

THE

# International Sugar Journal



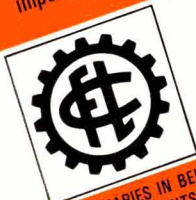
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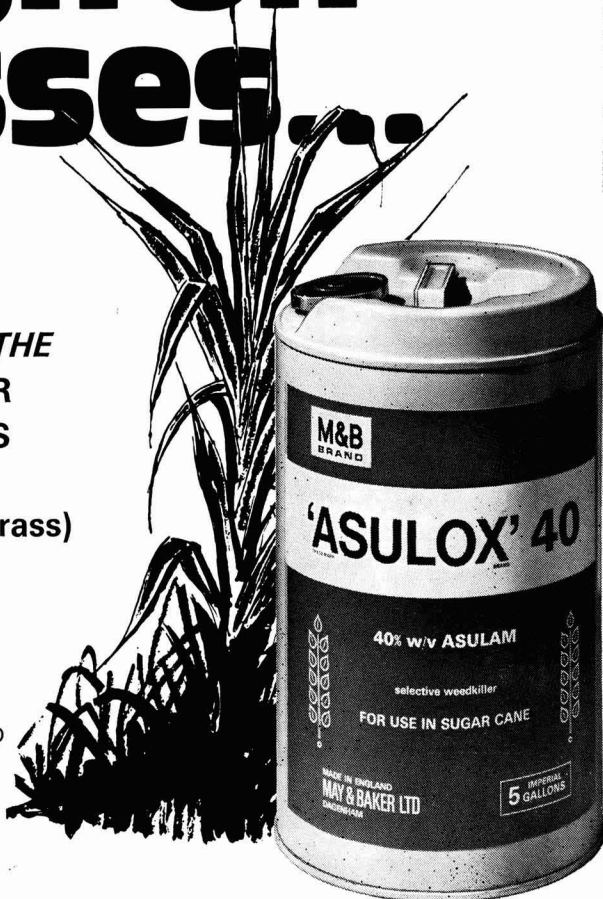




# tough on grasses...

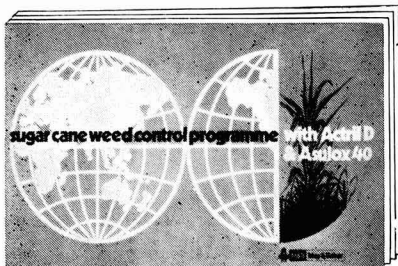
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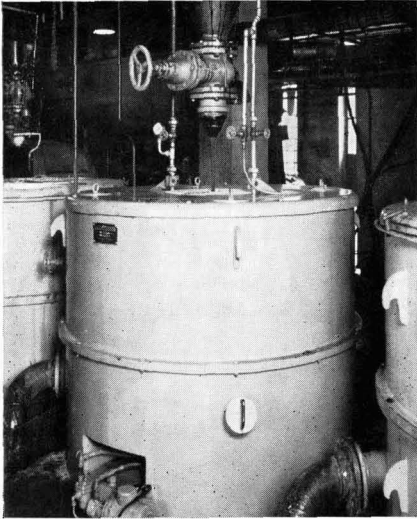
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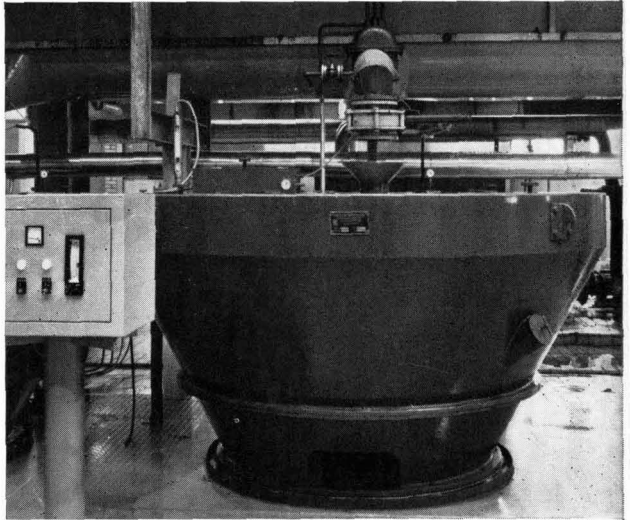
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- you must be extremely good at your job, otherwise how could you possibly hope to survive by serving a single industry as we have done, for 135 years?
- you have to keep ahead of the field — as we have done in process technology and product design. (It helps, of course, to be able to draw upon the practical experience of a group of companies like ours, which owns and operates 9 modern sugar factories and manages several others).
- in an industry geared to seasonal cropping periods and continuous operation where delays or breakdowns may involve your customer in considerable loss, you must acquire the sort of reputation that we have earned, for an acute sense of timing and complete dependability.
- you have to be flexible and resourceful in arranging your financial and commercial package as skilfully as you design your product.

Of course you also need to have stamina to outpace your rivals in dealing with the increasingly complex problems of international trading and competition. Many have already fallen by the wayside and others will undoubtedly follow them, but with good judgement and a little luck you could survive.

Meanwhile to those who specialise in the production of sugar from cane or beet, we would modestly suggest that whether you require a new factory, the modernisation or extension of your existing factory or simply new unit equipment or spares, you approach the specialist's specialist.

When you think of sugar machinery — think of —

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# **FS**

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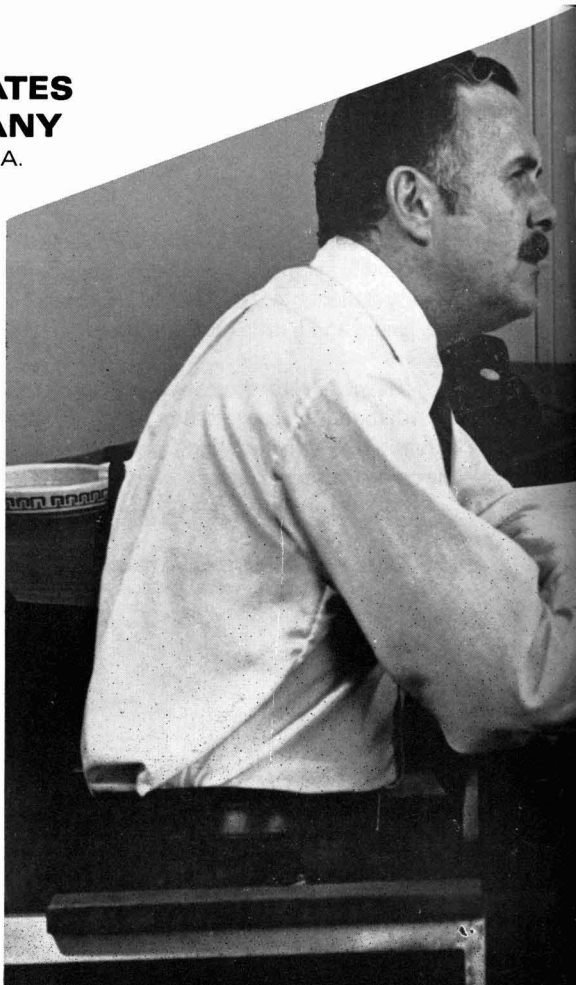
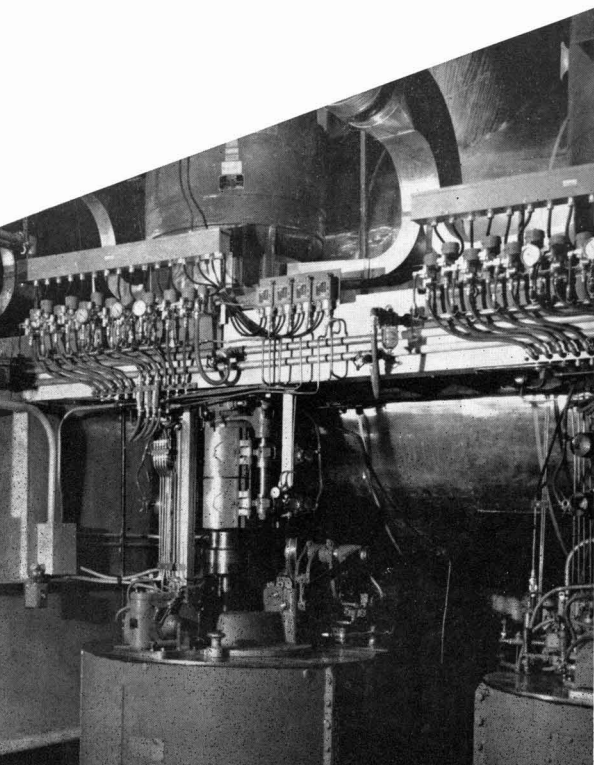
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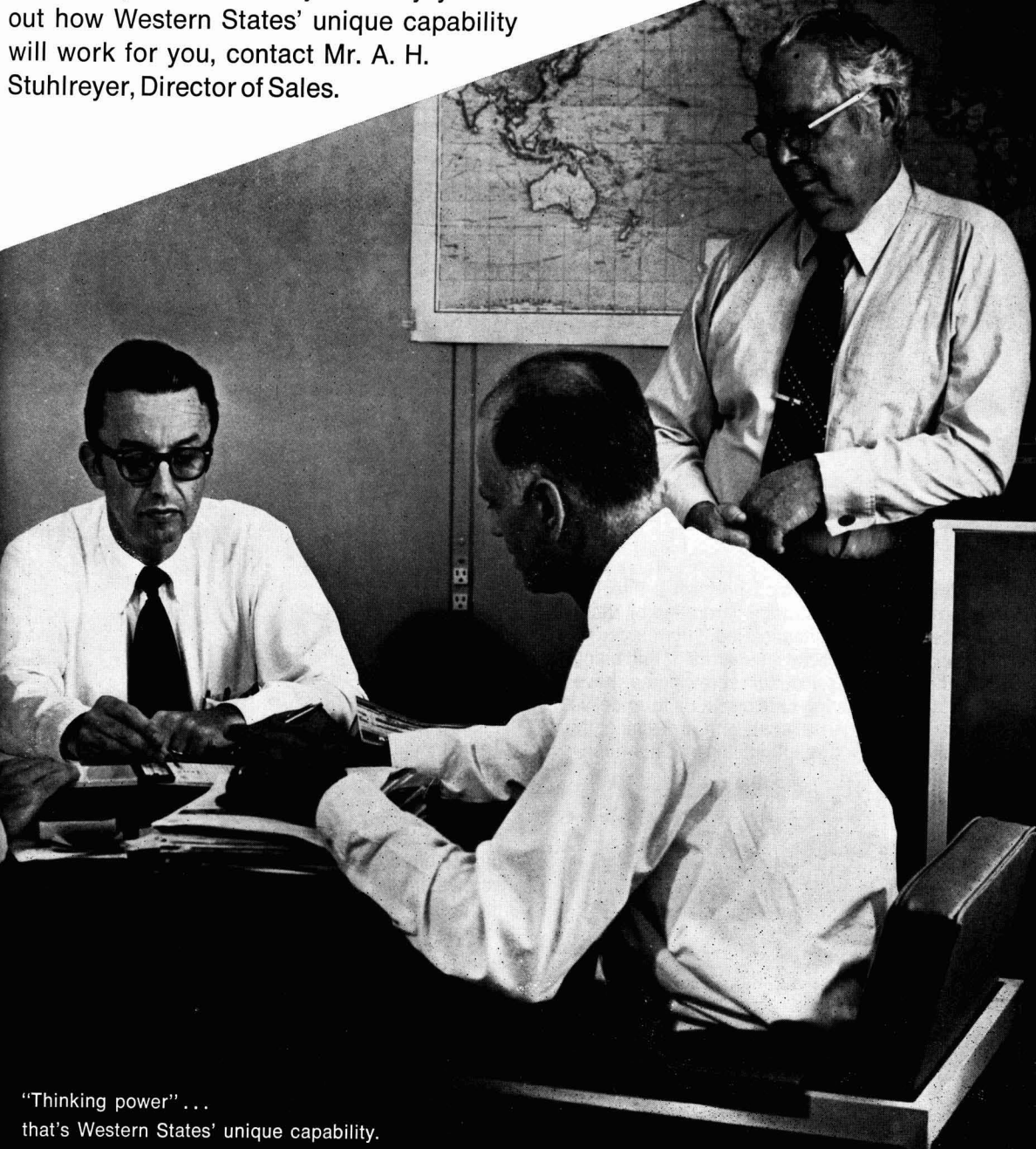
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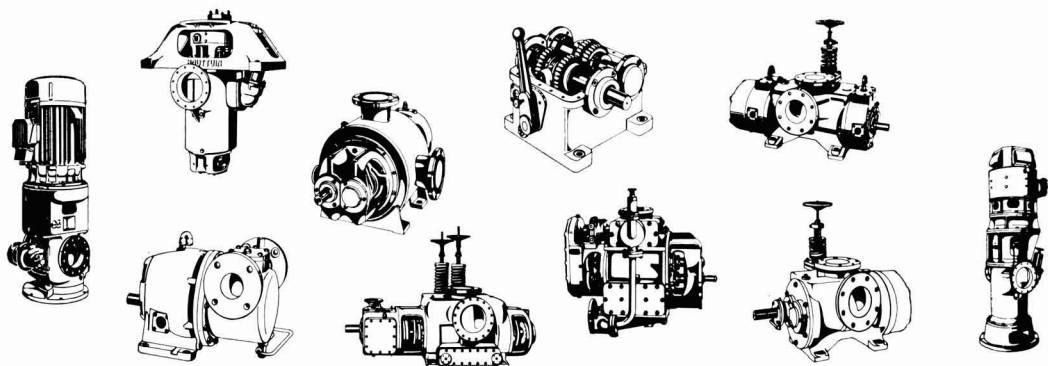


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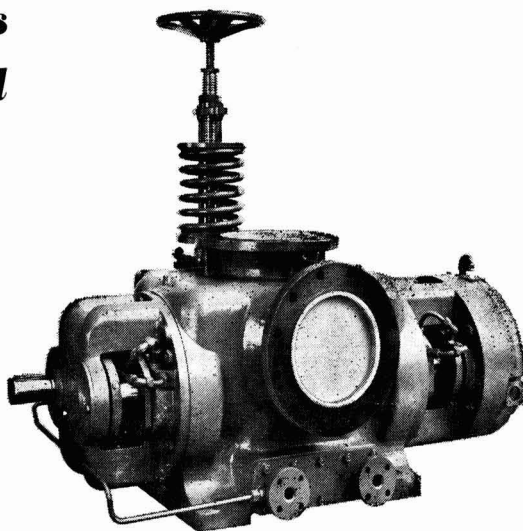
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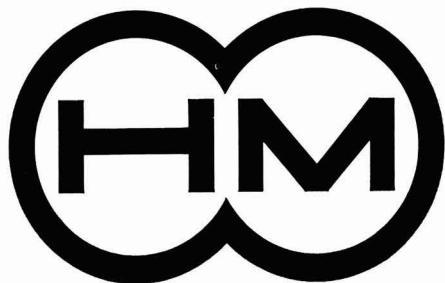
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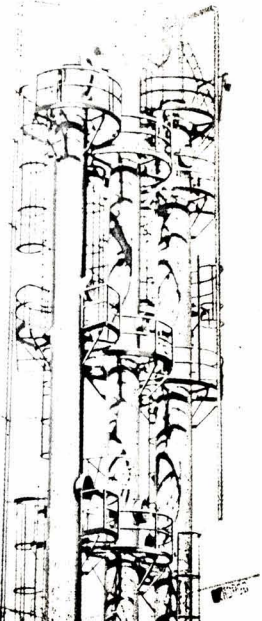
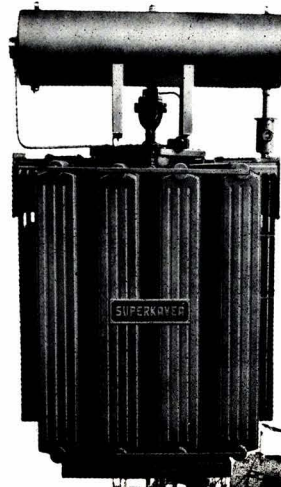
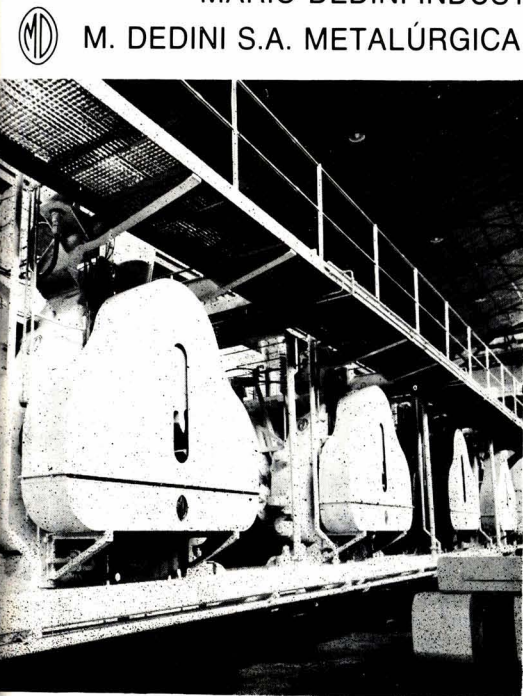
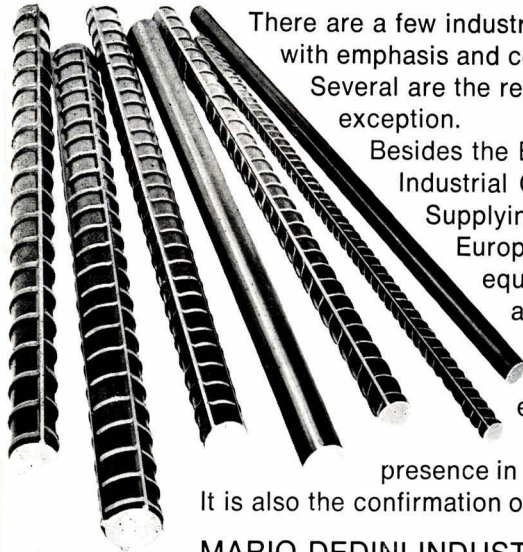
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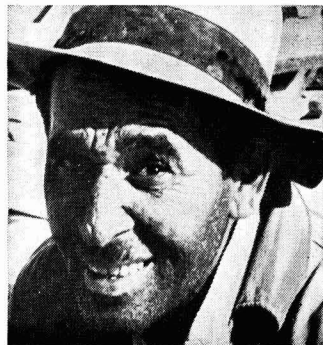
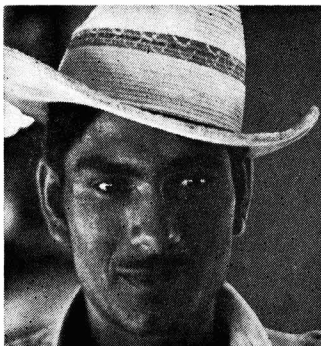
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We have commissioned factories together to mutual satisfaction, and thinking back to these times of hard work we say au revoir, auf Wiedersehen, hasta luego or, in Dutch, 'tot ziens'!

