have been made since that time.

Part III, section II, referred to the maceration of beet material with the "Atomix 100" blender which had been modified to prevent leakage of the liquid contents from the lid. Subsequent experience showed that these machines were not sufficiently robust to withstand the continual use to which they were subjected in the determination of the sugar content of rossettes, pressed pulp and dried pulp. A new unit was therefore made incorporating a larger motor (½ h.p.), a 3 minute timer and a speed indicator and control. The speed indicator is simply a voltmeter measuring the voltage applied to the motor and on that account is liable to error; however, this assembly has proved much more satisfactory and capable of almost continuous working.

The container has also been modified and now consists of a 200 ml stainless steel jar with a round top. The container is closed by forcing a sealing ring against the inside of the container. This is accomplished by turning the bakelite knob on the top of the cover assembly. Details of the can and cover are shown in Fig. 1.

[1] *I.S.J.*, 1958, **60**, 102–105, 132–135, 159–161, 197–200; 1959, **61**, 231–235.

The can is fluted to below the level of the cutting assembly to prevent streamlined motion of the contents and ensure adequate maceration. It is also necessary that the correct cutting assembly is used, viz:— one in which the blades reach nearly to the

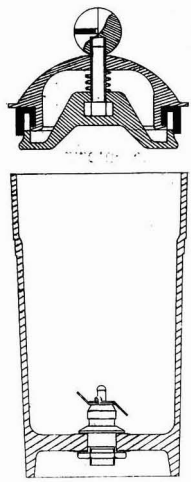


Fig. 1

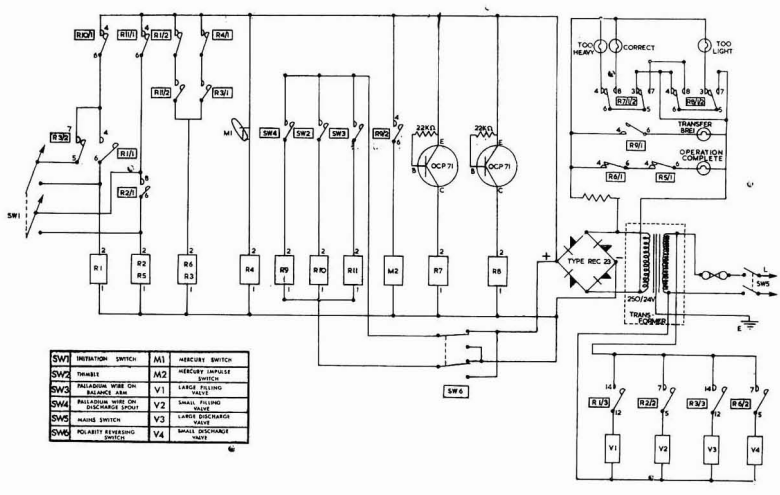
bottom of the container. When using this blender the residues should be inspected, since any pieces left unmacerated are evidence of incomplete extraction. It is the practice in our laboratories to carry out routine checks using the normal hot water digestion method against the macerator method.

Part V of the previous article referred to automation in the tare laboratory procedure, and this has been considerably improved by the incorporation of an improved "reagent adder" and an automatic stirring and filtration apparatus. Owing to existing contract conditions this apparatus is not yet in general use in the Corporation's tarehouses, but it has been proved and was to be installed for the 1962 campaign. With this apparatus it is anticipated that two operators will be able to handle up to 75 samples per hour.

(1) *The "Spaldinlab" Reagent Adder.*

The reagent adder was designed by G. M. BOND and developed by his successor, R. COPLAND, and automatically adjusts the volume of reagent added for any weight of brei between 25 and 27 grams. It consists essentially of a normal balance damped by the addition of a vane to the pointer. One of the pans is removed and the arm to which this is normally attached extended to twice its original length. The extension is arranged so that with 26 g and an "onion-skin" paper on the pan, the beam is horizontal. In place of the other pan a rigid palladium wire hangs and this takes up a position according to the weight added to the pan of the balance. Attached to the beam is a small shutter which passes between a light beam and photo-cells arranged so that interruptions occur if the load is less than 25 g or exceeds 27 g, and the impulse generated operates signal lights on the front of the instrument indicating "too light" or "too heavy". An orange light automatically indicates that the load on the pan is within the limits allowed. The wiring diagram for these lights is shown in Fig. 2.

The reagent is measured in two vessels. The main one has a fixed volume of about 160 ml and the other is a narrow tube in which the palladium wire moves. The bore of the tube is so chosen and movement of the balance so adjusted that the distance moved by the wire for a change in weight of 1 g, multiplied by the cross-section area of the tube, is 6·8 ml. The instrument is calibrated by placing 26 g and an onion-skin paper on the pan and raising or lowering the level of the outlet tube so that 177 ml is discharged. The volumes with 25 and 27 g respectively will then be 170·2 ml and 183·8 ml.



SW1	INITIATION SWITCH	M1	MERCURY SWITCH
SW2	THIMBLE	M2	MERCURY IMPULSE SWITCH
SW3	PALLADIUM WIRE ON BALANCE ARM	V1	LARGE FILLING VALVE
SW4	PALLADIUM WIRE ON DISCHARGE SPOUT	V2	SMALL FILLING VALVE
SW5	MAINS SWITCH	V3	LARGE DISCHARGE VALVE
SW6	POLARITY REVERSING SWITCH	V4	SMALL DISCHARGE VALVE

Fig. 2

The sequence of operations can be followed by reference to Figs. 2, 6 and the following description.

When the amber light indicates that an acceptable weight

is on the balance pan, the operator depresses the switch SW1. Current then flows through the normally closed contacts of R10, and through the normally closed contacts of R3. At the same time a

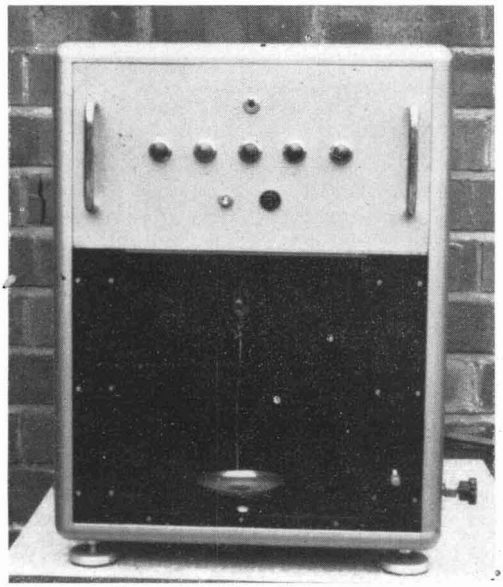


Fig. 3: Front view of reagent adder

set of contacts on R1 closes, R1 is locked, and the valve (V1) through which the large container is filled, opens. Dilute lead acetate solution from a header tank fills up the large container and overflows as a jet at the top. This impinges on an inverted thimble and falls into a small trough below and

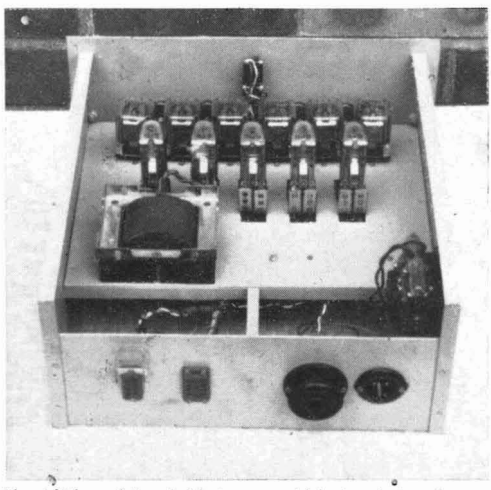


Fig. 4: View of detachable tray on which electrical equipment is mounted

thence to waste. The jet of liquid forms a conductive path (SW2) for a 24V D.C. supply in series with R10, thus opening the contacts momentarily unlocking R1 and breaking the mains circuit to the valve V1 which closes.

The initiating switch SW1 also energizes R2 and opens V2, which allows dilute lead acetate solution to feed into the small container from the base. The rate of flow of solution into this container is made much slower than that into the large pipette. The level of solution rises until it reaches the bottom tip of the palladium wire, thus causing a conductive path (SW3) which energizes R11, opening the contacts, allowing R2 and R5 to release, thus closing the valve V2. At the same time another pair of con-

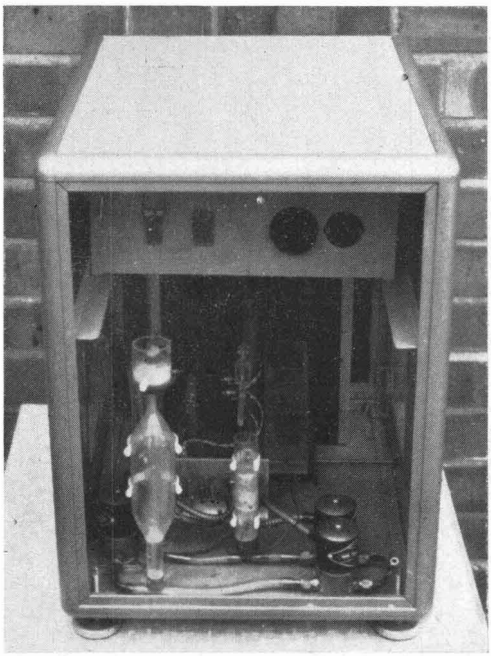


Fig. 5: Rear view of reagent adder showing measuring vessels and valves

tacts on R11/2 close and current is switched on to the priming contacts of R3, locking R3/1 and so opening V3 (the discharge valve for the large container). Simultaneously R6 is energized, and this in turn opens V4 (R6/2) the discharge valve for the small container. The two containers are thus discharged simultaneously but via separate outlet pipes. When the discharge commences, a signal light indicates that the brei may be transferred from the balance pan to the appropriate stainless steel container on the automatic stirrer described later.

Just below the outlet pipe from the large container, a stout piece of palladium wire is fixed, insulated from the pipe, and a 24 V D.C. potential is applied between the pipe and the wire (SW4). When the

discharge commences, current flows (SW4), energizing R9. R9/1 closes, illuminating a lamp which indicates to the operator that the brei sample may

RELAY SCHEDULE

TYPE	No.	COIL	CONTACTS IN CIRCUIT DE-ENERGIZED CLOSED	DE-ENERGIZED OPEN	C O	CONTACT No. USED
3000	R1, R3		1 24VDC.	1 24VDC. 1 250VAC.		4 6 5 7 12 14
3000	R2			1 24VDC. 1 250VAC.		6 8 5 7
3000	R4, R11		1 24VDC.	1 24VDC.		4 6 5 7
3000	R9		1 24VDC.	1 12VAC		4 6 5 7
3000	R6		1 12VAC.	1 250VAC.		4 6 5 7
3000	R5		1 12VAC.			4 6
3000	R10		1 24VDC.			4 6
3000	R7, R8				2 12VAC.	4 6 8 3 5 7

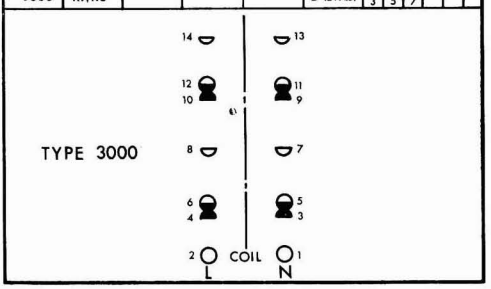


Fig. 6

now be transferred to the receptacle receiving the dilute lead acetate solution. Another set of contacts R9/2 opens, and de-energizes the coil of "single impulse" which is normally energized. This tilts back a mercury impulse switch but does not make contact. When the two containers have discharged their contents, the circuit through SW4 is broken. R9 is thus de-energized, R9/1 transfer brei light is extinguished and the single impulse coil is energized through R9/2. This tilts the mercury switch and contact is made for half a second, energizing R4 which in turn unlocks R3 closing valves V3 and V4. At the same time R3 and R6 are also de-energized thus illuminating the lamp "operation complete". The motor on the "Auto-Stirrer" is also started and this moves the conveyor until it is stopped in the appropriate position by a micro switch.

