THE International Sugar Journal

MAY 1973

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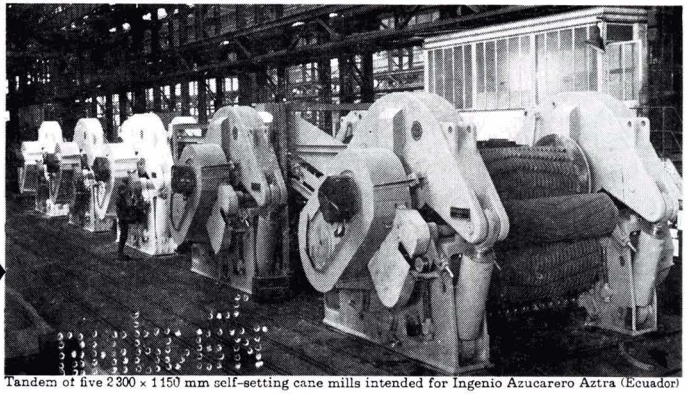

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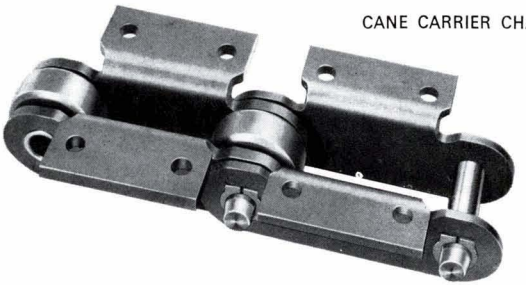

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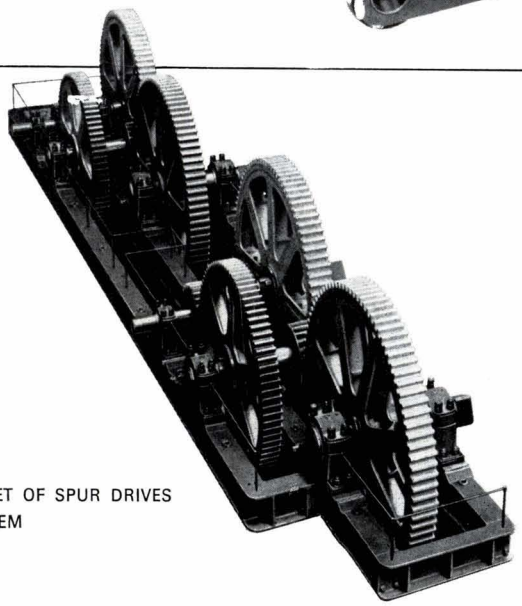

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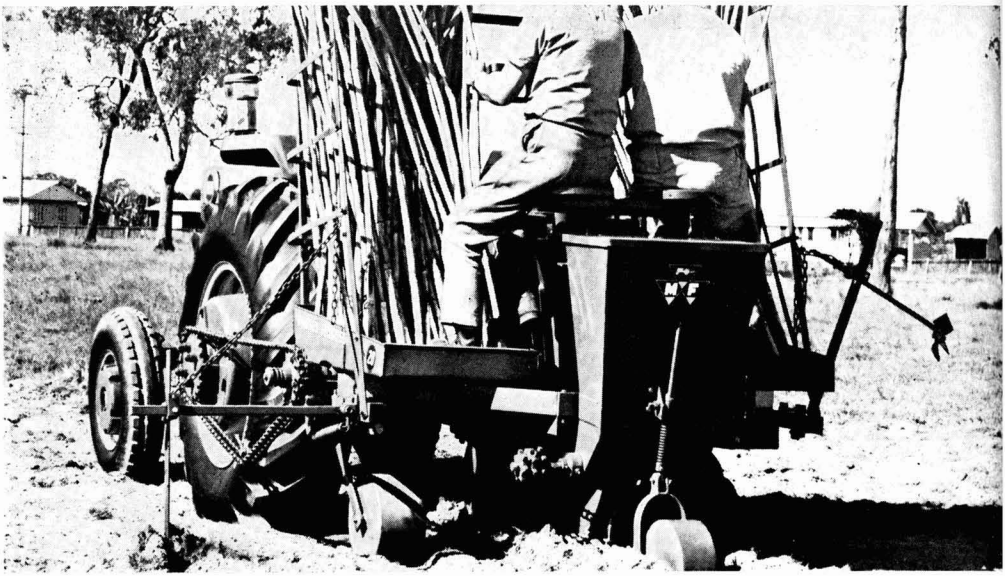

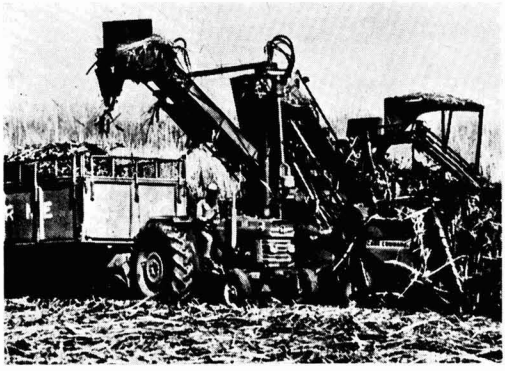

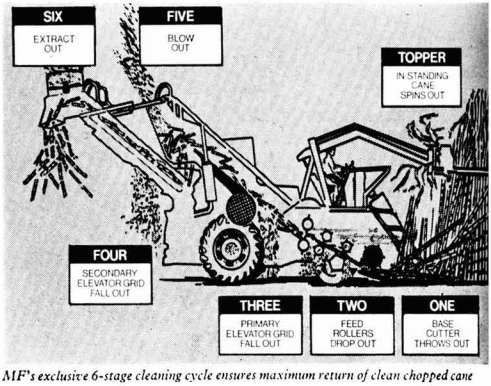

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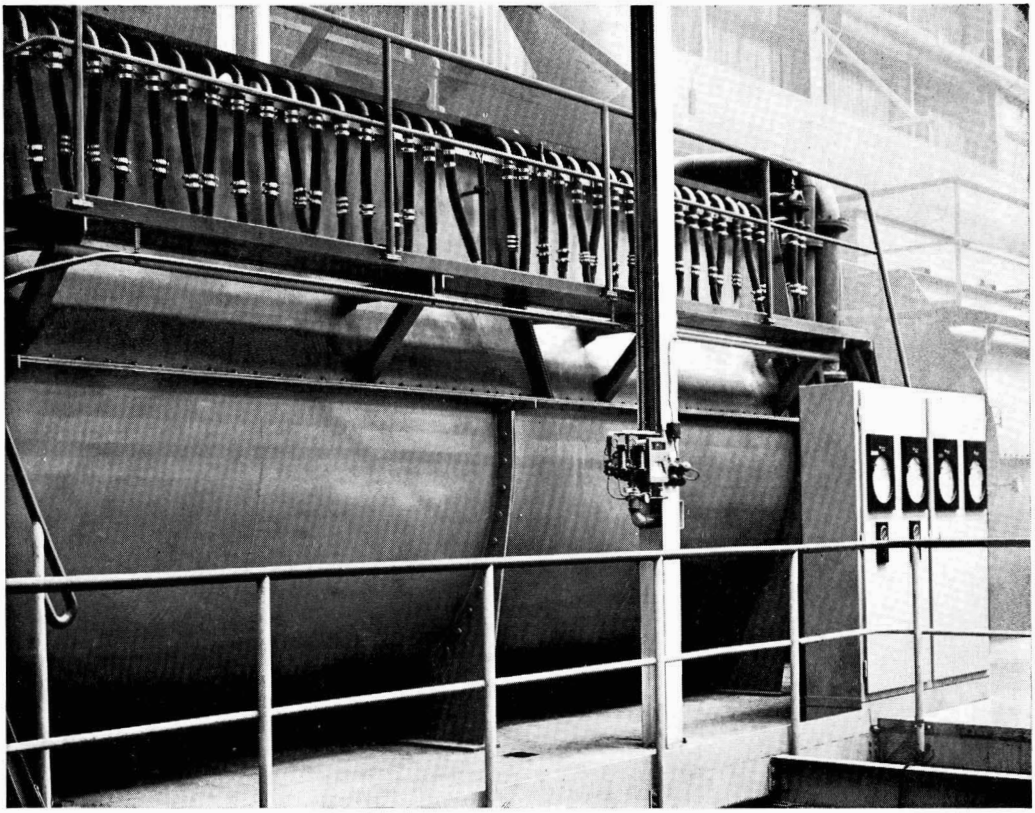

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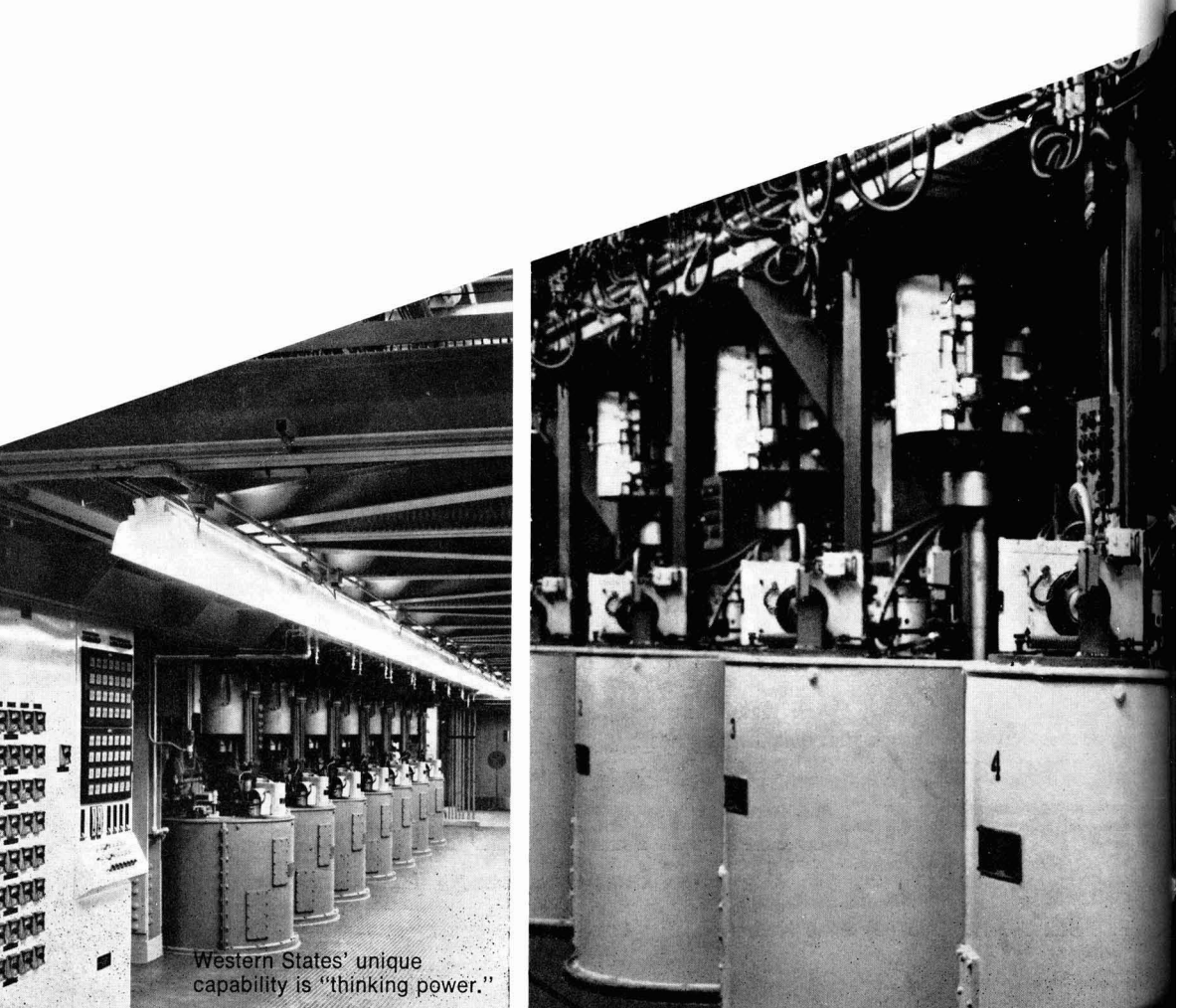

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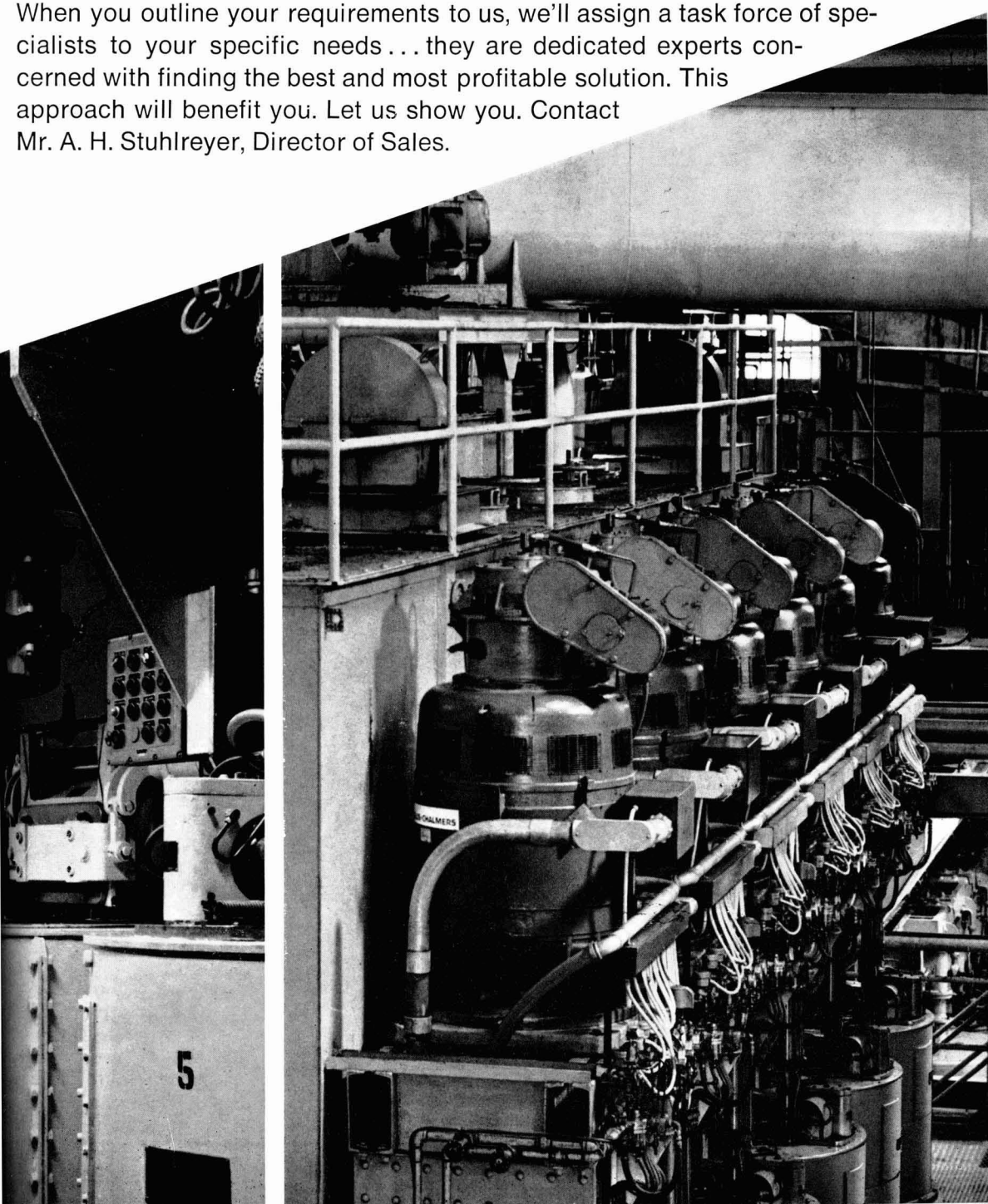

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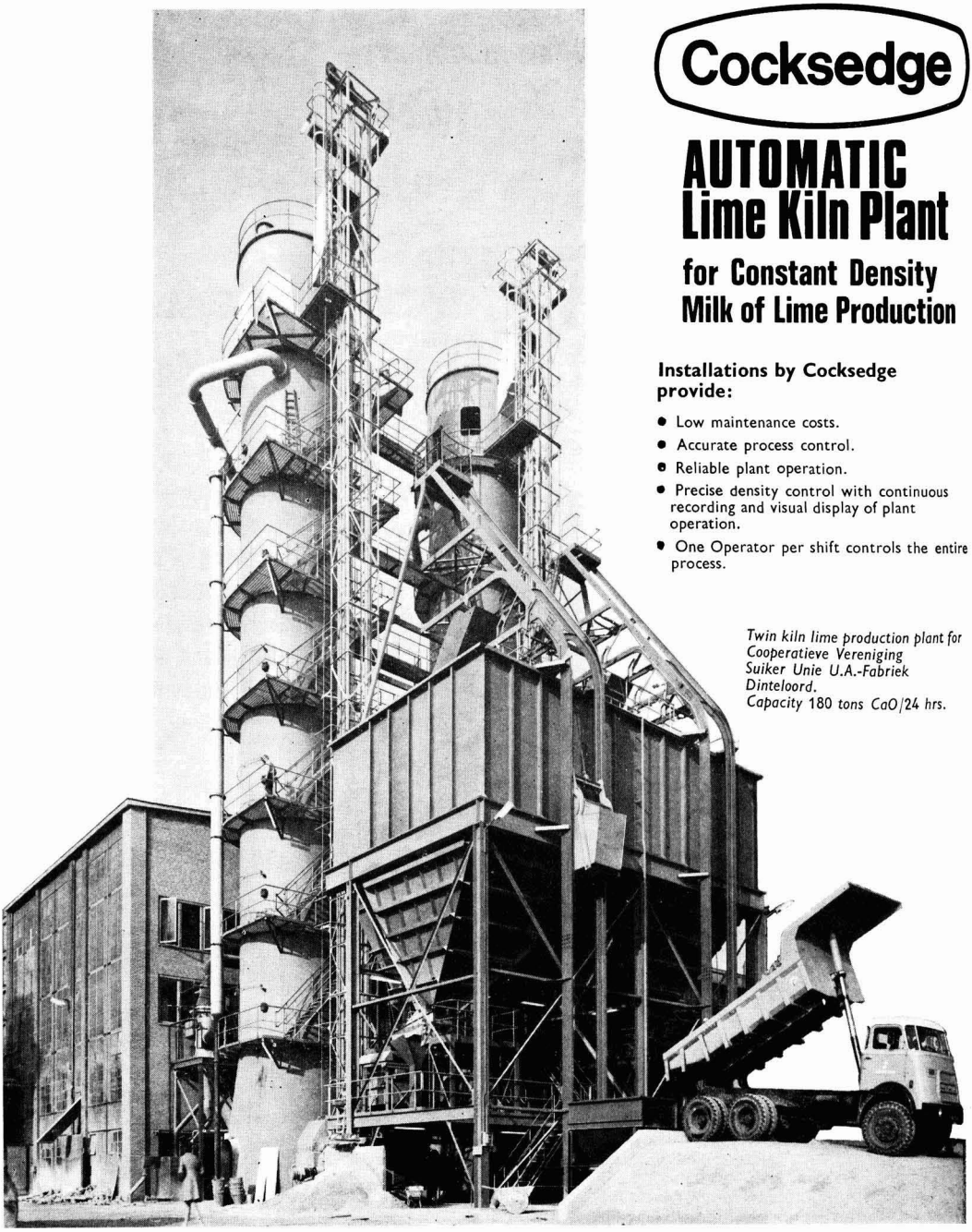

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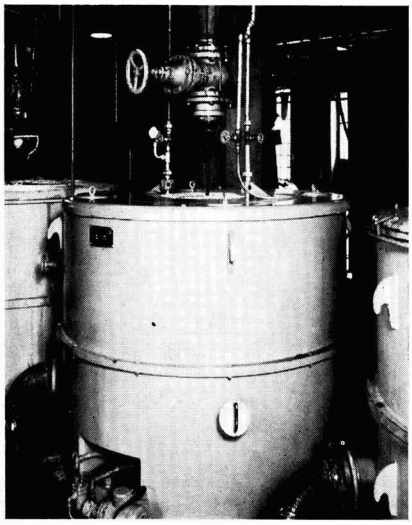

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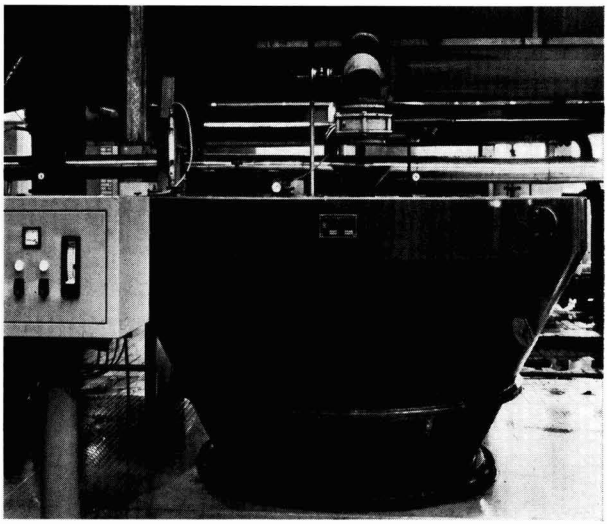

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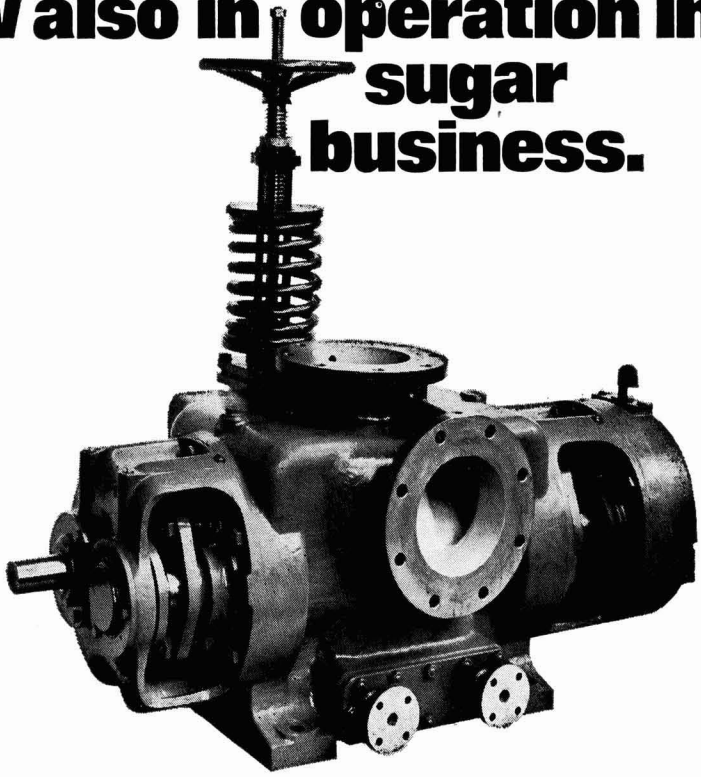

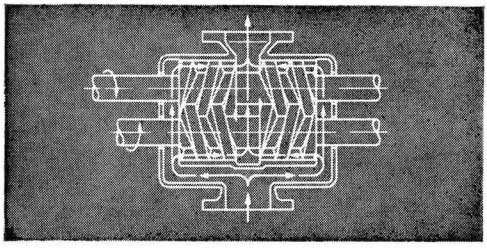

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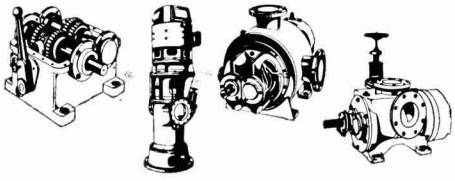

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Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

Les particules de carbonate de calcium obtenues au cours d'études concernant la carbonatation. F. H. C. KELLY, F. K. MAK et M. G. SCHUA. *p.* 131–135

Au cours d'essais concernant l'effet d'impuretés ajoutées sur la dimension des particules de carbonate de calcium, on trouve que des additifs polaires tels que le phénol ou le bromure de cétyltriméthyl-ammonium (CTAB) favorisent la croissance tandis que les polymères tels que l'amidon et la gélatine suppriment la croissance et forment des précipités de type colloïdal. On reproduit des micrographies électroniques de cristaux de carbonate, montrant leur forme rhombique et démontrant les effets des additifs.