sugar industry engineers

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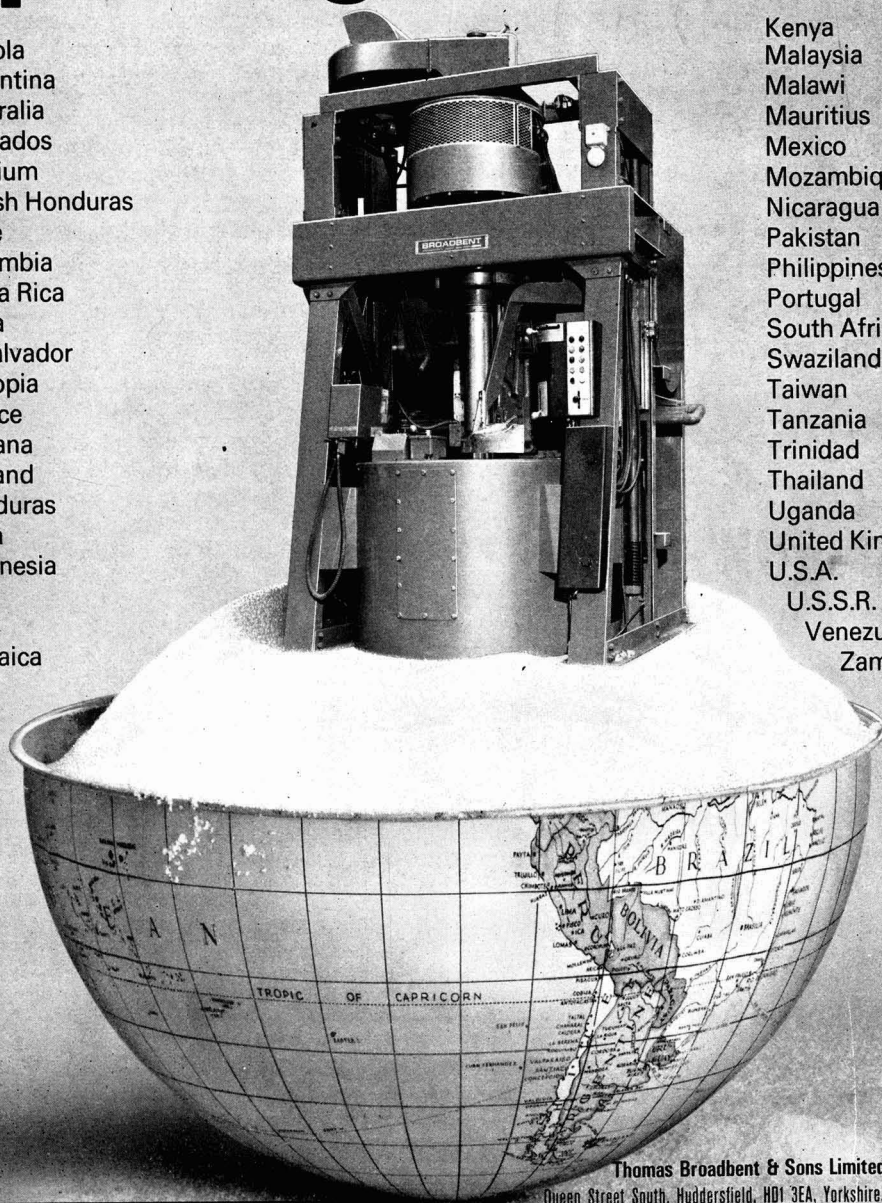
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When you think of sugar machinery—think of FS.

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# GRUENDLER CANE PREPARATION PROCESS

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### 12,139,373 TONS

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ARE SHOWN IN THESE

### 5 BIG POINTS

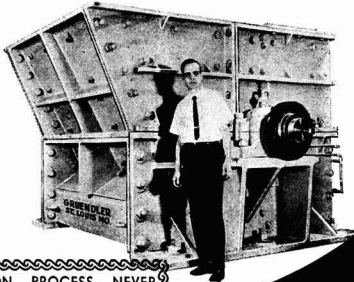
#### WITH CONVENTIONAL MILLING

TONS CANE/HOUR	189.91
FIBER % CANE	14.61
TONS CANE/TON 96 SUGAR	8.44
SUCROSE % BAGASSE	1.43
SUCROSE EXTRACTION	96.42

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TONS CANE/HOUR	52.45
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SUCROSE % BAGASSE	1.27
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OPERATION  
WITH VERY  
REAL RESULTS



THE GRUENDLER CANE PREPARATION PROCESS NEVER BECOMES OBSOLETE BECAUSE UNITS NOW IN OPERATION FOR CONVENTIONAL MILLS CAN BE ADAPTED FOR THE DIFFUSION PROCESS. Units purchased for diffusion process can be rearranged for conventional mill process.

CONVERSION OF EXISTING SHREDDERS  
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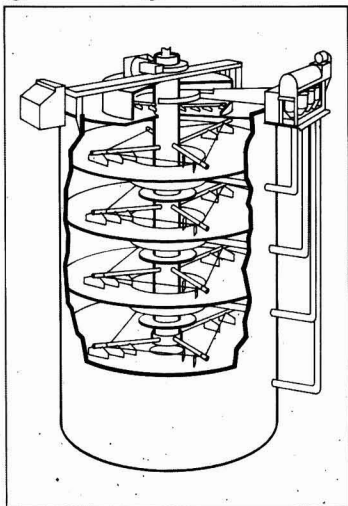
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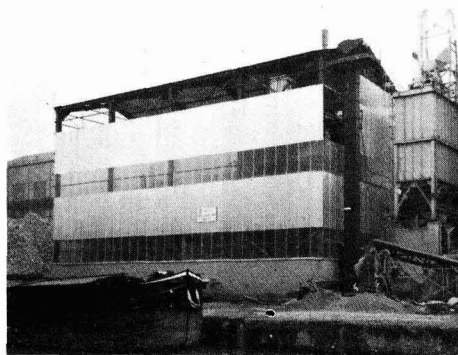
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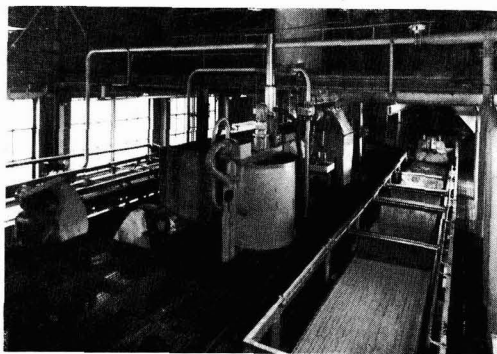
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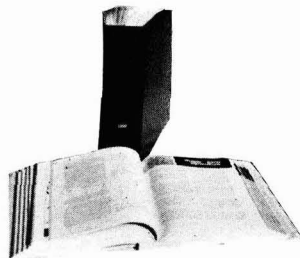
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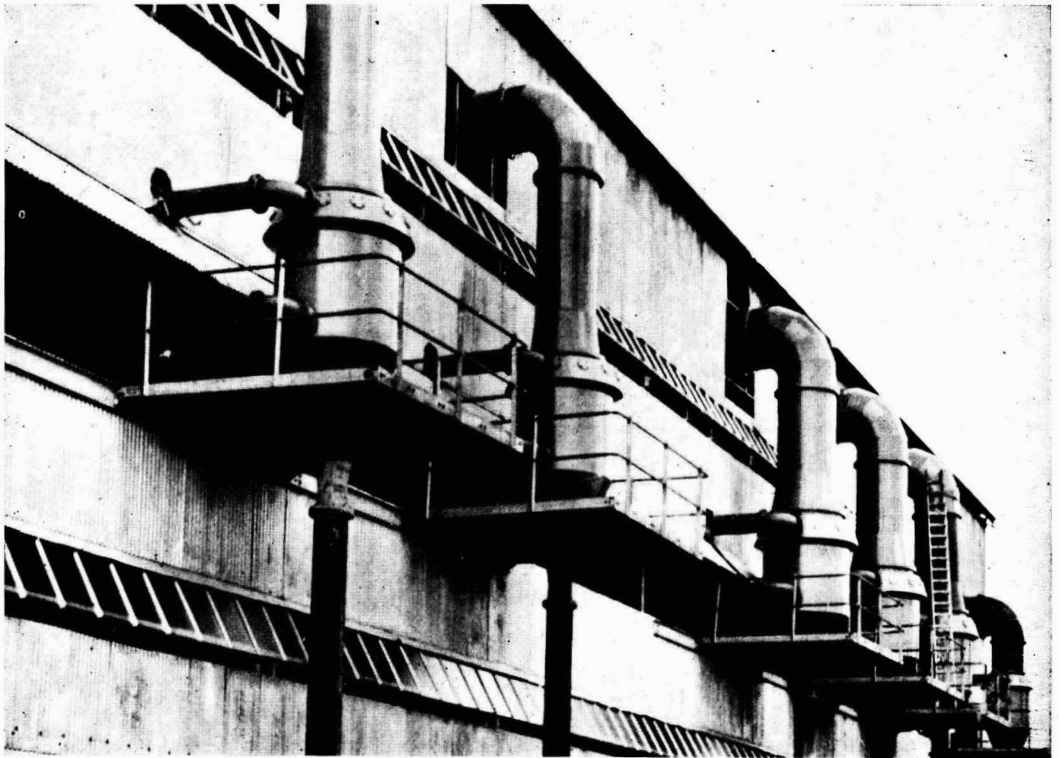
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# International Sugar Journal

December 1973

## Contents

	PAGE
Notes and Comments . . . . .	361
* * *	
Frequencies and time delays observed in a crushing train . . . . .	363
By W. McWhinney	
Part II	
Chemical control of parasitic nematodes in sugar cane . . . . .	369
By Kishan Singh and S. R. Misra	
Part II	
The potential of a screw press tandem . . . . .	371
By S. G. Smart	
* * *	
Sugar cane agriculture . . . . .	376
Sugar beet agriculture . . . . .	385
Cane sugar manufacture . . . . .	386
Beet sugar manufacture . . . . .	389
Laboratory methods and Chemical reports . . . . .	393
By-products . . . . .	396
Patents . . . . .	397
Trade notices . . . . .	398
International Society of Sugar Cane Technologists 15th Conference 1974 . . . . .	399
US sugar supply quotas 1973 . . . . .	400
Brevities . . . . .	399-400
Index to Advertisers . . . . .	xxii

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**SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS**


---

**Fréquences et retards temporels observés dans un train de presses. Ite Partie.** W. McWHINNEY. *p. 363-368*

On continue les recherches sur les auto-corrélations et les corrélations croisées dans le cas de la pression de la canne en vue de déterminer les fréquences et les retards temporels pour des moulins 1-6 en tandem. On montre que les corrélations croisées donnent des résultats plus précis que les essais au colorant bien que cette dernière méthode soit simple. On a pu utiliser des fonctions d'auto-corrélation pour déterminer les fréquences prédominantes dans les données. On examine le composant périodique d'un nombre de variables. En annexe on traite des fonctions de corrélation et de leurs dérivations.

\* \* \*

**Contrôle chimique des nématodes parasites dans la canne à sucre. Ite Partie.** K. SINGH et S. R. MISRA. *p. 369-371*

On décrit le contrôle des nématodes à l'aide de dichloropropène-dichloropropane (DD) pour des plantations en rangées alternées (espace entre les rangées alternativement longue et courte). Le labour de bandes de terre donnaient un bénéfice maximal par unité de nématicides appliqué. La culture en rangée alternée, qui convient bien lorsque d'autres cultures sont faites entre les rangées de canne, a aidé à accroître de manière appréciable le rendement, tout en utilisant des quantités plus faibles de DD que celles nécessaires au traitement général conventionnel.

\* \* \*

**Les possibilités d'un tandem de presses à vis.** S. G. SMART. *p. 371-375*

On examine mathématiquement un schéma théorique qui comprend l'utilisation d'un tandem de trois presses à vis au lieu d'un tandem de pression conventionnelle. On montre que la performance d'une presse à vis est approximative équivalente à celle de deux moulins conventionnels. L'efficacité du mélange et les effets de la macération sont calculés pour chaque cas. On examine également en détail la possibilité d'utiliser un tandem à quatre presses.

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**An einem Mühlenaggregat beobachtete Frequenzen und Stillstandszeiten. Teil II.** W. McWHINNEY. *S. 363-368*

Die Untersuchung über Auto und Crosskorrelationen beim Mahlprozess zum Zweck der Bestimmung der Frequenzen und Stillstandszeiten wird für die Mühlen 1 bis 6 eines Tandem-Mühlenaggregats fortgesetzt. Es wird gezeigt, dass Crosskorrelationen genauere Resultate geben als Anfarbeversuche, obwohl die letztere Methode einfach ist. Autokorrelationsfunktionen lassen sich zur Ermittlung der vorherrschenden Frequenzen in einer Datenaufstellung verwenden. Die periodische Komponente einer Anzahl von Variablen wird untersucht. Ein kurzer Anhang enthält Korrelationsfunktionen und ihre Ableitung.

\* \* \*

**Chemische Bekämpfung parasitischer Nematoden in Zuckerrohr. Teil II.** K. SINGH und S. R. MISRA. *S. 369-371*

Die Bekämpfung von Nematoden mit Dichlorpropen-Dichloropropan (DD) beim Zuckerrohranbau in wechselnden Reihenabständen (abwechselnd lange und kurze Reihenabstände) wird beschrieben. Obwohl bei der Bandspritzung der stärkste Wiederbefall pro Einheit des angewendeten Nematizides eintrat, hat der Anbau in wechselnden Reihenabständen, der vorteilhaft ist, wenn andere Kulturen zwischen den Zuckerrohrreihen stehen, zu beachtlichen Ertragssteigerungen bei geringeren DD-Mengen geführt, als bei der konventionellen Flächenspritzung angewendet wurden.

\* \* \*

**Die Leistung eines Tandem-Schraubenpressenaggregats.** S. G. SMART. *S. 371-375*

Der Verfasser untersucht mathematisch ein theoretisches Schema, in dem ein Tandemaggregat von drei Schraubenpressen anstelle eines konventionellen Tandem-Mühlenaggregats verwendet wird. Es zeigt sich, dass die Leistung einer Schraubenpresse ungefähr der von zwei Mühlen entspricht. Mischleistungen und die Wirkung der Verbundmazeration werden für alle Varianten berechnet. Die Möglichkeit der Verwendung eines Vierpressentandems wird etwas weniger ausführlich untersucht.

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**Frecuencias y demoras observado en un tandém de molienda. Parte II.** W. McWHINNEY. *Pág. 363-368*

Investigación de auto-corelaciones y contra-corelaciones de molienda de caña, con el fin de determinar frecuencias y demoras, se ha continuado para los molinos 1-6 de un tandém, y se demuestra que las contra-corelaciones dan resultados más precisas que el método con ensayos usando tintes, mientras que éste es más sencillo. Funciones de auto-corelación pueden usarse para determinar las frecuencias predominantes en un registro de datos. Se examine el componente periódico de algunas variables. Un breve apéndice se incluye respecto de funciones de correlación y su derivación.