It should be noted that the operator, having transferred the brei when the appropriate signal appears, can save considerable time by placing the requisite quantity of brei from the next sample on to the pan, whilst the lead acetate solution is still being discharged.

The switch SW6 reverses the polarity on the palladium wire hanging from the balance arm, the thimble and the palladium wire attached to the discharge pipe. This switch is changed regularly, thus preventing a build-up of lead on the various parts.

(2) *The "Auto-Stirrer".*

The brei from the balance pan is transferred by the operator into a stainless steel capsule which is one of a number carried on an endless double chain conveyor. The capsule has been automatically brought to rest under the discharge spout of the reagent adder by a micro switch being operated by a trip on the chain. A $1\frac{1}{4}$ in length of No. 12 s.w.g. iron wire is placed in the capsule prior to the brei and onion skin paper. When discharge of the reagent is complete, the capsule automatically moves forward and then comes to rest over a rotating magnet. The next operation of the reagent adder moves the capsule a further stage when it again comes to rest over a second magnet rotating in the opposite direction. In all, the stirrer consists of four rotating magnets, giving three changes of direction of the stirring. After passing over the stirrers, there is one more position before the capsule passes over a roller of 3 inch radius which enables the contents to be poured into a filter funnel which is part of the "Auto-filter" described later. It was found advisable to allow a settling stage after stirring and prior to pouring to allow the extracted brei to settle to the bottom of the capsule, thus retaining the wire with the brei and allowing it to be recovered during the washing of the capsule. The drive of the chain is by means of an eccentric sprocket which moves the capsule slowly whilst pouring takes place. After passing over the roller, the capsule continues underneath the stirrers where it is washed by a jet of hot

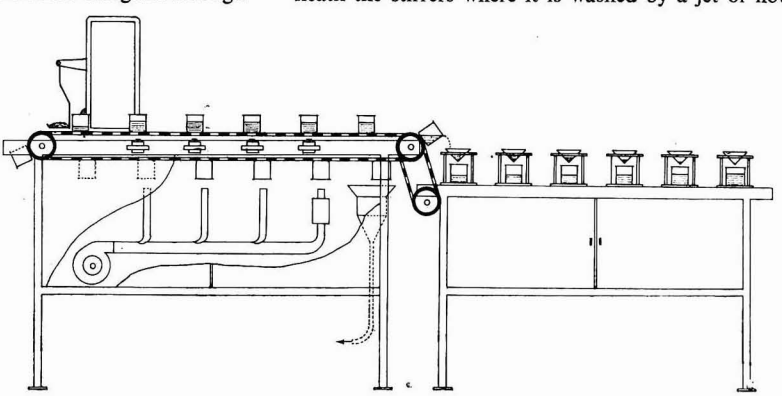


Fig. 7

water, dried by hot air and cooled by cold air before returning to the position under the reagent adder discharge spout.

(3) *The "Auto-filter"*.

This portion of the apparatus consists of a number of stands carried on a chain moving round a rectangular table in a horizontal plane. Each stand consists of a base to which are attached three vertical rods holding the top which is cut away to hold a filter funnel. The base has two pins screwed in to position the filter beaker. Each stud is attached to the chain at two points and at intervals so that they move under the discharging capsule from the stirrer. Both the stirrer unit and the filter unit are driven from the same motor and stop and start simultaneously.

A ball bearing is attached to the base of the rod at the apex of the base to maintain the base in the horizontal plane and to form a runner. A general arrangement is shown in Fig. 7.

The beakers travel round the filtration unit until they reach the operator at the saccharimeter. Here the beaker is changed, the filter paper and its contents discarded and a new filter paper inserted in the funnel.

An ETL/NPL automatic saccharimeter is used and all that is required of the operator is to insert the probe into the beaker and press a button. This operates a valve which is held open for a given time, allowing liquid to syphon through the cell, closed and again opened for a further period to ensure adequate flushing of the cell in the saccharimeter. On finally closing the valve, the saccharimeter is initiated, the result appearing on the display. The whole sequence requires some 40 sec, leaving the operator ample time to carry out the other operations.

This unit consists of a cam driven by a synchronous motor. The cam operates a switch which controls the current to the valves which may be a double acting type enabling a composite sample of the filtrates to be collected.

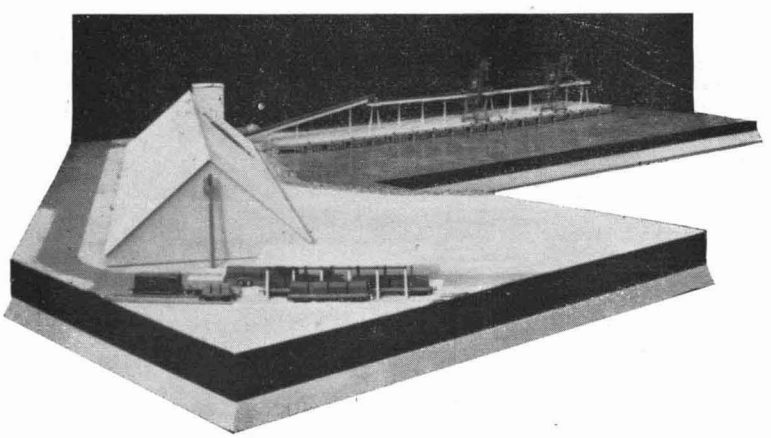
ACKNOWLEDGMENTS

The author wishes to express his thanks to the Directors of the British Sugar Corporation Ltd. for permission to publish this work and to all those who have contributed to the development of the instruments.

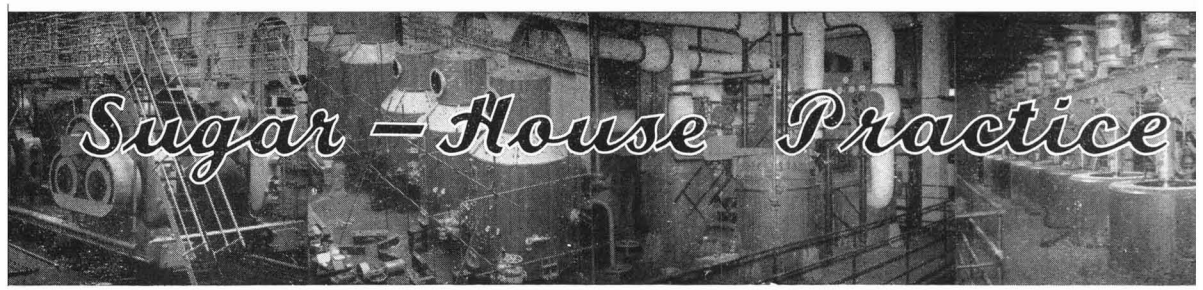
RAW SUGAR LOADING PLANT FOR PERU

To design, construct and equip a large plant for storage of raw sugar and loading it into ships, the Peruvian Ministerio de Hacienda y Comercio has signed a contract with George Wimpey & Co. Ltd., of London, for the civil engineering work and with the Swiss engineering firm Buhler Brothers, of Uzwil, Switzerland, for the mechanical and electrical equipment. A model of the plant is illustrated.

Located in Puerto de Salaverry, the warehouse will be equipped to receive raw sugar by either truck or rail at a rate of 200 metric tons per hour. Total storage capacity will be 60,000 tons. Ships will be loaded at a rate of up to 600 tons per hour by means of special conveying equipment installed on the wharves.



Some of the more important items supplied by Buhler are: 15 chain conveyors with a total length of approximately 1970 feet (600 m) and capacities of 200 and 300 metric tons per hour, 2 conveyor belts with a total length of 925 feet (282 m) and each with a capacity of 600 tons per hour, 2 travelling loading towers with jibs slewing vertically and horizontally, and two 300 tons-per-hour loading trimmers with telescopic tubes swivelling through 360°.



The sorption of colour substances by ion exchange resins. A. R. SAPRONOV, G. A. CHIKIN, V. P. MELESHKO and T. A. KLOCHKOVA. *Sakhar. Prom.*, 1962, (11), 15–17.—Tests were carried out in which individual colour substances (including forms of invert sugar alkaline decomposition products) were adsorbed on a KU-2 cation exchanger in H and Na forms and an EDE-10P anion exchanger in OH and Cl forms. The solutions of concentration 0·5 g/litre were adjusted to pH 7 and 250 ml passed through a column (of 0·8 sq. cm. cross-section) containing 5 g resin at a rate of 200 c.c. per hr. The colour of the treated solutions was measured spectrophotometrically. The sorption effects for each type of colour substance and resin are discussed in some detail. In further tests using the degradation products of invert sugar, it was found that sorption by the cation exchanger in H form was almost independent of pH, whereas with the anion exchanger in OH form and in Cl form the sorption decreased and considerably increased respectively with increase in pH. The nature of the sorption of the colour substances was also studied with the decomposition products and the results are expressed in the form of curves of log optical density *vs.* wavelength λ. Changes in the spectral positions indicate chemical changes in the substances. The results suggest that sorption by the cation exchanger was molecular (without any change in the substance), while on the anion exchanger it was of the nature of ion exchange proper.

* * *

Improving evaporator designs. V. N. SHCHEGOLEV and I. E. ZINGEL'. *Sakhar. Prom.*, 1962, (11), 27–30.—The entrainment separator of the VTs evaporator designed by SHCHEGOLEV & TOBILEVICH is a baffle in the form of an inverted umbrella placed just below the vapour discharge port at the top of the body. For best separation a large steam chest is provided and it is claimed that under normal conditions there is no sugar in droplet form above a height of 2·0–2·5 m. The float-type level indicator is defective because the diameter of the tube leading to the float chamber is too small. Traps installed between certain types of evaporator effects "sugar-up" when the juice line from the trap is of too small a diameter, and sugar consequently passes into the condensate. Entrainment separators in various types of evaporators including TsINS, Duncan Stewart and Robert types, are considered complicated and sometimes inefficient. When sugar adhering to the separators is caramelized after a long period at high temperatures, the passage through the separators is narrowed and the vapour being discharged has a reduced pressure and temperature (by 1–2°C), which can result in a 15–25% reduction in evaporator throughput, or even a shut-down for boiling out. For best results separators should be placed outside the evaporator. Certain other measures are recommended to reduce sugar losses caused by prolonged juice retention at high temperatures. The use of concave, removable bottom plates is advocated only where the service life of the heating tubes can be extended, since these cannot then be replaced. Their life can be lengthened by using compensators. The question of juice transfer between effects is discussed. The elimination where possible of flanged joints is recommended.

* * *

Slow processes of sucrose crystallization. I. S. CHEN'. *Sakhar. Prom.*, 1962, (11), 12–14.—The mean crystallization rate found in previous experiments[1] is used to calculate the permissible rate of cooling of a final-product massecuite at the end of the crystallization process (in order that the supersaturation coefficient does not exceed 1·1) and to calculate the crystallization period necessary for accurate determination of standard molasses purity. The final calculated duration of final-product massecuite cooling is shown to be much shorter using mixers with moving surfaces than the usual period in Soviet factories, e.g. 16 hr compared with 24 hr. Calculations of the time necessary for molasses purity determination showed that 50·6 hr is necessary for an accuracy of ±0·2 units; however, since too much time is spent on the determination of standard molasses purities, experiments have been carried out to examine the possibility of shortening the period, results of which are to be discussed later.

* * *

Perlite filter-aid. YU. D. GOLOVNYAK and B. N. TERESHIN. *Sakhar. Prom.*, 1962, (11), 37–39.—The use of expanded perlite as a filter-aid is discussed and information is given on the production of this substance under various trade names in Europe and the U.S. (e.g. "Clarcel FLO" and "Dicalite"). The extraction and processing of perlite is simpler and cheaper than kieselguhr and the raw material easily transportable, so that its use in Soviet sugar factories is strongly advocated. At present it is used in the U.S.S.R. as a heat insulator in the building industry, and is found naturally in a number of regions.