* * *

Quelques effets du niveau de la nappe phréatique sur la croissance de la canne à sucre. J. M. GOSNELL. *p.* 135–139

On examine les effets de la profondeur de la nappe phréatique sur de la canne cultivée pendant 3 ans dans des récipients profonds. Alors qu'une nappe d'eau constant à 25 cm a un effet défavorable marqué, on obtient les meilleurs résultats avec des nappes à 75, 100 et 125 cm, une nappe à 50 cm donnant des résultats intermédiaires. Les effets deviennent progressivement plus défavorables depuis la canne plantée jusqu'à la canne de 2ème repousse. Dans tous les traitements le sol se salinise à environ 20–30 cm au-dessus du plan d'eau; elle n'est pas importante dans les traitements avec nappe à 100 et 125 cm, mais on trouve des valeurs élevées de conductivité électrique et de taux d'absorption du sodium dans l'extrait à saturation du sol pour les autres traitements. Le niveau d'eau doit être maintenu en-dessous de 1 m pour la croissance optimum de la canne.

* * *

L'épuration du jus par la précarbonatation. S. ZAGRODZKI. *p.* 139–140

On donne les détails d'une méthode d'épuration du jus de betterave dans laquelle le jus est préchaulé à pH 11,0 par des boues du chaulage principal, chauffé à 87°C et carbonaté simultanément avec 700% de jus recyclé du premier chaulage. Le pH, ramené à 9, est porté à 11 par un premier chaulage avec 0,4% de CaO, puis à 12 par un chaulage principal avec 1,1% CaO, où le sucre inverti et les amides sont decomposés. Le jus est ensuite carbonaté à pH 11–11,1 et filtré avant 2ème carbonatation. On obtient un accroissement considérable des vitesses de filtration et de décantation.

Untersuchungen über die in der Carbonatation gebildeten Calciumcarbonatteilchen. F. H. C. KELLY, F. K. MAK und M. G. SCHUA. *S.* 131–135

Bei Untersuchungen über den Einfluss eines Zusatzes von Verunreinigungen auf die Grösse der Calciumcarbonatteilchen hat sich ergeben, dass polare Additive wie Phenol und Cetyltrimethylammoniumbromid (CTAB) das Wachstum fördern, während Polymere wie Stärke und Gelatine das Wachstum unterdrücken und zur Bildung kolloidförmiger Niederschläge führen. Es werden elektronenmikroskopische Aufnahmen von Carbonatkristallen gezeigt, an denen man die rhombische Form dieser Kristalle und den Einfluss der Additive erkennen kann.

* * *

Einige Auswirkungen des Grundwasserspiegels auf das Wachstum des Zuckerrohrs. J. M. GOSNELL. *S.* 135–139

Es wurde der Einfluss der Höhe des Grundwasserspiegels auf Zuckerrohr untersucht, das drei Jahre lang in tiefen Behältern gezüchtet wurde. Während ein konstanter Grundwasserspiegel von 25 cm einen beträchtlichen negativen Einfluss hatte, wurden die besten Ergebnisse mit einem Grundwasserspiegel von 75, 100 und 125 cm erzielt. Ein Grundwasserspiegel von 50 cm lieferte mittelmässige Resultate. Der Einfluss wurde jedoch vom gepflanzten Rohr bis zum zum zweiten Mal zurückgeschnittenen Rohr laufend stärker. Bei allen Versuchen trat eine Versalzung des Bodens ungefähr 20 bis 30 cm oberhalb des Grundwasserspiegels auf. Sie war nicht bedeutend bei den Versuchen mit einem Grundwasserspiegel von 100 und 125 cm, aber bei den anderen Behandlungsmethoden wurden ziemlich hohe Werte für die elektrische Leitfähigkeit und eine beachtliche Natriumabsättigung im Bodenextrakt gefunden. Um ein optimales Wachstum zu erreichen, sollte der Grundwasserspiegel unter 1 m gehalten werden.

* * *

Saftreinigung mit Hilfe der Vorcarbonatation. S. ZAGRODZKI. *S.* 139–140

Der Autor beschäftigit sich mit den Einzelheiten einer Saftreinigungsmethode, bei welcher der Saft mit Schlamm aus der Hauptkalkung auf pH 11 vorgekalkt, auf 87°C erwärmt und unter Rücknahme von 700% Saft aus der ersten Stufe der Kalkung mit Kohlendioxid behandelt wird. Der auf 9 gefallene pH-Wert wird in der ersten Stufe der Kalkung mit 0,4% Calciumoxid auf 11 und in der nachfolgenden Hauptkalkung mit 1,1% Calciumoxid auf 12 erhöht. Dabeit zersetzen sich der Invertzucker und die Amide. Der Saft wird dann bis zum pH-Wert 11 bis 11,1 carbonatiert, erhitzt und vor der zweiten Carbonatation filtriert. Auf diese Weise konnte eine beträchtliche Steigerung der Filtrations- und der Sedimentationsgeschwindigkeit erreicht werden.

Partículas de carbonato de calcio de estudios sobre carbonatación. F. H. C. KELLY, F. K. MAK y M. G. SCHUA. *Pág.* 131–135

En ensayos del efecto del adición de impurezas sobre el tamaño de partículas de carbonato de calcio, se demuestra que el adición de aditivos polares como fenol y bromuro cetiltrimetilamónico (CTAB) creció su desarrollo, mientras que polimeres como almidón y gelatina suprimió el aumento, que resultó en precipitados del tipo coloidal. Electron-micrográficas de los cristales de carbonato se presentan y demuestran su forma rómbica y los efectos de los aditivos.

* * *

Algunos efectos del nivel del alero de desagüe sobre el desarrollo de la caña de azúcar. J. M. GOSNELL. *Pág.* 135–139

Los efectos se investigaron de la profundidad del alero de desagüe sobre caña cultivado tres años en cajas profundas. Mientras que un alero constante de desagüe de 25 cm tuvo un efecto notablemente desfavorable, las mejores resultas se obtuvieron con aleros de desagüe de 75, 100 y 125 cm, dando un alero de desagüe de 50 cm resultas intermedias. Sin embargo, los efectos llegaron a ser progresivamente más severo de caña sembrado al 2o. retoño. En todos tratamientos se encontró salinización del suelo 20–30 cm arriba del alero de desagüe; no estaba una cosa grave en los tratamientos con aleros de desagüe de 100 y 125 cm pero bastante altos valores de conductividad eléctrica y relación de adsorción de sodio se encontró en los tratamientos.

* * *

Purificación de jugo por medio de pre-carbonatación. S. ZAGRODZKI. *Pág.* 139–140

Se presentan detalles de un método de purificación de jugo de remolacha en que se alkaliza a pH 11 con cachaza del alkalización principal, se calienta a 87°C y se trata con CO_2 en combinación con 700% de jugo reciclado del alkalización del primera etapa. El pH, reducido a 9, se aumenta a 11 con 0,4% de CaO en el alkalización del primera etapa y a 12 con 1,1% CaO en el posterior alkalización principal en donde se descomponen azúcar invertido y ámidos. El jugo se trata con gas a pH 11–11,1, se calienta y se filtra antes de la segunda carbonatación. Un aumento notable en las velocidades de filtración y sedimentación se obtuvo.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXV MAY 1973 No. 893

Notes & Comments

I.S.A. supply commitment price

After a series of discussions arising out of recent changes in currency values, the Executive Committee of the International Sugar Organization announced on the 28th March that it had adjusted the supply commitment price from 6·95 to 7·60 cents per pound, basis f.o.b. and stowed Caribbean port in bulk. This adjusted price will apply to:

(*a*) sugar covered by options which may be exercised under sub-paragraphs (iii) and (iv) of Article 30(4)(**a**) of the International Sugar Agreement; and

(*b*) sugar unshipped on the 1st March 1973 within the option exercised by a traditional importing Member in January 1973 under sub-paragraph (ii) of Article 30(4)(a) up to one-half of that option.

The announcement was made just in time, since a new supply commitment pricing period started on the 1st April and it was necessary for Members to know the price levels to apply before making contracts. The negotiations went on for a number of weeks with considerable resistance, particularly from Canada, to an increase in the commitment price to compensate producers for its fall in real terms as a result of the devaluation of the US dollar. It seems likely that there will be hard bargaining ahead when the new ISA is negotiated later this year and in regard to the latter, C. Czarnikow Ltd. note[1]:

"Adjustments to Agreement indicative prices following changes in currency parities have now had to be made on two occasions; in order to ensure the smooth working of the Agreement and to avoid a recurrence of the lengthy negotiations which have been witnessed during the past month it would be well if some automatic adjustment procedure were included in the 1973 ISA".

* * *

Mauritius sugar in 1972[2]

The 1972 crop started on the 23rd June and ended on the 29th December 1972 except for one factory where crushing operations were delayed and which completed on the 11th January 1973. The 21 mills crushed a total of 6,215,222 metric tons of cane, i.e. about 325,000 tons more than the record figure of 1965. Total sugar output amounted to 675,557 long tons and represents an all-time record. Average cane yield reached the record figure of 31·3 tons as against 29·1 tons in 1969. The average sugar recovery was 10·87 and represents the lowest figure recorded since the war, but the yield of sugar per acre amounted to the all-time record of 3·40 tons per acre, as compared with 3·35 tons in 1969.

The calendar year exports of 604,219 long tons of sugar represent a record in the history of Mauritius; this figure has been achieved, as will be recalled, while International Sugar Agreement quota restrictions have been suspended. Destinations and quantities of the exports are tabulated below, with comparative figures from 1971:

	1972	1971
	long tons	
Bangladesh	10,062	—
Canada	128,389	152,765
Iran	12,402	—
Malaysia	13,125	—
Réunion	—	199
Sudan	—	9,647
UK	387,951	380,000
USA	27,500	16,800
USSR	24,790	—
	604,219	559,411

* * *

Antigua sugar industry closure.

The Antigua Government announced in October that it owed WI $11,500,000 to commercial banks for the sugar industry's operation and that interest on the debt cost the island $37,500 a month[3]. The announcement was interpreted as additional fuel for the expectation of acceptance by the Government of a report by a firm of British accountants which was said to have recommended phasing out of sugar production in Antigua. It was subsequently reported[4]

[1] *Sugar Review*, 1973, (1120), 55.
[2] *Mauritius Sugar News Bull.*, December 1972.
[3] *The Cane Farmer*, 1972, **13**, 351.
[4] *Barclays International Review*, January 1973, 50.

that the accountants had indeed concluded that the industry was not viable in Antigua and that the cane crop is to be replaced by a diversified agricultural development programme.

* * *

Tate & Lyle Ltd. 1972 report

Pre-tax profits for 1972 were higher by 28% than in 1971 and reached £16·2 million. With an imbalance of demand over supply in 1973 causing high prices, and a shortage of white sugar, the Company are confident of another good year for refined sugar exports. Home sales were slightly higher at 1,469,000 tons against 1,456,000 tons in 1971, while 269,000 tons were exported in 1972 as compared with 245,000 tons. The Raffineries et Sucreries Say had an excellent crop in 1971/72 and while the 1972/73 campaign went well, production was lower. The Say company has been merged with Société F. Beghin and the combination, producing 800,000 tons/year, is one of the largest in Europe.

In Canada, Redpath Sugars Ltd were adversely affected by the floating of sterling and trading losses in raw sugar; nevertheless the outlook for 1973 is reasonable. The Company's name has been changed from Canada & Dominion Sugar Co. Ltd. to Redpath Industries Ltd. because of its diversification into other fields such as construction materials. The volume of sales in Nigeria has expanded and the Ilorin factory is being expanded; however, current high prices are expected to have an inhibiting effect on sugar consumption. The two Rhodesian refineries continue to operate profitably but normal business relations cannot yet be resumed with them.

The West Indies Sugar Co. Ltd. in Jamaica made a small profit which would have been larger if it had not been for strikes during the crop. Belize Sugar Industries in British Honduras showed much improvement and indicated a profit. Tate & Lyle continued to provide certain services for Caroni Ltd. in Trinidad which, while still in a loss position, had a better year thanks to increased production and higher prices. Illovo Sugar Estates in South Africa incurred a loss but cane tonnage should be increased in 1973 since the Government has sanctioned planting of a further 17,000 acres of cane land, and profits should be made when the mill is no longer underutilized. Transfers of shares in the Zambia Sugar Co. Ltd. to the Government has not yet taken place because of the time needed to implement all the necessary changes; however, the consumption of sugar continues to rise, the Nakambala estate and factory have produced a record sugar output and the Ndola refinery has increased its output.

There has been increased demand for the consultancy services of Tate & Lyle Enterprises and growing interest in the "Talo" products, while Farrow irrigation equipment sales are growing rapidly. A. & W. Smith & Co. Ltd. are building a sugar factory in Mexico in conjunction with a Mexican associate, while Mirrlees Watson's Venezuelan factory has started operations three months earlier than scheduled.

* * *

US Sugar Act

The initial supply quota for 1973 was set by the US Dept. of Agriculture at 11,700,000 short tons, raw value, or 100,000 tons less than the final figure for 1972. In spite of this, ready availability of sugar had lowered the domestic price of sugar so that when it had averaged 9·15 cents/lb over a seven-day period, the Department took action on the 16th February to raise it by cutting the overall quota, reducing it to 11,600,000 tons[1].

The low values persisted and the Department announced a further 100,000-ton cut in the quota[2], bringing it to 11,500,000 tons, on the 27th February.

As the US Domestic Beet quota was originally below its full entitlement, its normal reduction of 47,666 tons was added to the quota reductions for foreign quotas on each occasion, making total reductions of 82,666 tons. In addition, an extra 75,000 tons was added to the Hawaiian quota and deducted from foreign suppliers. The changes involved are tabulated below:

	Initial quotas	*First cut*	*Second cut*	*Quotas in effect*
		(*short tons, raw value*)		
Domestic Beet	3,500,000	—	—	3,500,000
Mainland Cane	1,625,667	17,334	17,333	1,591,000
Texas Cane	20,000	—	—	20,000
Hawaii	1,110,000	—	(+75,000)	1,185,000
Puerto Rico	205,000	—	—	205,000
Philippines	1,376,758	14,457	14,710	1,347,591
Argentina	81,970	1,589	3,199	77,182
Australia	212,620	1,789	5,622	205,209
Bolivia	6,966	137	271	6,558
Brazil	591,480	11,476	23,088	556,916
British Honduras	36,433	708	1,422	34,303
Colombia	72,863	1,414	2,844	68,605
Costa Rica	73,935	1,435	2,885	69,615
Dominican Republic	685,773	13,306	26,769	645,698
Ecuador	87,328	1,693	3,409	82,226
Fiji	46,591	392	1,232	44,967
Guatemala	63,220	1,227	2,468	59,525
Haiti	33,216	644	1,296	31,276
Honduras	12,858	249	502	12,107
India	85,133	717	2,251	82,165
Ireland	5,351	—	—	5,351
Malagasy Republic	12,707	107	336	12,264
Mauritius	31,343	264	829	30,250
Mexico	606,479	11,767	23,672	571,040
Nicaragua	69,113	1,341	2,697	65,075
Panama	69,113	1,341	2,697	65,075
Paraguay	6,966	137	271	6,558
Peru	423,250	8,212	16,521	398,517
Salvador	46,075	894	1,799	43,382
South Africa	60,144	507	1,590	58,047
Swaziland	31,343	264	829	30,250
Taiwan	88,521	745	2,340	85,436
Thailand	19,483	163	516	18,804
Venezuela	65,899	1,279	2,572	62,048
West Indies	220,732	4,281	8,616	207,835
	11,700,000	100,000	100,000	11,500,000

[1] C. Czarnikow Ltd., *Sugar Review*, 1972, (1115), 34.
[2] *ibid.*, (1116), 39.

Calcium carbonate particles from carbonatation studies

By F. H. C. KELLY, F. K. MAK and M. G. S. CHUA
(Department of Chemistry, University of Singapore, Bukit Timah Road, Singapore 10)

Introduction

IN white sugar production the carbonatation process is used almost universally as one stage in the purification of sugar juices or syrups for removal of colouring materials and perhaps of some other non-sucrose substances.

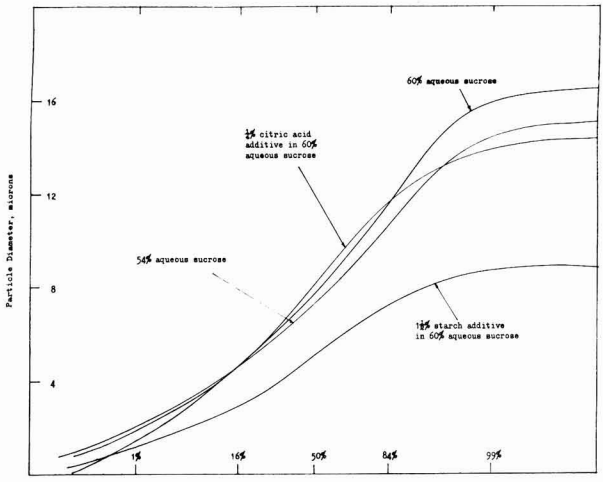


Fig. 1

Current practice involves a liming with a high-grade calcium hydroxide suspension to a high degree of alkalinity followed by gassing with carbon dioxide. The resulting precipitate of calcium carbonate is removed by filtration and with the precipitate is removed a useful amount of colouring material.

Techniques normally employed to improve the effectiveness of the carbonatation process involve variations in degree of alkalinity, temperature and stages of operation for the carbonatation itself. The structure and size of the carbonate precipitate have been recognised[1] to affect significantly both degree of clarification and the filtrability and to justify investigation of factors affecting nucleation and growth of the carbonate.

The present series of tests was conducted under close control of pH, temperature, rate of gassing and sucrose purity to study size distribution and particle shape in relation to the presence of impurities which are known to be polar in their behaviour. A precipitation medium of 60% w/w aqueous sucrose served as the basis from which to commence observations, with a carbonatation time of approximately 1½ hours to effect a pH change from 10·5 to 8·0 measured at 60°C. It was found that, in general, the polar impurities which were tested tended to increase $CaCO_3$ particle size whereas polymers such as starch and gelatin suppressed growth resulting in colloidal-type precipitates. The two polar substances initially selected for study were phenol as a very simple but nevertheless well-oriented dipole exposing a strongly electron-attracting site, and cetyl trimethyl ammonium bromide (CTAB) which is a larger molecule, strongly surface active and with both the electron-accepting and -donating sites well exposed although tending to give some problems because of its very nature and size.

It is conceivable that the growth of the precipitate would proceed only from "precursor nuclei" of a critical size determined entirely by the statistical thermodynamics of the system. Also it is conceivable that the probability of nucleation and growth would be higher if a polar mechanism were operating. It is important therefore that in order to ensure particle growth (i.e. to large particles) then multiplication of

[1] DEDEK: *Sugar*, 1951, **46**, (5), 21.

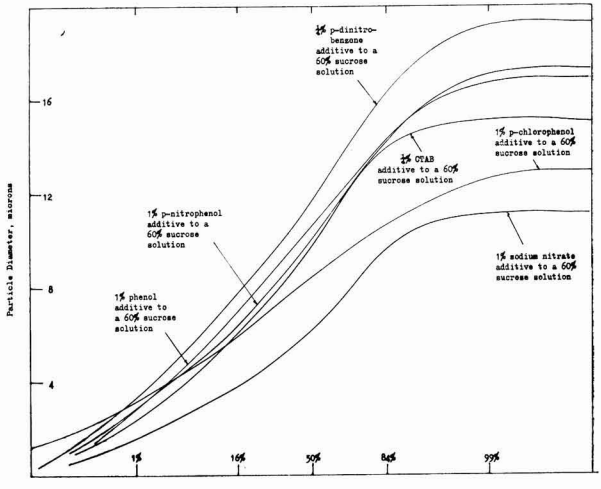


Fig. 2

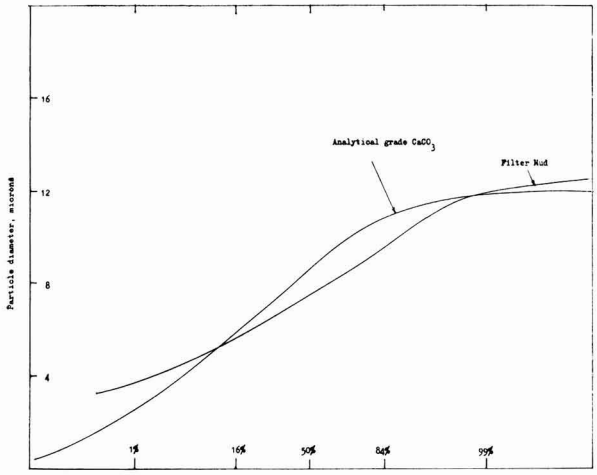


Fig. 3

nuclei should be suppressed. The problem lies in finding an impurity polar molecule which will operate only in the growth stage and serve as a "building unit". On the other hand impurity molecules which are isomorphous with the precipitating crystal might be expected to contribute to nucleation. However an impurity molecule such as starch might be expected to hinder growth by virtue of the sheer size of its molecule.

The present study does suggest a polar mechanism for both nucleation and growth, the calcium carbonate molecule itself being polar in character. Two of the oxygen atoms resonating in the plane of the CO_3-group expose anionic sites to the cationic calcium atom lying normal to the CO_3-group[2]. The molecule is thus polar with both electron-donating and accepting sites.