\* \* \*

**Control químico de nemátodos parasíticos en caña de azúcar. Parte II.** K. SINGH y S. R. MISRA. *Pág. 369-371*

Se describe control de nemátodos con dicloropropeno-dicloropropano (DD) para plantación en filas tambaleadas (filas con intraspacios alternamente largo y corto). Mientras que cultivación en tiras de suelo produjo los máximos ingresos por unidad e nemátocida aplicada, cultivación en filas tambaleadas, conveniente cuando otras cosechas se cultivan entre filas de caña, ha ayudado dar crecimientos notables en rendimiento con cantidades de DD usado menores que en tratamiento convencional de todo el superficie.

\* \* \*

**El potencial de un tandém de prensas a tornillo.** S. G. SMART. *Pág. 371-375*

Un esquema teórica, que involve el uso de un tandém de tres prensas a tornillo en lugar de un tandém convencional de molinos, se examina matemáticamente, por lo cual se demuestra que el cumplimiento de una prensa a tornillo es casi equivalente a élo de dos molinos. Eficiencias de mezcla y los efectos de maceración compuesta se calculan en todos casos. La posibilidad de usar un tandém de 4 prensas se examina también en algo menos detalle.

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# THE INTERNATIONAL SUGAR JOURNAL

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## Notes & Comments

### International Sugar Conference

It was announced on the 12th October that the conference which had been in session since the 10th September had failed to attain its objective of a new Agreement to replace the one due to expire at the end of 1973. In a communiqué issued when the talks were concluded, it was mentioned that "the main issues for consideration by the Conference were basic export tonnages, prices, including the problems of inflation and exchange rates, reciprocal rights and obligations between exporters and importers including questions of supply commitments and purchase commitments, the status of the International Sugar Agreement in relation to special arrangements, shortfall distributions and the other elements of the quota mechanism designed to balance supply and demand and to stabilize the market price within a price range. It was unfortunately not possible to resolve all these major issues of policy.

"On some of these issues the Chairman made proposals, principally on basic export tonnages, prices and quota mechanism. There were some reservations as to the recommendations on basic export tonnages and agreement could not be reached on the proposals made by the Chairman, in consultation with the Secretary-General of UNCTAD, for a price range of 5.40 to 7.90 cents a pound and a supply commitment price of 8.90 cents a pound.

"An Agreement with economic provisions could not be negotiated at the present time. Instead, the Conference concluded a new Agreement to come into effect on 1st January 1974 which will contain no economic clauses but will keep in being the International Sugar Organization. The Council of the Organization, apart from the continuing duty of collecting statistical and other information on sugar, has been authorized to arrange for studies to be made and discussions to be held between Members and with non-Members and other organizations with a view to determining the basis for an Agreement that will be in the general interest, and particularly in the interest of developing countries. It will then be for the Council to decide when the circumstances are propitious for inviting the Secretary-General of UNCTAD

to convene a new United Nations Sugar Conference for the purpose of negotiating a new Agreement with full economic provisions."

As mentioned in our last issue, the price proposals by the importers were, in absolute terms, only slightly higher than those of the 1968 Agreement while in real terms they are below, because of the fallen value of the US dollar. It was only to be expected, in view of current world market price levels, that the exporters would reject these proposals as unrealistic and inadequate. On the other hand, while the current values may be expected to remain for some time, they are untypically high and it is not surprising that some exporters' wish to have them as a basis for the Agreement was not acceptable to the importers. It is a great pity that both sides were so unprepared to compromise by moving farther from their initial stances.

As to the future, F. O. Licht K.G.<sup>1</sup> comment: "The world sugar economy is thrown into disarray and will have to live without an Agreement for at least one year but this will not change the situation dramatically because the present price and quota regulations have been out of force for quite a time. But nevertheless the sugar market is nervous. It is argued that importers will no longer receive their usual quantities from exporting members at the SCP in the present Agreement... Therefore it is expected that there will be a rush by importers either to purchase actual sugar or at least to buy hedge purchases on the terminal market to cover their sugar requirements. Such a market behaviour could of course lead again to a substantial improvement in world market values...."

"Some quarters expect that exporters might scramble to sell in the future markets. Furthermore, it is feared that the high prices and absence of regulation of exports to the free market could encourage the pursuit of policies of irresponsible expansion of production. These considerations could result in a downward trend in prices at least in the short run.

<sup>1</sup> *International Sugar Rpt.*, 1973, 105, (29), 1-2.



“In general the collapse of the negotiations in Geneva is no disaster for the world sugar economy. Exporters have the opportunity to show production possibilities without restrictions, the EEC has time to clarify its own sugar policies—one of the big unknowns—and the importers can wait for a supply position which is less tight than the present one. The chances for a new Agreement might be much better in a year, two years or even three. The countries which attended the negotiations have already indicated in the Press statement that they hoped to try again ‘when the circumstances are propitious’. Next time it might be a good idea to start the discussions with the crucial issues like prices and quotas.”

\* \* \*

#### World raw sugar price

Reports of crop damage in Australia and Brazil, and reduced estimates of European beet sugar production, coupled with increased demand for sugar, raised prices on the London Terminal from £90 or so in mid-September until a new record of £106 per ton was reached on the 11th October, the uncertainty about the ISA negotiations and the Middle East War also having contributed at the end of this period.

Following the breakdown in the Geneva talks there was a swift and marked decline to £96.50 per ton. But with renewed demand and notification of reduced availability from the EEC, an upward movement of prices began and on the 2nd November a new record price was established of £108 per ton.

\* \* \*

#### UK sugar industry future

There has been much discussion on the future of the British sugar industry of recent weeks. The refiners—Tate & Lyle Ltd. and Manbré Sugars Ltd.—have refining capacity greater than the two million tons of cane raws they currently handle per year in addition to the 250,000 tons of beet raws they have taken from the British Sugar Corporation Ltd. With British entry into the EEC the Corporation's obligation to deliver these raws has gone and it is economically preferable to produce only white sugar in the beet factories in any case. Further, assuming the 1.4 million tons from Commonwealth suppliers continues after 1974 but that Australian supplies cease, this will mean only 65% of present raw sugar tonnage will be handled by equipment currently under-used. In addition, the 1.4 million tons does not need to come to the UK; the Commonwealth could supply raw sugar instead to other countries of the EEC for refining. Thus it seems inevitable that there must be a contraction for the refining industry.

A complicating factor arises because of the refining margin: that set by the EEC of six members was £11.50 a ton for the small amount of granulated refined sugar made from cane raws. A much higher margin was allowed for cube and tablet sugar which is the common form in which cane sugar appears on the Continent. The British market is mainly for granulated sugar, however, and the refining margin before Britain joined the EEC was £17 per ton.

Following a warning of financial difficulties, a Treasury subsidy of £5.50 a ton was given and, although this is strictly against the EEC rules, the Commission in Brussels allowed it until the 30th June 1974. Should the Commission insist that the subsidy cease after next June, Tate & Lyle would lose money on its sugar refining operations which would have to cease—and what would happen then to the commitment to import Commonwealth raws? There would be considerable political trouble also for a Government that allowed the loss of 6000 jobs in the refineries as well as those indirectly dependent on the industry.

It is expected that the British representatives will argue strongly that the subsidy should continue after June at least until February 1975 when the Community's new sugar policy must be worked out; this will supercede previous arrangements. But in the meantime the future shape of the UK sugar industry must be worked out and discussions have been going on for many months in an effort to settle this. The Government are reported to favour a unified sugar industry processing both beet and cane raws and are said to be prepared to provide finance for the reconstruction. Neither the B.S.C. nor T & L favour this plan and it is pointed out that a single body would be very easy to nationalize if the Government of the day so decided. In addition, it is likely that such a body's formation would fall foul of EEC anti-trust authorities in Brussels.

\* \* \*

#### US sugar supply quotas 1973

Movement of the US spot price above its corridor creates conditions under which the US Secretary of Agriculture is obliged to increase the overall quota and this occurred on the 28th September when 100,000 short tons, raw value, was added to bring the total to 11,600,000 tons. At the same time, the Department declared deficits of 106 tons for Paraguay and 47,667 tons for the Domestic Beet area (its entire share of the enlarged overall quota). As it was necessary to obtain sugar as quickly as possible to relieve a shortage for the immediate future, the balance of the increase not allocated to the Mainland Cane area, 82,773 tons, was made available on a first-come, first-served basis to foreign suppliers (other than Cuba and Rhodesia) able to make delivery on or before the 16th November instead of the usual proration to all quota holders.

Offers were made and accepted for most of this amount when on the 5th October a further deficit was declared for the Texas Cane area in the amount of 15,000 tons. This also was made available on a first-come, first-served basis, and on the 12th October, the Department announced allocations of the entire 97,773 tons. Changes in quotas as a result of the allocations are given in the table published elsewhere in this issue; also included are an increase of 723 tons in the quota for Nicaragua which is to fill the deficit in its quotas previously reallocated to and now deducted from the quotas of Costa Rica, Guatemala and El Salvador, fellow-members of the Central American Common Market.

# Frequencies and time delays observed in a crushing train

By W. McWHINNEY

(Sugar Research Institute, Mackay, Queensland, Australia)

## PART II

The auto-correlations for speed, lift and escribed volume for the first mill are shown in Fig. 7 while the cross-correlations for speed/escribed volume and lift/escribed volume are shown in Fig. 8. The auto-

correlations of speed and escribed volume are quite similar in form and different from the lift auto-correlation, suggesting that speed is the controlling variable at the first mill. The cyclic components in the escribed volume were probably due to speed variations. The speed/escribed volume cross-correlation shows a strong period of approximately 2.25 minutes while the lift/escribed volume cross-correlation does not oscillate significantly.

The speed/lift/escribed volume interactions were quite different at the final mill. The mean lift was between 30 and 40% of the work opening at zero lift. The auto-correlations shown in Fig. 9 have no cyclic components. However, the cross-correlations shown in Fig. 10 suggest that the speed/escribed volume correlation is more significant than the lift/escribed volume correlation.

The auto-correlations for the preparation equipment showed quite distinct oscillations as indicated in Table VI. The correlations for the combined power to the knives and the shredder in run 8/1968 are shown in Fig. 11. The form of these curves was typical of those for the preparation equipment. Both the knives and the shredder showed approximately the same period of 2.6 to 2.8 minutes which was very close to twice the period of tipping of a truck of cane.

2.8 minutes which was very close to twice the period of tipping of a truck of cane.

### Time delay estimates

The cross-correlation functions produced from the Fourier smoothed data could be used to estimate some time delays in the crushing train behaviour. Table VII lists time delays so obtained.

Not all the cross-correlations contained definite maximum values from which the time delays could be estimated. This was particularly true of correlations involving

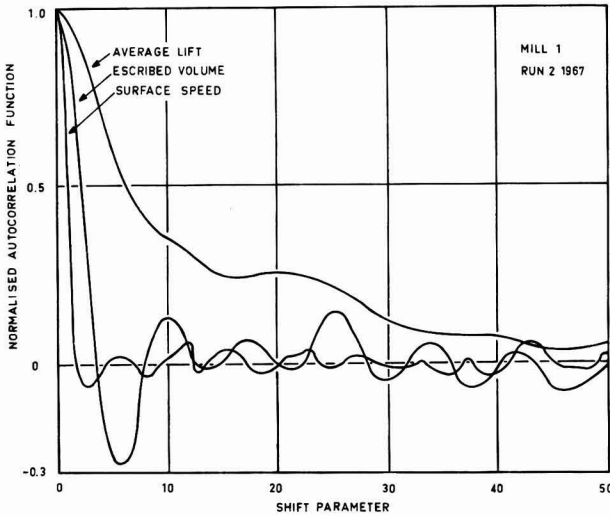


Fig. 7. Speed, lift and escribed volume auto-correlations—Mill 1

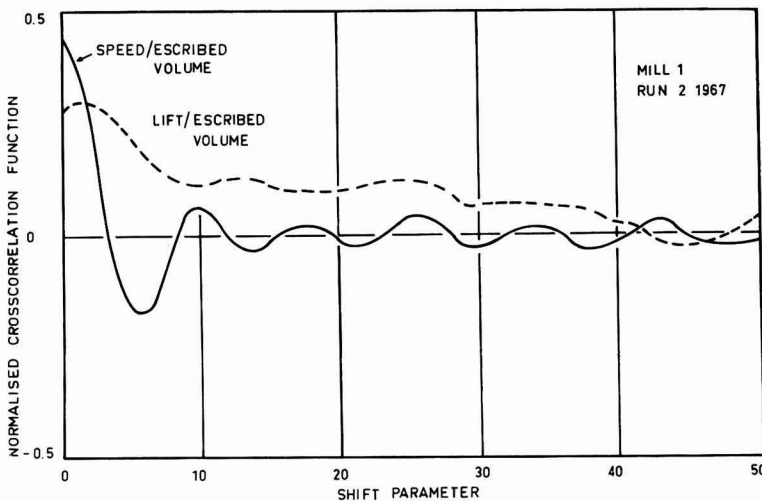


Fig. 8. Speed, lift and escribed volume cross-correlation—Mill 1

combined knife power. Since the power to the top and bottom knives could not be measured separately, the recorded data were confounded by the interaction of the two sets of knives. Fig. 12 shows the significant cross-correlations obtained. Plot A shows a clear maximum for run 10 at 14 shift units and a less distinct maximum for run 15 at 16 shift units while Plot B has a group of runs with maxima averaging 3.3 shift units. The occurrence of these two distinct time delays is explained as either the top or bottom set of knives contributing most to the recorded power for a given experiment. In Plot A, the bottom knives are using the major share of power and the computed delay is from the bottom knives to the shredder. In Plot B the delay recorded is from the top knives to the shredder. Run 15 in Plot A shows a peak close to the delay computed in Plot B while all curves in Plot B show secondary peaks corresponding to the delay in Plot A. From the geometry of the preparation equipment and its operating speed, time delays of 3.8 and 0.9 minutes are feasible. In runs that had indefinite forms in the cross-correlation function, both the top and bottom knives should have contributed the major power at different times in the run so that no maximum existed in the cross-correlation.

Fig. 13 shows the cross-correlations used to estimate the delay from shredder to the delivery opening of

the first mill in the crushing train. These curves agree well in form and position of maximum value. The elevator from shredder to feed hopper for the first mill was 17.4 metres long and moved at an average

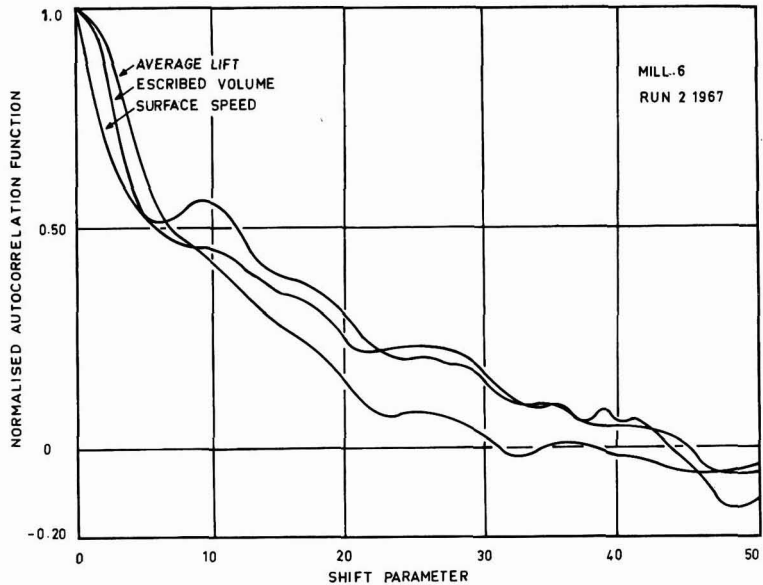


Fig. 9. Speed, lift and escribed volume auto-correlations—Mill 6

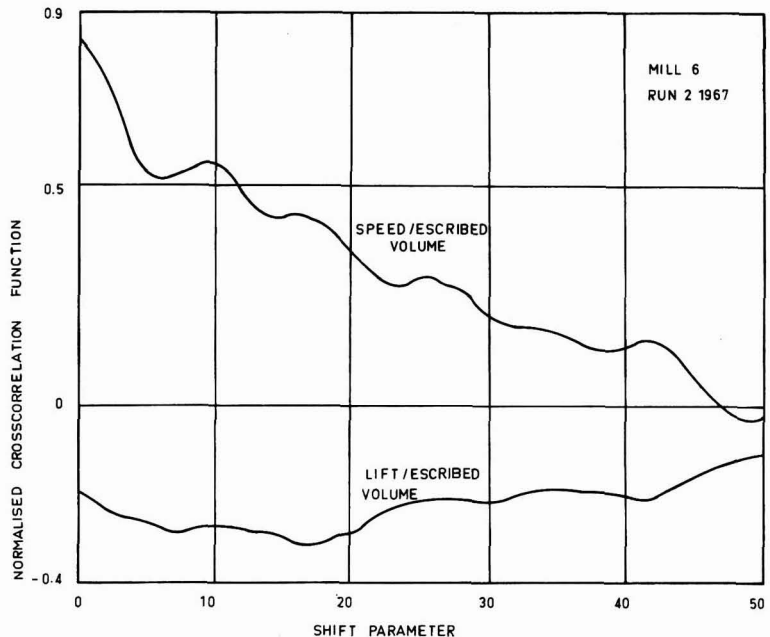


Fig. 10. Speed, lift and escribed volume cross-correlation—Mill 6



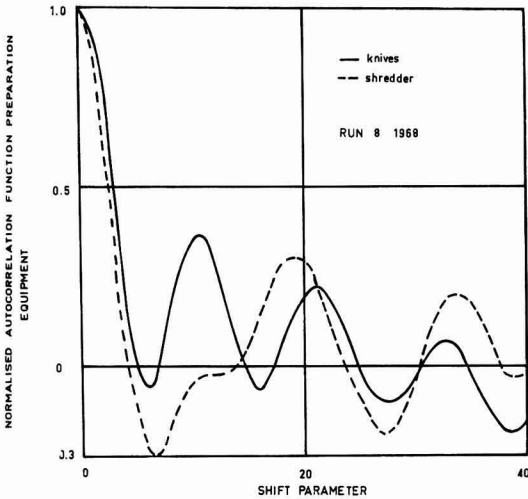


Fig. 11. Preparation equipment correlations

speed of approximately 15.2 m/min. Allowing one minute residence in the feed hopper, the time delay of 2:1 minutes from shredder to delivery of mill 1 is acceptable.