* * *

The modified two-boiling system as in use at Gray's Inn factory. J. H. DITMAR JANSSE. *J.A.S.T.J.*, 1961, **23**, 71–73.—As the 3-massecuite system formerly used was unsuitable for a grinding rate above 48 t.c.h., a two-boiling scheme was introduced. A seed strike is boiled from *A*-molasses and 75 purity syrup and grained with slurry made of pulverized grocery

[1] *I.S.J.*, 1963, **65**, 122.

sugar in methylated spirit. The seed is boiled on *A*-molasses to provide the magma for the *A*-massecuite ("Java" strike). The *A*-massecuites of 80 purity yield export and local grocery sugars, while *D*-massecuites boiled from seed and *A*-molasses yield local consumption sugar. The boiling house capacity has been raised by 12% and should eventually be raised by at least 20% when certain modifications have been made to the crystallizer and centrifugal stations.

* * *

From the sugar bag to the sugar silo. ANON. *Zucker- u. Süsswarenwirtsch.*, 1962, **15**, 567–568.—Raw sugar silos and methods of conveying the sugar to and from the silos are discussed, as is also the unloading of sugar from tankers, e.g. by pneumatic means. The advantages of bulk handling are described. The erection of a sugar silo within the factory building is preferred to a silo outside the building, since in the latter case a large number of difficulties arise which are usually not mentioned by the suppliers.

* * *

Liquid sugar. F. KASTNER and A. MALÝ. *Listy Cukr.*, 1962, **78**, 203–209.—The production, physical properties and uses of liquid sugar are discussed. The three types of liquid sugar that would be required in Czechoslovakia are: pure sucrose, a mixture of sucrose with 10% invert sugar and sucrose with 40–50% invert sugar. The problem of raising the dry solids content of pure liquid sucrose by adding an anti-crystallizing substance is discussed. This additive would have to be stable at high temperatures so that water content could fall to the required extent when the solution thickened up.

* * *

Examination of the raw material and molasses in the processing of raw sugar. V. M. KATS, T. P. KHVALKOVSKII and L. K. IVANOVA. *Sakhar. Prom.*, 1962, (11), 45–49.—Cane raw sugar and molasses samples from various sources were analysed. The tabulated results show that the maximum difference between the sucrose content given by direct polarization and by acid inversion was ±0·3%, although the mean values agreed. For molasses, the mean deviation was ±0·2% (maximum 1·5%). Since the normal molasses yield does not exceed 10% on weight of raw sugar, the maximum deviation may be 0·15% on weight of raw sugar. Consequently, any drop in polarization occurring during refining mainly reflects actual sugar losses, apparently caused by sucrose degradation and mechanical losses of sucrose. The difference in the values given by direct polarization and by acid inversion is attributed to the effect of invert sugar in which the glucose:fructose ratio may not be 1:1, so that 1% invert sugar may not cause a 0·3% drop in the polarization.

* * *

Automatic cane feeder control at Victorias Milling Co. Inc. E. F. GAMBOA. *Sugar News* (Philippines), 1962, **38**, 515–518.—Details are given of the automatic control mechanism regulating cane feed to the milling tandem at Victorias. The mechanism comprises three main parts: the first regulates the speed of the main carrier feeding the crusher and is actuated by the floating feed roller. The second part is an override device actuated by the top roller of the crusher when it reaches its "critical lift point" and which stops the feed roller, main carrier and the feeder carrier simultaneously and restarts these when normal level is achieved. The third control device is also an overrider which regulates the main carrier speed when the cane mat thickness from the feeder carrier is below the normal level, thus reducing time lags caused by "humps" in the cane mat on the carrier. Satisfactory results have been obtained during 6 months' operation. The system is illustrated by diagrams.

* * *

The Pulupandan bulk sugar terminal. C. ALINCASTRE. *Sugar News* (Philippines), 1962, **38**, 520–524.—Further information is given on the bulk sugar terminal at Pulupandan in Negros, Philippines[1].

* * *

Multispeed sugar centrifugal motors. C. C. KING and M. T. HUANG. *Taiwan Sugar Quarterly*, 1962, **9**, (2), 22–25.—The requirements of centrifugal motors and the operational characteristics of centrifugals over a complete cycle are discussed with the aid of graphs. Tests were conducted on motors driving 1200 and 1800 r.p.m. centrifugals. The results, expressed in graph form, show that while an A.C. induction motor developed very low torque when running at a speed far below the rated speed, a pole-changing 3- or 4-speed motor could operate as a constant torque motor and is thus preferable for centrifugal operation. It was found that cutting off the power supply 30 sec after the spinning speed was reached resulted in a saving of 0·07 kWh and 0·28 kWh for a 48 in × 30 in × 1200 r.p.m. and a 40 in × 24 in × 1800 r.p.m. machine respectively.

* * *

Starch in the manufacture of raw sugar. P. N. BOYES. *Taiwan Sugar Quarterly*, 1962, **9**, (2), 26–30.—See *I.S.J.*, 1962, **64**, 205.

* * *

Filtration of Oliver-Campbell sugar cane mud filtrate with "Fas-Flo" filter at Victorias Milling Company. E. R. DE LUZURIAGA. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 57–64.—See *I.S.J.*, 1962, **64**, 143.

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Bulk sugar handling through the Guimaras bulk sugar terminal. L. WINTERNITZ. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 65–67.—See *I.S.J.*, 1962, **64**, 207.

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Why sugar boilers want to use live steam. T. O. SORIANO. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 206–208.—See *I.S.J.*, 1963, **65**, 20.

[1] *I.S.J.*, 1962, **64**, 236–237.

Performance of continuous low-grade centrifugals at Pilar Central. D. TANCO. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 280–284.—Performance data are presented for a BMA continuous centrifugal which at a capacity of 0·17–3·85 tons of massecuite per hr gave sugar of 87·5–91·5 purity from low-grade massecuites of 59·5–61·5 purity. Such sugar increased boiling house capacity when used as seed, despite the presence of broken grains, since the powder from the broken grains was eliminated with the first syrup intake after seeding and the small broken chips grew relatively faster than the larger unbroken grains giving final crystals of satisfactory uniformity. The advantages of the BMA centrifugal are summarized.

* * *

Multiple effect evaporation and juice heating. A. L. WEBRE. *Sugar y Azúcar*, 1962, **57**, (10), 32–34.—The application to juice heating of Rillieux's second principle (if vapours are withdrawn from any body of a multiple effect evaporator to replace steam used in another apparatus, the saving will be equal to the number of pounds of steam so used multiplied by the sequence position of the body in the set and divided by the total number of bodies) is discussed. The slight deviation in accuracy of this principle is referred to, but its usefulness in heat economy studies is emphasized. A number of important points are listed which must be considered when preparing to calculate the differences in heat balances for systems employing exhaust steam, vapour alone or combinations of the two for juice heating.

* * *

Principles and theory of filtration with filtrant auxiliaries (filter-aids). G. G. HOLVARSEN. *Bol. Azuc. Mex.*, 1962, (157), 18–22.—The purposes of filter-aids are discussed, together with the kinds available, when and how they are used—as a "body aid" addition to the suspension to be filtered, as a thin precoat for filter cloths, or as a thick precoat on a rotary filter screen, etc. Filtration rate is expressed by a formula $\frac{P_c A}{C P_c^s \mu L}$, where P_c is the pressure drop across the cake, A is the filter area, C is a constant depending on the nature of the cake, s is a factor characterizing the compressibility of the cake, μ is liquor viscosity and L is the cake thickness. The influence of these factors and of temperature and dilution is discussed and a number of recommendations made for increasing filter rates.

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Studies on the use of flocculating agents during cane juice clarification. II. A comparative trial of "Separan AP 30", "NP 20" and "NP 10". S. BOSE and A. N. SHRIVASTAVA. *Sharkara*, 1961, **4**, 152–160.—Tests are described in which 500-ml portions of sulphitation juice were adjusted to pH 7 and brought to the boil and "Separan AP 30", "Separan NP 20" and "Separan NP 10" were added in the form of 0·05% solutions (2–10 p.p.m.). The polyelectrolytes were added with gentle stirring, after which the juice was transferred to measuring cylinders. The Ca content of the treated juice was determined by EDTA titration, the alcohol-precipitable matter by the conventional method and the colour of the supernatant with a Spekker photo-colorimeter. The effects of "Lytron X 886" and Jeol gum were also tested. "Separan AP 30" was superior to the other polyelectrolytes and gave a pronounced improvement in flocculation, the other additives sometimes producing a hazy supernatant resulting from incomplete removal of light suspended particles. The optical densities of the supernatant from treated juice and a control sample were identical, as were the Ca content and alcohol-precipitatable matter. "Separan AP 30" increased the settling rate three-fold, the optimum dosage being 3 p.p.m. The final mud volume after one hour's settling was always 10–15% lower than with the blank, suggesting that "Separan" causes greater mud compaction. Settling rates, mud volumes, optical densities, etc. are recorded in the form of tables and graphs.

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Continuous juice sulphitation unit designed by the (National Sugar) Institute (Kanpur, India). ANON. *Sharkara*, 1961, **4**, 161–164.—Further details are given of the unit which has been described earlier[1] and tests with which have also been reported[2].

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Damp-proofing of sugar godowns. N. A. RAMAIAH. *Sharkara*, 1962, **5**, 6–13.—Details are given of the construction of a damp-proof floor of a sugar godown, and information is given on the preparation and application of "Insproof" damp-proof material (which contains asphalt and lime) to the floor and walls of a godown. Tests conducted on "Insproof" are discussed and certain precautions to adopt in the application of this material are enumerated.

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Sugar and electricity. A. N. BOTT. *Rev. Agric. Sucr.* (Mauritius), 1962, **41**, 195–200.—Information is given on the electricity supply scheme operating in Mauritius which has no local coal or oil sources and therefore depends entirely on electricity. Since the power drawn from the rivers through the hydroelectric stations is inadequate from August to December because of reduced rainfall (70–75% of the annual rainfall occurs in December-August), a scheme has been launched whereby a number of sugar factories with surplus power in the form of bagasse and surplus process steam supply electricity to the main grid. In 1962 the power taken from 7 factories by the Central Electricity Board is given as 14 million kWh, i.e. 16·5% of the island's annual power requirement. Future plans are discussed. The reasons for rejection of a plan for a central steam station using surplus bagasse instead of drawing the power direct from the factories are listed.

[1] RAO and BHALERAO: *Proc. 4th Conv. Deccan Sugar Tech. Assoc. (India)*, 1947, 220–228.
[2] *I.S.J.*, 1962, **64**, 333.

BEET FACTORY NOTES

Several râperies or one large sugar factory? S. ZAGRODZKI. *Gaz. Cukr.*, 1962, **64**, 208–210.—Details are given of the Longchamps râperie (juice extraction station) which is connected by a 27-kilometre pipeline to Wanze sugar factory, Belgium. An RT diffuser is used with a daily capacity of 4000 tons of beet and the juice is limed before being pumped to Wanze. Losses in the diffuser are recorded as 0·2–0·3% on beet at a draught of 107%. Wanze also collects juice from two other râperies, Crisnée and Waremme which have daily capacities of 800 and 2200 tons of beet respectively.

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The expediency of payment for beet on the basis of sugar content. S. ZAGRODZKI. *Gaz. Cukr.*, 1962, **64**, 257–262.—The factors affecting the costs of beet sugar production (sugar yield, factory throughput, costs of raw materials, the value of by-products, and particularly the beet pol) are considered. The optimum beet varieties are discussed from the point of view of sugar content. Fluctuations in beet yield are compared with those in sugar yield, and the effect of beet cultivation and breeding methods on the sugar content are discussed. Methods of determining the sugar content of individual beet sections are described and the advantages of beet payment on a pol basis are listed.

* * *

Purification of industrial waste waters at Ziebice sugar factory. S. GORSKA and B. MAZUR. *Gaz. Cukr.*, 1962, **64**, 269–272. —Details with flow-sheets are given of the biological and field waste water treatment at Ziebice factory. The scheme may be used by any small or moderate-sized factory with a battery diffuser. A small amount of treated waste is discharged into the local river from which is taken the fresh factory water.