Table I

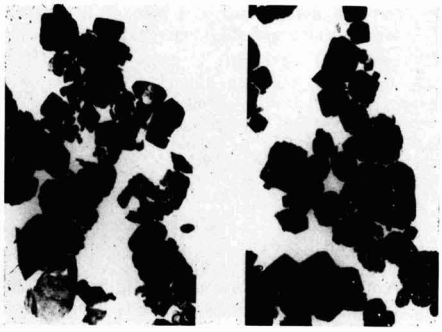
Precipitation medium	*Mean aperture (M.A.), microns*	*Coefficient of variation (C.V.)*
0% sucrose	6·00	0·33
54% w/w sucrose	6·75	0·46
60% w/w sucrose	6·85	0·37
66% w/w sucrose	7·90	0·45
½% starch	5·63	0·46
1% starch	5·95	0·45
1½% starch	4·85	0·44
¼% gelatin	<5·00	—
¼% citric acid	8·00	0·46
1% phenol	10·60	0·34
1% *p*-chlorophenol	8·25	0·31
1% *p*-nitrophenol	10·00	0·38
¼% *p*-dinitrobenzene	11·90	0·36
¼% CTAB	9·80	0·41
1% sodium nitrate	6·15	0·51
Analytical grade $CaCO_3$	8·40	0·29
Filter mud	7·40	0·26

GORTIKOV and MALINOVSKAYA[3] reported a positive charge on colloidal calcite which is in agreement with our results from electrophoresis and heat of adsorption studies of the carbonate precipitates[4], and these also suggest that the positive charge is preserved or accentuated during growth in the aqueous sucrose medium. However similar tests showed that a commercial calcium carbonate sample of analytical grade was electrically neutral whilst a sample of marble chips after being subjected to pulverizing in a vibrating ball mill was found to possess a positive charge which we believed to have been generated by the nature of the cleavage developed in the vibro-milling process.

Photographs taken of electron microscope enlargements of the surfaces of our calcium carbonate precipitates have shown clearly defined layer growth which is characteristic of a polar mechanism.

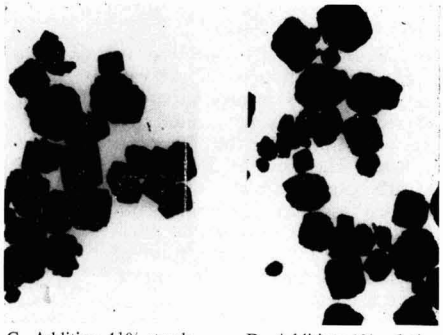
Experimental procedures

200 grams of a 60% w/w aqueous sucrose prepared from refined granulated sugar were placed in a double-necked glass flask and maintained at 60°C in a water bath.



A. Water B. 60% aqueous sucrose

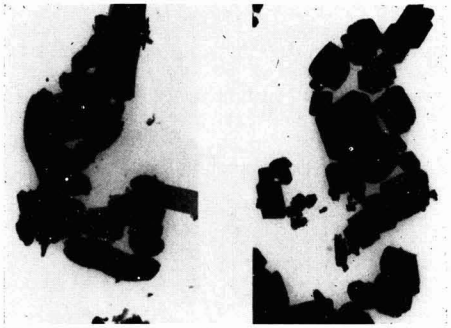
Fig. 4



C. Additive: 1½% starch. D. Additive: ¼% gelatin

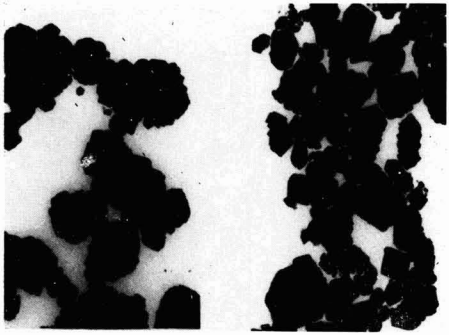
Fig. 5

[2] PAULING: "The Nature of the Chemical Bond" 3rd ed. (Cornell University Press, Ithaca, N.Y.) 1960.
[3] *Colloid J.* (U.S.S.R.), 1936, **2**, 429–433.
[4] CHUA: B.Sc. (Hons.) Thesis, Chemistry Department, Singapore University, 1972.



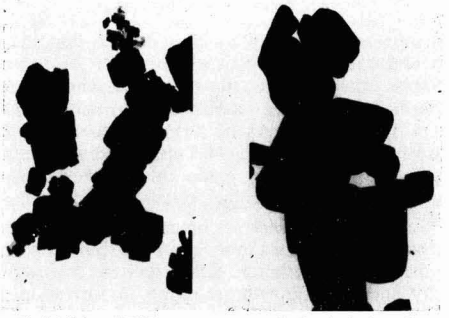
E. Additive: $\frac{1}{4}$% citric acid F. Additive: $\frac{1}{4}$% phenol

Fig. 6



G. Additive: $\frac{1}{4}$% *p*-dinitrophenol H. Additive: 1% *p*-nitrophenol

Fig. 7



I. Additive CTAB J. Analytical grade calcium carbonate

Fig. 8

The pH was raised to 10·5 by addition of calcium hydroxide, and carbonatation effected by slowly bubbling carbon dioxide until the pH of the carbonatated liquor reached 8·0. Time taken for carbonatation was about $1\frac{1}{2}$ hours.

The filtered precipitate was washed free of sucrose with distilled water before carrying out a size analysis on the Hitachi Particle Size Analyser whose operating principle has been discussed in a previous paper[5].

As the lowest reliable limit of the Particle Size Analyser is around 3 microns, particles in the range 0–5 microns were measured visually against a calibrated micro-scale.

Results and Discussions

(*a*) *Particle size analyses*

The cumulative size distribution curves are illustrated in Figs. 1–3 from which the mean aperture (M.A.) and coefficient of variation (C.V.) were calculated and are given in Table I.

Increase in sucrose concentration from zero to 66% w/w resulted in a size increase from 6 to 7·9 microns in fairly uniform distributions. Addition of starch and gelatin offered steric and viscous hindrance on swelling with corresponding decrease in M.A. to 0·6 microns and increase in C.V. to 0·46, whilst poor filtrability was also observed for the liquor (Fig. 1).

The use of additives such as citric acid and CTAB resulted in higher M.A. values being recorded. Favourable electrostatic clustering and improved filtration characteristics were observed which we

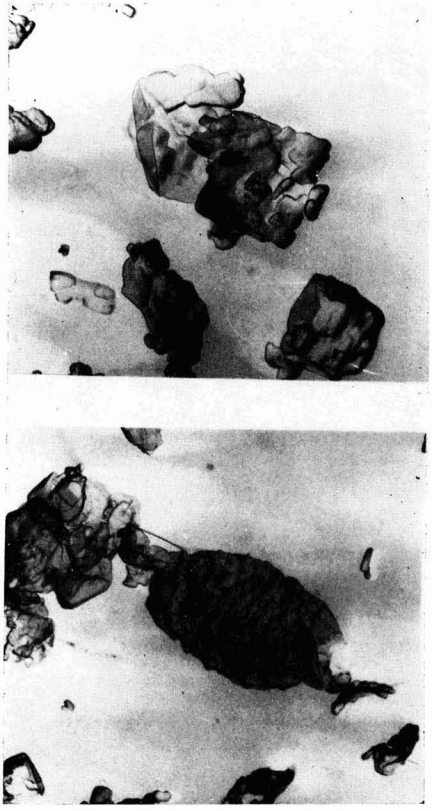


Fig. 9. Electron micrographs A_1, A_2

[5] KELLY and MAK: *I.S.J.*, 1971, **73**, 323–325.

attribute to ready adsorbability of citrate ions on the calcium carbonate[6] resulting in more electron-donating "active sites".

Additives specifically selected for their simple polar characteristics—phenol, nitrophenol and dinitrobenzene-resulted in significant size increases to 8–12 microns with C.V. of 0·3–0·38 in a fairly normal size distribution. The polar substances thus appeared to have participated in the polar growth of the carbonate particles (Fig. 2).

The effect of adding sodium nitrate was also studied, it being isomorphous with calcite, and was observed to have an adverse effect on nuclei development with a highly non-uniform size distribution; with M.A. of 6·15 microns the C.V. was as high as 0·51.

For comparison, samples of calcite from a refinery filter mud and from commercial analytical grade product were also analysed. A M.A. of 7·5 microns and C.V. of 0·26 were obtained for the filter mud, and M.A. of 8·4 microns and C.V. of 0·29 for commercial calcite (Fig. 3).

(b) Electron micrographs

The photomicrographs A–J show that the carbonate crystals do generally possess a rhombic shape although

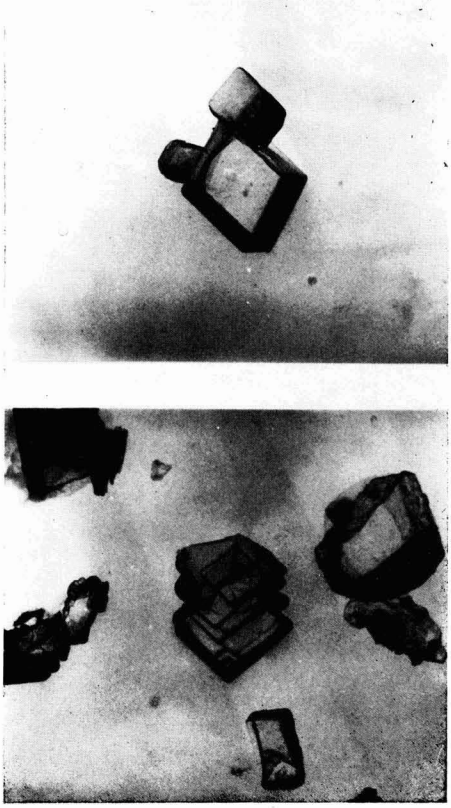


Fig. 10. Electron micrographs F_1, F_2

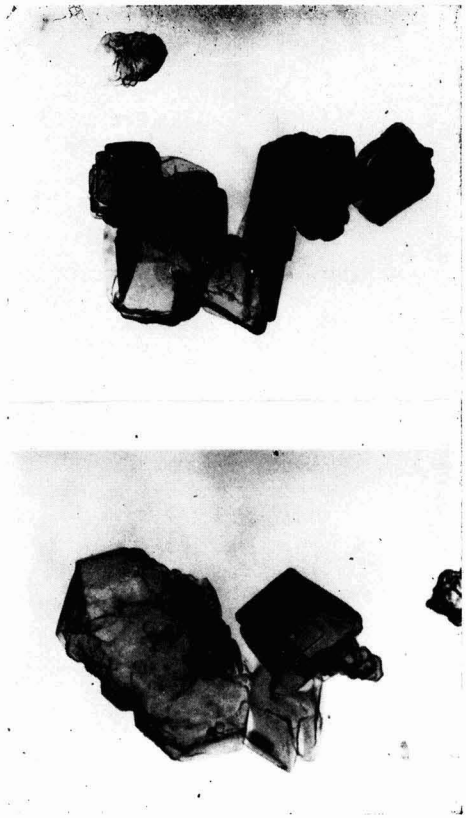


Fig. 11. Electron micrographs F_3, F_4

conglomeration and clustering of crystallites are marked. However E shows deviation from the rhombic, the presence of citric acid giving rise to deformed nodes. The citrate ion has been found to be readily adsorbed on calcium carbonate nuclei[6], the adsorbed ions controlling the ultimate crystal form. By contrast, analytical grade calcium carbonate J shows well-defined rhombic crystals in cluster.

A1 and A2 are electron micrographs of calcium carbonate precipitated in water. They show extensive primary conglomeration which occurs during the early stages of growth, resulting in formation of crystalline conglomerate units. The rhombic crystallites were formed and cemented together by the random deposition of new incoming molecules of calcium carbonate.

F1–F4 are electron micrographs of carbonate precipitated in 60% w/w aqueous sucrose with a 1% phenol additive. The growth pattern observed is that of layer growth with crystallites possessing a definite crystalline shape. F1 shows the distinct rhombic calcite structure, while F2 shows clearly a layer growth pattern in the central crystal. Layer

[6] PACHLOPNIK: *Z. Zuckerind. Csl. Rep.*, 1925/26, **50**, 269–288.

growth has been found to be associated with polar or ionic substances[7] and it is probable that adsorbed phenol, being itself polar, may have directed the calcium carbonate in layer growth. This pattern persists in F4 although evidence of primary conglomeration is detectable in both F3 and F4.

Acknowledgment

The authors wish to thank JEOL Ltd. (Tokyo) for taking the electron micrographs of the calcium carbonate samples.

[7] BUNN and EMMETT: *Discussions Faraday Soc.*, 1949, **5.**

Some effects of a water table level on the growth of sugar cane

By J. M. GOSNELL

(Rhodesia Sugar Association Experiment Station, Chiredzi, Rhodesia)

Paper presented to the 14th Congress I.S.S.C.T., 1971

INTRODUCTION

A SEARCH of the literature reveals little factual information on the effects of various depths of water table on the growth of sugar cane. The most useful work has been done by PAO and HUNG[1], who obtained a marked reduction in number and length of stalks, millable cane yield, sucrose content and root weight with a 50-cm water table compared with one at 150 cm. A 100-cm water table was generally intermediate.

Field experience on the subject has been rather contradictory. Whereas in some instances excellent growth of sugar cane has occurred in fields where a water table occurs, in other cases severe retardation of growth has been observed with or without salinization of soil. These differences are probably related to the oxygen content of the soil water, the depth of water table, and the length of time which the crop has been subjected to a shallow water table. In order to try and throw some light on the subject, it was decided to initiate a trial in which various depths of water table would be kept at constant levels for an extended period.

The effects of varying depths of water table on the salinization of soils in soil columns has been described by YEN[2]. He found high levels of conductivity near the surface at all water table depths.

EXPERIMENTAL PROCEDURE

Twenty-five containers were constructed by welding two 45-gal petrol drums end-to-end and removing the bottom from the top drum. Each container was 175 cm deep × 57 cm in diameter. All joints were covered with glass fibre-reinforced polyester resin to prevent leaks. Ten cm of graded aggregate and 7 cm of sand were placed in the bottom of each drum, which was then filled with soil, a Triangle P2 loamy sand which had previously been excavated and well mixed to obtain uniformity. Its average mechanical analysis was 10% clay, 6% silt and 84% sand, and the cation exchange capacity was 8 meq. A perforated pipe was inserted into the aggregate in the bottom of each drum and connected to a vertical pipe as shown in Fig. 1.

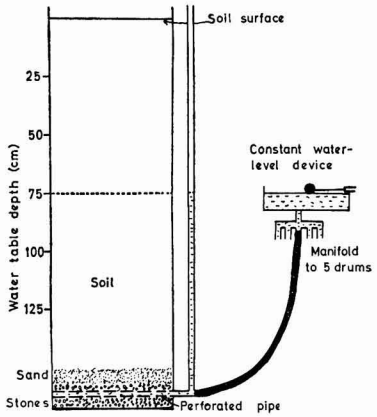


Fig. 1. Drawing of drum with constant water level device to maintain constant water table at 75 cm

The experiment consisted of 5 trenches each containing 5 drums placed in the soil, leaving about 5 cm protruding above ground level. The drums were then filled with soil to ground level. The design was a 5 × 5 Latin square.

A constant water table was maintained at differing depths for each treatment, viz. 25, 50, 75, 100 and 125 cm below soil level. Flexible PVC pipes were connected to the bottom of each drum, and all those from any one treatment were joined at a manifold leading into a container in which the water level was maintained at a constant level by means of a ballcock.

[1] *Rpt. Taiwan Sugar Expt. Sta.*, 1961, **24,** 19.
[2] *Taiwan Sugar*, 1970, **17**, (4), 11.

By this means, a constant water level was maintained in all drums. In order to guard against blockages, daily checks were made on the depth of water in the pipes adjacent to each drum. In the case of rain or excessive irrigation causing a build-up of water in the drum, the water level rose in the containers and overflowed when it reached more than 3 cm above the constant level point. Thus the water level was maintained constant to within 3 cm.

Irrigation was applied daily to the surface of all drums; the quantity applied was varied according to evaporative demand and to treatment, and was sufficient to satisfy crop requirements without causing an excessive build-up of the water table. Five nylon resistance blocks were installed at various depths above the water table in the 125-cm treatment. Twice-weekly determinations of soil moisture were carried out to check on the adequacy of irrigation.

The irrigation water was of high quality: its conductivity was 0·10–0·14 mmho/cm with a mean analysis as follows: Ca = 6·2 ppm; Mg = 3·2 ppm; Na = 7·1 ppm; HCO_3 = 63·4 ppm; Cl = 6·4 ppm; total = 86·3 ppm. Fertilization with the major nutrients N, P, K, and S was carried out by topdressing at intervals.

Each drum was planted with four 1-eyed setts of N:Co 310 in August 1967. Regular weekly height measurements and monthly stalk counts were taken during the course of the experiment; flower counts were also made when appropriate.

The experiment was harvested in June 1968, July 1969 and July 1970; at each harvest the yield of cane, sucrose % cane and stalk number were determined. Following the final harvest, soil samples were taken in each drum by 15-cm increments down to 150 cm. The drums were then cut open, the root systems exposed and photographed, and the roots washed, dried and weighed.

The soils were analysed for available P by the resin extract method, exchangeable cations using neutral N ammonium acetate, pH in 0·01M $CaCl_2$, organic matter by the WALKLY-BLACK method and electrical conductivity of the saturation extract. In addition, some of the saturation extracts were analysed for Na, Ca, and Mg in order to obtain the sodium adsorption ratio[3].

RESULTS

General growth

Two weeks after planting, good germination was observed in all drums except those in which a 25-cm water table was maintained. At it was clear that all canes would die in this treatment, the water level was dropped to 50 cm for 11 days, after which time full germination was recorded in all drums and the water level was then restored to 25 cm. This procedure was also carried out at each ratoon since it became evident that no ratooning would occur with a water table at 25 cm. Subsequent to these operations, the growth of cane was appreciable, although very retarded, with the 25-cm water table.

The cane in all drums grew satisfactorily during plant and 1st ratoon, but actually died in two of the 25-cm water table drums during the 2nd ratoon. Symptoms of yellow wilt were observed in all treatments in the plant crop.

Cane yield

The shallow water table caused great reductions in cane yield; Table I shows that cane yields were reduced on average by 35% with the 50-cm water table and by 63% with the 25-cm water table compared with the remaining treatments. There were no significant differences between the 75-, 100- and 125-cm water tables. In addition, it appears that there was a more rapid deterioration in yield over the ratoons with the shallow water-table treatments; the reduction in yield from plant to 2nd ratoon was 62% for 25-cm, 40% for 50-cm and 21% for the 75-, 100- and 125-cm water-table treatments.

Table I. Effect of water table on cane yield (kg/drum)

Depth of water table (cm)	*Plant cane*	*1st ratoon*	*2nd ratoon*	*Mean*
25	13·5	6·3	5·2	8·3
50	18·0	14·8	10·8	14·5
75	22·8	23·4	18·3	21·5
100	24·6	24·8	19·5	23·0
125	24·3	24·4	19·1	22·6
LSD 5%	4·5	3·6	5·1	—
CV (%)	15·8	13·9	25·4	—

Sucrose % cane

Table II shows that a shallow water table did not result in lower sucrose content in the plant crop;

Table II. Effect of water table on sucrose % cane

Depth of water table (cm)	*Plant cane*	*1st ratoon*	*2nd ratoon*	*Mean*
25	16·5	15·8	15·1	15·8
50	16·5	16·6	16·3	16·4
75	16·4	16·9	17·2	16·8
100	16·2	16·9	16·9	16·7
125	16·2	16·4	16·9	16·5
LSD 5%	ns	0·7	—	—
CV (%)	6·1	3·1	—	—

however, there was a slight reduction in 1st ratoon and a marked reduction in 2nd ratoon. The sucrose level overall in the experiment was somewhat higher than in field grown cane.

Sucrose yield

The reduction in yield of sucrose (measured in kg sucrose/drum) with the shallow water tables was even more marked than that of cane yield. The deterioration in the ratoon crops was also very marked. These two effects are shown in Fig. 2.

Stalk population

A shallow water table caused a marked reduction in the number of harvested stalks per drum (Table III). This accords with field observations of reduced tillering under waterlogged conditions. It is also noteworthy that the number of stalks in the 25-cm water-table treatment declined from plant to 2nd

[3] RICHARDS: *USDA Handbook*, 1954, (60).

ratoon while it increased in the remaining treatments. An increase in stalk number is normally expected between plant and 1st ratoon.

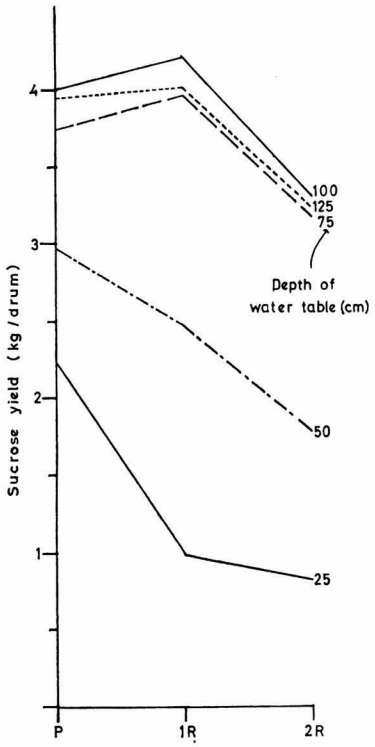


Fig. 2. Effect of water table on sucrose yield (kg/drum)

Table III. Effect of water table on number of harvested stalks per drum

Depth of water table (cm)	*Plant cane*	*1st ratoon*	*2nd ratoon*	*Mean*
25	18·0	18·8	16·0	17·6
50	21·6	25·4	26·2	24·4
75	25·0	29·0	34·0	29·3
100	23·4	29·2	35·8	29·5
125	25·0	28·6	37·0	30·2
LSD 5%	3·4	5·1	10·3	—
CV (%)	10·9	14·2	14·5	—

Table IV. Effect of water table on height of plants (cm)

Depth of water table (cm)	*Plant cane*	*1st ratoon*	*2nd ratoon*	*Mean*
25	223	127	59	136
50	249	227	142	206
75	272	258	175	235
100	283	263	178	242
125	264	265	178	236
LSD 5%	27	24	37	—
CV (%)	7·6	7·7	20·4	—

Height growth

The effect of waterlogging on height growth was similar to but more marked than on stalk population. Height measurements were carried out weekly, and the data used in Table IV were those from the last week before the effects of flowering obscured genuine stalk elongation effects. The height of the 25-cm water-table treatment, expressed as a percentage of that of the 125-cm water table treatment, dropped from 85% in the plant crop to 33% in the 2nd ratoon.

Root growth

The visual effect of water table on root growth was very marked. The majority of roots stopped at a fairly sharply demarcated line 5–10 cm above the water table. The effect of a 25-cm water table on root weight was very marked, as shown in Table V. With the 50-cm water table, there was an apparent but non-significant reduction in root weight.