Table VI. Periods observed in auto-correlation functions for preparation equipment

1968 Run number	Auto-correlation period, minutes	
	Knives	Shredder
5	2.5	2.75
8	3.0	3.75
9	2.75	2.25
10	2.25	3.75
12	2.25	2.25
13	2.25	2.50
15	3.75	2.50
Mean	2.67	2.82

Table VII. Time delay estimates

Delay between	Delay in minutes	
	1967	1968
Knives and shredder: min. . .	—	0.9
max. . .	—	3.8
Shredder and Mill 1 . . . . .	—	2.1
Mill 1 and Mill 2 . . . . .	2.5 (3.0)	2.0 (1.2)
Mill 1 and Mill 6 . . . . .	9.8 (11.0)	7.0 (7.6)
Feed and Delivery Mill 6 . . . .	0	0

- NOTE: (1) Delays in brackets determined by dye tests.  
 (2) No tests were performed on preparation equipment in 1967.  
 (3) Combined power was recorded for top and bottom knives.

The cross-correlations of the juice flows from mills 1 and 2 showed very definite and repeatable (in 1968) time delays as shown in Figs. 14 and 15. Run 2/1967 with a maximum number of data points (1150) was the only significant cross-correlation in the first year's experiments. However, the cross-correlations for the 1968 season show remarkably similar form and give a very good estimate of the time delay between juice expressed in the first mill and juice expressed

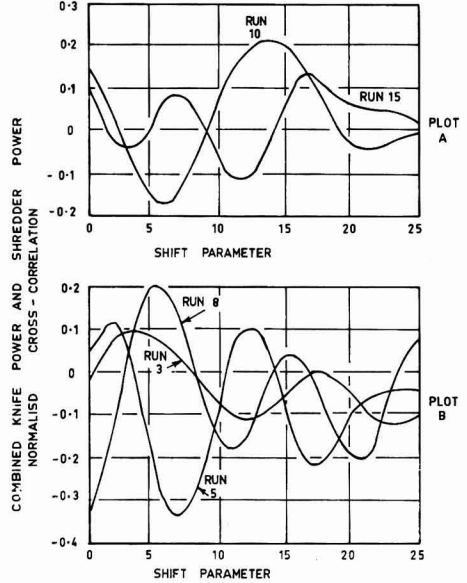


Fig. 12. Estimation of time delay from knives to shredder

Run No.	Time delay Plot A		Time delay Plot B	
	Shift Units	Minutes	Shift Units	Minutes
10	14	3.50		
15	16	4.00		
3			3	0.75
5			2	0.50
8			5	1.25
Average		3.8		0.9

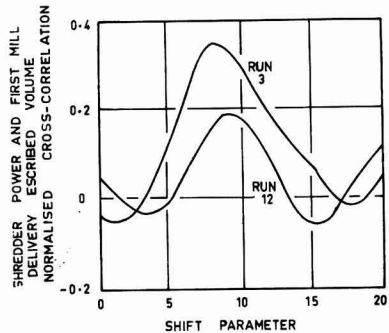


Fig. 13. Estimation of time delay from shredder to first mill

Run No.	Time delay	
	Shift units	Minutes
3	8	2.00
12	9	2.25
Average		2.1

in the second mill. Allowing for the time for the expressed juice to drain into the pump sump and be recorded by the venturi flowmeter (0.75 minutes as determined from the cross-correlations in Fig. 16), the 1968 estimate of the delay between first and second mills would be 1.25 minutes compared with 1.0 and 1.4 minutes (average 1.2) from the dye tests.

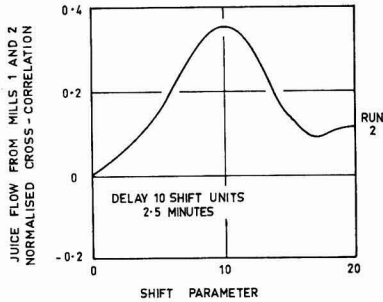


Fig. 14. Estimation of time delay between Mill 1 and Mill 2 for 1967 tests

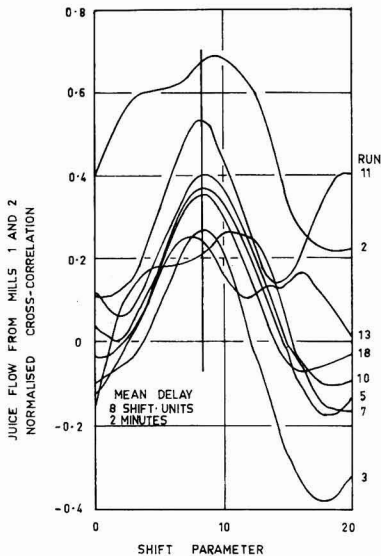


Fig. 15. Estimation of time delay between Mill 1 and Mill 2 for 1968 tests

The cross-correlation of the recorded escribed volumes gives two time-delay estimates. By correlating the delivery escribed volumes from the first and sixth mills, an estimate of the total delay in the bagasse stream from first to last mill can be determined. Run 3/1968 and Run 4/1967 shown in Fig. 17 give estimates of this delay as 6.3 and 9.8 minutes, respectively. In the 1968 crushing season the crushing rate (and mill speed for substantially the same settings and hydraulic pressures) was higher. The second

estimate from escribed volume correlation is that of the time delay within a single mill in the crushing train. Fig. 18 shows clearly that the feed and delivery escribed volumes cross-correlate well at zero shift and the correlation rapidly decreases for increasing shifts. In other words, the time delay within a mill is small enough to neglect in this study. From the geometry of a mill and typical roller surface speed (say 12.2 m/min) the time for the bagasse to move from feed opening to delivery opening is approximately four seconds. Using a sampling period of 15 seconds, time delays of this magnitude cannot be resolved.

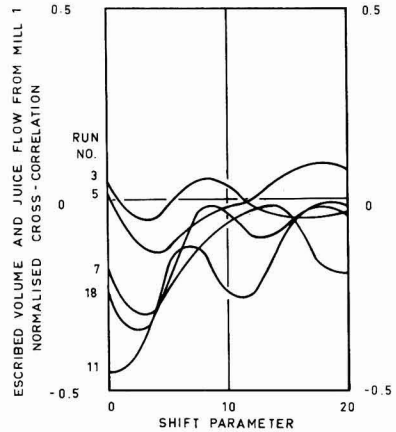


Fig. 16. Estimation of drain-down time within a single mill

Run No.	Time delay, shift units
3/1967	3.5
5/1968	4.0
7/1968	3.5
11/1968	1.5
18/1968	2.5
Average	3.0 (0.75 min)

Another estimate of the delay between first and last mills in the crushing train can be obtained from the cross-correlation of the flow of outside imbibition (variable 13) and the flow of expressed juice (variable 11) from the second mill. The order in which the individual time delays are encountered is different from that for the escribed volumes where the order was 1 to 2, 2 to 3, 3 to 4, 4 to 5, 5 to 6. In this latest correlation the order is 5 to 6, 4 to 5, 3 to 4, 2 to 3 and 1 to 2. Fig. 17 shows two typical cross-correlations for variables 13 and 11. These flow correlations showed a much more consistent pattern in correlation than the escribed volume correlations.

Fig. 19 gives another estimate of the delay between first and last mill. In this figure the average lifts of the top and delivery rollers of the first and last mills are correlated. This correlation does not consider the effect of mill speed as does the escribed volume correlation. For the average lift correlation to be

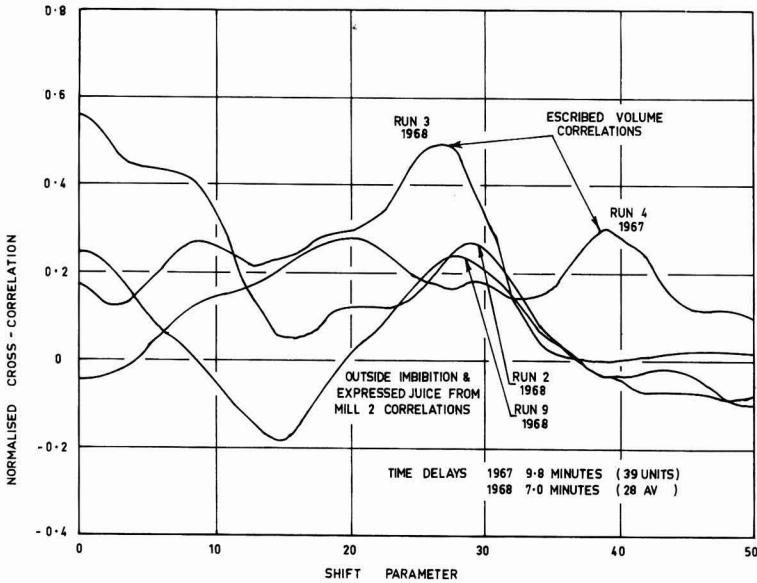


Fig. 17. Estimation of time delay between Mill 1 and Mill 6 using escribed volumes and flows

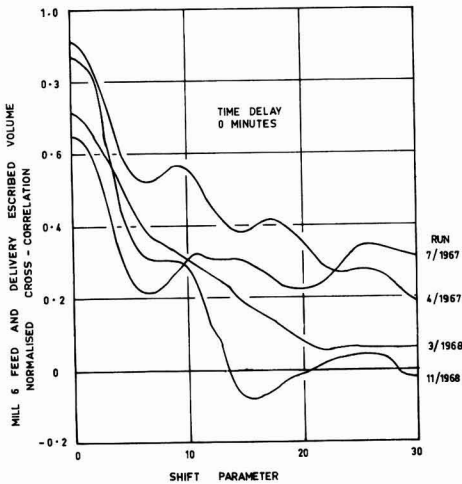


Fig. 18. Estimation of time delay within a single mill

meaningful, the speed of the mills should be assumed constant. None of the other average lift cross-correlations showed any reasonable peak.

*Conclusions*

The results of this investigation indicate the frequencies and time delays that could be expected in a typical sugar mill crushing train. The estimations of time delays by cross-correlations gave more precise

results than could be obtained from dye tests simply because there are hundreds of data points in a cross-correlation estimate. However, for practical purposes the dye estimate may be preferred because of the ease with which it can be performed.

The auto-correlation functions could be used to determine the predominant frequencies in a data record even though the record may be only weakly stationary. The supply of prepared cane to the crushing train appeared to have a weak periodic component as indicated by both the knife and shredder correlations. The escribed volume data showed a similar periodicity at the first mill but at the final mill no periodicity was apparent. The major variations in the mixed juice flow were attributable to the fluctuations in the first mill expressed juice flowrate since its coefficient of variation was approximately twice that for the second mill and both first and second mill mean expressed juice flowrates were approximately equal. The second mill expressed juice flowrate showed a characteristic period for steady outside imbibition flow.

Deliberate perturbations in the outside imbibition flowrate over a reasonable range did not cause the second mill expressed juice flowrate to exhibit any tendency towards instability. The damping effect of the counter-current recirculation system is very large and probably eliminated any tendency towards instability.

*Acknowledgments*

The author wishes to express his appreciation to Dr. C. R. MURRY of the Sugar Research Institute for



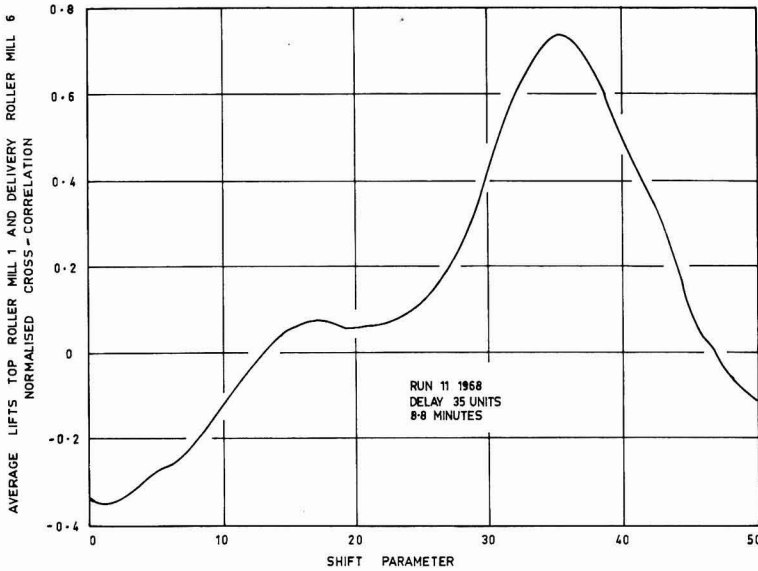


Fig. 19. Estimation of time delay between Mill 1 and Mill 6 using average lifts

his helpful discussions. The Australian Research Grants Committee has provided some financial support for this project.

APPENDIX  
CORRELATION FUNCTIONS

The auto-correlation function of random data describes the general dependence of the values of the data at one time on the values at another time. Consider a continuous time history record  $x(t)$ . An estimate for the auto-correlation between the values of  $x(t)$  at times  $t$  and  $t + \tau$  as shown in Fig. 20 may be obtained by taking the product of the two values and averaging over the observation time  $T$ . The resulting average product approaches the exact auto-correlation function as  $T$  approaches infinity or:

$$R_{xx}(\tau) = \lim_{T \rightarrow \infty} \frac{1}{T} \int_0^T x(t) x(t + \tau) dt \dots \dots \dots (2)$$

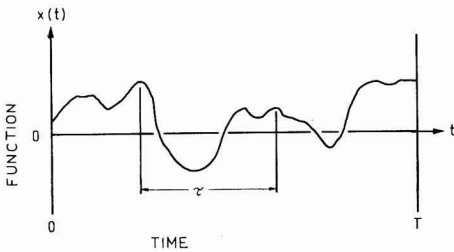


Fig. 20. A data record as a function of time

The quantity  $R_{xx}(\tau)$  is always a real-valued, even function with a maximum at  $\tau = 0$ , and may be either positive or negative.

For a digital (sampled) data function of  $N$  values equally spaced in time and expressed as  $x_n$  ( $n = 1, 2, \dots, N$ ) with zero mean value, the auto-correlation function at the displacement  $rh$  (where  $h$  is the sampling interval) is given as:

$$R_{xx}(rh) = \frac{1}{N} \sum_{n=1}^{N-r} x_n x_{n+r} \dots \dots \dots (3)$$

where  $r = 0, 1, 2, \dots, m$

Equation 3 is only a convenient form of the continuous equation 2 but gives a biased estimate for the auto-correlation function. However, for  $N$  large and  $m$  small with respect to  $N$ , equation 3 gives values that differ very little from those obtained from equation 2. In these studies,  $N$  was as large as 1200 with  $m$  only as large as 60.

For cross-correlation functions between two variables,  $x$  and  $y$ , equation 3 becomes:

$$R_{xy}(rh) = \frac{1}{N} \sum_{n=1}^{N-r} x_n y_{n+r} \dots \dots \dots (4)$$

where  $r = 0, 1, 2, \dots, m$

Equation 4 formed the basis for the cross correlations developed in this paper.

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Ventilated. Comfort seat. Extra large windows for max. visibility. Only SIX levers to operate.