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Screen centrifuges. E. JUNG. *Socker Handl.* II, 1961, **17**, 39–53.—The applications of centrifugal filters and the fundamentals of mud separation by this means are discussed. A number of equations are presented for calculation of various factors. A survey is given of the main types of centrifugal filters with information on their modes of operation and some advice is given regarding the choice of machine.

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Centralized grease lubrication in sugar factories. A. KERSTEN and K. LANG. *Zeitsch. Zuckerind.*, 1962, **87**, 494–498.—The advantages of centralized lubrication are listed and details given of two two-line systems installed in an average-size sugar factory. The first automatically greases about 180 points at the beet end of the factory, while the other lubricates about 150 grease points at the sugar end. One man supervises the work of both installations, the intervals between lubrication as well as the lubrication operation itself being controlled electrically. Apart from staff reductions (from an original 9), the grease consumption has been almost halved. A diagram is reproduced of an installation for the beet end of a factory. The two types of installation best suited to sugar factories (the multiple- and two-line systems) are described with information on their construction, mode of operation and installation. Break-even is possible within 2–3 campaigns.

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The Jaworowski column vessel for continuous progressive defecation. S. GAWRYCH and W. DREWNOWSKA. *Gaz. Cukr.*, 1962, **64**, 262–267.—Various types of continuous progressive liming vessels are described and details are given of the Jaworowski vertical liming vessel. This is separated into compartments from the top by alternate upward sloping and downward sloping conical hoods, the former fastened to the column walls and the latter attached to a central rotating shaft. The milk-of-lime is fed at three points, each just above an upward sloping section, and is mixed with juice flowing up the vessel. The juice takes a zigzag path, flowing through the central annuli of the upward sloping sections and through perforations at the edges of the plates forming the downward sloping sections. The discharge port is at the top of the vessel. Between the three liming chambers are anti-foam S-shaped rotating vanes. A flow-diagram is presented showing the liming scheme at Chelmza sugar factory and performance data are given for the Jaworowski vessel which is included in the scheme. A number of advantages are claimed for the apparatus.

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Where has continuous purification in the sugar factory come to? J. GENOTELLE. *Ind. Alim. Agric.*, 1962, **79**, 631–645.—Flow diagrams are presented for a total of 17 continuous 1st carbonatation procedures, each with an explanatory paragraph. Features of the techniques are compared in a table, and three important factors deduced to be essential in the treatment of raw juice. Each is discussed separately: controlled lime action with stabilization of the colloids and progressive preliming; recycling of the $CaCO_3$ flocculate; and overcarbonatation of the flocculate. The objects of continuous carbonatation are discussed; these are high degree of chemical juice purification and lime economy. Finally, a survey is made of equipment introduced in the last ten years, particularly for thickening carbonatation muds.

Different methods of drying in the sugar industry. *Ind. Alim. Agric.*, 1962, **79**, 683–710.—Information supplied by ten manufacturers of pulp and sugar dryers is presented with diagrams and illustrations.

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Improving the sedimentation properties of 1st carbonatation juice using beet diffusion and press juices. A. K. KARTASHOV and YU. D. GOLOVNYAK. *Sakhar. Prom.*, 1962, (10), 14–19.—A number of tests have been carried out in which raw or press juice has been added to 1st carbonatation juice in order to improve the settling properties[1]. While both had a positive effect on settling and improve the quality of the supernatant, press juice was more effective than raw juice. The optimum amount of either is 2–5% on volume of juice; foaming occurs if this quantity is exceeded. The best results have been achieved by first heating the 1st carbonatation juice to 85°C, at which temperature the albumins coagulate instantaneously. Addition of albumin to the juice before and after heating gave identical results. The effects on 2nd carbonatation juice quality have been noted; differences in purity, colour and lime salts content at 2–10% raw juice addition have not been great. In the case of 2nd carbonatation juice from good quality beet, only at 10% raw juice addition has there been improvement in all three factors, the purity rising only very slightly. With poor beet, there has been no improvement in the 2nd carbonatation juice quality.

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Flocculating properties of raw cane sugar affination syrup. D. V. GORBAN'. *Sakhar Prom.*, 1962, (10), 20–21.—Invert sugar has been found to have an adverse effect on juice settling. However, it has also been noted that in the combined processing of beet and raw cane sugar the cane non-sugars do improve settling if added to 1st carbonatation juice. A mixture of cane sugar affination syrup (purity 93·4, invert sugar content 1·61%) and a white sugar solution containing 10·4% invert sugar (obtained by citric acid inversion) was added to unfiltered 1st carbonatation juice. The contents were mixed in a glass cylinder. The results show that while the height of the supernatant liquor was greater after a given time than without addition of the cane syrup, with a maximum difference after 5 min, the syrup caused an increase in juice colour. The optimum quantities to be added should be worked out for individual factories. However, an editorial footnote rejects the scheme because of the colour increase, mentioning also that addition of 2–5% raw juice (by weight) to 1st carbonatation juice similarly improved settling, although amounts greater than this have an adverse effect on filtration.

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Filtration of thick juice. V. A. KOLESNIKOV. *Sakhar. Prom.*, 1962, (10), 26–27.—Difficulties encountered at Ust'-Labinsk sugar factory in the filtration of thick juice using bag filters are discussed. Since such filters are unsuitable for the treatment of thick juice above 62°Bx, it is suggested that it should first be diluted to 45–50°Bx or withdrawn from the evaporator at a lower concentration. However, boiling of the 1st massecuite would then be prolonged by at least 1 hr. Practices in U.S. factories are cited as well as the so-called "inter-effect" scheme adopted in Swedish factories, juice from the 4th effect (at 52°Bx) being filtered instead of from the 6th effect (at 68°Bx). Attention is called to the need for modern filter equipment and for kieselguhr of Soviet origin.

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Calculation of massecuite mixers. M. R. AZRILEVICH. *Sakhar. Prom.*, 1962, (10), 30.—A formula given in "Standards for Technological Planning in Beet Sugar Factories" (Moscow, Pishchepromizdat, 1954) for calculation of trough-type massecuite mixers gives a value for the effective volume which is approximately half that required. In fact, increasing the width of a 2nd product massecuite mixer to 800 mm for a factory slicing 1500 tons of beet per day as proposed at an official meeting in 1960 would result in a capacity 4 times that given by the formula. The total volume (V) is given by another formula: $V = 0{\cdot}5312$ L cu.m., where L = length of the mixer (m).

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Methods of pulp conveying. I. L. VILYANSKII. *Sakhar. Prom.*, 1962, (10), 38–41.—The article by BONDARENKO[2] is criticized and the adoption of methods of pulp conveying suggested in it are considered unsuitable. At a distance of up to 400 m between diffuser and pulp storage, belt conveyors are recommended, and above this distance a telpher line is advocated.

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Removing impurities from sugar beet. F. M. PASHKOVSKII and V. F. KONYAKIN. *Sakhar. Prom.*, 1962, (10), 41–42.—Various pieces of equipment for removal of soil and trash, etc. from mechanically-harvested beet are described and a scheme for beet cleaning is suggested.

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Power requirement of beet pumps and selection of electric motors for these. N. R. FREPON. *Sakhar. Prom.*, 1962, (10), 43–48.—Graphs and formulae are presented showing the main operating characteristics and power consumption of two types of Soviet beet pumps.

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Dependence of sugar losses in respiration of beet on storage temperature. V. Z. ZHADAN and M. Z. KHELEMSKII. *Sakhar. Prom.*, 1962, (10), 55–59.—Formulae are presented for calculation of sugar losses by respiration and of total sugar losses in beet storage piles. The losses at 0°C are used as a basis.

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Changes in the construction of a Russell sand trap. N. F. DOMASHENKO. *Sakhar. Prom.*, 1962, (10), 61–63.—A number of alterations to an already

[1] *See also I.S.J.*, 1963, **65**, 25
[2] *I.S.J.*, 1962, **64**, 305.

modified Russell sand trap are described. These have resulted in the production of good quality milk-of-lime during 5 months' faultless working.

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Fundamental problems of modern juice purification in Hungary. K. VUKOV. *Zuckererzeugung*, 1962, **6**, 284–286.—See *I.S.J.*, 1963, **65**, 22.

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Purification of beet sugar products by electrodialysis using ion exchange membranes. L. D. BOBROVNIK and I. M. LITVAK. *Sakhar. Prom.*, 1962, (11), 18–26.—Investigations were carried out to determine the optimum parameters concerning electrodialysis. Determination of the coefficients of dialysis of sucrose at 50–70°C showed that membranes have high diffusion resistance to sucrose so that calculations show that sucrose losses in electrodialysis will be negligible. Prepared solutions containing sucrose and specific non-sugars were treated in a 23-cell dialyser (alternate anion and cation membranes of 50 sq.cm. active surface). The relative rates at which the impurities are removed are given for each group of non-sugars. Deionization of green syrups containing 11–53% dry solids during 40 min showed that the highest effluent purity was at 10–11°Bx, although the total non-sugars removed was greatest at 30–42°Bx. The purity could be brought to the same level with higher Brix solutions by lengthening the period of dialysis. The effect of the dialysis time on the type and amount of non-sugars removed was studied with a 29·3°Bx green syrup at 40°C using a current density of 17–116 A/sq.m. and a syrup of 15·75°Bx using a current density of 15–80 A/sq.m. Highly melassigenic inorganic non-sugars were the ones most eliminated, ash being almost completely removed. The intensity of ion removal depends on current strength; 50–60% of the total N could be removed, giving a total purification efficiency of about 70%, since the current is very small with large molecule substances. A gradual drop in pH that takes place during electrodialysis was found to result from the more rapid elimination of relatively highly mobile cations of alkali and alkaline earth metals compared with the low-mobile organic acid radicals. Since an electrodialysate of below pH 7 cannot be subjected to high temperatures, the pH must be raised. This can be done by adding free lime (as little as 0·01% on weight of solution will raise the pH from 5·4 to 8·0 since the buffering capacity of the electrodialysates is negligible) or by passing the solution through a strongly basic anion exchange column, thereby decolorizing and raising the purity. The alkali used to regenerate the exchanger may be regenerated by electrodialysis and thus make such a process economically sound. The molasses yield from a green syrup treated by electrodialysis and subsequently evaporated to 95°Bx, crystallized and boiled to A, B, and C massecuites, was reduced (from 71·9 to 25·9% on the weight of green syrup) and the sucrose yield increased (from 26·7 to 64·5%). With the removal of cations of alkali and alkaline earth metals from products of varying purity, the melassigenic capacity of the remaining non-sugars even became negative. The deionization of solutions in a number of stages according to non-sugar fractions is recommended. Thus, ashes are first removed, and nitrogenous substances are in the last fraction removed. Membrane fatigue may be determined by electrodialysing a solution of 0·1N NaCl, and determining the change in current and in the concentration of the solution after a given time. Changes in the pH of the solution have shown that the electivity of the cation membranes changes more rapidly. A 5–10% NaCl solution can be used to regenerate the membranes. Experiments have shown that about 45 kW and an active surface of 65 sq.m. are required per 100 metric tons of beet, although the power usage may be cut by reducing the width of the cells and by other means.

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Experience in the operation of a twin-scroll diffuser. F. N. DOBRONRAVOV. *Sakhar. Prom.*, 1962, (11), 31–33.—Some information is presented on the operation of a DdS-type twin-scroll diffuser working in parallel with a battery diffuser at Novo-Troitsk sugar factory. The diffuser was run at lower than rated capacity since extensions to the sugar house were not completed. Details are given of cossette length, diffusion temperature, juice draught, cossette fill and on disinfection of the diffuser. No actual performance figures are given. Some difficulties in the handling of sub-standard cossettes are described.