Table V. Effects of water table on root weight and flowering

Depth of water table (cm)	*Root weight (kg/drum)*	*Number of flowers/drum* 1968	1969
25	1·75	7·8	2·0
50	6·61	13·4	12·2
75	7·56	18·2	17·0
100	7·64	19·4	20·4
125	7·05	18·4	19·2
LSD 5%	2·69	4·0	3·9
CV (%)	31·9	18·1	20·0

Flowering

Flowering in sugar cane varies greatly year by year in the Rhodesian Lowveld from virtually no flowing as in 1970 to very profuse flowering as in 1969. This variability is primarily related to minimum temperatures during the photosensitive period in March[4]. In the water table experiment, flowering was profuse in 1968 and 1969 but no flowering occurred in 1970. Table V shows that flowering occurred in all treatments, but there was significantly more in the 75-, 100- and 125-cm water table treatments than in the shallow water tables. This was particularly marked in 1969.

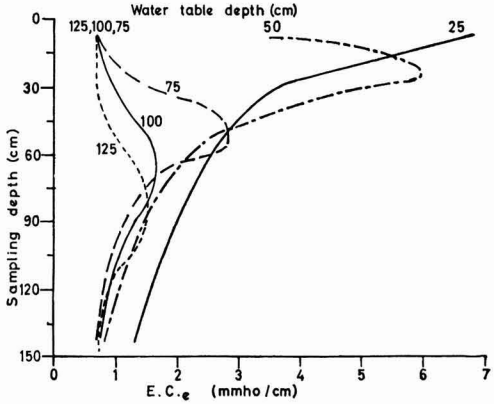


Fig. 3. Effect of water table depth on conductivity of saturation extract

[4] GOSNELL: *Sugarcane Newsletter* (Rhodesia Sugar Assoc.), 1969, **14**, 8.

Soil salinity

The effect of water table on the conductivity of the saturation extract is shown in Fig. 3. With all treatments there was a build-up in conductivity which reached a maximum value at a level 20–30 cm above the water table. This was evidently due to the upward movement of salts from the water table being deposited in the root zone as moisture was extracted. With the 25-cm water table the salinity at the surface was largely due to evaporation. The conductivity values obtained in the surface 30 cm of soil of both the 25- and 50-cm water-table treatments were high enough to cause significant reduction in cane growth, i.e. more than 4 mmhos/cm[5]. The conductivity of the soil below the water table was much lower than the peak values mentioned above, and in general was below the threshold value for sugar cane (2 mmhos/cm). There was also a marked reduction in conductivity towards the surface with all treatments except the 25-cm water table.

Fig. 4 shows the effect of a shallow water table on the sodium adsorption ratio of the soil saturation extract. This reached a maximum value of nearly 15 with the 75-cm water table at a depth of 40–60 cm. This value is sufficiently high for reclamation with gypsum to be required, and it is interesting that it

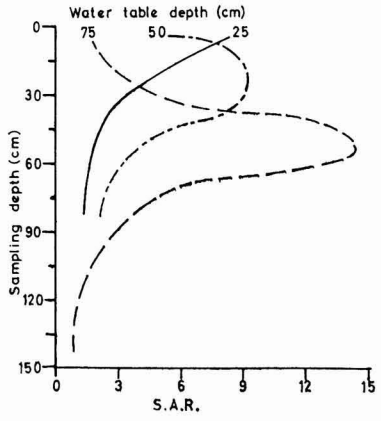


Fig. 4. Effect of water table depth on sodium adsorption ratio of saturation extract

occurred at depth in a soil where the value was low near the surface. Routine soil sampling, which is carried out to a depth of 20 cm, would not detect this problem. Thus it can be seen that a water table at 75 cm may pose a serious soil-sodium problem.

Soil pH

The effect of water table on the soil pH is shown in Table VI. The pH in all treatments at all depths below 45 cm lay between 7·3 and 7·9 with a mean of 7·6 (Table VII). It is clear that there was appreciable leaching from the 0- to 15-cm zone in the 50-cm water table treatment and from the 0- to 30-cm zone in the 75,- 100- and 125-cm treatments. This is borne out by the values for exchangeable Ca and Mg, which showed similar trends to the above.

Table VI. Effect of water table on soil pH

Depth of water table (cm)	*Depth of sampling (cm)* 0–15	15–30	30–45
25	7·3	7·6	7·5
50	6·7	7·6	7·7
75	5·5	6·5	7·1
100	5·9	6·9	7·4
125	5·5	6·5	7·4

Table VII. Effect of water table on exchangeable cations in the 0- to 15-cm zone (m.e.%)

Depth of water table (cm)	*Ca*	*Mg*	*Na*	*K*
25	13·0	2·5	1·7	1·10
50	13·0	1·1	1·5	0·46
75	4·7	0·7	1·2	0·47
100	6·0	0·8	1·1	0·43
125	5·0	0·8	1·2	0·52

Soil P

There was a marked reduction in available P with increasing depth. This was due to heavy applications of P on the surface with relativley little vertical movement below the 30-cm zone. There was no significant treatment effect on soil phosphate and no leaching down the profile was observed under waterlogged conditions. There was some movement downwards under aerobic conditions, however, as shown in Table VIII. This is contrary to evidence of VAN'T WOUDT and HAGAN[6], who observed leaching of P under waterlogged conditions.

Table VIII. Available soil P (ppm P_2O_5) in relation to soil depth

Depth of sampling, cm	*Mean (all treatments)*	*25-cm water table*	*100-cm water table*
0–15	134	131	138
15–30	123	129	127
30–45	54	37	76
45–60	19	12	25
60–75	11	7	14
75–90	11	5	12
90–105	10	5	10
105–120	8	3	11
120–135	9	2	11
135–150	8	4	9

Table IX. Soil organic matter (%) in relation to soil depth

Depth of sampling (cm)	*Water table depth (cm)* 25	50	75	100	125
0–15	1·2	1·3	1·4	1·4	1·8
15–30	0·8	1·3	1·3	1·2	1·3
30–45	0·7	1·0	1·1	1·1	1·1
45–60	0·5	0·9	0·7	0·9	0·9
60–75	0·7	0·7	0·9	0·9	0·9

Soil organic matter

There was a marked reduction in organic matter with increasing depth owing to accumulation of root material in the surface horizons over 3 years. There was also a slight though consistent tendency for the shallower water table treatments to have a lower organic matter, as shown in Table IX. This is contrary

[5] HUMBERT: "The Growing of Sugar Cane". (Elsevier, Amsterdam). 1968.

[6] *Amer. Soc. Agron. Monograph*, 1957, (7).

to results of VAN'T WOUDT and HAGAN[6], who stated that organic matter is usually higher under waterlogged conditions because of lack of aerobic decomposition.

SUMMARY

Cane was grown for 3 years in deep containers in which the water table was maintained at constant depths of 25, 50, 75, 100 and 125 cm in different treatments. The 25-cm water table inhibited germination at planting and ratooning, and caused large reductions in stalk number, height growth, cane yield, sucrose % cane, sucrose yield, root weight and flower number. The 50-cm water table gave intermediate results, and no differences in growth were observed between 75-, 100- and 125-cm water tables, which gave the best results. These effects became progressively more severe from plant crop to 2nd ratoon. Salinization of the soil occurred about 20–30 cm above the water table in all treatments; it was not serious in the 100- and 125-cm water table treatments, but fairly high values of electrical conductivity and sodium adsorption ratio of the soil saturation extract were observed in the 25-, 50- and 75-cm water table treatments. Leaching of calcium and magnesium occurred down the soil profile towards the water table, but no leaching of phosphate occurred in waterlogged soil. Soil organic matter was lower in waterlogged soil than in soil above the water table. For optimum cane growth, the water table should be kept below 1 metre.

Juice purification by means of pre-carbonatation

By S. ZAGRODZKI

(Dept. of Sugar and Food Technology, Lódz Technical University, Poland)

Paper presented to the 21st Technical Conference, British Sugar Corporation Ltd., 1972

TRADITIONAL methods of juice purification, mainly consisting of pre-liming, main liming and carbonatation to a pH of 10·8, do not effect complete removal of non-sucrose substances capable of elimination, and are often accompanied by settling and filtration difficulties, particularly in the later stages of the campaign during December and January. Further disadvantages are peptization of colloids after carbonatation and juice foaming in the evaporators. Because of this, twelve years ago[1], pre-liming in an eight-chambered plant was tried, permitting progressive liming with pauses in the 4th and 8th chambers at pH 9 and pH 11. In this way we found that coagulation was better and partial dehydration of the colloids was achieved. Further improvement could be made by separating colloids after the pre-liming[2,3]. The precise dosing of milk-of-lime in suitable quantities for pre-liming, main liming and additional liming before 2nd carbonatation is as important as ever[4,5,6,7].

During development in the course of years of research work to find the correct method of juice purification, a method using pre-carbonatation during pre-liming was tried.

This method comprises subjecting the juice to carbonatation during simultaneous pre-liming, after cold pre-liming and heating to 88°C. In effect one changes the pH value 6 or 7 times from 11 to 9 and vice versa. Only when such conditions obtain is colloidal coagulation complete and a thorough dehydration ensured.

Fig. 1 shows schematically the method of juice purification with optimal total lime addition of 1·6% CaO on beet. The milk-of-lime dosing must be divided accurately: 0·4% CaO added to the pre-carbonatation of heated pre-limed juice, 1·1% CaO added to the main liming to decompose amides and invert[8] and 0·1% CaO added to the post-liming before the final carbonatation (2nd carbonatation).

The raw juice passes from tank A through a flowmeter which proportions the lime dosing simultaneously to all three liming points. Approximately 4%

[1] ZAGRODZKI and ZAORSKA: *Gaz. Cukr.*, 1963, **71**, 45; *Ind. Alim. Agric.*, 1964, **81**, 721.
[2] ZAGRODZKI and SZWAJCOWSKA: *Gaz. Cukr.*, 1970, **78**, 283.
[3] *idem*: *Zucker*, 1972, **25**, 195.
[4] ZAGRODZKI and ZAGRODZKI: *Gaz. Cukr.*, 1963, **71**, 9.
[5] ZAGRODZKI: *Zeitsch. Zuckerind.*, 1958, **83**, 17.
[6] ZAGRODZKI and MAKOWSKI: *Gaz. Cukr.*, 1966, **74**, 261.
[7] ZAGRODZKI *et al.*: Polish Patent 65252 (8th December 1971).
[8] ZAORSKA and ZAGRODZKI: *Zucker*, 1970, **23**, 6; *Gaz. Cukr.*, 1970, **78**, 105.

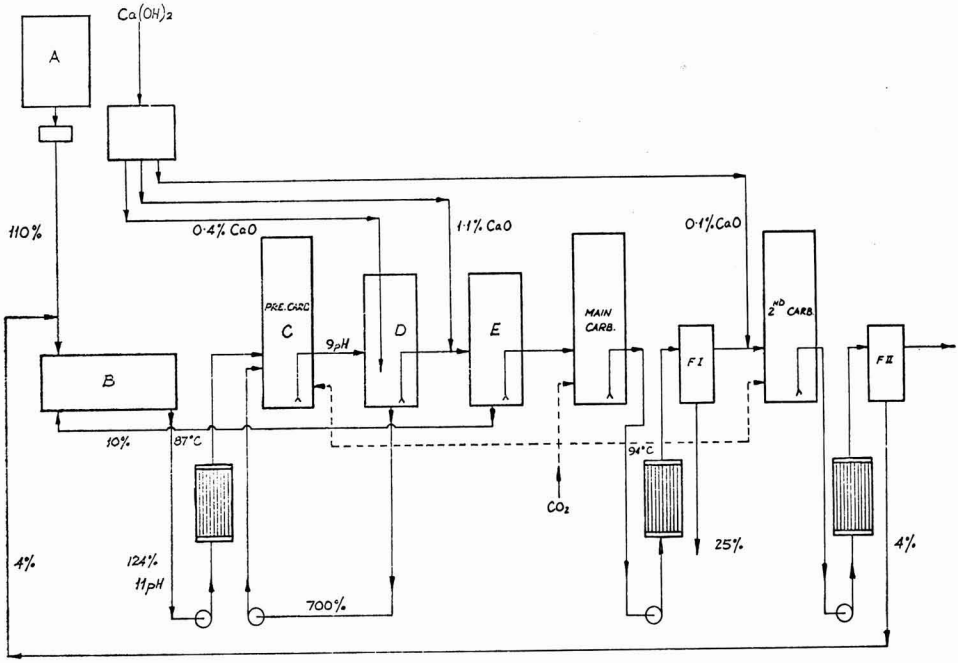


Fig. 1. KEY: (A) Raw juice tank, (B) Pre-liming tank, (C) Pre-carbonatation during pre-liming, (D) 1st stage liming, (E) Main liming, (FI) Continuous vibratory filter for screening suspension from main carbonatation, (FII) Continuous vibratory filter for screening suspension from 2nd carbonatation.

on beet of thickened sludge from the 2nd carbonatation filter is returned to the raw juice before it passes to 1st liming B where it is limed with unfiltered sludge after 2nd liming (10% on beet) to a pH of 11. The juice is pumped successively through heat exchangers and heaters, utilizing condensate and 5th, 4th and 3rd vapours for heating to 87°C.

The heated juice enters the 1st carbonatation station C, where the pH decreases to 9. The juice passes to tank D where the alkalinity is raised to pH 11 by addition of 0·4% CaO. Approximately 700% juice is returned by means of a low-speed, high-performance unchokeable pump from tank D to 1st carbonatation C.

In order to coagulate the precipitated impurities properly and effect good dehydration of colloids the juice must be recirculated as much as possible, maintaining a pH of 9 after 1st carbonatation and pH 11 after 1st liming. The juice then passes at a temperature of 85°C to tank E where the main liming dose of 1·1% CaO is added, raising the pH to 12, the destruction of invert and amides taking place during the reaction time of not less than 5 minutes. From tank E the juice overflows to the counter-flow main carbonatation plant. There it is carbonatated to a pH of 11–11·1 (or an alkalinity of 0·09 to 0·10% CaO) to obtain maximal precipitation of all impurities.

The experiments performed at Łódź Sugar Institute on a semi-technical scale, and also in a factory under campaign conditions, showed many advantages in the new method. Owing to the repeated pre-liming up to pH 11 and pre-carbonatation to pH 9, very good colloidal coagulation accompanied by simultaneous dehydration was obtained, whereby filtration was accelerated, filtration resistance decreased and settling rate increased.

When purifying raw juices of 90 purity it was possible to achieve practically double the rate of settling in comparison with that obtained using the classical method, whilst obtaining a final juice purity of 94, i.e. an additional increase of 0·5 purity. When purifying raw juices of 87 purity a threefold increase in filtration rate and a twofold increase in settling rate were obtained, an additional purity increase of 0·6, i.e. from 92·4 to 93·0, also being obtained. Observed simultaneously were a decrease in invert content and an appreciable reduction in juice colour measured as specific light extinction.

The introduction of juice purification by means of pre-carbonatation requires exactly proportioned dosing of milk-of-lime at the liming points and, owing to the significant increase in filtration rates, permits the maintenance of high juice alkalinities of 0·09 to 0·10% CaO after the main carbonatation following main liming, which, *inter alia*, ensures the favourable results observed.

Sugar cane agriculture

Sugar cane Co 1336 for early crushing. R. L. BHOJ and P. C. KAPOOR. *Indian Sugar*, 1971, **21**, 317–319. The history of this variety and its suitability for filling the void in sugar cane cultivation in Western Uttar Pradesh are discussed. Its agronomic and botanical characters and disease resistance are considered. With heavy manuring and irrigation the variety is inclined to lodge.

* * *

History of the US Sugar Cane Field Station at Houma, Louisiana. E. V. ABBOTT. *Sugar y Azúcar*, 1971, **66**, (10), 69–71.—The first planting of cane at Houma, Louisiana, was made in 1922 with the variety POJ 234. The following year POJ 36 and 213 were obtained. At first, seed cane was distributed in 4-lb lots. The development of the station over the years is described. The station has produced over 700 research papers on the production, harvesting and processing of sugar cane. Cane farmers have benefited in numerous ways from the work carried out at Houma.

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US Sugar Cane Field Station, Canal Point, Florida—first fifty years 1920-1970. L. P. HEBERT. *Sugar y Azúcar*, 1971, **66**, (10), 73–76.—The initiation and development of this well known sugar cane research station is discussed. 1918 saw the beginning of breeding work at the station, where the primary objective has always been the production of improved varieties. In the early days it was necessary to replace the noble canes which were failing. By the mid-fifties Canal Point varieties occupied more than 95% of the sugar cane acreage in Louisiana. The station is well known for its extensive collection of sugar cane varieties and related species, a valuable source of germ plasm for breeding.

* * *

LSU's sugar cane research programme at the Louisiana Agricultural Experiment Station. S. J. P. CHILTON. *Sugar y Azúcar*, 1971, **66**, (10), 84.—This station operates a comprehensive research programme on sugar cane. The work of the station is briefly described under various departmental headings: agronomy, agricultural engineering, plant pathology, entomology and cooperative extension.

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Insecticides not necessarily pollution villains. N. J. KING. *Producers' Rev.*, 1971, **61**, (11), 9.—It is pointed out that there is no indication whatsoever that the insecticides being used by the sugar industry are having any damaging effects on soils or the fertility of those soils, despite the fact that one insecticide has been in continual use since 1948.

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Fiji disease at Bundaberg. ANON. *Producers' Rev.*, 1971, **61**, (11), 11.—Work done in connexion with the outbreaks of Fiji disease in Queensland in 1969, after freedom from the disease for 12 years, is explained. Complete eradication is difficult. Although the direct cane losses are small, the financial burden on the local growers and millers, imposed by Cane Pest and Disease Control Board expenditure on control, is appreciable. If these control measures fail to contain the outbreak and to reduce the disease incidence to a level low enough to lead to eradication, it may become essential to cease the growing of the "rogue" variety temporarily in favour of a disease-resistant one, even if some productivity losses ensue.

* * *

Recent developments in mechanical sugar cane harvesting. R. F. SPARGO. *Producers' Rev.*, 1971, **61**, (11), 17–25.—The main features of a chopper harvester and of a self-propelled harvester developed in Australia are described and developments in Australian harvester design during the last decade surveyed. The need to be able to alter considerably the cutting level of harvesters because of the variation in ridge or furrow size is stressed. Other subjects discussed include air blast separation of trash and the advantages of hydraulic drives. Future developments are briefly considered.

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The evaluation of sugar cane in South Africa. A. C. BARNES. *Producers' Rev.*, 1971, **61**, (11), 37–47.—See *I.S.J.*, 1972, **74**, 346.

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Economics of fertilizer use. ANON. *Producers' Rev.*, 1971, **61**, (11), 51–53.—Results from 18 nitrogen trials and 44 phosphorus and potassium trials, over an eleven-year period, are discussed. The importance of nitrogen in the Mackay area is emphasized. The profit per Australian dollar invested from the use of nitrogen in plant cane was 1·6 times the profit from phosphorus and 5·7 times the profit from potassium at the present sugar:fertilizer price ratio. Results in other areas and of lime and silicate trials are also given.

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Three diseases prominent. C. G. HUGHES and D. R. L. STEINDL. *Producers' Rev.*, 1971, **61**, (11), 55–56. Three diseases prominent in Queensland during 1971 were yellow spot in the north (worst attack for many

years), leaf scald, which covered a wide area, and Fiji disease. Yellow spot is always present to some extent in the areas north of Townsville. South of this it has not caused serious losses. The susceptibility of the different cane varieties to the disease is discussed. The varieties Q57 and Q78 remained reasonably free of the disease.

* * *

Phenotypic associations among characters at single stool selection stage in sugar cane. J. A. MARIOTTI. *Rev. Agron. Noroeste Argentino*, 1971, **8,** 327–340. This study was carried out at Tucumán (Argentina) in order to ascertain relationships between characters at the single-stool stage of the selection programme. For the work, approximately 100 seedlings from the progeny of 9 crosses were taken at random from the field. Characters studied were: number of stalks in the stool, diameter, height and weight of stalk, erectness, fibre content, Brix and juice purity. It was found that stool weight was closely correlated with stalk number, weight per stalk and height of stalk.

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Response functions and optimum fertilizing rate in sugar cane. R. LLANOS LL. *Rev. Agron. Noroeste Argentino*, 1971, **8,** 341–372.—Basic information was taken from trials carried out at the Tucumán Agricultural Experiment Station. Mitscherlich, quadratic and square root regression equations were calculated from these data. By means of these functions a mathematical procedure was derived for estimating marginal yields and economical fertilizing rates under several conditions.

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Inheritance estimates in five sugar cane hybrid populations. J. A. MARIOTTI. *Rev. Agron. Noroeste Argentino*, 1971, **8,** 373–389.—A study was carried out on 5 sugar cane progenies in order to estimate genetic parameters and responses to selection. The progenies, derived from 1966 series of crosses, are named. Single stools were randomly chosen in 1968 and planted in clonal plots. The characters considered at selection are indicated and the results summarized in 4 tables.

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The Caldwell scrapper. ANON. *Sugar Bull.*, 1971, **49,** 374.—For "scrapping" or dealing with lodged or tangled cane a modified loader proved very successful. The modification consisted of welding a "tooth" in the middle of the loader pusher. A good loader operator is needed for satisfactory operation.

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Outfield evaluation of sugar cane varieties in 1970. M. J. GIAMALVA. *Sugar Bull.*, 1971, **49,** 350–354.—A large number of varieties was studied on both light and heavy soils. Results are summarized in 6 tables. On light soils CP 65-357 was the highest yielding variety in plant cane. L 62-96 was the highest yielding released variety in plant cane and first and second ratoons. L 60-25 produced good yields of sugar per acre. CP 61-37 produced good yields in tons of cane per acre but was low in sugar per ton. On heavy soils CP 65-357 and L 62-96 were significantly better than L 65-69, CP 52-68 and CP 65-350.

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The Louisiana sugar cane variety census for 1971. R. J. MATHERNE. *Sugar Bull.*, 1971, **49,** 375–377. The variety L 60-25 is the major sugar cane variety in Louisiana. It reached this elevated position very rapidly. Results of the census or survey are given in 3 tables, dealing with parishes in the south eastern area, south western area and northern area. A fourth table gives the results for all areas in Louisiana. Top varieties were: L 60-25 (30·13%); CP 52-68 (25·57%); CP 61-37 (15·51%); N:Co 310 (8·94%); and CP 48-103 (8·87%).

* * *

Scrapping cane. L. L. LAUDEN. *Sugar Bull.*, 1971, **49,** 393–394.—Methods of "scrapping" badly lodged cane resulting from a hurricane are described.