### HYDRAULICS

Fully hydrostatic ground drive. Fully hydrostatic steering. Hydraulic lifting system for cutterhead. Hydraulic cross elevator drive. Hydraulic axial-type cleaning fan.

### CLEANING SYSTEM

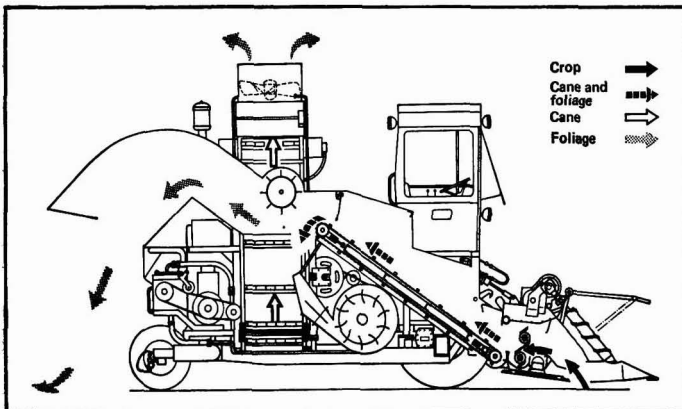
Double base cutter throw out. Perforated extra wide main elevator 1400 mm – 56". Twin-type main cleaning fan. Perforated unloading elevator. Axial-type cleaning fan.



Development of this new harvester for GREEN and burnt cane began in the early 60's and serial production started 1970. The machine began its conquest of the world's sugar cane fields in Middle and South America by proving

1. its high capacity – up to 60 t/h,
2. its minimal amount of trash, never reached by others, and
3. its easy operation and lowest operating and maintenance costs.

The big 190 HP MERCEDES engine, the heavy duty hydrostatic drive, the heavy duty frame and special low pressure tyres ensure operation under all field conditions. Do you want to reduce your production costs? This is your cane harvester – a German quality product from one of the three biggest manufacturers of combine harvesters in the world. Do contact us!



# Chemical control of parasitic nematodes in sugar cane

By KISHAN SINGH and S. R. MISRA

(Indian Institute of Sugarcane Research, Lucknow, India)

## PART II

Subsequent to application of nematicide the population of plant parasitic nematodes decreased considerably in both cases. However, it appears that those nematodes which escaped fumigation multiplied very fast and within 4-5 months their populations were again as high as in the untreated plots (Fig. 2). The population of nematodes in the inter-row spaces was very low as compared with the planted rows of the untreated strip-tilled plot. In the treated plot, this trend was in conformity with the observations made above after about 4 months of treatment (Fig. 2).

### Nematode control in staggered row planting

In the next experiment, planting of sugar cane by the conventional method, preceded by nematicide application, was compared with planting of paired

rows of sugar cane preceded by application of DD. The following were the various treatments:

(i) *Conventional planting*: In one sub-treatment DD was applied overall at the rate of 400 litres per hectare and in another it was injected in rows spaced 90 cm by a hand injector at the rate of 135 litres per hectare.

(ii) *Staggered-row planting*: The preparation of the experimental plots was done as in the previous case. After preparation, lines were marked out in pairs. The distance between the two rows was 30 cm and the distance between pairs of rows was kept at 150 cm. DD was applied in one treatment along these lines at the rate of 135 litres per hectare and in the other treatment in the middle of the two lines at the rate of 68 litres per hectare by a hand injector. These were compared with non-fumigated control plots.

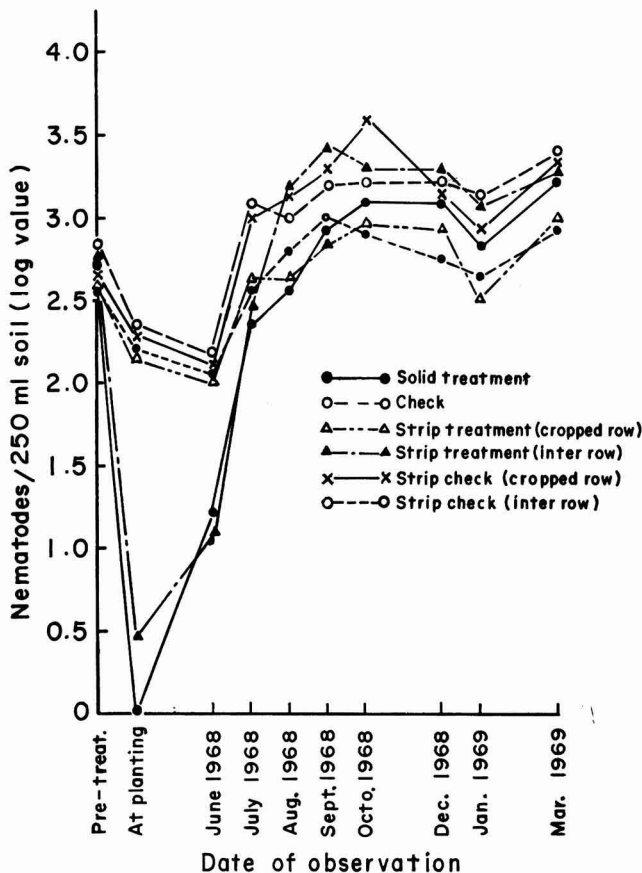


Fig. 2. Effect of DD on nematode population

The results obtained from the experiment (Table IV) indicate that there was an increase in the number of millable canes and yield of cane in all the plots treated with DD. The greatest increase in yield (20.2%) was recorded with overall application of DD and conventional planting. The increase in yield of sugar cane was smallest (8.8%) in the plots treated with DD at the rate of only 68 litres per hectare. These differences were statistically significant.

So far as control of nematodes was concerned, the maximum kill was obtained in the overall treated plots followed by row treatments (Fig. 3). As observed in the experiment 3, here too the build up of the left-over nematodes was very rapid and their populations reached almost the level of those present in the untreated plots within 5-6 months.

## DISCUSSION

Since cane is planted in rows about 90 cm apart, and during the first 3-4 months up to the monsoon the plants make very little growth, presumably the extensive preparation of the soil confers very little benefit on the plant. On the other hand, this tilling and the spread of irrigation water into the inter-spaces would encourage the development of lateral roots and would also promote the development of weeds, rather than the deep vertical roots which are vital to the plant during the drought period. Perhaps the tillage requirements of the sugar cane crop would be fully met if a narrow strip along the row where cane



setts are actually planted were tilled to a depth of about 20 cm. The distribution pattern of plant parasitic nematodes in the tilled strips and the untilled inter-spaces has been reported above. Here, the population of plant parasitic nematodes in the untilled inter-spaces was much lower than that in the tilled strips where the cane was planted. The distribution of nematodes when viewed in the light of observations made in the first experiment and rooting pattern in strip-tilled and conventional methods of planting as reported by MENON<sup>1</sup> fits into an expected pattern. This shows that in the strip-tiling method of planting, as the roots are restricted to a narrow linear strip, so are the nematodes restricted thereto. This indicated a possibility of reducing the amount of nematicide and thereby reducing the cost of the treatment.

This was confirmed in the third experiment when the amount of nematicide applied was reduced to one-third of that required for the conventional overall treatment. It would appear that the returns in terms of yield per unit of nematicide are higher than those with the overall application.

The same information was put to more practical use in the case of companion or inter-cropping of sugar cane where it is planted in pairs of rows 30 cm apart, the distance between two pairs being 150 cm. The nematicide can be safely applied only in the rows where the cane is to be planted without much loss in yield. The staggered-row planting of sugar cane has also been found helpful in growing an inter-crop such as sugar beet, wheat, etc., along with the cane<sup>7</sup> in addition to the possibility of reducing the expenditure on nematicide.

The above studies indicate that the increased yield can be obtained with strip application of the nematicides either in staggered planting or in regular planting. Further work is required to improve the efficiency of strip application.

Summary

In a set of four experiments data have been gathered to indicate the possibility of economizing on the quantity of nematicides for the control of nematodes affecting sugar cane. Distribution of nematodes as affected by spread of the roots, has been studied in two planes indicating heaviest nematode population in the feeder root zones. Strip tillage for cultivation

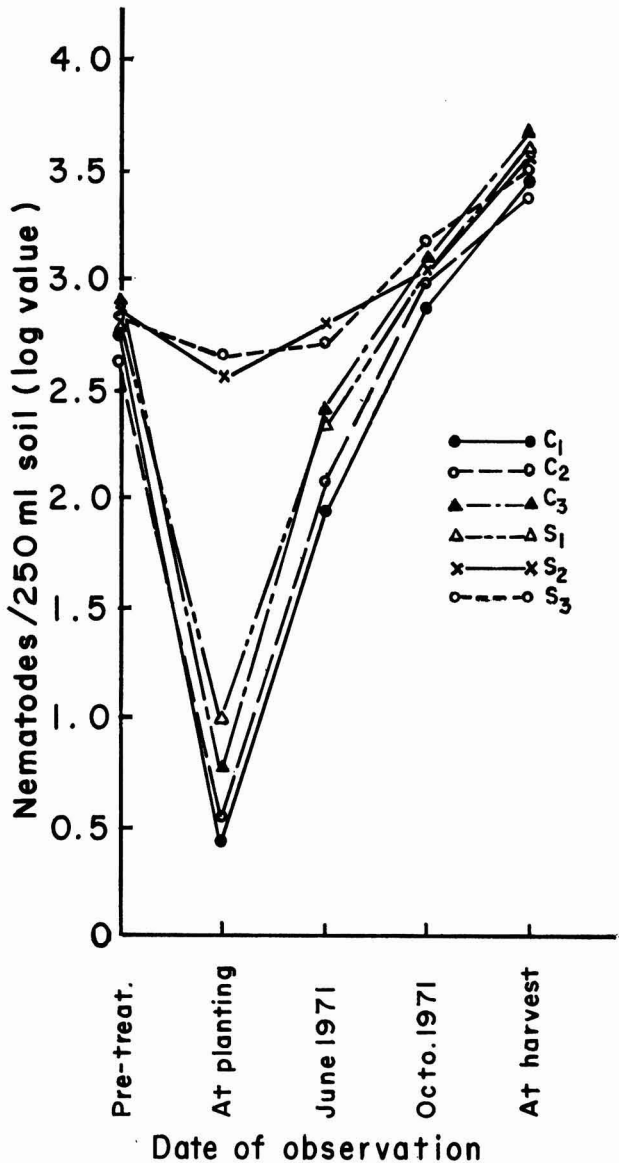


Fig. 3. Effect of DD on nematode population

offers maximum returns per unit of nematicide applied. Nematode control has been studied in the staggered-row method of cultivation. This method, suitable for companion cropping with cane, has helped to achieve appreciable increases in yields with smaller amounts of nematicides as compared with conventional overall treatment.

<sup>7</sup> SINGH: *Indian Sugar*, 1971, 20, 203.

Table IV. Effect of preplant treatment of DD on growth and yield of sugar cane

Randomized block design; 4 replications; plot size 54 m<sup>2</sup>, treatment applied on 9th March 1971; cane planted on 25th March 1971, harvested on 10th January 1972; variety Co 1158

Treatment	Germination %	No. of millable canes (thousand/ha)	Yield (t/ha)	Increase in yield over control, %
<i>Conventional planting</i>				
Application: overall (C1)	65.4	97.95	69.29	20.2
Application: row (C2)	62.0	92.18	61.38	9.9
No nematicide (C3)	55.4	89.30	55.25	—
<i>Staggered-row planting</i>				
Application: both lines of pair (S1)	56.5	82.55	56.87	11.6
In the middle of pair (S2)	58.9	78.98	54.07	8.8
No nematicide (S3)	53.4	77.50	49.26	—
S.E.		± 4.58	± 2.20	
C.D.		13.80*	6.63***	

\* significant at 5% level; \*\*\* significant at 0.1% level.

## The potential of a screw press tandem

By S. G. SMART, A.R.C.S.T., A.R.I.C.

IN an earlier paper<sup>1</sup> it was suggested that a tandem of screw presses could successfully replace a train of mills for the extraction of sugar from cane. A scheme is developed below for the use of a three-press tandem employing compound maceration with addition of 30% water added on cane. It is proposed that 10% of water on cane be added to bagasse fed to the second press and 20% on cane to bagasse fed to the third unit. Juice from the second press is added to the prepared cane fed to the first press, juice from which is sent to process. Juice from the third press is added, with the 10% maceration water, to the feed to the second press. Cush-cush need only be separated from the process juice and added to the feed to the second press; the avoidance of other separations thus simplifies plant layout.

### Mixing efficiency

In practically all press installations the plant includes a mixing bin or screw conveyor system where the added water is intimately mixed with bagasse before feeding to the press. Based on actual measurements communicated privately to the author, the mixing efficiency achieved is calculated below; these calculations are based on Brix rather than pol since sucrose is subject to inversion whereas Brix does not alter unless complete destruction occurs.

A further step in these calculations is the comparison between observed and calculated sucrose in bagasse; the differences between these is difficult to explain if one accepts the complete accuracy of the analytical data, and it is strongly recommended that both cane and bagasse should be analysed for sucrose, fibre and moisture to provide sufficient information for a good accounting system since it is not sufficient to know only sucrose and moisture in final bagasse.

Laboratory data employed for a typical calculation are as follows:

<i>Last mill bagasse:</i>	Bagasse % cane	23.68%
	Pol content	3.45%
	Moisture content	54.33%
	Brix content (calc. from pol content and purity of last mill juice = 76.84)	4.49%
	Fibre content (100 — Brix — Moisture)	41.18%
<i>Press bagasse:</i>	Pol content	2.70%
	Moisture content	53.45%
<i>Press juice:</i>	Brix	4.83%
	Pol content	3.46%
<i>Maceration:</i>	% cane	6.2%
	% bagasse	26.182%

The press feed, i.e. last mill bagasse plus maceration, will comprise, per 100 parts of bagasse by weight:

Fibre	41.180
Solids	4.490
Water	54.330 + 26.182 = 80.512
	<hr/> 126.182

Since the moisture content of the press bagasse is 53.45%, the amount of water extracted by the press ( $Y$ ) may be calculated by the following formula<sup>1</sup>, assuming a mixing efficiency of 100%:

$$\frac{80.512(80.512 - Y)}{80.512 \times 126.182 - Y(80.512 + 4.490)} = 0.5345$$

from which  $Y = 29.993$

$$\text{Thus, solids extracted} = (29.993 \times 4.49) / 80.512 = 1.673$$

$$\text{and pol extracted} = (29.993 \times 3.45) / 80.512 = 1.285$$

$$\text{The Brix of the press juice} = 1.673 / (1.673 + 29.993) = 5.283$$

$$\text{and pol of the press juice} = 1.285 / (1.673 + 29.993) = 4.058$$

<sup>1</sup> I.S.J., 1969, 71, 356-358.

Table I

Last mill bagasse

Bg%C	23.68	25.59	25.53	23.85	24.09	26.05	24.59	27.18	24.70	25.57	25.24	23.92	29.73	25.64	22.10	24.39	27.26	25.69	26.44	28.66
P%MB	3.45	3.54	3.45	3.52	2.92	3.40	3.22	3.29	3.36	3.59	3.43	3.38	3.31	3.21	3.04	3.14	3.40	3.33	3.49	3.20
M%MB	54.33	54.42	54.75	54.50	55.33	55.00	55.17	54.67	54.42	55.33	54.58	54.92	56.70	57.17	57.25	57.75	57.50	56.75	57.33	
LMJ Py	76.84	76.64	77.76	78.21	75.70	75.60	74.36	75.62	74.92	74.35	75.67	75.14	75.62	74.68	74.13	75.27	76.29	74.44	75.79	74.65
Bx%MB	4.49	4.62	4.44	4.50	3.86	4.50	4.33	4.35	4.48	4.83	4.53	4.50	4.38	4.30	4.10	4.17	4.46	4.47	4.60	4.29
F%C	9.75	10.48	10.42	9.78	9.83	10.55	9.96	11.14	10.15	10.42	10.13	9.79	12.10	10.00	8.56	9.41	10.30	9.77	10.22	11.00

Maceration

AW%C	6.20	7.21	7.10	6.99	7.34	6.46	8.08	6.41	6.90	7.49	7.43	7.42	7.80	10.60	8.39	7.30	7.60	8.05	6.98	9.91
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Press juice

Pol	3.46	3.28	3.37	3.66	3.28	3.40	3.20	3.38	3.47	3.99	3.84	3.31	3.24	2.88	2.58	3.22	3.33	2.82	3.59	3.26
Brix	4.83	4.45	4.50	4.93	4.63	4.60	4.56	4.67	4.80	5.52	5.35	4.68	4.45	4.18	3.73	4.33	4.83	4.08	4.95	4.57

Press bagasse

M%PB	53.45	51.92	51.42	50.64	51.60	49.25	52.90	51.43	50.67	51.50	52.59	51.25	51.67	54.50	56.17	57.17	55.67	54.63	54.75	53.08
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Mixing Efficiency

Pol B	85.2	81.0	84.9	91.8	100.7	84.3	91.8	84.8	89.7	98.4	99.9	88.2	83.7	91.8	84.2	93.7	88.2	79.0	90.3	98.0
Brix B	91.4	84.0	88.2	96.7	107.5	86.2	97.2	88.7	93.0	101.2	105.4	93.7	86.9	99.5	90.3	94.9	97.6	85.2	94.4	102.5

KEY: Bg%C = Bagasse % Cane, P%MB = Pol % Mill bagasse, M%MB = Moisture % Mill bagasse, LMJ Py = Last Mill juice purity, Bx%MB = Brix % Mill bagasse, F%C = Fibre % Cane, AW%C = Added water % Cane, M%PB = Moisture % Press bagasse, Pol B = On Pol basis, Brix B = On Brix basis.