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The use of natural gas for limestone burning at sugar factories. A. S. KRENDEL'. *Sakhar. Prom.*, 1962, (11), 39–44.—The fundamentals of lime burning with natural gas and the problems connected with conversion of kilns to gas burning are discussed. While the two main advantages of natural gas are claimed to be intensified heat exchange and higher quality lime, some authors have mentioned certain disadvantages, including higher fuel consumption, reduced CO_2 content in the carbonatation gas and a greater volume of dry combustion products. The present author discusses these points and indicates errors in the calculations, supporting his argument with results from various factories. The increased fuel consumption he attributes to inefficient mixing of the methane and heavy hydrocarbons in the gas with air caused by defective burner design. Advice is offered on optimum operation of a gas-fired kiln and on the distribution of burners. Diagrams are also provided.

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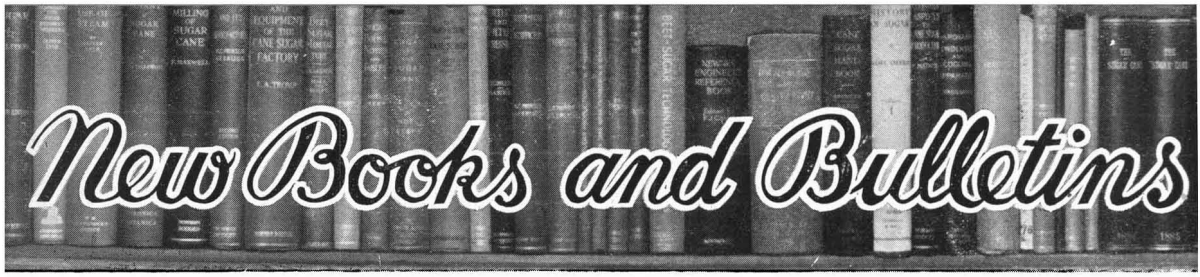
The Ust'-Labinsk experimental model sugar factory project. R. M. KHMEL'NITSKII. *Sakhar. Prom.*, 1962, (11), 50–56.—Details are given of the layout and equipment of the proposed converted sugar factory at Ust'-Labinsk which at present has a daily slice of 2500 tons of beet. The factory has a high level of automation, and is expected to produce 45,500 tons of sugar annually. A high standard of efficiency is aimed at, with low sugar losses and fuel consumption and a high sugar quality.



Indian Sugar Manual, 1961. R. B. SAXENA. ix + 310 pp.; $7\frac{1}{4} \times 9\frac{1}{2}$ in. (The Sugar Technologists' Association of India, Nawabganj, Kanpur, U.P., India.) 1962.

The 17th edition of the Manual contains the same number of pages as the previous edition and the general layout remains unchanged. The information has been brought up to date, the most recent data covering the 1960/61 period. The three sections deal with the world sugar situation, the Indian sugar industry, and general information on world sugar organizations, sugar schools, beet and cane technologists' associations, Indian sugar manufacturers, Indian sugar production, crushing seasons, etc. The book is a valuable guide to the Indian sugar industry.

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50 Jahre Zuckerfabrik & Raffinerie Aarberg A.G. 1912-1962. 79 pp.; $8\frac{1}{4} \times 11\frac{1}{2}$ in. (Zuckerfabrik & Raffinerie Aarberg A.G., Aarberg, Switzerland.) 1962.

This well-illustrated and printed book has been published to mark the 50th anniversary of the founding of the Company. It contains a brief history of the Swiss beet sugar industry, from the building of the "Helvétia" factory at Monthey to the current erection of the new factory at Frauenfeld. Information is given on the original Aarberg factory which was erected in 1899 to house the equipment from the Monthey factory, which had gone into liquidation only three years after first starting production. The present Aarberg factory was erected after the original factory was burnt down in 1912 and today provides 14·2% of the sugar needs in Switzerland. Details are also provided of the agricultural holdings of the Company—other products are grown besides beet, and cattle and pig farming has been developed on a small scale. Finally, details are given of the Company's officers and a map is given showing the beet areas and tonages produced by cantons. A number of graphs are also included.

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Proceedings of the International Conference of Consultants and Technologists of the Sugar Industry. 309 pp.; 7 × $9\frac{1}{2}$ in. (Instituto Tecnológico Azucarero Veracruzano, Cosamaloapan, Ver., Mexico.) 1962.

The Instituto Tecnológico Azucarero Veracruzano was founded and is supported completely by Ingenio San Cristóbal y Anexas S.A. The present volume is a record of a conference organized by the Instituto during July 1960, and gives in mimeograph form the texts of the papers presented and ensuing discussions. A description of the San Cristóbal company is provided as well as a reprint of the information provided on it is the Mexican Sugar Manual. An index to the papers is included and a list of the technical personnel of the Institute.

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The Sugar Tramp 1961. The Oxnard beet sugar factory, Oxnard, California. The last chapter. DAN GUTLEBEN. 176 pp.; $8\frac{1}{4} \times 11$ in. (Dan Gutleben, 1366 Mt. Pisgah Rd., Walnut Creek, Calif., U.S.A.) 1962.

The Oxnard sugar factory started operations in 1899 and closed in 1959, during which time it produced nearly two million tons of sugar. An interesting and anecdotal account is given of the factory and, to a greater extent, the people who brought about its erection and those who ran it. A second part of the book is called "The Oxnard Builders" and gives a plentifully illustrated account of the people who built the Oxnard string of factories later called The American Crystal Sugar Co. The Oxnard Construction Co., as it was called, also built plants for other sugar manufacturers and accumulated a considerable fund of knowledge and experience. Mr. GUTLEBEN has spent much time and effort in collecting the information on these sugar men and the stories about them and the product is a remarkable and unique fund of both interest and entertainment for the reader.

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The South African Sugar Year Book 1961-62. 296 pp.; $8\frac{1}{2} \times 11$ in. (The South African Sugar Journal, P.O. Box 1209, Durban, Natal, South Africa.) 1962. Price: R.1; 10s. 0d.

The latest Year Book, in its 32nd edition, follows the pattern set in previous years, starting with the section of special articles and features, largely reprinted from the South African Sugar Journal, as are the Industrial Reviews and Reports which form the second section. The latter includes a 48-page summary, by C. G. M. PERK, of the chemical laboratory reports of the sugar factories for 1961/62.

The third part—the Reference section—provides up-to-date information on the membership and officers of the various millers' and planters' groups, advisory board, etc., as well as on the South African Sugar Journal (Pty.) Ltd., South African Sugar Terminals (Pty.) Ltd., the Experiment Station, South African Sugar Technologists' Association officers, and Mechanization Committee.

In the fourth part are the statistical data on sugar production, crop data, sugar prices, etc., which

include the figures for 1962. Sugar milling enterprises in South Africa and Swaziland are described in detail in the next part, while rather less information on the industries of other African territories appears in the succeeding section. The final part is devoted to manufacturers and suppliers to the sugar industry describing the development of the firms concerned together with the products they offer.

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Las Plagas de la Caña de Azúcar en Venezuela. (**Sugar Cane Pests in Venezuela.**) P. GUAGLIUMI. (Condo Nacional de Investigaciones Agropecuarias, Centro Simon Bolívar, Torre Norte-piso 13, Caracas, Venezuela.) 1962. Price: 25 Bolívares; $6.00.

This Monograph, No. 2 of the series, is in two volumes, with 22 maps and 212 illustrations as well as 14 colour plates. The first volume includes extracts from the diaries of Bolívar, and an introduction which describes the origin of the sugar cane, its introduction into Venezuela, entomological investigations in that country and a bibliography of these studies. After mention of the elements of entomology, the various insect pests (coleoptera, lepidoptera, hymenoptera, etc.) and other animal pests (arachnida, myriapoda, nematoda, etc. up to rats and other mammals) are discussed separately, with a section on pathogenic fungi and viruses related to sugar cane insects.

The second volume discusses the equilibrium between harmful and beneficial organisms, and then deals with the beneficial insects and animals (including birds). General methods of combating pests are discussed—cultural, biological, physical or mechanical, chemical, etc.—with a more detailed account of controlling the more important pests. Appendices list the insects and animals attacking cane and those beneficial to cane, hyperparasites attacking the latter, fungi, bacteria and viruses, host plants for the principal cane pests, common names for insects and animals mentioned in the text, etc. A bibliography is presented as well as indexes to illustrations, authors, and to scientific botanic names and zoological names.

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Laboratory Manual for South African Sugar Factories. 84 pp.; 6½ × 10 in. (South African Sugar Technologists' Association, c/o South African Sugar Association Experiment Station, Mount Edgecombe, Natal, South Africa.) 1962. R.3·00; £1.10s. 0d.

In his preface to this book, J. L. DU TOIT, President of the South African Sugar Technologists' Association, refers to the "Recommended Methods" for chemical control which succeeded the "Official Methods" of 1926–31; the former have been used in South African sugar factories for more than 25 years. The new book, developed by the S.A.S.T.A. Committee for Standardization of Chemical Control, revises the earlier techniques and includes useful additional methods.

It includes a chapter of definitions and then gives detailed instructions on determination of factory weights, calculations of stocks, proportions (e.g. of sucrose % cane) and ratios (e.g. extraction). A chapter describes standard equipment and its use, while succeeding sections cover sampling, reagents, general analytical techniques, and analysis of sugar factory products. A series of tables required for certain of the methods is included, and a number of illustrations of equipment are provided. One feature is the fact that the separate sheets are loosely bound in a stiff folder which gives adequate protection but will permit replacement of individual pages and sections as their contents are superceded.

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Sugar in the West Indies and British Guiana. 1961 Handbook of British West Indies Sugar Association (Inc.). 123 pp.; 7¼ × 9¼ in. (B.W.I. Sugar Association Inc., P.O. Box 170, Bridgetown, Barbados, W.I.) 1962.

The first Handbook of the Association was published in 1952 and succeeding editions appeared in 1954 and 1959. The present edition is somewhat wider in scope than its predecessors and is an attempt to give a broad general picture of the sugar industry of the West Indies and British Guiana at the end of 1961.

To this end, the importance of sugar in the area and geographical, political and other factors are discussed with a mention of such matters as industrial relations, employment, exports, marketing, the Commonwealth and International Sugar agreements, etc. Historical sketches of the industry are presented, with a review of the period 1959/61. Chapters deal with research, pests and diseases, irrigation and separately with cane breeding, field mechanization and factory automation, bulk handling and shipping since 1952, and social measures, the last three being newly introduced with this edition. Details are provided of sugar industry organizations and of sugar factories in the West Indies and British Guiana, while a section of statistics for 1950–61 completes the volume.

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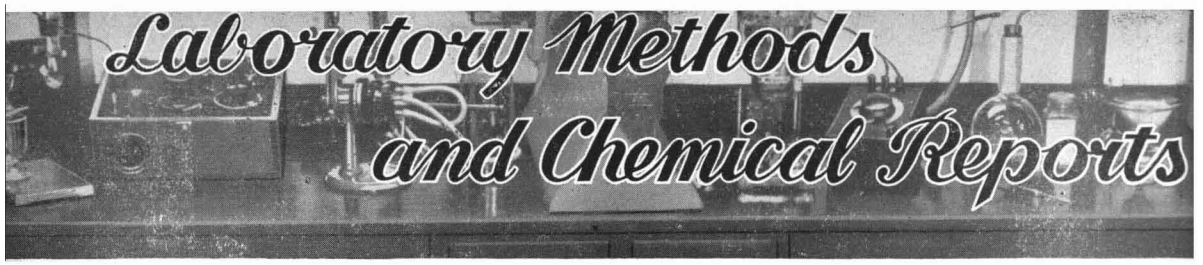
Recommended Practice for Troughed Belt Conveyors. 78 + iv pp.; 8½ × 11 in. (Mechanical Handling Engineers' Association, Glen House, Stag Place, London S.W.1.) 1962.

The troughed belt conveyor was first developed in Britain nearly a hundred years ago. and has remained the most flexible and economical system for handling loose bulk materials, although many improvements have been made, of course, in both the mechanical parts and construction of the belts used. This new manual is introduced to provide a knowledge of sound modern practice in the design, application and operation of troughed belt conveyors and should be useful to manufacturers and users alike.

The section cover definitions, design, classification of materials, associated equipment, statutory requirements in the U.K. for guarding and safety precautions, and maintenance. A number of illustrations are provided plus a useful index.