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Studies on the accumulation of sucrose in some new promising varieties of cane. P. D. BAJPAI and R. C. TRIPATHI. *Indian Sugar*, 1971, **21,** 377–386.—In these investigations cane samples were drawn at fortnightly intervals from standing cane and the juice extracted by a 3-roller power crusher and analysed. Six varieties of cane grown at two fertility levels were used. Results are depicted in tables and graphs. Accumulation of sucrose was found to be highly seasonal, high from October to mid-December and low from mid-December to the end of January. There was inverse relationship between the rate of accumulation of sucrose and that of hexoses.

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Leaf blight of sugar cane in Taiwan. IV. Resistance trial. L. S. LEU and W. H. HSIEH. *Sugarcane Pathologists' Newsletter*, 1971, (7), 4–7.—Leaf blight, induced by *Leptosphaeria taiwanensis*, is one of the most important sugar cane diseases in Taiwan. Incidence of the disease is greatly affected by the weather. The use of resistant varieties of cane seems to be the most rational method of control. This paper reports the artificial inoculation of numerous sugar cane varieties with ascospore suspensions of the fungus and the development of the symptoms thus induced.

* * *

Sugar cane leaf scald investigations January-July 1971. M. S. KHAN. *Sugarcane Pathologists' Newsletter*, 1971, (7), 8–9.—The bacterium responsible for the disease (*Xanthomonas albilineans*) is endemic in Guyana. Screening trials in the search for resistant varieties are described and discussed. An account is given of the technique employed for obtaining pure cultures. Only 4 out of 19 varieties tested showed resistance to leaf scald, these being B 6522, B 6523, B 65262 and B 61209.

A note on fungicides. G. M. THOMSON. *Sugarcane Pathologists' Newsletter*, 1971, (7), 9.—With the prospect of mercurial fungicides being withdrawn from the South African market within 3 years, the Experiment Station has initiated a programme of screening trials in a search for replacements for those compounds at present in use. Early indications from trials are that "Benlate" ("Benomyl") will probably be amongst those non-mercurial compounds found to be suitable for use as a means of controlling pineapple disease.

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Sugar cane and nematicides in South Africa. R. H. G. HARRIS. *Sugarcane Pathologists' Newsletter*, 1971, (7), 9.—Nematodes are prevalent in the coastal sandy cane soils of Natal. Trials with nematicides have given variable results, with growth responses ranging from nil to 70 metric tons/ha. There was little difference in effectiveness between DBCP, EDB and D-D fumigants. "Temik" ("Aldicarb") in granular form applied in the planting furrow has shown promise.

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Reaction of clones of *Saccharum spontaneum* to *Ustilago scitaminea*, the causal fungus of the culmicolous smut of sugar cane. L. S. LEU. *Sugarcane Pathologists' Newsletter*, 1971, (7), 10–11.—In Taiwan cane smut virtually disappeared when thick-stemmed noble cane came into cultivation. It re-appeared years later with the adoption of other cane varieties, especially N:Co 310. It is thought that the disease may have been harboured by the wild *Saccharum spontaneum*, which is common in the island. In experiments to test this theory, various clones of *S. spontaneum* were inoculated with spores from diseased N:Co 310 cane. The proportions of stools which became infected are given in a table and ranged from 0 to 100%.

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Sugar cane seed pieces: heat treatment and inoculation with sugar cane mosaic virus. G. T. BENDA. *Sugarcane Pathologists' Newsletter*, 1971, (7), 11.—The belief that increased susceptibility to mosaic disease persists in heat-treated sugar cane was tested in a series of 9 experiments, which are described. In many instances the belief proved to be well founded.

* * *

An unusual leaf spot of sugar cane caused by *Physalospora tucumanensis* Speg. P. PRAKASAM and P. APPALANARASIAH. *Sugarcane Pathologists' Newsletter*, 1971, (7), 12.—Leaves in a clump of cane of the variety Co 419 growing at the Sugarcane Research Station, Anakapalle, Andhra Pradesh, India, exhibited a peculiar or unusual pattern of leaf spots. Isolations yielded a dark race of the fungus *Physalospora tucumanensis* Speg.

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***Alternaria* leaf spot of sugar cane.** S. SINGH. *Sugarcane Pathologists' Newsletter*, 1971, (7), 13.—Typical spots due to *Alternaria tenuis* were observed on the leaves of 3 varieties of cane at Coimbatore from November 1970 to February 1971. Pathogenicity tests showed that infection of deliberately injured leaves ranged between 70 and 100% as against 30–50% of uninjured leaves.

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The 1971 yellow spot epidemic in North Queensland. B. T. EGAN. *Sugarcane Pathologists' Newsletter*, 1971, (7), 14.—A description is given of the epidemic, accompanied by a striking photograph showing a test-strip of the variety Q 91 (susceptible) in a field of Q 82 (resistant) in the Innisfail area, North Queensland. The present position in regard to varietal susceptibility to the disease is discussed.

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Ratoon stunting disease virus *in vitro*; association with host material. A. G. GILLASPIE. *Sugarcane Pathologists' Newsletter*, 1971, (7), 15.—Studies on the virus and attempts at isolating it are described.

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Sugar cane diseases recorded in Burma. M. M. THAUNG. *Sugarcane Pathologists' Newsletter*, 1971, (7), 15.—A list is given of diseases so far recorded on sugar cane in Burma. The list includes 17 fungal diseases.

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R.S.D. in three commercial varieties. G. M. THOMSON. *Sugarcane Pathologists' Newsletter*, 1971, (7), 16–17. The sugar cane varieties in question are N:Co 376, N 53/62 and N 55/805. Dramatic photographs show the effects of the disease in cane plots where diseased cane and healthy cane subjected to heat treatment are shown.

* * *

The vector of white leaf disease in Taiwan. L. S. LEU. *Sugarcane Pathologists' Newsletter*, 1971, (7), 17.—It is pointed out that the correct generic name for the leafhopper vector of white leaf disease should be *Matsumuratettix* and not *Epitettix*.

* * *

Fungus pathogens of sugar cane in Asia and Australia. P. HOLLIDAY. *Sugarcane Pathologists' Newsletter*, 1971, (7), 17.—Sugar cane has certain fungus diseases which arose in the regions where the crop evolved (West Pacific Islands) and are still more or less restricted to these regions in some instances. There is uncertainty over the differential distribution of rusts in the genera *Erianthus* and *Saccharum*.

* * *

New sugar cane diseases reported in Hawaii. R. S. BYTHER, G. W. STEINER and C. A. WISMER. *Sugarcane Pathologists' Newsletter*, 1971, (7), 18–21.—In recent years certain sugar cane diseases have been recorded in Hawaii for the first time. An account is given of these, illustrated with photomicrographs of spores, fruiting bodies, etc. Of special interest are the seedling blights accounting for seedling losses in greenhouse "flats" and ranging from 8 to 31% with an average of 16%. The fungi concerned are: *Cochliobolus lunatus*, *Curvularia senegalensis*, *Drechslera hawaiiensis*, and

D. rostrata. Smut (*Ustilago scitaminea*) and black rot (*Ceratocystis adiposa*) are also included.

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Ecological relationships among three fungi associated with wilt disease of sugar cane. P. PRAKASAM. *Sugarcane Pathologists' Newsletter*, 1971, (7), 22–23.—The fungi in question are: *Cephalosporium sacchari*, *Physalospora tucumanensis* and *Fusarium* sp. It has long been known that wilt disease and red rot occur in association with each other, but the reason for the co-existence was not known. Laboratory work on these fungi is described. It was found that when a mixed inoculum consisting of these two organisms was introduced into a Petri dish, *C. sacchari* alone grew, inhibiting *P. tucumanensis*, and the rate of growth of the organism was found to be more than that when *C. sacchari* alone was grown under identical conditions. When *C. sacchari* and *Fusarium* sp. were introduced into a Petri dish, each in one half, they grew as separate colonies, while in mixed inoculum they grew in separate sectors alternating with each other.

* * *

Striate mosaic of sugar cane in India. M. V. NAYUDU, K. S. SASTRY and Y. R. SARMA. *Sugarcane Pathologists' Newsletter*, 1971, (7), 24.—The symptoms of mosaic in cultivated sugar cane around Tirupati were found to correspond with those of striate mosaic in Australia. This is the first record of the disease from India. Since the disease is not controlled by hot water or hot air treatment, breeding resistant varieties may be the only solution.

* * *

Tissue culture and plants thus derived against sugar cane leaf blight fungus, *Leptosphaeria taiwansis* Yen et Chi. L. S. LEU, Y. T. LIU and W. H. HSIEH. *Sugarcane Pathologists' Newsletter*, 1971, (7), 25–27. Tissue culture with sugar cane in Taiwan was commenced in 1969. The preliminary results on callous formation and differentiation of plantlets were reported earlier. The present paper reports briefly on the methods used and the plants obtained in regard to resistance to leaf blight.

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R.S.D. reactions and symptoms. ANON. *Sugarcane Pathologists' Newsletter*, 1971, (7), 27.—A summary is given of the reaction of sugar cane varieties cultivated in South Africa to ratoon stunting disease.

* * *

Disease reactions in recent trials at Mount Edgecombe. G. M. THOMSON. *Sugarcane Pathologists' Newsletter*, 1971, (7), 28.—A table shows the ratings given to South African sugar cane varieties in their reaction to mosaic, smut and streak diseases as a result of trials at the South African Sugar Association Experiment Station.

* * *

Pathogenicity of *Pythium tardicrescens* to sugar cane: a first report. H. KOIKE. *Sugarcane Pathologists' Newsletter*, 1971, (7), 29.—Details are given of *Pythium tardicrescens* attacking sugar cane in Puerto Rico. Laboratory and greenhouse investigations of this and other species of *Pythium* are given.

* * *

The international collection of slides illustrating diseases of sugar cane. ANON. *Supplement to Sugarcane Pathologists' Newsletter*, 1972, (7), 8 pp.—This supplement lists 215 slides which are currently available for distribution to pathologists. So far 1608 duplicates have been despatched to pathologists in almost all sugar cane producing countries. Contributions of slides to add to the collection would be welcomed. These and requests for slides should be addressed to: Dr. P. B. Hutchinson, CSR Research Laboratories, P.O. Box 39, Roseville, N.S.W. 2069, Australia.

* * *

Mechanical harvesting and handling of cane in the Philippines. T. R. ESCOBER. *Sugar News* (Philippines), 1971, **47**, 410–413.—A survey in 1970/71 showed that mechanical harvesting and loading had made little progress in the Philippines. Reasons for this are given. The "Mascane" loading system, introduced from South Africa, is favoured by many sugar men because of low initial cost. There is also a minimal waiting time for the trucks, trailers and tractors and the bundle of cane is compact and clean. This loading system is explained. The small size of cane fields in the Philippines has hitherto been a drawback to mechanical harvesting.

* * *

Performance of selected sugar cane varieties at Don Pedro Mill district, Nasugbu, Batangas. M. A. TETANGCO, A. M. GALVEZ and M. R. PEGANIA. *Sugar News* (Philippines), 1971, **47**, 496, 498.—In the experiments reported, seven varieties of cane were studied for yield and other agronomic characters. A clay loam, 1600 metres in extent, was used. The variety Phil 6112 gave a good performance, comparing favourably with the standard variety Phil 545. Also promising were Phil 6114 and CAC 5760.

* * *

Cane loading with "double" vehicles on wet soils. L. MARES S. *Bol. Azuc. Mex.*, 1971, (260), 28.—The advantages of using the double system with the tractor-mounted grab loading cane onto a self-propelled adjoining vehicle are discussed. Doubled tractor wheels, as shown in a photograph, make for easier working and less soil compaction under wet or muddy soil conditions.

* * *

Rocky Point self-help drainage system. L. G. VALLANCE. *Australian Sugar J.*, 1971, **63**, 370.—In an area where drainage is poor and not helped by the use of heavy mechanical harvesters the enterprise of local cane growers in excavating an enormous drain is referred to. The drain (shown in a photograph) is approximately one mile long, 40 feet wide at the top and 20 feet wide at the bottom.

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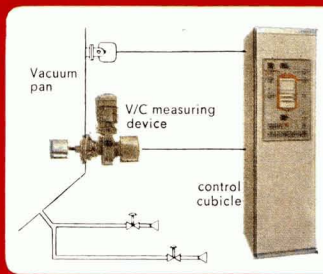

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Cercospora **leaf spot epidemics on sugar beets in the Texas-New Mexico high plains.** E. P. VAN ARSDEL, T. W. JARES and R. F. GINN. *Plant Disease Reporter*, 1971, **55**, 1073–1077.—Epidemic years may be correlated with climatic conditions or rainfall in the area concerned. A detailed study was commenced in 1970 after the disastrous *Cercospora* leaf spot outbreak in 1969. An account of this is given. There are also brief comments on the aerial photographic detection of the disease.

* * *

Pests of sugar cane in Mexico. S. FLORES C. *Bol. Azuc. Mex.*, 1971, (261), 5–9.— Rats are given first place in importance. No less than 5 different species damage cane throughout Mexico. *Sigmodon hispidus* exists in 2 subspecies. *S. hispidus major* predominates on the north east coast (Sinaloa) and *S. hispidus toltecus* around the Gulf of Mexico. The other 3 are all species of *Peromyscus*. Among the other 4 major pests listed cane borers are important. Three groups of minor pests are listed. Control methods for some of the pests are briefly discussed.

* * *

Borer and frost damage to the cane at Hyesons, Crescent and Kohinoor, crop 1970-71. O. D'HOTMAN. *Proc. 9th Conv. Pakistan Soc. Sugar Cane Tech.*, 1971, 60–71.—Most damage was done by borers at Hyesons and Crescent sugar factory plantations. Frost damage was severe at Kohinoor and may have been at other factories in the Punjab. Late harvesting of cane, running into the hottest months of the year, is blamed for the severity of borer attack. The recommendation is made that cane be cut low to avoid leaving a stump to harbour borers. The cane, CoL 54, a stable variety in the Punjab, is very susceptible to frost damage.

* * *

Improved cane varieties for the Punjab. S. FASIHI. *Proc. 9th Conv. Pakistan Soc. Sugar Cane Tech.*, 1971, 106–108.—The history of sugar cane varieties in the Punjab is reviewed from early days when "Katha" and other local varieties, with very low yields, were grown. At present more than 80% of the cane area is under CoL 54, this variety having been under large-scale cultivation since 1963. Two noteworthy varieties now showing promise are BL 4 (early) and BL 19 (mid-season). Both show resistance to frost. The performances of these and other varieties are given in tables.

* * *

Feasibility of intercropping sugar cane with wheat and sugar beet in the Central Region of West Pakistan. S. FASIHI, K. B. MALIK, M. BASHIR-UD-DIN and K. A. ASGHAR. *West Pakistan J. Agric. Res.*, 1970, **8**, 124–133.—An account is given of experiments on intercropping sugar cane with sugar beet and with wheat at the Ayub Agricultural Research Institute, Lyallpur from 1965 to 1968. Different spacings were used. Cane yield was reduced as a result of the intercropping but sugar yields per acre were at the maximum in the case of sugar cane with sugar beet as intercrop, while the cost per unit area of sugar production was the lowest. No significant depression in quality of cane or beet was observed from different intercrop combinations.

* * *

New harvesters. L. G. VALLANCE. *Australian Sugar J.*, 1971, **63**, 375–381.—The performance of two new cane harvesters in Australia, first released for the 1971 season, is described, the harvesters being the Massey-Ferguson "102" and the Toft "Robot CH 364".

* * *

A note on egg parasites of sugar cane borers at Cuddalore. G. VARADHARAJAN, K. SAIVARAJ and S. RAGHAVAN. *Indian Sugar*, 1971, **21**, 433–434.—Important sugar cane borers in Tamil Nadu are *Chilo infuscatellus*, *Proceras indicus* and *Tryporyza nivella*. These attack cane at different stages. Observations are recorded on the prevalence of natural parasites at the Sugar Cane Research Station, Cuddalore. A systematic study on the exact degree of parasitization of egg parasites was undertaken. The egg masses of *Chilo infuscatellus* were largely parasitized by *Trichogramma minutum* and *Telenomus beneficians*. The egg masses of *Triporyza nivella* were parasitized mostly by *Tetrastichus schoenobii*. The occurrence of *Telenomus diginus* was also noted. The data on the collection of egg masses and the percentages of parasitization are presented in a table.

* * *

Co 6811—a promising new mid-cane for East U.P. S. S. KHANNA, B. K. MATHUR and N. P. SINGH. *Indian Sugar*, 1971, **21**, 435–437.—The life of sugar cane varieties in Uttar Pradesh is considered to be shorter than in the southern part of India, probably because of greater disease prevalence for the north. Varieties like BO 17 and BO 32, still occupying large areas, have deteriorated owing to red rot disease. The variety Co 6811 has given good results as a replacement. Details about this mid-season variety are given.

* * *

Biology of *Sturmiopsis inferens* **Townsend.** A. P. SAXENA. *Indian Sugar*, 1971, **21**, 439–445.—This larval endoparasite may attack several sugar cane borers. As little is recorded about it, a study was made of its biology with a view to its possible extended use in India and other countries for the control of stalk borers. Information is given under the following headings: the uterine egg; the larva; first instar larva; second instar larva; third instar larva; the puparium; breeding technique; copulation; gestation period; larval period; pupal period; longevity of adults; host preference; and secondary parasites.

* * *

Encouraging developments in cane harvesting equipment. ANON. *Producers' Rev.*, 1971, **61**, (12), 33.—See *I.S.J.*, 1973, **75**, 94.

Sugar beet agriculture

Residual soil nitrate measurement as a basis for managing nitrogen fertilizer practices for sugar beets. D. W. JAMES, A. W. RICHARDS, W. H. WEAVER and R. L. REEDER. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16,** 313–322.—In 1967 a 3-year programme was initiated to evaluate the adaptability of the soil test for nitrates to sugar beet production management. The purpose of this report is to summarize some of the results. A soil test nitrogen (STN) index, based on the sum of nitrate-N ppm in 1-ft layers throughout the root zone, was used as the measure of soil fertility. Some results, which were out of line with the majority, were explained on the basis of soil moisture and soil organic matter interactions with STN. The best control of root quality was obtained when the beets were planted on sites with minimal STN and which received N fertilizer. Under these conditions N availability was adequate for early season plant growth vigour, the N supply being reduced to low levels in late season.

* * *

Effect of gibberellic acid, several growth retardants and nitrogen levels on yield and quality of sugar beets. I. POOSTCHI and W. R. SCHMEHL. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16,** 323–331.—Reference is made to the work of others who found that applications of gibberellic acid to the foliage of sugar beet increased root yield per acre but reduced sucrose content, resulting in no gain in gross sucrose production per acre. The purpose of the work here described was to study further the effects of gibberellic acid and four growth inhibitors, these being maleic hydrazide, pyrocatechol, oxyvanadium sulphate and 2-chloroethyl trimethyl ammonium chloride. Earlier results with gibberellic acid were confirmed. Foliar applications of pyrocatechol significantly increased sucrose concentration in the root and recoverable sucrose production per acre. Maleic hydrazide increased sucrose content and decreased root yields leaving gross sucrose production about the same. The other two growth inhibitors had little effect on yield or beet quality.

* * *

Quantitative relationships of three free amino-acids in fibrous roots of nematode-infected sugar beets. D. L. DONEY, J. M. FIFE and E. D. WHITNEY. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16,** 341–347.—This investigation was carried out to test the quantitative association of aspartic acid, glutamic acid and glutamine with nematode effects. Significant increases in concentration of aspartic acid, glutamic acid, and glutamine in the fibrous root juice of sugar beet seedlings were found 4 weeks after inoculation with *Heterodera schachtii* larvae, compared with healthy plants of the same age. There was no measurable nematode effect in tap and fibrous root weights of sugar beet seedlings 4 weeks after inoculation of nematode larvae. Significant genotypic variances were obtained for the concentration of the 3 amino-acids tested and for tap and fibrous root weights.

* * *

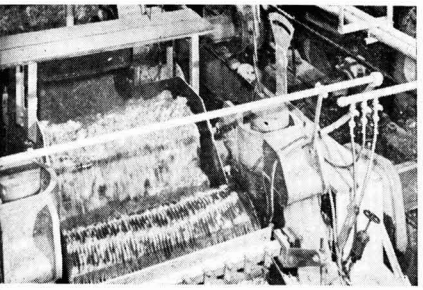
Inheritance studies of a pollen restorer from Ruby Queen table beet. J. C. THEURER. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16,** 354–358.—The present study was undertaken to determine the inheritance of pollen fertility restoration in certain crosses. A strong pollen-restorer gene derived from the Ruby Queen variety of table beet showed monogenic inheritance with the annual tester SLCO 3CMS. The widely used tester line, SLCO3CMS, possibly carries minor modifier genes which influence the degree of pollen fertility when the line is crossed to the Ruby Queen Rf inbred. Segregation of plasmogenes or the reversion of S to N cytoplasm are other possible explanations for variation in pollen fertility of the sugar beet and need to be further investigated.

* * *

Storage of sugar beet. M. MARTENS and J. F. T. OLDFIELD. *Publ. Trimest. Inst. Belg. Amél. Betterave*, 1971, 65–96.—In the survey here reported a questionnaire was sent to the sugar beet-producing countries of Europe, 16 of which replied. The report is considered to be a broad and approximate approach to a vast and complicated problem. Most countries foresaw an increase in factory capacity. In general, field storage has been less studied than industrial storage. The usual losses in farm clamps are indicated. Losses from unventilated industrial clamps vary from country to country. Forced ventilation of industrial clamps is used in the following countries: West Germany, Austria, Finland, Greece, Italy, Poland, Rumania and Czechoslovakia. Ventilation seems to reduce sugar losses by about 120 g per ton per day.

* * *

Harvesters assessed visually on Essex clay at Witham. ANON. *British Sugar Beet Rev.*, 1971, **40,** 71–74, 81–82.—At the autumn sugar beet demonstration of working machinery, 16 sets of harvesting equipment were on view in action. These included several multi-row and/or multistage machines. Details of these, accompanied by photographs, are given.



Cane sugar manufacture

Influence of burning, mechanization and drought on the industrial process. E. BATULE D. *ATAC*, 1972, (1), 21–32.—The literature on the effects in the factory of crushing burnt, mechanically-harvested cane, especially if a delay occurs before milling, and of drought, are briefly reviewed. During the 1971 crop drought affected the cane crushed by Central Héctor Molina, while any rain that fell was badly distributed. As a consequence, cane showed signs of dehydration as well as fungal infections which caused inversion in the juice and non-sugars which reduced sugar quality. In addition some mechanically-harvested burnt cane was milled after a delay. An account is given of the difficulties experienced in clarification, as a result of scaling in the evaporators, and in crystallization—the last involving high losses in molasses and low final sugar purity.