The composition of the press bagasse on the basis of this calculation for 100% mixing efficiency is, per 100 parts by weight of last mill bagasse:

Fibre	41.180
Solids (4.490 — 1.673)	2.817
Water (80.512 — 29.993)	50.519
	<hr/>
	94.516

This composition, brought to a % basis is:

Fibre	43.57%
Solids	2.98%
Water	53.45%

and similar calculation for pol gives a content of 2.291%.

Since the measured Brix and pol of press juice were 4.83 and 3.46%, respectively, the mixing efficiency on a Brix basis is  $4.83/5.283 \times 100\% = 91.425\%$ , while on a pol basis the mixing efficiency is  $3.45/4.058 \times 100\% = 85.260\%$ . Similar calculations have been made from data obtained with a screw press installation added to an existing mill tandem and are given in Table I.

Taking the Brix-based mixing efficiency, for the reason given above, we may calculate that the solids extracted in the press, per 100 parts by weight of mill bagasse, are not 1.673 but  $1.673 \times 0.91425 = 1.5295$  and pol extracted is  $1.285 \times 0.91425 = 1.1748$ . Thus the press bagasse composition is readjusted to

Fibre	41.1800
Solids	2.9605
(Pol)	2.2752
Water	50.5190 + X
	<hr/>
	94.6595 + X

where X is a correction factor determined from the equation

$$\frac{50.5190 + X}{94.6595 + X} = 0.5345$$

from which  $X = 0.1471$ , bringing the press bagasse moisture to 50.6661 parts per 100 parts of mill bagasse, and total press bagasse weight to 94.8066. This, brought to a percentage basis, gives a press bagasse composition of

Fibre	43.436%
Solids	3.123%
(Pol)	2.40%
Water	53.441%

The measured pol in press bagasse was 2.70% instead of 2.40%; since fibre and Brix content of the press bagasse were not reported it is not possible to check the calculated figures (which should be more reliable) against measured values.

It is possible to back-calculate to the pol and Brix content of the original press feed, as follows:

For 100 parts of last mill bagasse:

$$\begin{aligned} \text{Weight of press feed} &= 126.1820 \text{ parts} \\ \text{Weight of press bagasse} &= 94.8066 \end{aligned}$$

$$\therefore \text{Weight of press juice} = 31.3754$$

$$\begin{aligned} \text{Weight of pol in press juice} &= \\ &31.3754 \times 0.0346 = 1.0856 \end{aligned}$$

$$\begin{aligned} \text{Weight of pol in press bagasse} &= \\ &94.8066 \times 0.027^* = 2.5598 \end{aligned}$$

$$\therefore \text{Total pol in press feed} = 3.6454 \text{ parts}$$

\* Assuming that the measured pol in bagasse was accurate.

This compares with the measured pol in last mill bagasse of 3.45 parts.

Calculation on Brix values is more in accord with measured values:

For 100 parts of last mill bagasse

$$\begin{aligned} \text{Weight of Brix in press bagasse} &= \\ &= 94.8066 \times 0.03123 = 2.9608 \text{ parts} \end{aligned}$$

$$\begin{aligned} \text{Weight of Brix in press juice} &= \\ &= 31.3754 \times 0.0485 = 1.5217 \text{ parts} \end{aligned}$$

$$\therefore \text{Weight of Brix in press feed} = 4.4825 \text{ parts}$$

which corresponds to the original value given above of 4.49 parts.

Analytical data assembled in Table I were obtained on consecutive operational days with a screw press. As may be seen, the mixing efficiencies, calculated on a Brix basis, varied between 84% and 107.5%. Obviously, efficiencies of over 100% result from errors in analytical or process data and, in fact, in one instance it was found that the water meter had been reading incorrectly, although it was subsequently put into order. There is no doubt that improved methods of measurement of maceration water, coupled with improved analytical techniques, would give improved data for control purposes. Nevertheless, on the basis of the efficiencies calculated in Table I, the writer believes it is justifiable to take, for convenience in calculation, a figure of 95% as representing the typical level of mixing efficiency which is to be expected from a screw press operating on bagasse or prepared cane.

*Calculations for a three-press tandem*

To make the calculations required, we start with a cane of assumed composition: 15% fibre, 16% solids and 69% water content. We assume also that the bagasse from the press will have a moisture content of 48%, a figure which is easily attained by press installations under normal factory conditions.

Thus, using the same method of calculation as above for  $Y_1$ , the water extracted in the first press at 100% mixing efficiency, we have:

$$\frac{69(69 - Y_1)}{6900 - 85Y_1} = 0.48$$

from which  $Y_1 = 51.383$

Solids extracted at 100% efficiency would be

$$51.383 \times 16/69$$

$$\text{and at 95\% efficiency } 0.95 \times 51.383 \times 16/69 = 11.3192$$

Thus the first press bagasse comprises

Fibre	15.0000
Solids	4.6808
Water	17.6170 + $X_1$
Total	37.2978 + $X_1$

where  $X_1$  is a correction factor for  $Y_1$  to allow for the fact that the latter was calculated at 100% mixing efficiency instead of 95%.

$X_1$  is evaluated from the equation

$$\frac{17.6170 + X_1}{37.2978 + X_1} = 0.48$$

from which  $X_1 = 0.5498$ , and the first press bagasse comprises:

Fibre	15.0000
Solids	4.6808
Water	18.1668

To this is added 10 parts of maceration water per 100 parts of cane, giving

Fibre	15.0000
Solids	4.6808
Water	28.1668
	47.8476

During a second pressing to 48% moisture content,  $Y_2$  parts of water would be expressed, calculated as before:

$$\frac{28.1668(28.1668 - Y_2)}{28.1668 \times 47.8476 - Y_2(28.1668 + 4.6808)} = 0.48$$

Solving this,  $Y_2 = 11.8118$ , so that solids extracted on a 95% mixing efficiency basis =  $0.95 \times 11.8118 \times 4.6808/28.1668 = 1.8648$  parts

Thus the second press bagasse composition is given by

Fibre	15.0000
Solids	2.8160
Water	16.3550 + $X_2$
	34.1710 + $X_2$

where  $X_2$  is the correction to allow for 95% mixing efficiency.

$X_2$ , calculated as for  $X_1$  above = 0.0906, giving a corrected second bagasse composition

Fibre	15.0000
Solids	2.8160
Water	16.4456
	34.2616

To this is added 20 parts of maceration water per 100 tons of cane and the whole subjected to a third pressing. By similar calculations to those above, the water extracted in the third press  $Y_3 = 21.5361$  parts, containing 1.5808 parts of extracted solids, and giving a final bagasse of composition

Fibre	15.0000
Solids	1.2352
Water	14.9095 + $X_3$

or, after calculation of  $X_3$ , Water 14.9864

Extraction with the simple maceration process above is given by  $(16.0000 - 1.2352)/16.0000 = 92.28\%$ .

*Effects of compound maceration*

In the first maceration cycle, the first press feed comprises the prepared cane plus 2nd press juice and will have the composition

Fibre	15.0000	= 15.0000
Solids	16.0000 + 1.8648	= 17.8648
Water	69.0000 + 11.8118	= 80.8118
	113.6766	

From this feed, to give a bagasse of 48% moisture content, the water extracted,  $Y_1'$ , is calculated as before and is evaluated as 63.4158. The solids extracted at 95% mixing efficiency becomes 13.3182, and the correction to  $Y_1'$  produces a 1st press bagasse of composition



*The potential of a screw press tandem*

Fibre	15-000
Solids	4-5466
Water	18-0429

and a juice comprising

Solids	13-3182
Water	63-4158

To this bagasse is added 10 parts of maceration water and the 3rd press juice giving a second press feed of

Fibre	15-0000	= 15-0000
Solids	4-5466 + 1-5808	= 6-1274
Water	18-0429 + 21-5361 + 10	= 49-5790
		<hr/>
		70-7064

Calculating as above we obtain  $Y_2' = 33-9499$

Solids extracted = 3-9860

and a 2nd press bagasse having a corrected composition

Fibre	15-0000
Solids	2-1414
Water	15-8228
	<hr/>
	32-9642

with a 2nd press juice comprising

Solids	3-9860
Water	33-9499

The feed to the third press comprises the second press bagasse plus 20 tons of maceration water, i.e.

Fibre	15-0000
Solids	2-1414
Water	35-8228
	<hr/>
	52-9642

The water extracted  $Y_3' = 21-1680$  and

solids extracted = 1-2021,

giving a final bagasse with a corrected composition

Fibre	15-0000
Solids	0-9393
Water	14-7133

and a 3rd press juice comprising:

Solids	1-2021
Water	21-1680

Thus, on the first compound maceration cycle, overall extraction =  $(16-0000 - 0-9393)/16-0000$

$$= 94-13\%$$

On the 2nd maceration cycle, the first press juice added to the prepared cane is of the composition obtained from the calculation for the 1st maceration cycle; thus the feed to the first press comprises:

Fibre	15-0000	= 15-0000
Solids	16-0000 + 3-9860	= 19-9860
Water	69-0000 + 33-9499	= 102-9499
		<hr/>
		137-9359

Using similar calculations to those before, the water extracted at 100% mixing efficiency is  $Y_1'' = 86-0807$  parts per 100 of cane

Solids extracted at 95% mixing efficiency = 15-8756 parts and the corrected composition of the first press bagasse is

Fibre	15-0000
Solids	4-1104
Water	17-6404

and that of first press juice

Solids	15-8756
Water	86-0807

The feed to the second press is thus composed of

Fibre	15-0000	= 15-0000
Solids	4-1104 + 1-2021	= 5-3125
Water	17-6404 + 21-1680 + 10	= 48-8084
		<hr/>
		69-1209

Water extracted in the second press ( $Y_2'' = 33-4157$ ) and solids extracted at 95% efficiency = 3-4552. Hence, by calculation the corrected composition of the second press bagasse is

Fibre	15-0000
Solids	1-8573
Water	15-5606

and that of the second press juice is

Solids	3-4552
Water	33-4157

The third press feed comprises the second press bagasse to which has been added 20 parts of maceration water per 100 parts of cane, i.e.

Fibre	15-0000	= 15-0000
Solids	1-8573	= 1-8573
Water	15-5606 + 20	= 35-5606
		<hr/>
		52-4179

By calculation as before, the water extracted ( $Y_3'' = 21-0131$ ) and solids extracted 1-0426, giving a corrected final bagasse composition of

Fibre	15-0000
Solids	0-8147
Water	14-5982

and a 3rd press juice of composition

Solids	1-0426
Water	21-0131

The overall extraction for the second maceration cycle is given by  $(16-0000 - 0-8147)/16-0000 = 94-91\%$ .

This procedure can be continued for further stages of compound maceration, and calculated results for up to nine cycles are given in Table II.

The total cane processed during the ten cycles is 1000 parts and the solids content 160 parts. Consequently the extraction of 151-7029 represents an overall extraction of  $151-7029/160 = 94-81\%$ .

*Application to factory operations*

The above calculations were made for a tandem of three presses. Since it is always advisable to allow for the possible mechanical breakdown of a press,

it is suggested that it would be better to consider a four-press tandem with maceration distributed in the proportions of 10% to the feeds of each of the 2nd, 3rd and 4th presses. Again, the crush-crush need only be removed from the process juice extracted by the first press. A by-pass structure should be included, as suggested previously<sup>1</sup> so that, in the event of a breakdown, the press tandem operation could be changed from four to three presses with only a relatively small loss in extraction. This is a most important consideration in view of the very limited crop period dictated by the maturity of the standing cane.

Table II. Extraction from ten cycles of 100 parts of cane of assumed composition and at 95% mixing efficiency

Stage	Solids extracted in process juice from first press	Bagasse losses	Extraction efficiency
Virgin cane	11-3192	1-2352	92-28%
1st maceration	13-3182	0-9393	94-13%
2nd "	15-8756	0-8147	94-91%
3rd "	15-4524	0-7738	95-16%
4th "	15-3137	0-7604	95-25%
5th "	15-2682	0-7565	95-27%
6th "	15-2533	0-7548	95-28%
7th "	15-2470	0-7543	95-29%
8th "	15-2473	0-7541	95-29%
9th "	15-2474	0-7540	95-29%
	147-5413		
	3-1967 (2nd press juice solids from 9th cycle)		
	0-9649 (3rd press juice solids from 9th cycle)		
	151-7029		

The extent of the possible loss is demonstrated by figures in Table III, calculated for ten cycles as before but using four presses in series with maceration distributed as suggested above.

Table III

Stage	Solids extracted in process juice from first press	Bagasse losses	Extraction efficiency
Virgin cane	11-3192	1-0192	93-63%
1st Maceration	13-3182	0-8326	94-80%
2nd "	14-8361	0-7092	95-57%
3rd "	15-8765	0-6416	95-99%
4th "	15-6140	0-6105	96-18%
5th "	15-5042	0-5964	96-27%
6th "	15-4551	0-5901	96-31%
7th "	15-4331	0-5872	96-33%
8th "	15-4231	0-5860	96-34%
9th "	15-4187	0-5854	96-34%
	148-1982		
	3-4095 (2nd press juice solids from 9th cycle)		
	1-2464 (3rd press juice solids from 9th cycle)		
	0-3877 (4th press juice solids from 9th cycle)		
	153-2418		

The overall extraction over the ten cycles is 153-2418/ = 95-78%. The ten cycles total 1000 tons of cane and with a higher number the extraction figures tend

to stabilize at 95-29% for three presses and 96-34% for four. Thus it may be seen that the performance of the screw press is equivalent to that of two mills approximately, while if one press of a four-press tandem became inoperative and a by-pass system with three presses were adopted, the loss of extraction would be only about 1%.

This might be considered an argument for limiting the tandem to three presses, but it is contended that the investment in the fourth press is economically justifiable since (a) there will be no need to shut down the complete tandem in the event of a press failure, and (b) the cost of the additional unit could be recouped in 5 or 6 crops depending on throughput.

From calculation using the figures above, the Brix of the mixed juice from the first presses sent to process is approximately 15-3, a figure somewhat higher than that published for mill data.

It has been repeatedly stated that the power requirements of presses are excessive compared with mills. Recent information available shows figures of between 27-5 and 27-8 h.p. per ton of bone-dry fibre per hour for presses, a figure which compares very favourably with some of the modern mill tandems of similar capacity with pusher feeders, etc. Further, it must be remembered that a screw press is a very much more efficient extraction unit than a mill so that fewer presses will be required for a similar level of extraction. An added advantage is that the press is capable of giving a much lower moisture figure as well as a 40-45% reduction of pol in final bagasse. This means that the bagasse has a higher calorific value and those factories needing to burn supplementary oil can obtain further financial advantage.

Capital outlay is about two-thirds of that of a mill of similar capacity and maintenance costs are lower. Press reliability has considerably improved over the years and time efficiencies of 99-5% have been reported by those factories employing a press unit at the end of their existing mill tandems. The capacity of modern presses is such that 5000-6000 tons of cane with a fibre content of about 15% can be handled per day. It has also been established in practice that no processing difficulties are experienced with the extracted juices so that the installation does give a genuine overall increase of sugar in the bag.

It is suggested that where new factories are to be set up, serious consideration should be given to a press tandem as the extraction unit. Furthermore, it is suggested that in factories where mills need extension or replacement, the press should be substituted. In all installations in the United States cane belt where presses have been installed an increase in sucrose extraction has resulted. In addition, where special presses have been used for crush-crush treatment, it has been found that the throughput of the existing tandem can be increased by as much as 10%. It therefore appears that a press installation can bring about an improvement in sucrose extraction at a lower cost per ton of sugar produced.

# Sugar cane agriculture



**Controlled-release fertilizers for sugar cane.** M. ISOBE. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 83-87. Some of the controlled-release fertilizers available for experiments on cane are briefly described and results of a field test given, which showed the advantages of sulphur-coated urea over ordinary urea in increasing cane and sugar yield per acre<sup>1,2</sup>.

\* \* \*

**Response of ratoons to calcium silicate.** H. H. HAGIHARA. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 88-94.—Application of 3 tons of calcium silicate per acre to the soil surface 2½ months after ratooning at a soil residual silicon content of 56 lb/acre-ft gave the maximum increase in sugar yield (0.9 tons/acre) in trials, while the average increase was 0.5 tons/acre, compared with untreated controls. Recommendations for application of supplemental calcium silicate are given on the basis of economic considerations.