The crystallization rate of a low purity sugar. I. S. CHEN'. *Sakhar. Prom.*, 1962, (10), 21–25.—The rate of crystallization was determined for sugar from molasses solutions of approximately 62 and 70 purity which were first concentrated to about 1·2 supersaturation. Sugar crystals (2 g) were added to 20 g of the thickened molasses in 30-ml flasks which were then sealed with rubber bungs, and placed in a thermostatically-controlled laboratory crystallizer rotating at 10 r.p.m. The results are given in graph form and show that the crystallization rate for the sugar from the lower purity molasses was approximately half that for the higher purity samples (18·90 compared with 35·68 mg/sq.m./min). It was found possible to calculate the crystallization rate from refractometer readings taken during the process, given the initial molasses composition, to an accuracy of within $\pm$ 0·05%. The tests have demonstrated the possibility of calculating the permissible rate of cooling of low-grade massecuite at the end of crystallization from the rate of crystallization of sugar having a purity close to the "standard" purity of the massecuite.

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The Maillard reaction—its harmful effects in the sugar factory. J. DUBOURG and P. DEVILLERS. *Ind. Alim. Agric.*, 1962, **79**, 625–629.—The Maillard reaction is discussed with an account of experiments on the isolation and decomposition of the initial condensation product of sugar and amino acid. Progress of the reaction is divided into three stages: the initial induction phase, the propagation phase, which has an explosive character, and the final phase in which the initial reactants disappear. The reaction is seen to be exothermic, which aids the propagation stage. Occurrences of the Maillard reaction which have harmful consequences are quoted; these include spontaneous degradation of cane and beet molasses, losses by foaming in mixers, auto-degradation of sugars in store, and heat generation and spontaneous combustion of cossettes or dry pulp in bulk.

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Boiling and crystallization of 2nd product massecuite. YU. D. KOT and A. L. SOKOLOVA. *Sakhar. Prom.*, 1962, (11), 7–11.—Massecuite was crystallized at varying temperatures in a laboratory unit mounted in a thermostat. In the first series of tests the artificial massecuite was cooled from 75°C to 40–50°C during 16 hr and water was added during the initial cooling stage (to 65–70°C). In the second series, the massecuite, prepared from sugar crystals and a saturated molasses solution at 50°C was heated for 30–60 min to 70°C and than cooled during 12 hr to 50°C, so that any change in crystal composition was a result only of re-crystallization. The tabulated results show that adding water helped to increase the proportion of large crystals (0·8–1 mm) by dissolving the finer crystals (up to 0·3–0·4 mm) particularly when the amount of water is considerable (up to 6% by weight of massecuite). Rapid heating of the massecuite before crystallization increases the effect, and results in a markedly shortened curing process. Factory tests confirmed the results and showed that the duration of crystallization has no effect on crystal composition nor on the degree of exhaustion of the intercrystalline syrup.

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Automatic counter-flow laboratory diffuser. S. LANGE. *Sucre. Belge*, 1962, **82**, 50–56.—The diffuser is a horizontal battery with removable cells of 3·6 litre capacity and has a throughput of about 20 litres of juice per hr. Water level, temperature, rate of circulation, juice withdrawal, and pH of the fresh water are electrically controlled and are variable within certain limits. One cell at a time is removed when the exact volume of juice to be withdrawn from the diffuser has been collected in a measurer and a new cell is automatically switched in, the whole operation being synchronized. Some test results are given together with diagrams.

* * *

A short treatise on available sugar. D. SUERTE. *Sugar News* (Philippines), 1962, **38**, 526–535.—Several formulae are presented for calculation of available sugar in juice (Deer's *s-j-m*, Winter-Carp-Geerligs, c.c.s, Follett-Smith, etc.) and discussed and compared. The variations in non-sugar composition and molasses purities make it likely that empirical formulae will continue to be used where they have been derived from local data. The *s-j-m* formula is unsuitable for calculation of the refined sugar equivalent of raw sugar because of the numerous variables involved and the use of many arbitrary constants. The International Sugar Council formula is recommended for conversion calculations.

* * *

Filtration efficiency of a rotary drum vacuum filter. J. C. P. CHEN. *Taiwan Sugar Quarterly*, 1962, **9**, (2), 31–34.—An equation which includes a Brix factor to correct the dilution effect of wash water is presented for calculation of the so-called "filtration efficiency index" which is an indication of the % reduction in insoluble solids from cachaza to filtrate. The equation takes the form: filtration efficiency index $= 100\,\frac{C-F\frac{Bc}{Bf}}{C}$

where C = insoluble solids in cachaza (g/litre or

g/kg), F = insoluble solids in filtrate (g/litre or g/kg), and *Bc* and *Bf* are the refractometric Brix of juice from centrifuged cachaza and filtrate respectively. Insoluble solids in filtrate and cachaza separated by laboratory centrifuge were determined and used to calculate the efficiency index from Madon's equation[1]. Comparative curves are drawn of the index calculated from both equations. The Madon equation takes no account of dilution of the filtrate and gives higher results. In addition, calculation from the author's equation is simpler for routine tests.

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Technical aspects of raw sugar producer-refiner relations. D. SUERTE. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 9–13.—See *I.S.J.*, 1962, **64**, 180.

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Evaluation of high polarization sugar to standard raw. J. P. STO. DOMINGO. *Proc. 9th Ann. Conv. Philippines Sugar Tech.*, 1961, 14–23.—See *I.S.J.*, 1962, **64**, 86.

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Device for rapid determination of the saturation coefficient. K. P. ZAKHAROV. *Sakhar. Prom.*, 1962, (10), 12–14.—Molasses of 78–84% dry solids is mixed with screened white sugar to 55–60% crystal content and the mixture then agitated in a vibratory chamber at 2000–3000 vibrations/min and a constant temperature (55–70°C). The massecuite is withdrawn after 1 hr and the Brix of 1–2 drops of the saturated inter-crystalline syrup is determined refractometrically. From the sugar content in the initial samples and the Brix of these and the saturated samples, the saturation coefficient is calculated by means of a nomogram[2].

* * *

Rapid and sensitive method for determining reducing substances in sugar products. M. ROCHE. *Ind. Alim. Agric.*, 1962, **79**, 647–649.—The method investigated is based on that described earlier[3] for determining reducing sugars in refined sugar. A copper solution used contains 40 c.c. N NaOH, 25 g Na_2CO_3, 25 g K Na tartrate and 6 g $CuSO_4,5H_2O$ per litre (and must be used within 2–3 days), while the titration is made with a mixture of 0·5 g murexide, 0·15 g purified methylene blue and 40 g salt as indicator. (This solid mixture must be kept in a desiccator.) To 10 c.c. of sugar solution (or 5 g sugar + 5 c.c. water) in a large test tube is added exactly 2 c.c. of copper solution, and the mixture placed in a boiling water bath for 5 min, after which it is cooled, a pinch of indicator added and the solution titrated with the EDTA solution to an endpoint when the colour changes from green to violet. A blank titration is made using distilled water. A table of results is given which takes into consideration the minor but variable effect of the sucrose itself, and examples are given of the application of the method.

Evaluation of massecuite crystallization. I. A. BELEKON' and V. D. POPOV. *Sakhar. Prom.*, 1962, (10), 27–29.—Size classification of sugar crystals by the sieve analysis method does not permit quantitative comparison of sugar samples. However, differential sieve analysis curves may be represented by an equation expressing normal (Gaussian) distribution. A probability equation is also presented for x (crystal size) in given limits as well as one for calculating the probable deviation of a function from its theoretical mean. Thus a sieve analysis integral is obtained. For the necessary sieve analysis graph only two values are required. The method may also be used for bone char grist evaluation, etc.

* * *

Methods of determining the decolorizing capacity of bone char. G. PIDOUX. *Zucker*, 1962, **15**, 516–522.—Four methods of determining the decolorizing efficiency of bone char were examined. Determination of the amount of iodine or of methylene blue adsorbed by the bone char was found to be unreliable. In the iodine test, the value given was much higher than the true decolorizing capacity; with the methylene blue, the values for fresh and used char were very similar, whereas there is considerable difference between a good quality char and a used char. Determination of the weight increase after absorption of a solvent (benzene or toluene) and thus of the pore volume (active pore surface) shows a sufficiently sensitive variation with char quality, but is unsuitable except for comparing chars of the same type or for supervising the char production processes. The pore volume may be used, e.g., as an indication of fluctuations in char density. The fourth method involves the decolorization of a refinery liquor of known colour content in a pilot-plant char column. The main disadvantages of such a method are: the considerable space taken up by the apparatus and the length of time required for the experiment. However, it is pointed out that only tests using char columns will give valid results. The effects of particle size and colour of the liquor to be treated on char efficiency were also studied. It was found that regenerated classified char had a higher decolorizing efficiency than regenerated unclassified char of smaller average grist size. The ascending column method was more effective than the descending method, independent of classification. A very fine char was more efficient under all conditions. In certain tests, while the initial colour content of two liquors was very similar, the colour of the treated liquors was quite different, indicating that the nature of the colour bodies has a considerable effect on the decolorizing efficiency. Thus, to evaluate char quality not only the working conditions but also the composition of the untreated liquor must be known. Therefore, tests using a liquor of known composition are useless if the char is to be used for other sugar products.

[1] Sugar and Alcohol Technique. (Casa Publicadora Batista, Brasil.) 1946. p. 145.
[2] *I.S.J.*, 1960, **62**, 258.
[3] *I.S.J.*, 1960, **62**, 344.

BY-PRODUCTS

The production of sucrose monoethers. F. GRUNDSCHOBER and V. PREY. *Zeitsch. Zuckerind.*, 1962, **87**, 502–504.—Details are given of experiments to produce surface-active sucrose monoethers from monosodium sucrate reacted with an alkyl halide in dimethyl formamide[1]. A suspension of 7·5 g monosodium sucrate (containing 0·01% ammonia) was stirred with the addition of 11 g *n*-dodecyl iodide (1:1·6 moles) and 40 ml dimethyl formamide at 50°C. The sucrate was completely dissolved. After cooling, the $NaI.2HCON(CH_3)_2$ crystals formed were filtered off. The dimethyl formamide was distilled off and the residue dissolved in ether, leaving a white crystalline mass consisting of $NaI.2HCON(CH_3)_2$ and reformed sucrose. The ether was evaporated from the extract, leaving 5·0 g of a brown syrup, which was dissolved in *n*-butanol, rinsed with water, the solution evaporated and the residue dissolved in acetone and poured into petroleum ether. The resultant precipitate was filtered off, dissolved in acetone and reprecipitated with petroleum ether. After drying, a soft, soapy mass was obtained (monododecyl sucrose). This was hydrolysed to yield (according to thin layer paper chromatography) fructose, glucose, 6-O-dodecyl glucose, 1-O-dodecyl fructose and 6-O-dodecyl fructose. The R_f values are given. Monooctyl- and monooctadecyl sucrose were produced in a similar manner.

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Grades, definitions and feeding values of blackstrap molasses. S. L. CROCHET. *Sugar J.* (La.), 1962, **25**, (4), 33–36.—See *I.S.J.*, 1962, **64**, 182.

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A processed feedstuff from filter-cake. C. E. HAINES and H. L. CHAPMAN. *Sugar J.* (La.), 1962, **25**, (4), 36, 44.—"Molakane Feed" (produced by fermenting filter-cake in ammoniacal gases and adding molasses after drying) was compared with dried citrus pulp as a constituent of a steer fattening ration in a 112-day test. Two preparations of "Molakane Feed' were tested, one containing 30% and the other 50% molasses. The ration also contained snapped corn and cottonseed meal. Steers fed on the "Molakane Feed" ate less of the ration and gained less weight than steers fed on the citrus pulp ration. Steers fed on pasture alone gained the least weight of any group. It is concluded that the "Molakane Feed" depressed palatability of the ration. No difference was found between the feeding values of the two preparations.