* * *

Clarification of press juice in cane diffusion systems. A. L. CANEVERO. *Bol. Azuc. Mex.*, 1971, (264), 16–19. After installation of a Silver ring diffuser at Central Cumanacoa, in which the juice was limed, the clarifier was no longer needed for its former purpose and was instead used for clarification of the press juice. This was unsatisfactory, however, and was replaced by the use of a DSM screen followed by a Chacon clarifier. It was found necessary to heat to 96°C and to treat with 8–10 ppm of P_2O_5, bringing the pH to 8·4–8·6 before the impurities would flocculate and give a mud which would adhere to the filter surface. Great further improvement was found on adding 1·7 ppm "Separan AP 273". The press juice was then clear and could be returned to the diffuser without trouble; average extraction in 1970 and 1971 became 97·54% and 97·61%, respectively.

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Drying of bagasse by a screw press. F. CORDOVEZ. *Bol. Azuc. Mex.*, 1971, (264), 24–25.—Experience with French presses at three sugar factories in Florida is discussed; their use has permitted increased sugar recovery (worth $250,000 per season at Osceola), and has reduced bagasse moisture, so eliminating trouble with burning. At Moore Haven, extraction was raised from 91·6 to 94·2% while permitting an increase from 4000 to 5000 t.c.d.

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Ideas on the method of full seeding in pans. M. A. MANCILLAS. *Bol. Azuc. Mex.*, 1971, (264), 30–32. An account is given of the basis for the seeding method and the technique used at the author's factory for preparation of the suspension of seed crystals in alcohol used for graining.

Justification of computer installation at Fairymead. J. W. CULLEN and G. F. DOHERTY. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 11–16. Reasons for the installation of an IBM computerized system at Fairymead for centralized accounting (including cane payment) and data processing are discussed and progress with the system so far is outlined.

* * *

Stresses in shredder hammers and relevant matters. W. R. CRAWFORD. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 81–93.—Possible cuases of failures in shredder hammers are examined from the stress and load viewpoints and the type of fracture found in hammers by the author is described. The value of photo-elastic stress analysis is underlined and possible solutions to problems of hammer design and construction are described.

* * *

The electro-casting of shredder hammer tips. D. G. JACKLIN. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 95–97.—Electro-casting of cane shredder hammer tips with chromium carbide is briefly described with the aid of diagrams. The process has resulted in considerable reduction in hammer maintenance and a slight increase in cane cell breakage.

* * *

Experiences with a 60-inch cane shredder. E. D. HARTLEY and S. G. CLARKE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 99–104.—A cane shredder having a diameter over the hammer tips of 60 inches as opposed to 50 inches in the case of Searby and heavy-duty shredders was installed at the factory of South Johnstone Cooperative Sugar Milling Association and first operated in 1971. The 208-hammer shredder is described and some performance results reported, showing that at 1000 rpm (the shredder is designed to operate at 1200 rpm, but the speed was reduced because of certain difficulties) an average of 88% open cells over the season was achieved, with many readings exceeding 90%.

* * *

A recent look at sugar mill power factor. R. J. MCINTYRE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 115–120.—While the typical power factor of a Queensland sugar factory is about 0·7, this is inadequate with increasing rates and higher electrical power demands. As an alternative to the expensive installation of turbo-alternators to increase the power factor, the author examines the use of

capacitors connected to individual motors and works out the economics for a factory correcting a power factor of 0·7 to 0·8.

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Reduction of sugar mill effluent by recycling. R. E. BICKLE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 153–156.—Information is given on the system at the author's sugar factory for reduction of the quantity of effluent being treated in three 100,000-gal mechanically-aerated ponds so as to avoid problems associated with overloading. The recycling scheme proved so successful during the last 7 weeks of the 1971 crushing season (the first period in which complete operation was possible) that there was insufficient effluent to fill the first pond.

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Salt water effluent treatment. G. E. MITCHELL and L. J. FINGER. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 157–164.—Laboratory and pilot-scale experiments at Fairymead, where up to 500,000 gal of salt water per hr is used as a cooling medium for the barometric condensers, indicated that the use of rotary aerators as for fresh water effluent[1] involves a number of problems such that it would be far easier, in most cases, to eliminate contaminants in the factory rather than treat the effluent. Details are given of the test results and of the measures adopted to reduce contamination in various factory processes.

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Mill housekeeping. J. R. SESTERO and J. T. LOGAN. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 165–168.—The sucrose contents of waste water at Mourilyan, as determined by the arsenomolybdate method during the five seasons up to and including 1971, are tabulated and sources of loss in 1970 and 1971, for which greater details are given, are listed. Return of drainings to process has resulted in a marked reduction in losses.

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Use of the fluidized packing contactor for removing fly ash in flue gas. L. S. LEUNG, B. K. O'NEILL and D. B. BATSTONE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 169–172.—Calculations of parameters involved in the use of a fluidized packing contactor for fly ash removal from bagasse furnaces are presented to show the advantages that would be obtained by installing one. It is considered practical to install the unit in the stack rather than modify existing ducting. The ash removal efficiency of the contactor has yet to be measured.

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Rheological properties of molasses and their use in the design of flow systems. S. BHATTACHARYYA, D. V. BOGER, A. L. HALMOS and C. TIU. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 209–216. The rheological properties of cane molasses were measured by means of a Weissenberg R16 rheogoniometer (manufactured by Farol Research Engineers Ltd., Sussex, England). The data, also relevant to massecuite since both materials are non-Newtonian liquids, are applicable to the design of flow systems, e.g. in the dimensioning of pumps and piping. A Brookfield "Synchro-lectric" viscometer, used to measure the fundamental shear stress-shear rate behaviour of the molasses, gave values in close agreement with those obtained with the rheogoniometer, although caution in use of the results is necessary. (See also MORITSUGU & SLOANE: *I.S.J.*, 1972, **74**, 252.)

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Feeding continuous centrifugals. L. K. KIRBY and E. J. STEWART. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 217–222.—Modifications to BMA K850 and K1000 continuous low-grade centrifugals included increasing the feed pipe diameter to 6 inches, installing a steam-jacketed feed conditioning chamber which applies water through a circumferential pipe at the chamber inlet and redesigning the feeding cup and bell to improve water-massecuite mixing. Tests of modified machines at Plane Creek showed that the modifications increased capacity of the K850 and K1000 machines by some 85% and 70%, respectively, while generally reducing molasses purity and raising sugar purity.

* * *

An analysis of continuous centrifugation. G. F. EASTAUGHFFE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 223–229.—The work done within a continuous centrifugal basket and crystal distribution on the screen surface are analysed mathematically with the aim of permitting comparisons to be made between test results for various types and sizes of machines and methods of feeding and washing to be evaluated.

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Reduction in final effet entrainment. R. E. BICKLE. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 245–247.—Modifications to the final evaporator effect at Cattle Creek factory, including installation of an entrainment scrubber in the vapour line, have reduced the vapour sugar content from 1927 ppm in 1968 to 12 ppm in 1971. Full details of the modifications are given.

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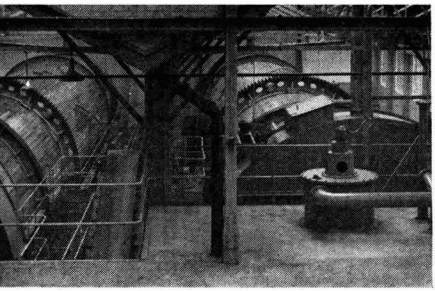
The depressing effect of deteriorated cane on raw sugar filtrability. G. P. JAMES. *Proc. 39th Conf. Queensland Soc. Sugar Cane Tech.*, 1972, 275–277.—Data obtained at South Johnstone factory support the theory of JAMES & CAMERON[2] that cane deterioration as expressed by sugar dextran content reduces raw sugar filtrability. The problem of stale cane and processing difficulties is examined generally.

* * *

Developments in clarifier design. D. J. HALE and E. WHAYMAN. *Sugar y Azúcar*, 1972, **67**, (3), 15–18, 34. See *I.S.J.*, 1972, **74**, 6–10, 40–45, 72–75.

[1] *I.S.J.*, 1972, **74**, 251.
[2] BEVAN: *ibid.*, 1970, **72**, 53.



Beet sugar manufacture

ARO automatic discontinuous centrifugals for the sugar industry. Z. KRAJČOVIČ. *Zeitsch. Zuckerind.*, 1972, **97,** 145–148.—See *I.S.J.*, 1971, **73,** 87.

* * *

Hydrocyclones in the sugar industry. H. J. DELAVIER. *Zeitsch. Zuckerind.*, 1972, **97,** 148–154.—The theory of hydrocyclone operation and practical applications in the sugar industry are surveyed with 37 references to the literature. Uses examined include treatment of water and waste water, milk-of-lime, raw juice and press water to remove solid impurities, and removal of carbonatation muds. Flow diagrams are presented of a number of carbonatation schemes.

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Experience in the automization of industrial sugar plant. F. ZAMA and G. CEROLINI. *Ind. Sacc. Ital.*, 1972, **65,** 10–15.—"Automation" is considered to require the inclusion of an electronic brain in a control system, and the present state of control in the sugar industry is thought to correspond more to "automization" or automatic regulation of variables. Installation of such control equipment in a number of sugar factories is described and individual control applications discussed.

* * *

Energy investigations of a multiple-effect evaporator used as steam converter. G. KIMENOV. *Zucker*, 1972, **25,** 225–230.—In the investigation described calculations were made of heat and steam losses in evaporation processes, e.g. evaporation proper, juice throttling and condensate expansion. It is shown that vapour withdrawal cannot be arbitrary, and two constraints have been derived: with an infinite quantity of primary steam, vapour withdrawal is maximum when it satisfies the first of the constraints. If the quantity of primary steam is limited, maximum withdrawal becomes a linear optimization problem.

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100 years of De Danske Sukkerfabrikker. H. B. OSTENFELD. *Zucker*, 1972, **25,** 231–235.—See *I.S.J.*, 1972, **74,** 99–102.

* * *

A stone catcher for deep flumes. S. DUŠEK. *Listy Cukr.*, 1972, **88,** 56–59.—Details are given of a Czechoslovakian stone catcher installed in a deep flume which operates by means of an upward current of water; this creates turbulence and causes stones and other impurities to sink to a discharge port towards the bottom of the catcher trough. Required quantities and flow rates of flume and ascending water are given.

Active carbon removal of non-sugars from thin juice before the evaporator station. H. ZAORSKA. *Zucker*, 1972, **25,** 257–260.—See *I.S.J.*, 1972, **74,** 117.

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Application in the sugar industry of a new microbial development inhibitor. B. GUERIN, M. S. GUERIN and M. LOILIER. *Sucr. Franç.*, 1972, **113,** 203–211.—Tests with "Septosol I 31" iodoacetone-based bacteriostat produced by S.A. Sopura, of Courcelles, Belgium, are reported in which 1 litre of a solution (4 cm^3/litre) added to diffusers at various sugar factories was found to have the same disinfecting properties as 1,000 litres of formalin. Results are given in table and graph form. "Septosol I 31" has negligible toxicity, is only very slightly corrosive and is sufficiently volatile to be eliminated in evaporation.

* * *

Sugar house operation in the light of new trends in technology. II. Critical analysis of certain problems of sugar house management. K. WAGNEROWSKI. *Gaz. Cukr.*, 1972, **80,** 60–64.—Factors having adverse effect on sugar house operation which are considered include defects in vacuum pan design (causing poor crystal structure), inadequate treatment of low-grade sugar used as massecuite footing and use of the traditional Polish 3-boiling system which the author suggests should be replaced by a 3-massecuite system in which 2nd massecuite is boiled on 1st massecuite run-off on a footing of magma made from 3rd sugar and 1st massecuite run-off[1]. The use of the GENOTELLE system of massecuite precuring[2] is also advocated.

* * *

Selected problems of automation of technological processes in sugar production in socialist countries. J. BROWKIN. *Gaz. Cukr.*, 1972, **80,** 65–67.—Automatic control problems which have been the subjects of research work in East European countries are reviewed, including beet pile conditioning, diffusion, carbonatation and syrup feeding to vacuum pans.

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Purification of waste water from the sugar industry. A. CANUTI and P. V. BALDACCI. *Ind. Alimentari*, 1972, **11,** (3), 109–116.—The literature on pollution caused by sugar factory wastes is surveyed and characteristics of waste water from a large sugar factory tabulated.

[1] *I.S.J.*, 1969, **71,** 310.
[2] *ibid.*, 1971, **73,** 246.

Methods of waste water treatment referred to in the literature are discussed.

* * *

Electronic data processing for sugar beet harvests. T. G. MEYER. *Sugar y Azúcar*, 1972, **67**, (2), 34–35. Information is given on the beet accounting system used at The Amalgamated Sugar Company's data processing centre at Ogden, Utah, USA.

* * *

Beet sugar factory in Azores doubles capacity, looks for new markets. J. R. LEFFINGWELL. *Sugar y Azúcar*, 1972, **67**, (2), 36.—A brief report is presented on the Sinaga beet sugar factory of Sociedade de Industrias Agricolas Açorianas on São Miguel island in the Azores. Average production in the 3-month campaign is 10,000 tons of sugar, which is expected to double with the installation of a new 1500 tons/day DDS diffuser and two Buckau-Wolf fully-automatic centrifugals.

* * *

Preparation of low-grade massecuite for curing. I. N. AKINDINOV. *Sakhar. Prom.*, 1972, **46**, (3), 15–19.—To minimize molasses losses when curing low-grade massecuite, the author advocates cooling the massecuite to 30°C, i.e. 10° below the curing temperature, then adding sufficient water to give slight supersaturation, after which the massecuite temperature is raised by 3–4° by heating before curing. Further work is being carried out to find the values of the parameters involved in the process, which is claimed to give a molasses purity 0·5 units below standard purity.

* * *

Waste water purification at Moldavian sugar factories. L. A. CHERNYI. *Sakhar. Prom.*, 1972, **46**, (3), 24–26. Methods used for treatment of sugar factory effluent in the Moldavian Republic are described. At Dondyushansk sugar factory, weekly treatment with 6 g ammonium nitrate and 2 g superphosphate per m^3 of water from the second half of March reduces the BOD_5 by 97–98% from an initial 737–747 mg/litre. The water is transferred from the ponds to reservoirs at the end of August, and carp deliberately bred in the ponds are caught.

* * *

Roller conveyors for bagged sugar. B. P. SHKOLENKO and N. M. KICHIGIN. *Sakhar. Prom.*, 1972, **46**, (3), 28–29.—Results of tests on use of static roller conveyors for bags of sugar are reported, in which an angle of slope of 14° and a distance between rollers of 130–140 mm were found to be optimum.

* * *

Determination of optimum juice level in a commercial evaporator. B. A. EREMENKO, A. I. TSENZURA and A. V. KAPATS. *Sakhar. Prom.*, 1972, **46**, (3), 35–37. Investigation of evaporation in the first two effects of a quadruple-effect evaporator showed that the heat transfer coefficient altered only slightly with considerable variation in the juice level, as demonstrated by a curve relating the two parameters. Hence, it is considered possible to establish more uniform conditions throughout the evaporator station without substantially reducing the heat transfer.

* * *

Automatic control of temperature in beet piles. U. A. KOVZIASHVILI. *Sakhar. Prom.*, 1972, **46**, (3), 30–34. Details are given of a unit for automatic temperature measurement and indication, in which thermometers at 120 points measure to within ± 1°C in the temperature range —5° to 0° and ± 2°C in the ranges —10° to — 5° and between 0 and + 30°C. The central panel can be situated up to 1000 m from the piles.

* * *

Element for measuring pH with continuous cleaning of the measuring electrode. S. P. GOTSKII. *Sakhar. Prom.*, 1972, **46**, (3), 47–49.—A description is given of a pH sensing element containing an antimony electrode which, even under extreme conditions of juice liming, where the electrode is quickly coated with lime, gave, over a month, readings averaging only slightly above the true pH.

* * *

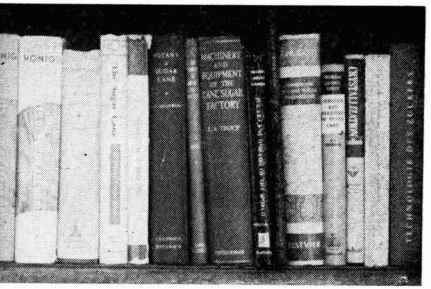
Device for trapping and removing light impurities in a beet washer. A. V. KISELEV. *Sakhar. Prom.*, 1972, **46**, (3), 54–55.—The device consists of a grid preceding a gutter placed across the washer trough. Small impurities fall through the grid and are removed, while larger impurities are pushed through the grid by paddles rotating on a shaft, each paddle coinciding with the space between each pair of grid bars. The unit is in use at a number of Soviet factories.

* * *

Device for dispersing lime in the preparation of milk-of-lime. V. F. GORSKII, A. A. MAZUR and V. A. TIKHHONOV. *Sakhar. Prom.*, 1972, **46**, (3), 57.—High-dispersion milk-of-lime is obtained by passing the lime slurry through a venturi section in the pipeline from the slaker. The venturi contains 15–20 perforated discs separated by distance rings. The perforations are out of alignment with respect to adjacent discs, so that the larger lime particles alter direction rapidly and are thus broken into very fine particles.

* * *

Problems in planning ventilation and heating units in the sugar industry. B. BISSINGER. *Zucker*, 1972, **25**, 283–291.—The harmful effect of moist air in a sugar factory on the sugar, buildings and machinery is discussed and a Mollier i,x diagram is presented showing the results, as regards damp air production, of heating, cooling and mixing processes. Possible solutions to the problem are suggested, particularly warm air drying in preference to processes involving precipitation of moisture on mechanically cooled surfaces and absorption and adsorption processes under the climatic conditions prevailing during a campaign. Diagrams are presented relating parameters involved in ventilating boilers and a pulp press with heated air.



New books

Proceedings of the 14th Congress of the International Society of Sugar Cane Technologists, New Orleans, Louisiana, USA, 1971. Ed. M. T. HENDERSON. 1771 pp.; 16·5 × 25 cm. (Franklin Press Inc., Baton Rouge, La., USA.) 1972. Price: $81.50.

This volume contains the texts of the 201 papers presented at the 14th ISSCT Congress held in New Orleans, 22nd October–5th November 1971 (abstracts of the papers have already appeared in the pages of this journal). The papers are preceded by various miscellaneous items connected with the Congress, including a group photograph, a list of the delegates, schedule of events, major addresses and a programme. Among the committee reports at the end of the book are two which deserve special mention: one on cane diseases, which lists the diseases in alphabetical order with their causal agents and distribution, followed by a list of countries, in alphabetical order, with the cane diseases found in each, and an alphabetical list of causal agents; the other detailed report concerns cane mechanical harvesting and handling and gives details of the situation in cane-growing countries listed alphabetically. Other committee reports of lesser detail cover cane germ plasm and breeding, and variety yield decline. The book concludes with a list of ISSCT members in alphabetical order of countries, a brief description of the post-Congress tour, and a subject and author index.

Although in the preface the general editor, M. T. HENDERSON, states that the editorial committee has cut the length of most manuscripts in order to bring about a reduction in the overall size of the Proceedings, the volume is still too unwieldy, and it is noted with some regret that the committee could not bring themselves to reject papers of a parochial nature, although the opinion of the general editor is evidently that such papers, being of very limited interest, "are not acceptable for ISSCT congresses. . . ." Hence, although it is true that 19 papers were rejected, obviously cutting the length of papers will have only minimal effect in the event of a greater number of papers published.

* * *

Seminar on sugar cane. ANON. 53 pp.; 22 × 29 cm. (Punjab Agricultural University, Sugarcane Research Station, Jullundur, India.) 1971.

A wide range of topics concerned with sugar cane and its cultivation were discussed at this seminar, held on 4th February 1971, as is obvious from the papers that have been reproduced in this report. These include: "Seed production programmes", "Newly released and promising varieties of sugar cane in Punjab", "Seed cane treatment for improved germination", "Fertilizer recommendations", "Weed control", "Irrigation and conservation of moisture", "Ratoon crops", "Frost damage", "Lodging", "Soil application of gamma BHC", "Field potential of sugar cane in Punjab", "Better sugar recovery in the mills", "Preparation of quality gur and its storage", "Sugar cane pests and their control", "Sugar cane diseases and their control" and "Nematodes".

Up-to-date information on the sugar cane variety position in Punjab is given. As a result of work at the Jullundur Sugarcane Research Station, three varieties (early, mid-season and late) have been released for cultivation. Their features are described as are studies on intercropping of cane with various food crops[1].

Sugar cane pests discussed include various borers[2], termites, pyrilla, white fly, Lygaeid bug or black bug and sugar cane mite. Cane diseases discussed include grassy shoot and ratoon stunting (both viral), red stripe (bacterial) and the fungal diseases red rot, wilt, smut and top rot. Altogether, the report contains a good deal of useful information for anyone concerned with sugar cane in India.

* * *

Açúcar Brasileiro (Brazilian sugar). 20 pp.; 22 × 29·5 cm. (Instituto do Açúcar e do Alcool, Divisão de Exportação, Praça 15 de Novembro, 42—4.°/20.000, Rio de Janeiro, Guanagara, Brasil.) 1972.

This well-illustrated, very colourful publication is a brief record of the Brazilian sugar industry and its growth plus information on the new bulk terminal at Recife[3]. The booklet is printed in Portuguese and English.

* * *

The Hungarian sugar industry. 14 pp.; 17 × 24 cm. (Cukoripari Vallalatok Trösztje, Budapest XIV, Komocsi u. 39–41, Hungary.) 1972.

Illustrated with coloured photographs, this 14-page booklet gives an outline review in English of the Hungarian beet sugar industry which includes 10 factories producing about 450,000 tons of white sugar annually, easily meeting the national requirements. Annual per caput consumption of sugar in Hungary is over 40 kg.

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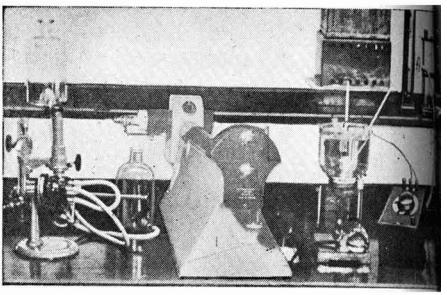
[1] *I.S.J.*, 1972, **74**, 76.
[2] *ibid.*, 131–132.
[3] *ibid.*, 1971, **73**, 384; 1972, **74**, 384; 1973, **75**, 57.

Laboratory methods & Chemical reports



The rate of crystallization of sucrose and the factors influencing it. F. SCHNEIDER. *ATAC*, 1971, (3), 56–67. See SCHNEIDER & SCHLIEPHAKE: *I.S.J.*, 1972, **74**, 57.

* * *

Relationship between viscosity and nucleation in sucrose solutions. G. PIDOUX. *Zucker*, 1972, **25**, 170–173.—See *I.S.J.*, 1972, **74**, 377.