\* \* \*

**Protective coatings for sugar cane seed pieces.** R. V. OSGOOD. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 95-99.—The susceptibility of single-eye seed pieces to adverse soil and moisture conditions was overcome in tests by coating with a wax preparation which, under stress conditions, improved germination and growth compared with uncoated seed; however, initial growth was still slower than that of three-eye seed, although the introduction of fertilizers into the wax coatings is thought to offer a solution.

\* \* \*

**The estimation of sugar losses from cane damage due to rats, borers and other causes.** A. H. TESHIMA. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 100-103. Three years of sampling on a plantation owned by the Mauna Kea Sugar Co. in Hawaii have shown that rats on their own were responsible for the greatest amount of cane damage (19.24%). Borers on their own caused 3.95% damage, while rats and borers together damaged 8.24% of the cane. Sugar loss in the rat-damaged cane was 3.58%, 0.83% was lost in the borer-damaged cane, while 2.90% was lost in the cane damaged by both borers and rats. Of the remaining cane, 14.03% was damaged by agents other than rats or borers and 6.19% of the sugar was lost.

\* \* \*

**Projections for gibberellic acid.** L. L. BUREN. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 104-108.—Tests have indicated that maximum response of cane to gibberellic acid (GA) treatment occurred with young plants, increases with older cane being insignificant.

Optimum response to GA treatment was also found to be governed by the time of year when GA was applied, maximum response being obtained with application during periods of low temperatures and/or short days.

\* \* \*

**"Sencor"—a new herbicide for Hawaiian sugar cane.** R. V. OSGOOD. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 109-110.—This herbicide, supplied by Chemagro Corporation as BAY-94337, has proved superior to "Ametryne" and "Diuron" in weed control and has low phytotoxicity towards cane.

\* \* \*

**Market potential for controlled-release fertilizers in Hawaii.** W. G. PURDY. *Rpts. 1971 Meeting Hawaiian Sugar Tech.*, 111-112.—Advantages of controlled-release fertilizers for Hawaiian cane growers are discussed and the various types and proprietary brands available are briefly described.

\* \* \*

**Losses caused by RSD and need for hot-air treatment.** R. J. STEIB and S. J. P. CHILTON. *Sugar Bull.*, 1972, 50, (19), 8-11.—Since the dominant cane varieties now grown in Louisiana are susceptible to ratoon stunting disease, the authors emphasize the need for hot-air treatment. Yields per acre of each of five varieties when grown from 100% infected seed are compared with yields from disease-free cane.

\* \* \*

**Quality of sugar cane in relation to sheath moisture.** T. R. SRINIVASAN and A. MARIAKULANDAI. *Indian Sugar*, 1972, 22, 83-87.—Irrigation plus N at 150 lb/acre gave maximum c.c.s. in the 10th and 11th months, increased N fertilization beyond this being accompanied by reducing c.c.s. In the 9th month 300 lb/acre gave the highest sugar yield. A negative correlation was found between leaf sheath moisture and c.c.s. during the maturation phase, a moisture content of 74-76% giving the highest sugar yield.

\* \* \*

**Rôle of seed material in carry-over of wilt disease of sugar cane.** K. KAR, G. P. SINGH and R. SHUKLA. *Indian Sugar*, 1972, 22, 89-90.—In experiments at three research stations in Uttar Pradesh, the incidence of cane wilt was considerably greater in crops raised from infected seed, which also adversely affected germination and yield, than in cane raised from healthy seed.

<sup>1</sup> See also HAGIHARA & DOI: *I.S.J.*, 1972, 74, 212.

<sup>2</sup> ISOBE & YAMASAKI: *ibid.*

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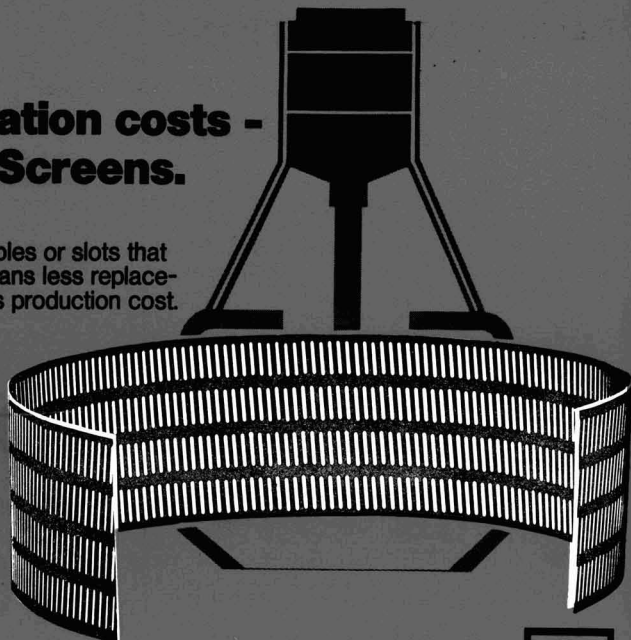
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**Factors affecting the incidence of the stalk borer (*Chilostraea auricilia*) in the western districts of Uttar Pradesh.** V. G. RAJANI and P. NATH. *Indian Sugar*, 22, 91-95.—High rainfall was accompanied by high incidence of stalk borers during the years under investigation (1964-1969); lodged cane also suffered increased damage, as did autumn-planted compared with spring-planted cane. Increased N fertilization and irrigation increased cane growth which attracted greater attention from the pest. Varietal differences were negligible, no variety remaining immune with a heavy attack.

\* \* \*

**Studies on the response of sugar cane to potash application on light soils of the Punjab.** S. SINGH and S. S. SAINI. *Indian Sugar*, 1972, 22, 97-99.—Tests on application of K in combination with N and P and with N alone showed no advantages, in terms of cane and sugar yield, over N and N-P applications.

\* \* \*

**Variety L 65-69.** ANON. *Sugar Bull.*, 1972, 50, (20), 3.—Properties of this Louisiana cane variety, a seedling of CP 52-1 × CP 48-103, are given in a notice of release.

\* \* \*

**Wide drill and double drill planting.** E. J. HICKS. *Sugar Bull.*, 1972, 50, (21), 6-7.—Preliminary results of tests have indicated the advantages, as regards cane stalk population per acre, of planting double drills 15 inches apart compared with the methods using drills with a standard or a wide opening between. On the other hand, some drawbacks to the double drill method are suggested.

\* \* \*

**Sub-surface drainage.** G. J. DURBIN. *Sugar Bull.*, 1972, 50, (21), 8.—Five-year trials with sub-surface irrigation in Louisiana in which the water table level was kept constant throughout the year showed that the method yielded 44% more cane and 27% more sugar per acre than did controls in which the water table fluctuated normally. The level of the water table (24, 32, 40 or 48 in below the soil surface) had no significant effect. The up-and-down variations in water table level appear to reduce cane yields by "pruning" the roots.

\* \* \*

**Canal Point sugar cane crosses in 1970-71 and 1971-72.** N. I. JAMES and J. D. MILLER. *Sugar Bull.*, 1972, 50, (21), 10-14.—Work at Canal Point, Florida, on seed production from cane crosses and the results achieved in 1970/71 and 1971/72 are reported and plans for the 1972/73 crossing season briefly discussed.

\* \* \*

**Sterilize machinery and eliminate crop losses.** ANON. *Producers' Rev.*, 1972, 62, (7), 57-60.—Attention is drawn to the need to sterilize cane harvesters and hold demonstrations of harvesters in disease-free cane blocks in order to stem transmission of ratoon stunting disease, which is responsible for higher cane

losses in Queensland than is any other disease. Ratoon stunting viruses are not airborne but are most commonly spread by equipment.

\* \* \*

**Aerial rat baiting again at Proserpine.** ANON. *Producers' Rev.*, 1972, 62, (7), 60.—Aerial rat baiting in the Proserpine mill area of Queensland, in which 19,592 acres were baited, is reported.

\* \* \*

**Short billets no help to cane growers.** N. J. KING. *Producers' Rev.*, 1972, 62, (7), 66-67.—While full-length (6-ft) cane stalks with two cut ends dry out rapidly, the same stalks, when passed through a chopper harvester, will be cut into six 12-inch billets having a total of 12 ends which do not dry rapidly because of the protection afforded by surrounding billets. The result is faster deterioration than in the case of the 6-ft stalks, the rate increasing with reduction in billet size, short billets also splitting more easily than long ones and thus being susceptible to attacks by bacteria.

\* \* \*

**Smut in the state of Rio de Janeiro.** J. P. S. L. NETTO. *Brasil Açuc.*, 1972, 80, 31-36.—An account is given of the occurrence of smut in Brazil where it was first observed in 1948. The history of the disease, its cause, transmission and control are described, the technique used in Brazil being the cultivation of resistant varieties. A table lists the susceptibility or resistance of a large number of varieties.

\* \* \*

**Fertilization in the cane-growing region of the state of Rio de Janeiro.** A. A. PEIXOTO. *Brasil Açuc.*, 1972, 80, 37-43.—An account is given of the results of N-P-K trials on a number of estates in Rio de Janeiro.

\* \* \*

**Economic aspects of the chemical control of weeds in sugar cane.** G. M. AZZI. *Brasil Açuc.*, 1972, 80, 50-53.—It is pointed out that the cost of manual weed control is high if the workers are to be paid wages comparable to factory workers, with indirect benefits amounting to 85% of their direct wages. In addition, the flight of such workers from the land to the cities has caused a scarcity of labour. Under such circumstances, use of herbicides has been successful in holding down weed control costs. A single general-application herbicide is recognized as not possible and economy must be achieved through selective use of appropriate quantities of different chemicals or mixtures.

\* \* \*

**The starch content as a function of the stage of ripening of cane.** M. A. A. CESAR and M. R. MAZZARI. *Brasil Açuc.*, 1972, 80, 54-67.—Starch contents of three cane varieties were measured in two locations in São Paulo with analyses at 15-day intervals and the data compared with Brix, pol, reducing sugars, phosphate, ash and available sugar % cane; the only

positive correlation found was with ash. Starch contents were generally low, increased initially, then decreased and behaved irregularly afterwards. Differences occurred between varieties in the same area and between the same variety in different areas.

\* \* \*

**Sugar cane herbicides—double doses.** J. FERNANDES. *Brasil Açuc.*, 1972, 80, 85–89.—Experiments have shown the possibility of using different doses of herbicide for treatment of the cane rows and the inter-rows, and three methods of such application are indicated.

\* \* \*

**Some observations on the mechanized harvest of sugar cane in Mexico.** A. L. FORS. *Sugar y Azúcar*, 1972, 67, (8), 19–21.—The problem of excessive trash accompanying cane into the sugar factory where mechanical harvesters, particularly the chopper type, are used under local conditions is the chief aspect of this article which describes the various harvesters working experimentally in Mexico. (Some information is also given on mechanical cutters introduced in the 1950's and 1960's but which proved unsuccessful.) Among solutions to the problem of "trashy" cane suggested is the installation of dry cleaners in the field and wet cleaners at the factory. However, it is pointed out that the cane grower lacks incentive to invest in such schemes, since he is paid for cane on a weight basis and has merely to guarantee a commercial sugar recovery of 8%.

\* \* \*

**Cane planting.** L. L. LAUDEN. *Sugar Bull.*, 1972, 50, (22), 5.—Advice on manual cane planting is given and guidance given on use of a Julien cane planter.

\* \* \*

**Some varietal characteristics of the more important commercial varieties.** ANON. *Sugar Bull.*, 1972, 50, (22), 18–19.—Advantages and disadvantages of the more important cane varieties grown in Louisiana are listed.

\* \* \*

**Sugar cane variety recommendations for Louisiana for 1972.** ANON. *Sugar Bull.*, 1972, 50, (22), 19–20.—Of the varieties recommended for 1972, L 62-96 and CP 61-37 are considered the generally most adaptable under Louisiana conditions. Soil recommendations are given for the varieties in each of the five major cane-growing areas of Louisiana.

\* \* \*

**Recommendations for the control of ratoon stunting disease in sugar cane in Louisiana, 1972.** ANON. *Sugar Bull.*, 1972, 50, (22), 22–23.—For hot-air treatment of seed cane to combat RSD, guidance is given on checking ovens for efficient operation so that the cane stalk internal temperature is maintained at between 50° and 54°C during treatment. Seed cane should be selected from heat-treated progeny, and all cane machinery should be cleaned. Recommendations are also given on prevention of mosaic infection in heat-treated cane.

**Controlling Johnson grass seedlings and annual weeds in sugar cane planted in Louisiana in summer and fall 1972.** ANON. *Sugar Bull.*, 1972, 50, (22), 23–24. Recommended herbicides are listed and their most suitable application procedures described, as well as supplementary practices.

\* \* \*

**The biology of *Physcus seminotus* Silv. and *P. subflavus* Annecke & Insley (Aphelinidae), parasites of the sugar cane scale insect *Aulacaspis tegalensis* (Zhnt.) (Diaspididae).** J. R. WILLIAMS. *Bull. Ent. Research*, 1972, 61, 463–484.—Details are given of the host insect and breeding methods, immature stages, female and male development, egg deposition, superparasitism, life span and fecundity, adult feeding habits and size variations, and mating habits of these two parasites of the cane scale insect which have been deliberately introduced into Mauritius from East Africa.

\* \* \*

**How to operate a fully mechanized sugar (cane) farm.** E. L. CLAPAROLS. *Sugarland* (Philippines), 1972, 9, (4 & 5), 6–10, 30–31.—Details and illustrations are given of the various operations from land preparation to cane harvesting on a fully-mechanized cane plantation (as demonstrated at Hacienda Claparols).

\* \* \*

**Soil compaction.** L. G. VALLANCE. *Australian Sugar J.*, 1972, 64, 205–207.—Soil compaction and its effects on first and second ratoon cane growth are discussed and means of overcoming the problem briefly described.

\* \* \*

**What about lime?** ANON. *S. African Sugar J.*, 1972, 56, 403.—The liming of acid soils and its advantages in such areas of South Africa as the Midlands region of Natal, where aluminium toxicity is a frequent problem, are discussed and the economics examined.

\* \* \*

**Sugar cane pests in Mexico.** S. FLORES. *Bol. Azuc. Mex.*, 1972, (268), 4–9.—With the great enlargement of the cane area in Mexico after 1930, infestation by pests which had formerly been slight increased markedly. The literature on pests in Mexico is reviewed and the present situation discussed regarding rodent pests, particularly rats and gophers.

\* \* \*

**Use of pipe drops in sugar cane fields.** D. E. MENARD. *Sugar Bull.*, 1972, 50, (24), 7.—To avoid soil erosion in cane fields caused by excessive drainage water at ditch outlets, the author advocates the use of pipes to take the drainage water from the ditch to a large canal.

\* \* \*

**Efficacy of hot air treatment in controlling ratoon stunting disease in different sugar cane varieties in the Punjab.** S. S. SANDHU and R. S. RAM. *Indian Sugar*, 1972, 22, 143–147.—Experiments using single-budded setts of four susceptible varieties showed that the causative virus was inactivated and the disease com-

pletely eradicated by hot air treatment in an oven at 54°C for 8 hours. Germination loss ranged from 13.8 to 59.2% but the weight of millable canes from the germinated setts was raised by 40–15% for the corresponding varieties, and the first ratoon yield by 138.4–30% respectively, compared with untreated controls.

\* \* \*

**Effect of "Eptam" and "Tillam" on the weeds and various phases of the sugar cane crop.** K. KAR. *Indian Sugar*, 1972, 22, 149–154.—Trials were conducted over three years with "Eptam" (ethyl di-*n*-propylthiol carbamate) and "Tillam" (S-propyl 1-N-butyl 1-N-ethyl thiol carbamate) for pre- and post-emergence weed control in cane. Two applications of each were more effective than one but neither controlled *Cynodon dactylon* or *Digitaria sanguinalis*. None of the doses employed affected germination or tillering, juice quality or cane yield. Plots treated with 2.8 or 5.6 kg/ha of "Eptam" gave cane yields equal to those obtained using normal cultivation and trash mulching for weed control.

\* \* \*

**Reappraisal of sugar cane variety CoL 9.** C. N. BABU, S. S. SANDHU and B. K. RATTAN. *Indian Sugar*, 1972, 22, 159–160.—This variety has been cultivated less than formerly because of its susceptibility to ratoon stunting disease. It is also damaged by the top borer and is prone to shy germination. However, these three can be overcome simply by hot water treatment of setts, application of "Endrin" and sett disinfection with "Agallo", respectively, under which circumstances the variety could be of wide application in northern India which is seriously affected by red rot, a disease to which CoL 9 has proved remarkably resistant during trials with many strains over 23 years.

\* \* \*

**Co 1053—another sugar cane variety for Orissa.** K. C. PANDA, K. C. MISHRA *et al.* *Indian Sugar*, 1972, 22, 161–163.—Co 1053 is a mid-maturing heavy-yielding cane with an erect habit and is resistant to red rot. It is gradually replacing Co 897 in Orissa.