* * *

Preliminary report on the feeding value of blackstrap molasses for beef cows. H. L. CHAPMAN. *Sugar J.* (La.), 1962, **25**, (4), 37–39.—Supplemental feed tests were carried out in which beef cattle were fed no molasses, molasses each winter, and molasses continually. The results indicate that the benefits derived from the molasses may be cumulative. The average rate of conception in cows and the weaning weights of calves were increased by molasses feeding. While differences occurred between the various breeds of cattle, the winter feeding programme appears to give almost the same results as the continual feeding. However, since factors other than weaning weights and productivity must be considered, complete evaluation of the economics of the two programmes will be possible only after 3-4 years.

* * *

Distillation, a chemical engineering process, and its importance in the agricultural and food industries. J. MEJANE. *Ind. Alim. Agric.*, 1962, **79**, 663–671.—The nature and history of distillation are very briefly described and an account given of its scientific basis. A practical study is made of a distillation problem, and various types of distillation used industrially are considered theoretically. Finally, various industries are examined for instances of distillation used in them.

* * *

Continuous fermentation of beet juice. L. LEFRANÇOIS, –. PAILLERET and S. TOURLIÈRE. *Ind. Alim. Agric.*, 1962, **79**, 675–680.—The advantages of continuous juice fermentation are discussed and some information is given on the first applications of the process in a distillery. To prevent deposition of pulp and yeasts on the bottom of a fermenter and thus remove a permanent source of infection, the "duck's bill" system is used whereby the sugar juice is fed at the top of the fermenter to a downpipe and flows almost to the bottom of the vessel where the pipe terminates in a nozzle shaped like a duck's bill. This directs the juice towards the centre of the vessel and thus aids circulation and creates a homogeneous mass. Details are given of the processes at the Distillerie Coopérative Agricole de Dammard which produces 650 hl of alcohol per day using a continuous system, compared with 450 hl per day with a batch system. It is claimed that the output could be raised to 700 hl/day. Three vats equipped with "duck's bills" are arranged in parallel, each receiving a third of the total sugar juice and a third of the recycled yeast suspension. The same level is maintained in all 3 fermenters for each production programme per day by means of a counterweight system and a slide tube through which flows the must. Retention time in the fermenters is 8–10 hr after which fermentation is almost 90% complete. From the vats the must passes in succession through 8 "dropping" vats in which fermentation is completed. That part of the yeast suspension not recycled is washed and concentrated to 18–20% dry solids, and alcohol removed to give a fodder yeast, of which 3 tons is produced daily.

* * *

Composition, proportion and application of vinasse. J. R. DE ALMEIDA. *Brasil Açuc.*, 1962, **59**, (5 & 6), 196–208.—The composition of vinasse and the effect of a number of factors are discussed together with the tabulated results of trials in which it was used as a fertilizer.

[1] *Austrian Patent* A 293/61.

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.

"Do-it-yourself" control gear. M.T.E. Control Gear Ltd., Leigh-on-Sea, Essex.

Until a few years ago control gear installations were tailor-made by a few specialist firms. M.T.E. Control Gear Ltd. have made it possible for users in every type of industry to build control panels and starters themselves. In 1955 the Company embarked on an ambitious new design programme from which a completely new range of unit built components was evolved. This simplified and streamlined the entire system of panel building, enabling M.T.E. to offer a dual service to industry. Turnover since then has trebled and new factory and office extensions, of 38,500 sq.ft. floor space, have made it possible to segregate the two classes of production. The original block with its 50,000 square feet of floor space is now devoted entirely to the production of components. The new extension houses the panel construction and testing areas, the sheet metal workshops and spray departments. Associated companies or distributors in the Commonwealth and other countries are assembling components and building control panels on similar lines to the equipment produced in the U.K.

* * *

"Electroma" belt conveyor kit. Electroma (Industrial Equipment) Ltd., 205 Chingford Mount Road, London, E.4.

This belt conveyor installation, capable of expansion in both length and width, has separate drive and tension units and can be extended by the fitting of intermediate units as it becomes necessary. The units are of nominal 30 inches height with an adjustment of 2 inches, while belt widths available are 6, 12, 18 and 24 inches.

* * *

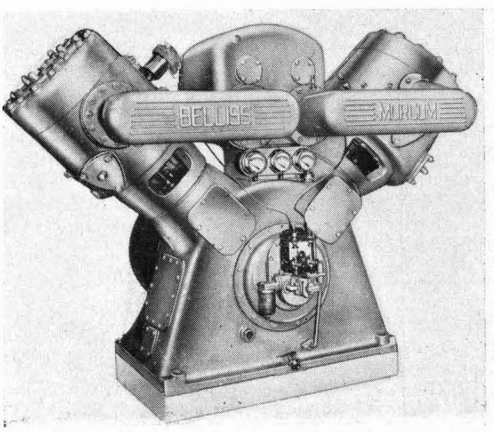
Sugar mill steam turbines. Worthington Corporation, Harrison, N.J., U.S.A.

A new 16-page bulletin, X-4845-B1, is now available from Worthington Corporation describing the company's line of single- and multi-stage turbines for the sugar industry. The fully illustrated bulletin presents in detail the features of Worthington turbines including maximum dependability and availability of complete control of several turbines from one centralized panel. Single-stage and multi-stage turbines such as are illustrated are chosen respectively for lower initial cost and lower steam consumption. Rotors and blades, diaphragms, bearings, etc., are all long-life components for reliability and efficiency, while reliable positive lubrication under maximum or minimum conditions is achieved by the use of oil coolers, gear-type pumps and pipes, valves and reservoirs of adequate capacity for continuous operation. Associated double-helical gears are used in conjunction with the turbines for rugged operation in a sugar mill, where the applications illustrated include driving cane cutters and shredders, mills, pumps and generators.

* * *

V-type heavy duty crosshead compressors. Belliss & Morcom Ltd., Icknield Square, Birmingham 16.

The compressor illustrated is the product of 100 years' development at Belliss & Morcom, and combines lower weight ratio with design simplicity and ease of maintenance. Two series, VH and VL, are available for two-stage (up to 150 p.s.i.g.) and single-stage (up to 50 p.s.i.g.) compression, respectively, and each is in four sizes.



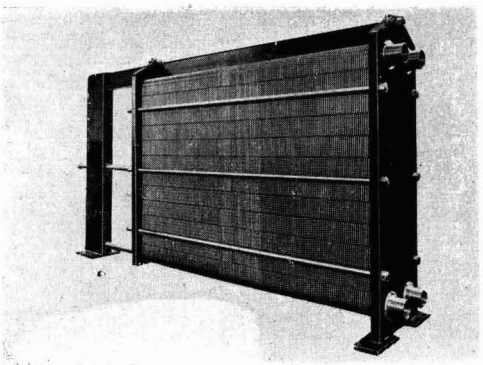
At a recent demonstration, the vibration-free running of the compressor was well exhibited when the holding-down bolts of one unit were removed and it continued operating in a free standing position, without any perceptible change in vibrationless performance.

* * *

A new and larger APV "Paraflow". The A.P.V. Company Ltd., Manor Royal, Crawley, Sussex.

The A.P.V. Company Ltd. announces the introduction of a new and larger "Paraflow" plate heat exchanger designed to meet the demand for the higher pressures and higher flow rates required by many processes in the industrial and chemical fields today. The R.55 "Paraflow," as it is named, has an entirely new type of plate designed for high pressure operation and will accommodate working pressures of 150 or

225 p.s.i. according to requirements. The R.55 plate combines the ability to withstand high pressures with excellent heat exchange characteristics, and, to accommodate the increased flow rates, port sizes of 4 inches dia. are provided with alternative types of connexions.



The frame has the strength with simplicity required by most industrial conditions. The follower is closed by a screwed spindle which is hinged to allow quick opening and closing. Six tie-bars are used to compress the plate pack into a unit of great rigidity and freedom from leakage. This new "Paraflow" will bring the advantages of the plate heat exchanger within the range of many additional duties. The A.P.V. Company has embodied in the design of the R.55 "Paraflow" its exceptional experience as the originator of the plate heat exchanger.

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PUBLICATIONS RECEIVED

TURNERS ASBESTOS FIBRE-FILLED ROPE LAGGING. Turner Bros. Asbestos Co. Ltd., Rochdale, Lancs.

Turners make three grades of asbestos fibre filled rope lagging, for temperatures up to 300°, 400° and 500°C, respectively. A new leaflet gives details of the sizes available and also the length of these required for lagging standard lengths of pipes of different outside diameters from $\frac{3}{8}$ inch to 14$\frac{3}{4}$ inches.

* * *

THE LARGEST POWER TRANSMISSION ENGINEERS IN THE WORLD. Crofts (Engineers) Ltd., Thornbury, Bradford 3, Yorkshire.

This claim is made in a new folder by Crofts whose extensive range of clutches and brakes is said to be the most comprehensive in the world. A number of designs are illustrated and described generally with a note of the leaflets giving full details; these include "Airflex" clutches and brakes, "Bom-L" multiple disc clutches, centrifugal multidisc clutches, D.S.-type rim friction clutches, Crofts patent roller-operated disc friction "RO" and "RM" clutches, and Crofts magnetic clutches and brakes.

* * *

NEW EVERSHED D.C. AMPLIFIER. Evershed & Vignoles Ltd., Devonshire Works, Dukes Avenue, London, W.4.

An entirely new Series 500 D.C. amplifier has been introduced for use in a wide variety of rôles, particularly in the process control field. It is described in Specification Sheet No. SS67. Solid-state circuits are used throughout for utmost reliability and minimum maintenance, the circuits being grouped onto easily-replaceable printed-circuit boards. Other points of special interest—high open-loop gain of 10^5 A/V ensures that substitution can be made of the amplifier or any of its boards without re-setting feedback circuits; overall gain and individual gains are fully stabilised; standby mains or D.C. supplies can be used without regulation; the circuit arrangement ensures that dangerous voltages cannot appear at the input under fault conditions, even in hazardous atmospheres. Typical applications of the Series 500 D.C. Amplifier are as a millivolt amplifier for use with thermocouples, resistance thermometers, strain gauges, etc. and as an operational amplifier.

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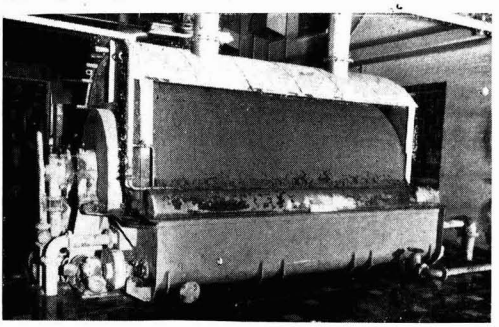
"AQUALARM" WATER PURITY MONITOR. Electronic Switchgear (London) Ltd., Hitchin, Herts.

The "Aqualarm" water purity monitor is a compact and inexpensive industrial control device of advanced design and performance. It operates an alarm or control device when the electrical conductivity of water, owing to the presence of soluble salts, acids or other inorganic contaminating matter, exceeds a critical degree. The alarm or control point may be preset at will to cause response at any desired value within a very wide range of water solution concentrations.

The "Aqualarm" control unit, contained within a watertight, surface mounting case with signal lamps on the front cover, is connected by cable to a robustly constructed conductivity measuring cell simply installed in the pipeline, tank or other container. Among important applications are: boiler feed and steam condensate purity supervision; boiler water concentration and blow-down control, etc. The unit is described in leaflet EE001.

* * *

Paxman filters for the sugar industry.—Seven rotary drum filters of special design have been ordered by the British Sugar Corporation Ltd., from Davey, Paxman & Co. Ltd., Colchester, Three of these are for the Corporation's factory at Colwick, near Nottingham and four for their Felsted factory, the latter being due for commissioning in the autumn of 1963. Each of these filters has an area of 300 sq. ft. and while being basically of the well known Paxman rotary drum type, the drums have internal pipe manifolds in place of the more usual deep cells and the units are recognisable at first sight by the characteristic hoods arranged to enclose the machines completely. The photograph shows one of the three 300 sq. ft. filters at the Colwick factory. The hood, with sides removed, can be seen covering the special wash gear.