* * *

Identification of sugar colorants. L. FARBER and F. G. CARPENTER. *Proc.* 1970 *Tech. Session Cane Sugar Refining Research*, 145–156.—High-voltage paper electrophoresis was used to separate colorants found in cane raw sugar and even, in some cases, in refined sugar. Where larger quantities of colorants were required, solvent extraction and thin-layer chromatography were used for separation. The following were found (the numbers are the fluorescent spot numbers previously allotted to the colorants[1]): kaempferol (1), umbelliferone (7-hydroxycoumarin) (11.5), 4-hydroxy-3,5-dimethoxycinnamic acid (sinapic acid) (12,13), 4-hydroxy-3-methoxycinnamic acid (ferulic acid) (14, 15.6), chlorogenic acid (15), *p*-hydroxycinnamic acid (*p*-coumaric acid) (20,21) and caffeic acid (22, 23). Also found were the following uncoloured compounds: 4-hydroxy-3,5-dimethoxy-benzoic acid (syringic acid) (17), 4-hydroxy-3-methoxybenzoic acid (vanillic acid) (21.1), *p*-hydroxybenzoic acid (22.1), fumaric acid (28), and aconitic acid (28).

* * *

The effect of solution structure on electrode processes in sugar solutions. M. A. CLARKE. *Proc.* 1970 *Tech. Session Cane Sugar Refining Research*, 179–188.—The physico-chemical nature of the sucrose-water system was examined with the aim of explaining the anomalous behaviour of pH and calcium ion-selective electrodes in sugar factory liquors and aqueous sucrose solutions. The structure of the system is described in terms of the FRANK-EVANS "iceberg" and the clathrate hydrate theories[2]. The activity concept, activity coefficient and dielectric constant of sucrose solutions are discussed. The DEBYE-HUCKEL and GUGGENHEIM equations were used to calculate single ion activity coefficients by means of a computer and the results compared with experimental values found by electrode measurements in sucrose solutions. The readings from both pH and calcium electrodes were too low at high concentrations and *vice versa*; this is explained on the basis of complexes in the electric double layer around the electrodes. The low precision of electrodes in sucrose solutions is partly attributed to difficulty in establishing a steady liquid junction potential.

* * *

The new beet laboratory at Leopoldsdorf sugar factory. G. DOSEDLA. *Zeitsch. Zuckerind.*, 1972, **97**, 90–94. Details are given of equipment and processes used in the beet tarehouse at Leopoldsdorf, in Austria, where a unit supplied by Venema Automation N.V., of Holland, determines the net weight and sugar, K, Na and α-amino-N contents in 120 samples per hour. A Bendix polarimeter is also used, as well as digital data processing. Flow diagrams are reproduced for sample preparation and analysis.

* * *

The effect of impurity on the nucleation and crystallization of sucrose. W. M. NICOL and C. L. FARMER. *Sucr. Belge*, 1972, **91**, 55–59.—Laboratory experiments with an isothermal continuous crystallizer in which sugar crystals were grown at 40°C and their colour and size distribution determined showed that the technique was difficult and slow but did permit steady state conditions for up to 100 hr with some fluctuations in the crystal population. In the presence of glycine or lysine dissolved in glucose solution, the nucleation rate was greater than in its absence, in apparent contrast to factory-scale operations. On the other hand, the presence of glycine- or lysine-generated colorant reduced the crystal growth rate, as is found in normal commercial experience. The ratio of colour impurity included in the crystal to that in solution was lower than is achieved on a normal factory scale.

* * *

The true pH (pOH) of beet sugar products in purification. V. A. PRONINA and S. Z. IVANOV. *Izv. Vuzov, Pishch. Tekh.*, 1971, (6), 86–88.—The pH of beet sugar factory products increased from prelimed to limed juice and thereafter fell with each product up to sulphitation syrup; it also decreased for each product with rise in temperature in the range 20–95°C. A temperature constant established for each product as the difference in pH between the values at 20° and 85°C divided by the temperature difference can be used to find the optimum pH under factory conditions from the values measured at room temperature. Similar treatment can be applied to pOH, values of which are also tabulated. The pH of products from deteriorated beet was lower than that of corresponding

[1] *I.S.J.*, 1971, **73**, 170–173.
[2] FRANKS: "Physico-chemical processes in mixed aqueous solvents" (Elsevier, New York) 1967.

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products from healthy beet, the difference being smaller with temperature rise. Differences were also found in the pOH values.

* * *

Boiling point elevation and supersaturation of higher concentration sugar solutions. G. VAVRINECZ. *Cukoripar*, 1972, **25**, 9–17.—The saturation function permits calculation of the supersaturation of juices, syrups and massecuites at various purities provided the boiling point at a given pressure is known. If the boiling point of water is measured instead of pressure, then only two temperature readings are required, i.e. syrup and water boiling points, plus the purity of the product to enable the supersaturation to be found. Tables are presented relating the dry solids-water ratio, boiling point of water, boiling point elevation of the product and supersaturation for products with purities in the range 70–100.

* * *

Some features of the structure of melanoidins and invert sugar alkaline decomposition products. V. F. SELEMENEV *et al. Sakhar. Prom.*, 1972, **46**, (2), 7–11. The chemical structures of these colorants are examined on the basis of investigations which included qualitative analysis, electrophoresis and light absorption in the infra-red part of the spectrum.

* * *

Electrical resistance of sugar solutions when sugar passes into a crystalline state. I. N. KAGANOV and V. I. TUZHILKIN. *Sakhar. Prom.*, 1972, **46**, (2), 11–13. The resistance rose sharply then fell gradually to a value still above the original when a sugar solution of 83·5°Bx was cooled in a laboratory vessel from 70°C. The initial sharp rise coincided with a temperature drop to 22°C during the first 2½ hr of the 20 hr cooling period.

* * *

Tables for determining results of refractometric and polarimetric analyses of sugar products. I. N. AKINDINOV. *Sakhar. Prom.*, 1972, **46**, (2), 35–36.—Reference is made to Brix and sugar tables drawn up by the Kiev Food Industry Research Institute for all sugar factory products having a Brix in the range 6–99·9° and purity in the range 48–100. Use of the tables, which occupy 381 pages, is explained and a Brix table presented by KHVALKOVSKII[1] is appraised.

* * *

The use of a digital computer for routine monthly calculations. J. R. FITZGERALD. *Proc. 45th Congr. S. African Sugar Tech. Assoc.*, 1971, 25–28.—As an introduction to the subject of computerized calculations, the author describes the application of a digital computer to calculations involved in the preparation of the monthly summaries of laboratory reports at the Sugar Milling Research Institute in Durban.

A proposal for the use of an E.R.S. (estimated recoverable sucrose) formula as a basic standard for the comparison of departmental factory performances. A. M. GUTHRIE. *Proc. 45th Congr. S. African Sugar Tech. Assoc.*, 1971, 81–85.—The performances of South African sugar factories were determined in terms of milling, boiling, undetermined losses and the Natal Ratio (ratio of sucrose produced to estimated recoverable sucrose in cane) and compared with standards calculated from a formula of the VAN HENGEL type, which is based on the average performance of South African sugar factories over the 10-year period 1956/1966 and which is designed to give the expected yield of sugar of 98·7 pol and 0·23 safety factor from cane of a given analysis.

* * *

A rapid quantitative method for the routine determination of oligosaccharides in cane molasses by thin-layer chromatography. K. J. SCHÄFFLER and A. H. JUCKES. *Proc. 45th Congr. S. African Sugar Tech. Assoc.*, 1971, 86–91.—As a contribution to more precise determination of sucrose in cane molasses, a thin-layer chromatographic method has been developed for determination of molasses oligosaccharides, of which kestose constitutes a large proportion. Details are given of the method, which is based on the use of pre-coated silica gel plates continuously developed with 100:85 butanol:ethanol and sprayed with diphenylamine, and of results obtained by means of an adaptation of the ferricyanide method for reducing sugars here applied to colorimetric determination of fructosyl oligosaccharides after inversion. Calibration curves for individual determinations were linear in the range 0–100 μg.

* * *

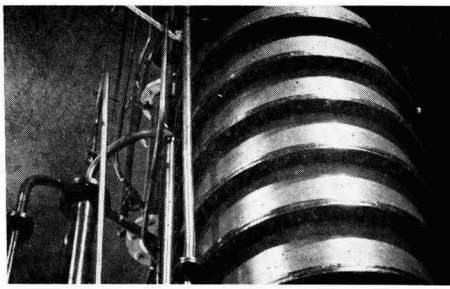
The determination of magnesium in molasses by atomic absorption spectrophotometry. V. A. SOFFIANTINI. *Proc. 45th Congr. S. African Sugar Tech. Assoc.*, 1971, 92–98.—A method is described in which Mg is determined in cane molasses by absorption spectrophotometry using a nitrous oxide-acetylene flame with a laminar flow burner. Addition of lanthanum was found to reduce interference from other chemicals and thus increase the quantity of magnesium found. Accuracy and reproducibility of the method were sufficient to permit its use for routine purposes. Total analysis time is far shorter than for gravimetric or EDTA titration methods and no lengthy pretreatment is necessary. Good correlation was established between the values given by the new method and EDTA titration.

* * *

Statistical analysis of factors affecting molasses production during sugar manufacture. M. KLIMEŠ. *Listy Cukr.*, 1972, **88**, 60–64.—The relationship between molasses yield and its chemical composition is examined in terms of regression equations. Results of statistical analysis using the correlations are expressed by graphs relating molasses yield to non-sugar and to ash contents. These have proved more reliable in the case of raw sugar factory molasses than for molasses from white sugar factories.

[1] *I.S.J.*, 1972, **74**, 182.

By-products



Production of lactic acid from waste molasses. III. By chemical means. S. MUKHERJEE and M. U. OVASISI. *Proc. 37th Conv. Sugar Tech. Assoc. India*, 1970, 335–339.—Laboratory experiments showed that addition of milk-of-lime to cane molasses to give a sugar:CaO ratio of about 3:1 was optimum for production of the maximum amount of calcium lactate (from which lactic acid was subsequently liberated by treatment with sulphuric acid). Hence, addition of 42·6 g active CaO to 250 g of molasses containing 132·1 g total sugars yielded 64 parts lactic acid/100 parts sugars. A cost balance is drawn up for the process.

* * *

Mechanization of molasses feeding. R. HUMMEL. *Zeitsch. Zuckerind.*, 1971, **96**, 562–563.—A technique developed for delivery of 1:1 diluted molasses from a holding tank to a cattle feeding trough in a modern cow shed is described with the aid of photographs.

* * *

Industrialization of bagasse in Mexico. R. VELÁZQUEZ R. *Bol. Azuc. Mex.*, 1971, (258), 5–6.—Most of the bagasse produced in Mexico is used as fuel for the boilers or is incinerated to remove the fire risk. Some is used in the manufacture of cellulose, hardboard, etc., and these applications are briefly reviewed. The calorific value of bagasse is tabulated for moisture contents of 0–54%, i.e. the L.C.V., and corresponding values for other fuels are listed. Other possible uses for bagasse, e.g. manufacture of furfural and animal fodder, are mentioned.

* * *

Application of electronic data processing units in drying technology. P. THELEN. *Zucker*, 1971, **24**, 760–771.—Details are given of a programme for electronic data processing which permits calculation of factors required for the plotting of a Mollier i,x diagram and hence evaluation of functions involved in drying processes. The use of the programme is demonstrated by an example involving beet pulp drying with and without use of exhaust vapour.

* * *

New bagasse particle board plant being erected in Trinidad. R. HESCH. *Sugar y Azúcar*, 1971, **66**, (10), 86–88.—Information is given on equipment and processes at the Trinidad Bagasse Products Ltd. plant being built for a daily output of 80 m^3 of bagasse particle board measuring 1·83 × 4·1 m with thicknesses varying between 4 and 45 mm and densities in the range 300–750 kg/m^3.

Huletts R5-million board factory has exciting possibilities for the sugar industry. J. T. BAIRD. *S. African Sugar J.*, 1971, **55**, 558–561.—Some information is given on the bagasse board factory at Amatikulu in Zululand which is designed to produce 3·4 million m^2 of board from 36,000 tons of bagasse.

* * *

Utilization of concentrated ion exchange non-sugar waste on dried beet pulp. J. A. LEVAD, T. D. CARPENTER and S. E. BICHSEL. *J. Amer. Soc. Sugar Beet Tech.*, 1971, **16**, 348–353.—Details are given of experimental work on utilization of reconstituted non-sugars (RNS) from the ion exchange plant at the Hamilton City sugar factory of Holly Sugar Corp. The RNS, found to have essentially the same chemical composition as hot waste from the Steffen process, is concentrated from 5° to 60°Bx in a station of two evaporator effects and a concentrator formerly used to concentrate Steffen waste at the company's Alvarado sugar factory. The RNS, containing 13·44% protein, is added to pressed pulp before drying, thus providing a cattle fodder of high nutrient value and disposing of 10 tons of BOD per day. However, stainless steel tubes must be used in the concentrator station, since mild steel tubes became heavily corroded after 73 days of RNS evaporation.

* * *

Transformation of bagasse from fuel to industrial material. P. C. KWAN and C. S. LU. *Taiwan Sugar*, 1971, **18**, 173–175.—The bagasse requirements and consumption for pulp, paper and board production in Taiwan are discussed as is the question of boiler replacement and reconstruction and means of improving factory heat efficiency to provide more bagasse. A bagasse surplus of 1 million tons a year is expected after conversion to oil-fired furnaces.

* * *

Use of molasses in feeding of cattle. M. H. BUTTERWORTH. *Bol. Azuc. Mex.*, 1971, (260), 5–7.—Brief accounts are given of feeding trials in which cattle were given molasses as a supplement to a ration of bagasse pith with maize stubble; a 15% supplement was better for weight gain than either 0 or 30%. Cattle were also fed on pasturage with molasses alone and with 3% and 6% urea. The urea increased weight gain but not significantly. Calf feeding studies with 10 and 20% molasses in the diet showed that the 10% level was better than the higher level and the control (0%). Limited rations supplemented by *ad lib.* feeding of molasses containing 3% urea did not give as high conversion efficiency as *ad lib.* feeding with both.

Patents

UNITED STATES

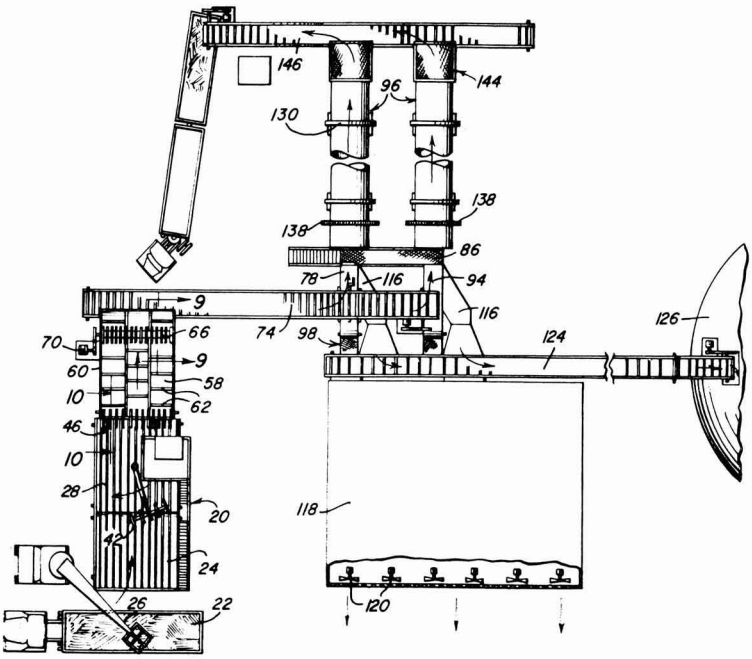
Granular sucrose products. M. NIIMI, T. FURUKAWA and H. MASADA, of Tokushima, Japan. **3,619,293.** 18th February 1970; 9th November 1971.—A granular crystalline product is prepared by subjecting a partially refined sucrose solution containing molasses (of 75–85°Bx, containing 1–6% non-crystallizable sugar) to a partial crystallization to form a massecuite composed mainly of dispersed micro-crystals. This massecuite is sprayed into a drying air stream to form atomized droplets containing a number of the micro-crystals from which part of the water is removed to give granular aggregates of the micro-crystals and residual sucrose solution and molasses. The granulated product (of 2–5% water content) is aged and dried to crystallize additional sucrose and to reduce its water content further.

* * *

Cane dry cleaning plant. A. C. STEEN and J. W. STEEN, of Abbeville, La., USA, *assrs.* J & L ENGINEERING CO. INC. **3,620,369.** 15th January 1969; 16th November 1971.

Whole-stalk cane including trash is brought by transport units 22 and unloaded by crane 26 onto the feeder table 24. This is in the form of a horizontal open-type conveyor which allows the mat of cane to pass but also allows loose trash, dirt and rocks to fall through. The cane is transferred by gravity to a second open conveyor 28, the cane flow being controlled from an overhead observation point by means of the grab 42 on a pedestal-mounted boom. The cane passes beneath the saw discs 46 mounted on a transverse shaft and the billets fall onto the elevator 58. The lugs 62 carry the cane up and beneath the leveller 66 and the billets fall onto the cross conveyor 74.

They are directed by an adjustable flap so that they fall onto either conveyor 78 or conveyor 94 which feed the drums 96. The conveyors are open-type units and allow trash to pass through each to a trash conveyor 98 directly below. Ducting beneath the upper surfaces of the trash conveyors is connected through ducts 116 to a large vacuum chamber 118 exhausted by fans 120. The separation of the trash from the cane billets entering the drums is thus assisted. The trash conveyor, once it has passed the vacuum ducting section, becomes horizontal and discharges the trash to conveyor 124 which takes it to storage or to an incinerator 126. Within the drum are



Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch block C, Station Square House, St. Mary Cray, Orpington, Kent, England (price 25p each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. 20231 USA (price 50 cents each).

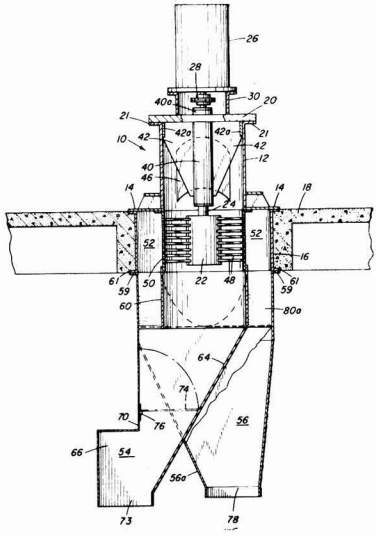
internal helical conveyor sections so that the cane is tumbled as the drums revolve; they are supported by bearing rings 130 and driven through external gear rings 138. This separates more trash which is separated through screens 144 at the end of the drums while the cleaned cane is taken by conveyor 146 to transport units delivering to the mill.

* * *

Bagasse depithing. K. M. GUNKEL, of Stamford, Conn., USA. **3,622,088.** 20th June 1969; 23rd November 1971.

A rotor 22 provided with hammers 48 is driven by a motor 26 through a coupling 28 and shaft 24, the latter maintained in position by sleeve 40 held with radial ribs and supported by plate 20 which carries the motor support ring 30. The plate 20 is held by the flanged ends 21 of support cylinder 12 with bottom flanges 14 bolted to support ring 16. This may be set in a floor as shown or may be supported externally when shielding is provided. Within ring 16 and below ring 12 is a screen 50 of cylindrical shape within which the rotor revolves, there being a small clearance between the hammers and screen. The perforations of the screen are large enough to permit passage of pith but too small to permit passage of fibres.

Bagasse is admitted through a gravity chute in the side of ring 12 and falls into the rotor zone where the action of the hammers separates the pith and fibre. The pith passes through the screen into chamber 52 and then falls into a bifurcated funnel 56. The fibre fraction passes through the rotor zone and passage 60 into the funnel 54. The size and shape of the passages and funnels are such as to prevent any blockages.



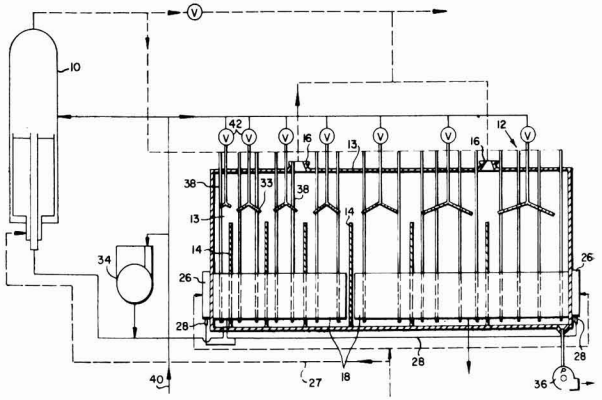
* * *

Beet harvester. R. G. DUQUENNE, of Gaurain-Ramecroix, Belgium. **3,627,052.** 19th December 1969; 14th December 1971.

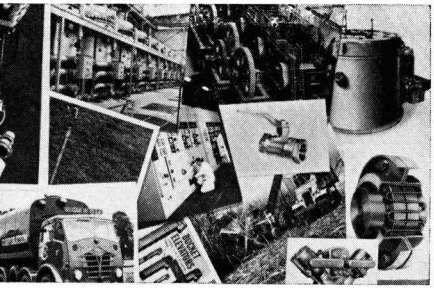
* * *

Continuous vacuum pan. F. DAMBRINE, J. C. GIORGI, J. DE CREMOUX and G. WINDAL, *assrs.* FIVES LILLE-CAIL, of Paris, France. **3,627,582.** 19th June 1969; 14th December 1971.

The pan 12 is in the form of a closed vessel of generally cylindrical form, divided into compartments by a series of partitions 14, the number of which may vary between 4 and 12. The partitions are slotted to permit the installation of plate heating elements 18 which are in two groups extending into the pan from steam chests 26 with condensate drains 28.



Juice is supplied to evaporator 10 through a pipe system 40, concentrated and, after addition of a magma formed in mixer 34 from juice and seed crystals, is supplied to the first compartment of the pan. Here it is further concentrated and the seed crystals developed to give a massecuite which passes along the pan, beneath the partitions 14, and is eventually withdrawn by means of pump 36 from the last compartment. The vapour evolved during boiling rises into the top of the shell 13 and is withdrawn through ports 16 connected to the condenser system. Circulation within the compartments is aided by injection of steam below the heating plates by means of pipes 38 which may be jacketed or coated with polytetrafluoroethylene to prevent adhesion of sugar crystals. A small quantity of juice is also admitted through the pipes 38 to prevent blockage of the nozzles with sugar while additional juice is supplied from pipe system 40 through valves 42 and spray heads 33 to maintain the desired concentration and solid:liquid proportions in each compartment. The size of the compartments, heater plate and thus massecuite level, heating surface, etc. are such as to optimize boiling.

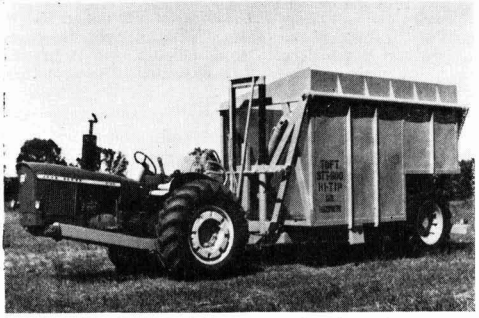


Trade notices

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.