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New centrifugal newsletter from Western States.—In January, 1963, The Western States Machine Company, Hamilton, Ohio, published the first edition of *The Western States Centrifugal*, a newsletter reporting many of the latest developments in centrifugation equipment for the sugar processing industry. According to a company spokesman, the newsletter will contain illustrated articles on technical improvements, engineering, machine features and world-wide installation reports. The newsletter will also contain special feature articles by Western States centrifugation specialists. The new four-page illustrated newsletter willl be published eight times each year. Individuals desiring to receive free copies are requested to send their name, company, title and address to: The Western States Machine Company, Hamilton, Ohio, U.S.A.

Brazil Sugar Exports[1]

Metric tons	1962 Raws	1962 Refined	1961 Raws	1961 Refined	1960 Raws	1960 Refined
France	—	—	7,791	—	28,086	60,784
Belgium	—	—	—	—	39,056	—
Netherlands	—	—	—	—	2,149	—
Norway	—	—	11,235	—	10,297	—
U.K.	—	—	—	—	13,520	—
Portugal	—	—	22,181	—	—	25,981
Poland	—	—	—	—	10,415	—
U.S.A	361,532	—	293,238	—	103,415	8
Canada	11,265	—	—	—	—	—
Bolivia	—	592	—	1,015	—	936
Chile	—	—	22,292	—	82,685	60
Paraguay	—	5,276	—	—	—	—
Uruguay	37,955	—	44,818	—	55,976	—
Morocco	—	—	49,176	—	31,566	—
Ceylon	—	—	10,058	—	72,200	9,747
Japan	21,085	—	258,638	—	288,261	—
South Korea	20,015	—	14,843	—	10,287	—
South Vietnam	20,866	—	9,580	—	9,500	—
Total	472,718	5,868	743,850	1,015	757,260	97,516
Total, raw value	479,238		744,978		865,611	

BREVITIES

Reduction of sugar surcharge.—The surcharge on sugar, levied by the U.K. Sugar Board, was reduced on 12th February 1963 by 14s 0d per cwt of refined sugar (1½d per lb) to 4s 8d per cwt (½d per lb). The reduction has been made possible by the continued rise in the world market price of sugar. This higher world price reduces the deficit incurred by the Sugar Board in purchasing sugar under the Commonwealth Sugar Agreement and selling it at world price; it also reduces the cost to the Board of financing the British Sugar Corporation.

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Jamaica and the I.S.A.[2]—Jamaica is applying to join the International Sugar Agreement as a member of the Commonwealth.

* * *

Hungarian sugar production 1962/63.—Hungarian factories turned out nearly 400,000 tons of sugar during the 1962/63 season, an increase of 11% on last year. Processing losses have been cut.

* * *

Puerto Rico sugar crop 1961/62.[3]—The 28 sugar factories of Puerto Rico crushed a total of 9,663,265 tons of cane during the 1961/62 season, compared with 10,754,017 tons in the previous season. Sugar outturn was 996,626 tons, compared with 1,095,751 tons in 1960/61, a recovery of 10·314% compared with 10·189%.

* * *

Sugar exports from Rhodesia.[4]—The Federal Sugar Millers and Refineries Association is to make every effort towards exporting the surplus of sugar expected in Rhodesia during 1963. The immediate plan is to expand markets in Katanga and Bechuanaland as well as to promote greater use of sugar within the Federation. If in the future surplus production becomes too large for absorption by neighbouring markets within southern Africa it might prove more profitable to curtail production rather than attempt to export sugar overseas, as it would cost £4 a ton to get it to the coast.

* * *

U.S. interest in Queensland molasses.[5]—The manager of Californian Molasses Co. is quoted as saying in Mackay, Queensland, recently, that his company would offer to buy 150,000 tons of molasses at present used as stock feed or fertilizer at a price which would give the producer £9 10s per ton after shipping costs were met. At present the molasses is sold, where possible, at a price of £1 15s per ton which often means a return of only 10s 0d per ton. Purchases by the U.S. Company would require the construction of storage tanks, and tankers would have to be chartered to transport the molasses to California. On the return trip the tankers would carry liquid ammonia fertilizer which would reduce the price of the latter to Australian farmers. The molasses would be used for fattening-off cattle during the cold part of the year.

* * *

Molasses deterioration in storage.[6]—Early in January 1963 1500 tons of molasses was lost during a period of intense heat at Mulgrave Mill, Australia, when it began to ferment and boil in the huge brick tank under a corrugated iron roof. Mill workers kept an eye on the molasses but the boiling did not seem to get any worse until several days later when it boiled over. Hot molasses flooded the mill yard, while the pressure and weight of the boiling molasses caused the 6-inch sides of the brick tank to crumple. Inside the crushed tank the molasses set into blocks 5 feet deep and had to be carried away in tankers and gravel trucks. The molasses which had been intended as stock feed can now only be used as a fertilizer since animals will not touch it after it has fermented.

* * *

New beet sugar factories for the U.S.[7]—The U.S. Dept. of Agriculture announced on the 7th February that 31,000 acres, estimated to yield about 50,000 short tons of sugar, raw value, were to be allocated to farms in North Dakota and Minnesota for the 1965 crop for the factory proposed for erection by the American Crystal Sugar Co. near Drayton, North Dakota. Farms in South Dakota, Iowa and Nebraska have also been allocated 19,000 acres, estimated to yield about 34,000 tons of sugar, for the factory proposed for erection by the Utah-Idaho Sugar Co. in southeastern South Dakota. The balance of the National Sugarbeet Acreage Reserve would be sufficient for another new factory prior to 1966 and leave a carryover so that two factories could be approved in 1966. The Acreage Reserve is made under the new Sugar Act which is to provide facilities for an annual growth of 65,000 tons of sugar for the domestic beet sugar industry.

[1] F. O. Licht, *International Sugar Rpt.*, 1963, **95**, (Supp. 3), 54.
[2] *Fortnightly Review* (Bank of London & S. America Ltd.), 1963, **28**, 126.
[3] *Sugar J.* (La.), 1962, **25**, (7), 84.
[4] *Commonwealth Producer*, 1963, (393), 33.
[5] *Producers' Review*, 1963, **53**, (1), 22–23.
[6] *Australian Sugar J.* (La.), 1963, **54**, 717.
[7] *Lamborn*, 1963, **41**, 33.

BREVITIES

Argentina sugar crop 1962[1].—The crushing season in Argentina closed on the 12th November when Ingenio La Esperanza in Jujuy finished operations. The sugar output was 735,737 metric tons, more than 84,000 tons higher than in the previous year. Cane milled totalled 9,005,435 tons, the yield being 8·170%.

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Finland sugar crop, 1962/63[2].—Total sugar production in Finland during the 1962/63 campaign amounted to some 38,000 metric tons, as compared with the record quantity of 57,732 tons manufactured during the previous season.

* * *

New sugar factory for Vietnam[3].—Capitalized at $4 million, a company was formed at the end of November to construct and operate a sugar factory to be erected at Quang Nai. Capacity is to be 1000 metric tons of cane per day and the plant is expected to start operations at the end of 1964.

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Yugoslavia sugar campaign, 1962/63[4].—During the 1962/63 sugar beet campaign in Yugoslavia some 1,900,000 metric tons of roots were delivered to the factories, yielding 240,000 tons, raw value, according to Reuter. In the previous season sugar production totalled 250,000 tons. It is planned that the tonnage of beet to be produced next campaign will show a considerable increase on this year's figures.

Stock Exchange Quotations

CLOSING MIDDLE

London Stocks (*at 18th March* 1963)	
Anglo-Ceylon (5s)	15/1½
Antigua Sugar Factory (£1)	6/9
Booker Bros. (10s)	23/6
British Sugar Corp. Ltd. (£1)	25/6
Caroni Ord. (2s)	4/3¾
Caroni 6% Cum. Pref. (£1)	15/–
Distillers Co. Ltd. (10s units)	33/–
Gledhow Chaka's Kraal* (R1)	18/6
Hulett & Sons (R1)	40/6
Jamaica Sugar Estates Ltd. (5s units)	4/4½
Leach's Argentine (10s units)	15/3
Manbré & Garton Ltd. (10s)	47/9
Reynolds Bros. (R1)	19/–
St. Kitts (London) Ltd. (£1)	11/–
Sena Sugar Estates Ltd. (10s)	8/6
Tate & Lyle Ltd. (£1)	48/10½
Trinidad Sugar (5s stock units)	4/–
United Molasses (10s stock units)	31/9
West Indies Sugar Co. Ltd. (£1)	15/9

CLOSING MIDDLE

New York Stocks (*at 16th March* 1963)	$
American Crystal ($10)	46⅛
Amer. Sugar Ref. Co. ($25)	50⅜
Central Aguirre ($5)	26¼
North American Ind. ($10)	16⅜
Great Western Sugar Co.	37⅛
South P.R. Sugar Co.	39¾
United Fruit Co.	24¾

* Conversion to R1 share values and 1:1 capitalization

Cuban Sugar Exports

The following statistics of exports during 1962 have been released by Cuban Foreign Trade Enterprises. They are compared with figures for the previous two years[5].

Metric tons, raw value	1962	1961	1960
Albania	10,700	—	—
Bahrein	—	11,207	—
Belgium	18,622	6,819	6,513
Bermuda	—	—	519
British West Indies	33	—	—
Bulgaria	117,796	57,258	—
Canada	19,880	15,822	74,969
Canary Islands	—	40,982	29,154
Ceylon	—	104,033	—
Chile	80,867	169,952	5,591
China	937,893	1,032,136	476,533
Colombia	—	—	5,350
Czechoslovakia	155,680	25,322	8,988
Denmark	—	500	—
Dutch West Indies	2,122	3,318	2,580
Finland	5,881	5,449	—
France	—	—	107,338
Germany (East)	179,343	111,910	61,867
Germany (West)	3,800	41,231	101 923
Greece	49,658	45,920	45,705
Holland	15,104	27,833	98,587
Honduras	—	—	25
Hong Kong	—	—	544
Iceland	749	5,230	3,542
Iran	—	61,340	19,206
Iraq	17,991	34,993	22,154
Ireland	—	—	23,373
Italy	2,167	—	551
Japan	431,482	423,256	204,557
Jordan	10,907	—	—
Korea	14,038	32,491	31,053
Lebanon	1,795	—	634
Malta	—	5,707	—
Morocco	265,124	157,287	160,984
Mozambique	—	—	6,684
Norway	36,138	32,132	—
Pakistan	—	38,204	—
Poland	151,285	261,927	143,989
Portugal	—	9,657	88
Singapore	—	—	1,255
Spain	58,312	12,226	4,093
Sweden	28,232	805	8,458
Switzerland	16,814	21,380	24,705
Syria	50,478	—	—
Thailand	—	19,028	—
Tunisia	90,057	31,990	22,425
U.A.R.	105,112	150,160	175,462
United Kingdom	76,143	79,302	173,366
U.S.A.	—	—	1,938,410
U.S.A. for re-export	—	—	10,154
U.S.S.R.	2,112,245	3,302,865	1,577,670
Vietnam	10,490	—	43,214
Yugoslavia	54,002	33,869	11,843
	5,130,940	6,413,541	5,634,463

Hawaii 1962 sugar production.[6]—The final and official 1962 sugar production figure for Hawaii is 1,120,011 tons, raw value, according to H.S.P.A. figures.

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Swiss sugar production, 1962/63.[7]—Aarberg sugar factory closed on the 19th of December after a 78½-day campaign in which it sliced 167,817 tons of beets to produce 26,985 tons of white sugar.

[1] *La Ind. Azuc.*, 1962, **68**, 333, 360.
[2] C. Czarnikow Ltd., *Sugar Review*, 1963, (593), 20.
[3] *Willett & Gray*, 1963, **87**, 16.
[4] C. Czarnikow Ltd., *Sugar Review*, 1963, (593), 20.
[5] C. Czarnikow Ltd., *Sugar Review*, 1963, (598), 40.
[6] *Willett & Gray*, 1963, **87**, 22.
[7] *Zeitsch. Zuckerind.*, 1963, **88**, 46.