In-field cane transport. Toft Bros. Industries Ltd., Bundaberg, Queensland, 4670 Australia.

Over the years in which mechanical cane harvesting has been developed, in-field cane transport has generally been in what motor trucks or tractor-drawn trailers were available. These have been adequate for the purpose, but with the present high capacity of harvesters and their ability to operate under adverse, wet conditions, this non-specialized transport has



become obsolete. Toft have now developed a purpose-built in-field cane transport system which is able to match the performance of the chopper-type harvester, giving minimum soil compaction and high operating capacity in difficult soil conditions as well as manoeuvrability and reliability. The photograph illustrates the STT-600 "Hi-Tip" unit of the range, the tipping action of which is hydraulically controlled by the tractor driver.

* * *

Scale inhibitor. Hodag Chemical Corp., 7247 North Central Park, Skokie, Ill., 60076 USA.

"HCA-21" is a new powdered chelating and dispersing agent formulated to inhibit scale formation in evaporators, vacuum pans, heat exchangers and distillation columns. Specifically designed for the food and chemical industries, it is a 100% active white powder which is completely water-soluble, and is best used as a dilute solution fed continuously by means of a metering pump or an in-line mixer. Samples are available for testing from the above address.

Synthetic flocculants. Allied Colloids Manufacturing Co. Ltd., Low Moor, Bradford, Yorks., BD12 0JZ, England.

The Allied Colloids "Percol" range of synthetic, water-soluble polyelectrolytes, of ultra-high molecular weight, are based on polyacrylamide which permits the "building-in" of various groups to make the flocculant anionic, cationic or non-ionic. A 12-page brochure gives details of the "Percol LT" series which has been developed to improve the settling characteristics of cane and beet juices and the filtrability of rotary filter muds. "Percol LT26" anionic grade is intended for cane juice treatment, while "Percol LT 25" is applicable to beet juice. However, "Percol LT20" non-ionic and "Percol LT24" cationic are more suitable in certain exceptional circumstances. Choice will depend on impurity particle nature, size and concentration, the quantity of flocculant required normally falling in the range 1–5 ppm. The flocculant may be fed dry into a stirred tank for solution preparation or a water dispersion can be prepared by means of the Allied Colloids eductor, which is described. The brochure also outlines the procedure for laboratory evaluation of "Percol LT" and briefly describes two other Allied Colloids products for the sugar industry: "Tetralon" chelating agent for evaporator scale reduction, and "Alcopol" surface-active agent for reducing syrup and massecuite viscosity and surface tension and thus improving circulation.

* * *

Multi-range moisture analyser system. Anacon Inc., 30 Main St., Ashland, Mass., 01721 USA.

The new Model 106 multi-range moisture analyser system announced measures the moisture content by directing an infra-red beam at the surface of the material at a set measuring wavelength. Variations in the moisture content cause variations in the degree of energy absorption. Light is also transmitted alternately to the material at a reference wavelength. The extent of energy absorption determines the amount of energy reflected back to the measuring head; this energy is directed by a concave morror to a lead sulphide photo-resistor, at which a signal is produced consisting of two series of pulses based on the alternate use of measuring and reference wavelengths. The signal level is raised by a pre-amplifier so that it can readily be transmitted to the control unit; after further amplification the signal passes to a discriminator circuit, where the two series of pulses are separated and converted to two D.C. currents corre-

sponding to the pulse amplitudes. The difference is then indicated on the meter or on a remote recorder. Accuracy is 1% of the full scale (values better than 0·02% have been obtained); the range for sugar and glucose is a minimum of 0–5% by weight and a maximum of 0–80%. The analyser is unaffected by temperature and density.

* * *

Cane loading and transporting. Volvo BM AB., S-631 85 Eskilstuna, Sweden.

The illustration shows a BM-Volvo "TC 860" multi-purpose vehicle ("TC" stands for "Terrain Chassis") being loaded with cane. The "TC 860" has been developed from the well-proven "DR 860" dumper and has a standard chassis to which different bodies can be fitted for a great variety of tasks. As a cane transport, it can carry 19 tons of cane, has 4-wheel drive, and is equipped with a 150-hp turbo-charged Volvo diesel engine. A special tandem axle bogie ensures 6-wheel ground contact at all times irrespective of the terrain, there being no direct suspension between chassis and axles; instead, two pivoting bars equalize the load on the axles, each of which has independent oscillation. Power steering, differential locks and 45° articulation with a turning radius of 7·5 m (24 ft) are other features. 4-speed power shift, forward and reverse, large wheels, disc brakes, high axle clearance and a completely insulated cab are also incorporated.

The loader in the illustration is an "LM 641", which is powered by a Volvo 80-hp diesel engine and has 4-wheel drive. The crane has a lift of 5 m (over 16 ft) and performs equally well to either side with excellent stability. Lift capacity is 43,000 lb ft, and loading speed is high, partly owing to the semi-automatic return of the crane and grapple vibration damper, e.g. 30 sec for a loading height of 13 ft and a load of 2,200 lb. The "LM 641" can be quickly adapted to other tasks when cane is not being loaded.

PUBLICATIONS RECEIVED

SLAT AND APRON CONVEYORS. Ewart Chainbelt Co. Ltd., Colombo St., Derby, England.

A new brochure, No. SAC/1, gives practical, comprehensive advice on selection of slat or apron conveyors for unit and bulk handling applications, among which is the handling of sugar cane. A 10-point selection procedure is used, with cross-references to pages carrying drawings of a variety of cross-section layouts and tables of important dimensions and operating factors. A separate section is devoted to the Ewart "Cobra" (carrier outboard roller assembly) conveyors described previously[1].

* * *

BEET PULP PRESSES. Stord Bartz Industri A/S, Bergen, Norway.

A special edition of the "Stord Press Review" has been published to celebrate the delivery of the 500th Stord beet pulp press. It is pointed out in a preface that No. 600 is already on the company's production programme for delivery this year, while about 100 Stord presses have been manufactured by a Spanish licensee. The booklet contains illustrated references to Stord presses in use in various sugar factories.

* * *

BALL VALVES. Hindle Valves Ltd., Victoria Rd., Leeds LS11 5UG, England.

A new brochure describing the Hindle range of full- and reduced-bore ball valves is announced. The 16 pages give details, with the aid of photographs, line drawings, exploded drawings and cut-away illustrations, of the design and construction features of the valves. Tables of dimensions are included and pages devoted to installation and maintenance, operation methods, details of the fire-safe ball valve and useful conversion tables.

* * *

BMA factories for the USA.—BMA, Braunschweigische Maschinenbauanstalt, together with their US subsidiary the BMA Machinery & Equipment Corp., of Denver, Colo., have received an order from the MINN-DAK Farmers Cooperative Inc., of Wahpeton, North Dakota, for the supply and erection of a beet sugar factory similar to one for which BMA received an order, worth $30 million, in September 1972. Both factories are expected to start operations in September 1974.

* * *

New Mexican sugar factory.—Gulf + Western Americas Corp., of Vero Beach, Fla., USA, a Gulf + Western Industries company, recently formed an Engineering Division to design and advise on the construction of sugar factories in Latin America. The new division has recently obtained a contract for the design of a 4000 tons/day factory to be erected at El Naranjo, San Luís Potosí, Mexico. The firm will also provide technical assistance during construction. Completion of the factory, which will be state-owned, is scheduled for the 1974 season.

* * *

Molasses treatment.—Salzgitter Maschinen AG, of 332 Salzgitter 51, Postfach 51 1640, West Germany, well known as suppliers of sugar factory machinery, have supplied a plant for treatment of 100 tons of beet molasses using the Salzgitter modification of the Steffen process. The plant is part of an extension of Miandoab sugar factory in Iran.

* * *

Gearing for Thailand sugar factories.—David Brown Gear Industries Ltd., of Park Gear Works, Huddersfield, Yorks., England, have received orders valued at almost £100,000 for the supply of gearing to Krung Thai, Thonburi and Prachuap cane sugar factories. The cast steel gearwheels ranging in diameter from 8 to 12 ft and forged steel pinions, all with straight spur teeth, form part of a final drive renewal programme.

[1] *I.S.J.*, 1972, **74**, 29.

Commission Internationale Technique de Sucrerie

15th General Assembly, 1975

The President of the Scientific Committee of the C.I.T.S., Prof. Dr. F. SCHNEIDER, has announced that the 15th General Assembly of the Commission is to take place at the Hofburg Congress Centre in Vienna during the 13th, 14th and 15th May 1975 while it may perhaps be extended to include the 16th May.

The two priority subjects adopted by the Scientific Committee are:

(1) Fundamental principles of the extraction of beet, and

(2) Products accompanying sucrose and their behaviour during the sugar manufacturing process.

Communications on other aspects of sugar chemistry or technology may perhaps be presented at the end of the session. Details of registration of participants, the list of communications to be presented and the detailed programme of the meetings will be published later, and will be available from the General Secretary, Dr. J. HENRY, Aandorenstraat 1, B-3300 Tienen, Belgium.

New Bulgarian sugar factory[1].—The seventh sugar factory in Bulgaria at Rasgrad is to go into operation in 1973/74 with a capacity of 3000 tons of beet per day. Other factories have been expanded so that the total capacities will reach 31,000 tons per day, an increase of 88% over the 1971/72 slice.

* * *

New sugar factory for El Salvador[2].—A new sugar factory with an initial capacity of 2500 tons of cane per day is to be constructed in El Salvador and will process the cane grown by some 3000 farmers in the Departments of San Vicente, Cuscatlán, Cabañas and La Paz.

* * *

New sugar factory for Andhra Pradesh[3].—The Andhra Pradesh Government in India has sanctioned the erection of a state-owned sugar factory to be built at Alampur in the Mahbubnagar District. It will have a cane crushing capacity of 1250 metric tons/day and will cost Rs 30 million. It is to go into operation in three years time and about 2400 hectares of land are being earmarked for cane cultivation to supply the factory.

* * *

New Venezuela sugar factory[4].—Agreement has been reached with the French Export Financing Bank on the financing of a new sugar factory at Gunare. The processing capacity is to be 30,000 tons and the factory is to be built within two years. Meanwhile, about 5000 hectares of land are to be cultivated in the area of the Río Gunare irrigation project.

* * *

New sugar factories for Kerala[5].—The Kerala Government in India is to erect four state-owned sugar mills at a cost of Rs. 100,000,000, according to the Minister of Industries. The proposed mills are to be located in the Cannanore, Kozhikode, Idikki and Trivandrum districts and should be completed in about four years. The new mills, with the three existing mills, will enable the state to become self-sufficient in sugar.

* * *

New Colombia sugar factory[6].—A large new sugar factory to be built in the Department of Risaralda is to produce 79,000 tons of sugar annually.

Brevities

Guatemala Sugar Technologists' Association.—The Asociación de Técnicos Azucareros de Guatemala is to hold its first Congress during the 21st–23rd June 1973 in Guatemala City. A number of foreign visitors are expected to participate as well as members of the Association. A principal subject for discussion is to be centrifugals and their operation. Further information may be obtained from the President of the Association, Ing. SENEN VIEGO D., Ingenio El Salto, Escuintla, Guatemala.

* * *

Government acquisition of Jamaican sugar factory[7].—Final arrangements have been made for the acquisition by the Jamaican Government of the sugar cane estate and factory of Holland Estate Ltd. As a result of insufficient cane supply, the factory had run at a loss for a number of years and the former owners had announced their intention of closing it and diverting cane to Appleton factory. With the Government acquisition, the factory is to continue operation under the Sugar Industry Authority which has been instructed to take urgent action to bring new cane lands into production to provide the supply needed to bring the Holland and Appleton factories up to efficient operating capacities.

* * *

Bagasse newsprint company.—The Bowater Paper Corporation Ltd. and the Natural Resources Group of W. R. Grace & Co. have formed a jointly-owned subsidiary, Bowater-Grace Bagasse Newsprint Ltd., to promote the construction of plants for bagasse utilization in newsprint manufacture. The Bowater Organization is a leading manufacturer of a wide range of papers while the Grace company has much experience of bagasse paper-making technology, so that the new company can call on much expertise in the constultancy services it can offer. Further information should be sought from Bowater-Grace at Bowater House, Knightsbridge, London S.W.1.

* * *

New US sugar refinery.—The Columbia Sugar Corporation has entrusted to MPS International Corporation the construction and management of a new sugar refinery to be erected on Staten Island in New York State[8]. The plant construction is to be completed within 18 months. It is reported[9] to involve a cost of $40 million and will have a refining capacity of 800,000 tons.

* * *

West Germany sugar production 1972/73[10].—The West Germany Sugar Association has published the results of the 1972/73 beet campaign in their country. The beet area amounted to 332,843 hectares, against 318,362 ha in 1971/72, an increase of 14,211 hectares or 4·55%. In spite of the increased beet area, sugar production remained below that of the year before, the campaign results being much worse than in 1971/72. The total beet slice was 14,658,569 tons, compared with 14,682,220 tons, so that the beet yield was some 44 tons per hectare in 1972/73 compared with 46·1 tons last campaign. In addition, the sugar content of the beets was considerably lower at 16·06% compared with 16·95% in 1971/72. Total sugar production amounted to only 2,241,901 tons, compared with 2,373,065 tons produced in 1971/72, a decrease of 131,164 tons or 5·5%.

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[1] *Zeitsch. Zuckerind.*, 1973, **98**, 110.
[2] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (6), 8.
[3] *Indian Sugar*, 1972, **22**, 417.
[4] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (6), 8.
[5] *Sugar News* (India), 1972, **4**, (5), 26.
[6] F. O. Licht, *International Sugar Rpt.*, **105**, (6), 8.
[7] *The Cane Farmer*, 1972, **13**, 350.
[8] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (3), 7.
[9] C. Czarnikow Ltd., *Sugar Review*, 1973, (1112), 20.
[10] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (3), 5.

Dutch sugar imports and exports[1]

	1972	1971
	(metric tons, tel quel)	
Imports		
Cuba	546	1,619
Finland	2,409	0
France	120	5,918
Germany, East	2	1,047
Germany, West	17,930	526
Surinam	2,242	1,034
UK	5,857	3,749
Other countries	2	7
	29,108	13,900
Exports		
Arabian Gulf	10,000	0
Denmark	815	1,838
France	0	44
Germany, West	321	579
Greece	24,252	15,096
Iceland	520	523
India	2,000	0
Indonesia	12	3,032
Israel	11,550	22,150
Italy	5	1,213
Libya	1,000	0
Malta	9,472	6,294
Muscat	0	1,000
Nigeria	5,550	11,250
Norway	3,417	585
Sierra Leone	0	950
Surinam	0	500
Sweden	800	0
Switzerland	10,750	21,890
Togo	250	0
USSR	10,000	0
UK	15,322	29,994
Other countries	295	1,461
	106,331	118,399

These figures do not include trade with Belgium/Luxembourg. During 1971 53,540 tons of sugar entered Holland from Belgium/Luxembourg while 782 tons were exported to that destination.

South African cane area expansion[2].—More land is to be planted to cane in South Africa to meet expected future sugar requirements in local and export markets. The planting of additional land to the extent of about 9000 hectares over the next two years has been authorized.

* * *

Italian sugar industry concentration.—Società Italiana per l'Industria degli Zuccheri S.p.A., an Italian sugar producing company with thirteen factories and a distillery, has been acquired by the Montesi Group of Padua. Since 1968, S.I.I.Z. has been engaged in a plant reconstruction programme; a new sugar factory has been built at Argelato and improvements made to the factories at Crevalcore, Legnago, Porto Tolle and Rendina, while obsolete factories at Badia Polesine, Battipaglia, Bologna, Ca' Venier and Granarolo have been closed[3]. It is reported[4] that a fusion with another company, Cavarzere Produzioni Industriali S.p.A., is now under consideration; the latter operates three sugar factories, a distillery and a yeast factory, and total sugar production of the combination would approach that of the largest Italian sugar company, Eridania Zuccherifici Nazionali S.p.A.

* * *

Tanzania new sugar factory[5].—The National Agricultural and Food Corporation (NAFCO) is to erect a new sugar factory near the village of Kagera. The plant will be erected in three stages to reach a final capacity of 80,000 tons of sugar per year, it is hoped by 1975.

Colombia sugar exports[6]

	1972	1971	1970
	(metric tons, raw value)		
Canada	12,600	0	0
Chile	21,333	0	0
Hong Kong	0	12,600	10,362
Japan	49,881	70,437	34,832
Malaysia	25,017	11,800	0
New Zealand	0	12,600	22,869
Singapore	12,600	0	0
USSR	10,199	0	0
USA	71,226	53,624	61,642
	202,856	161,061	129,705

Barbados cane separation plant[7].—A cane separation plant, estimated to cost EC$ 3,200,000, is expected to go into operation at Uplands Factory, St. John, Barbados, for the 1974 crop. The plant will make full-scale tests of a new process which has been designed to separate cane so that it can be put to practical uses for animal feed, high quality building materials and paper. The project has been financed by the Canadian Government through the Canadian International Development Agency by means of a long-term loan.

* * *

US beet area reduction[8].—The USDA Crop Reporting Board recently stated that, for the fifth year running, farmers intended to plant a lower area to beet than in the previous year. Sowings are expected to amount to 1,388,900 acres or 2% lower than the 1,419,000 acres planted in 1972, of which 1,345,800 acres were finally harvested.

* * *

New sugar factories for Assam[9].—The Assam Government in India has decided to set up six sugar mills under a public corporation in the next financial year. Three of the mills are to be located in districts south of the Brahmaputra river and three in districts to the north, including one in the Mikir Hills district. The six mills will be in addition to that at Dergaon in Sibsagar district and the proposed mill in Cachar district.

* * *

Peru sugar production, 1972[10].—It is reported that sugar production in 1972 amounted to 913,274 tons, compared with 794,902 tons in 1971.

* * *

UK beet crop, 1972/73[11].—The total tonnage of beets received by the British Sugar Corporation factories in the 1972/73 campaign, which ended on the 31st January 1973, was 6,118,000 tons (13·83 tons/acre) against 7,745,000 tons (17·33 tons/acre) the previous year. Sugar production amounted to 886,000 metric tons, white value, according to a final estimate prepared by the British Sugar Corporation[12]. This compares with 1,086,000 tons produced during 1971/72.

* * *

Chile accession to the ISA[13].—It has been officially announced that Chile has acceded to the International Sugar Agreement.

* * *

Czechoslovakia beet crop 1972[14].—According to information from Czechoslovakia, the 1972 sugar beet crop amounted to 5·8 million tons, slightly more than the 1971 total.

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[1] C. Czarnikow Ltd., *Sugar Review*, 1973, (1117), 45.
[2] *Public Ledger*, 2nd December 1972.
[3] *Ind. Sacc. Ital.*, 1972, **65**, 140–141.
[4] F. O. Licht, *International Sugar Rpt.*, 1972, **104**, (34), 15.
[5] *Zeitsch. Zuckerind.*, 1972, **97**, 658.
[6] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (8), ix–x.
[7] *Barclays International Review*, February 1972, 51.
[8] C. Czarnikow Ltd., *Sugar Review*, 1973, (1120), 56.
[9] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (3), 9.
[10] *Bolsa Review*, 1973, **7**, 77.
[11] *Public Ledger*, 24th February 1973.
[12] C. Czarnikow Ltd., *Sugar Review*, 1973, (1117), 42.
[13] *Public Ledger*, 3rd March 1973.
[14] F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (4), 5.

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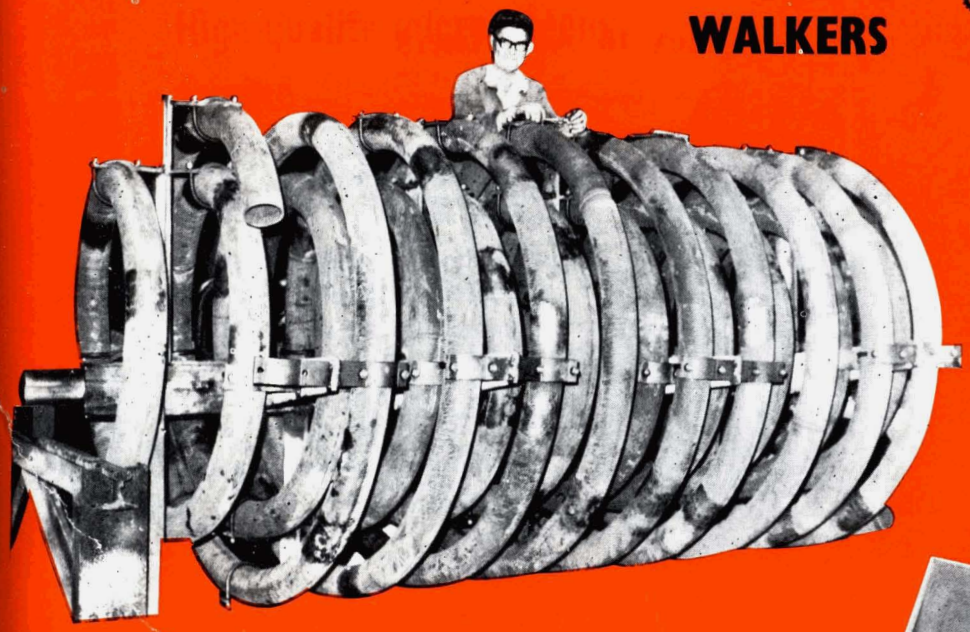

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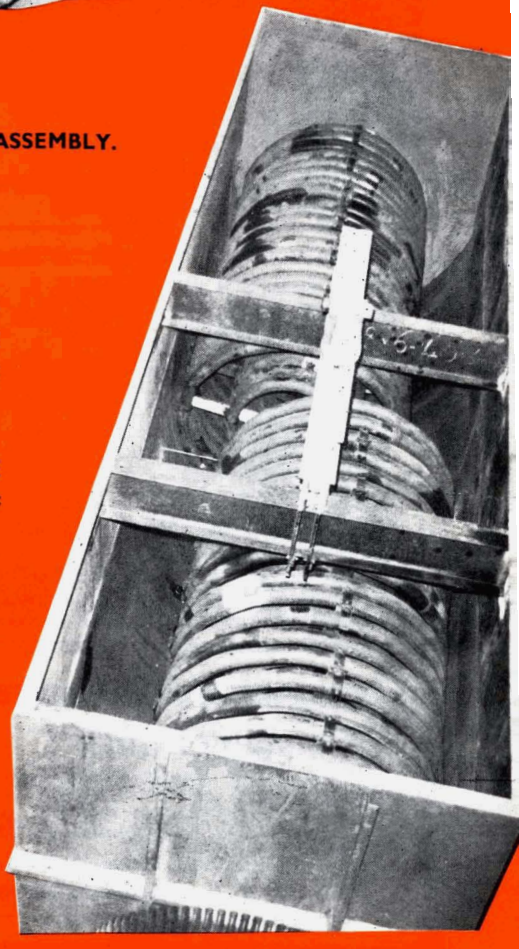

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