\* \* \*

**Green cane harvesters.** L. G. VALLANCE. *Australian Sugar J.*, 1972, 64, 249–261.—An illustrated description is given of the new chopper-harvester for green cane designed by Mr. R. GREVER and built for him by Toft Bros. Industries Ltd. of Bundaberg. The cane is cut at 20–30 tons/hour and the extraneous matter separation is most impressive. The Mizzi green cane harvester is provided with a series of five blunt-toothed cleaning rollers between the chopping blades and the elevator, the latter also having spiral cleaning scrolls as its base. It is a compact and manoeuvrable machine with a designed harvesting rate of 32–50 tons/hour. The Raiter harvester also uses mechanical assistance to blower separation of trash from the cane.

\* \* \*

**Biological control.** S. NAGARKATTI. *Indian Sugar*, 1972, 22, 313–315.—Aspects of biological control of cane pests are discussed and it is emphasized that

success in the past has invariably been by establishment of an exotic parasite or predator rather than intensive breeding and release of an indigenous one. Reasons for this are explained and circumstances favouring successful release outlined. The economics are discussed; while insecticides are a recurrent cost, successful introduction of a natural enemy of a particular pest will mean that the initial research and release are the only costs involved.

\* \* \*

**Implementation of a sugar cane research objective.** C. N. BABU and K. L. BEHL. *Indian Sugar*, 1972, 22, 317–318.—Valuable work has been done in selection for improved cane varieties at Coimbatore, yet the country's average cane yield and sugar recovery remain low and disease and pest problems are still unsolved. The authors believe that the objectives of breeding work should be re-defined and simultaneous work done to obtain high-yielding varieties and disease-resistant varieties. Irradiation of the former may produce mutants which are also disease-resistant, while the latter may be further screened for higher-yielding canes. Work should also be done on new forms of insecticides such as hormone types for control of pests while intercropping with plants harmful to cane pests should also be studied as a means of control.

\* \* \*

**Intercropping of sugar cane with onion.** K. KAR, R. L. BHOJ and P. C. KAPOOR. *Indian Sugar*, 1972, 22, 321–326.—Intercropping of cane with onions did not interfere with its germination but affected production of tillers and millable stalks. This could be countered by application of additional nitrogen and irrigation, and the highest cane yield was obtained using additionally 56 kg N/ha and six irrigations. The juice quality was observed to be somewhat poorer as a result of the extra N and irrigation.

\* \* \*

**Sugar cane culture in Puerto Rico and Louisiana.** R. S. KANWAR. *Indian Sugar*, 1972, 22, 329–333. Agricultural practices in Puerto Rico and Louisiana are summarized.

\* \* \*

**Occurrence of *Schizotetranychus andropogoni* Hirst on sugar cane in the Punjab and its control.** S. K. GUPTA, A. S. SIDHU and M. S. DHOORIA. *Indian Sugar*, 1972, 22, 335–337.—This mite had been reported in other parts of India but appeared in the Punjab in 1970. It may be controlled by application of "Carbophenothion", "Dicofol" or "Plictran" as 0.05% sprays applied at 1200 litres/ha<sup>-1</sup>, and "Monocrotophos" as a 0.75% spray. They had a quick knock-down effect and kept the plants free of mites for up to 15 days after spraying.

\* \* \*

**Potash with "Endrin" spray for control of sugar cane shoot borer.** S. SITHANANTHAM and S. C. DANIEL. *Fertilizer News*, 1972, 17, (8), 36.—Using two varieties, cane was sprayed with 3% KCl solution, with 0.1%



"Endrin" and with a mixed spray containing both KCl and "Endrin" at the same concentrations as when used alone. Water sprays were used as controls. Borer infestation, 30.5% in the control, was hardly affected by the KCl alone (28.7% infestation) but was reduced by the "Endrin" to 21.1% and by "Endrin" + KCl to 16.7%.

\* \* \*

**Preliminary results of biological action against the leaf frog hopper of sugar cane in the state of Pernambuco.** P. GUAGLIUMI. *Brasil Açuc.*, 1972, 80, 325-327. Limited effects were observed in regard to egg parasitisation by the microhymenopterous insect *Acmoonyx hervali* liberated during the 1970 season in cane fields where the frog hopper *Mahanarva posticata* was established as a cane pest. The fungus *Metarrhizium anisopliae*, on the other hand, became abundant in the fields after application of an aqueous suspension of spores to the fields infested by the frog hopper. The fungus is able to kill an average of 35-45% of adults and nymphs and was found to persist during more than a year.

\* \* \*

**Tile drainage.** A. I. LINEDALE. *Cane Growers' Quarterly Bull.*, 1972, 36, 40-43.—Where clay or rock prevents the drainage of subsoil, waterlogging can occur and tile drains, although expensive, may be the only way of removing the excess water. A description is given of the method with reference to an instance at Nambour where they have been found necessary to drain cane lands.

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**Cane production in the Burdekin—Trends over the past 25 years.** I. T. FRESHWATER. *Cane Growers' Quarterly Bull.*, 1972, 36, 44-46.—Cane yield in the Lower Burdekin area has increased from an average of 34.62 tons/acre in 1946/50 to 44.80 tons/acre in 1966/70. The sugar per acre figure has risen from 5.29 tons in 1950 to 6.92 tons in 1970. This is the more remarkable since the amount of land under ratoon cane is now 20% greater than the plant cane area, whereas in 1950 it was only 40%. The causes for the improvement are a matter of argument; varieties have played an important part but so have better farming equipment, pest and disease control, and improved fertilization and irrigation.

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**Fiji disease makes isolation plots necessary.** C. L. TOOHEY. *Cane Growers' Quarterly Bull.*, 1972, 36, 47-48.—Experimental plots at the Bundaberg Experiment Station have been infected in the past and remain at risk of further occurrence of Fiji disease. Consequently an isolated area 50 miles away has been adopted for production of disease-free cane for use in trials for control of the vector and breeding for resistance.

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**Protect your greatest asset—soil.** C. M. McALEESE. *Cane Growers' Quarterly Bull.*, 1972, 36, 49-50.—Soil erosion by wind and water are discussed as are

measures to overcome the loss of soil which can turn cane land into areas which will not even grow grass.

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**Hot water treatment—give it a chance.** A. W. FORI. *Cane Growers' Quarterly Bull.*, 1972, 36, 51-5. Points to observe in hot water treatment for disease control are mentioned; these include taking the see cane from well grown cane as disease-free as possible. The cane should be cut a few days before treatment to "harden up" and afterwards should be handled carefully to avoid eye damage. Cane knives to cut whole stalks into sets should be sterilized as should be planters. If germination is poor, gaps should be supplied only with treated cane.

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**Easy fertilizer calibration.** E. F. COPLEY. *Cane Growers' Quarterly Bull.*, 1972, 36, 54-55.—An illustrated description is given of a method of checking the accuracy of the fertilizer distributor by replacing a tube with a suitable bag and weighing the fertilizer collected over a distance of one chain. A table gives the proper weight for different rates and inter-row distances.

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**Harvesting hazards.** L. K. KIRBY. *Cane Growers' Quarterly Bull.*, 1972, 36, 57-60.—The introduction of mechanical harvesting and chopper-type machine in particular has brought with it a much greater hazard from infection of the cut surfaces by *Leucosticte* with attendant difficulties. The cutting of extra short billets has increased this tendency even more and should be stopped in order to save considerable financial losses.

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**Refractometers and profit—use and abuse.** P. J. NIELSEN. *Cane Growers' Quarterly Bull.*, 1972, 36, 61-63.—The use of the pocket refractometer in the field to measure juice Brix in cane as an indicator of cane maturity is explained. Interfering factors are also discussed.

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***Antitrogus mussoni*—major cane pest of the Bundaberg district.** R. M. BULL. *Cane Growers' Quarterly Bull.*, 1972, 36, 64-67.—This cane grub, its identification and life cycle and damage it can cause are described as is its control by broadcasting of BHC dust or its application in a half-open drill. For ratoon cane it is best applied as a side dressing.

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**Compaction rollers for aqua ammonia unit.** L. G. W. TILLEY. *Cane Growers' Quarterly Bull.*, 1972, 36, 67. After application of aqueous ammonia as a fertilizer using a tine injector, the soil should be somewhat compacted to prevent escape. A method of doing this with rollers mounted behind the tines is described and illustrated.

**A mechanical device for fertilizing standover cane.** J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1972, 36, 68-69.—A device is described and illustrated whereby a fertilizer distributor from a commercial planter is mounted on a tractor with a drive from the tractor wheel using chain and sprockets such that the required amount of fertilizer is released for a length of cane row.

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**Cane planters.** L. G. VALLANCE. *Australian Sugar J.*, 1972, 64, 297-305.—An illustrated description is given of the Don-Gough machine which accepts whole-stalk unstripped cane which it cuts into setts, sprays, fertilizes and opens and closes the furrow. It is operated by a three-man crew—including the tractor driver—and is in commercial production by Wyper Bros. Ltd. of Bundaberg. Another planter, operated by only one man—the tractor driver—is the Populin and Scalia automatic unit, also made by Wypers. The two-row Etwell cane planter uses setts cut by a chopper harvester designed to avoid undetected misses. It requires a three-man crew, the two on the planter ensuring that there is an even flow of setts from the two 1-ton bins to storage hoppers and to the chute leading to the drill.

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**Solving salinity in sugar cane.** R. P. HUMBERT. *World Farming*, 1972, 14, (10), 6.—Soil salinity in land for cane should be removed by irrigation with water from rivers, underground aquifers, etc., and the rate of application should be adjusted to correspond to the quality of the irrigation water, i.e. using larger amounts when the water is of good quality and smaller amounts when the quality is not so good. Illustrations show the levelling of land in Peru and installation of drains for removal of the saline water. Removal of salinity is needed to avoid scorching of the cane which restricts green leaf area available for photosynthesis.

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**Practical and theoretical assessments of sugar cane yield potential in Natal.** J. GLOVER. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 138-141.—Cane of variety N55/805 was grown on a coastal red sand soil under the best management conditions known and the yield compared with the estimated maximum theoretically possible on a basis of 100% efficiency of use of incoming sunlight energy in the production of sunlight. The yield attained was 70% of this theoretical maximum.

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**The effects of age and time of harvest on the productivity of irrigated sugar cane.** H. ROSTRON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 142-150. Well-irrigated and fertilized cane was planted and harvested at different times of the year. The first ratoon crop was then harvested in portions at ages ranging from 32 to 72 weeks and the effect of its start, i.e. time of harvest of the plant crop, on the change in the recoverable sucrose content of the ratoon crop with age was studied. Details are presented of the changes found and it is concluded that, in South

Africa, crops that begin to lodge at the beginning of summer should not be allowed to carry over for harvest in the following season.

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**Deterioration losses in whole-stalk sugar cane.** R. A. WOOD, J. L. DU TOIT and J. BRUUN. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 151-157.—Losses in cane weight and recoverable sugar content and changes in juice quality and composition were determined in whole-stalk cane burnt and unburnt, cut immediately or harvested a few days after burning. It was concluded that deterioration starts immediately the cane is burnt or harvested, the rate varying with weather conditions. Unburnt cane deteriorates more rapidly than burnt cane during the first week after harvesting but thereafter burnt cane deteriorates more rapidly. It is recommended that all cane should be milled as soon as possible after harvesting and only enough cane should be burnt for one day's harvesting.

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**Sugar cane variety and incidence of *Numicia viridis* Muir (Homoptera:Tropidichodae).** A. J. M. CARNEGIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 158-159.—Although significant differences in numicia numbers on different cane varieties were detected, they were inconsistent in different locations and cannot be considered important.

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**Sugar cane trash caterpillars (Noctuidae) and effects of defoliation on the crop.** A. J. M. CARNEGIE and J. DICK. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 160-167.—At least seven species of noctuid moths have been reared from caterpillars collected beneath trash in cane fields and some, at least, feed at night on leaves of young ratooning cane. Natural enemies included six tachinid flies, an ichneumonid wasp, a species of *Entomophthora* and what appeared to be a polyhedral virus. Insecticide trials showed that, in spite of the trash blanket's protective covering, a measure of control was achieved with "Endosulfan", DDT, "Carbaryl" and *Bacillus thuringiensis*. The moths have been caught in light traps, which may have some practical application as indicators of forthcoming infestations. Artificial defoliation of young ratoon cane to simulate the effect of the pests caused a significant reduction in yield with smaller internodes and lower sucrose content.

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**Critical growth stages for 2,4-D phytotoxicity to sugar cane in South Africa.** F. E. RICHARDSON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 168-176.—Yield losses were found when plant or ratoon cane with three or more unfurled leaves were band-sprayed with 2,4-D amine at a rate of 3.3 kg a.e. per hectare, the loss increasing with greater foliar development. Addition of a surface-active material considerably increased the crop loss, but directed sprays which minimized foliar contact caused no loss, even at susceptible growth stages,

except where excessive doses (20 kg.a.e. ha<sup>-1</sup>) were used. Differential varietal tolerance was recorded, but no residual effect was observed in ratoons.

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**Further results from experiments with five varieties harvested at different ages.** L. A. ROSSLER and P. K. MOBERLY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 177-180.—It was found that maximum production of sucrose in cane grown to 2nd ratoon (3rd ratoon in the case of 12-month cycle cane) was maximum with plant cane harvested at 20 months, 1st ratoon at 12 months and later ratoons at progressively greater ages. Adhering to a strict 12-month crop cycle gives maximum returns only if the crop is harvested in spring or early summer. Should this be impossible, a longer cropping cycle is advocated since yields of sucrose from old sugar cane are least affected by the time of harvest. Varietal differences were observed.

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**Four years' experience with maturity testing on Mhlume sugar estate.** R. D. TRUEN. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 181-187.—Ripening of cane is assisted by control of fertilization and irrigation supply to restrict growth in the month before harvesting. With stand-over cane and cane harvested at different times during the previous crop, the degree of maturity will vary and a harvesting programme needs to be based on maturity assessment to give maximum sugar recovery from the total weight of cane. The most satisfactory guide has been found at Mhlume to be that based on analyses of the 8-10 internodes taken from single stools at the rate of one stool per four hectares. The samples were subjected to direct analysis<sup>1</sup> for judgement of the maturity.

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**Some effects of varieties on seasonal fluctuations in cane quality.** J. M. GOSNELL and M. J. P. KOENIG. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 188-195.—Cane quality varies during the season and studies of such variations demonstrated the optimum harvesting periods for a number of cane varieties grown in Rhodesia.

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**A review of rainfall stimulation by means of cloud seeding and its possible application in the Natal cane belt.** E. HUGHES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 196-200.—Work carried out on cloud seeding with silver iodide particles to induce rain is reviewed with 18 references to the literature, and the value of such a technique to the South African sugar cane industry briefly discussed.

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**Quantitative clay mineralogical analysis of highly weathered Natal soils.** J. LE ROUX. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 201-203.—Analyses of three types of cane soil are presented and discussed.

**The rôle of strip planting in conservation farming in the sugar belt.** C. T. WISE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 204.—The adoption of strip planting on hillsides is recommended, rather than ploughing an entire hillside and leaving bare to the elements, which is conducive to erosion.

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**Deep tillage investigations on five soil types of the South African sugar belt.** P. K. MOBERLY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 205-210.—Where specific soil factors that limit growth can be identified, deep tillage may be beneficial, but as a standard field practice for cane land preparation the extra costs are not justified. The conventional plough depth of 20-25 cm is apparently adequate under most conditions and a useful guide might be to plough or subsoil to a depth approximately 10 cm lower than the depth of the proposed planting furrow.

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**Smut incidence in variety trials.** G. L. JAMES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 211-215.—Results are tabulated of smut resistance trials over several crops using 68 varieties. Two methods for establishing smut resistance are discussed; the better is that based on whip population observations. The necessity of finding a variety or varieties of equal agronomic potential to that of the susceptible N:Co 376 is emphasized.

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**Effects of cane row spacing and 50% population reduction upon smut expression in an infected crop.** G. L. JAMES. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 216-217.—A 50% reduction of populations in plots of N:Co 376 at 3 months of age was shown not only to stimulate the production of more tillers but also to increase smut incidence as the seed cane was infected. It was concluded that roguing of heavily smut-infected fields will increase rather than decrease incidence of the disease. The importance of not allowing infection to develop beyond low incidence level is emphasized.

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**A survey of commercially available hot water treatment tanks for the control of ratoon stunting disease (RSD).** R. F. KING and G. M. THOMSON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 218-219.—Six types of hot water treatment tanks were examined and found satisfactory as was the general standard of operational control at the sites visited during the survey.

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**Sugar cane pesticides and their residue analysis.** A. J. M. CARNEGIE and R. A. WOOD. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 220-223.—Samples of cane and final molasses were examined by the South African Bureau of Standards for residues of a range of pesticides which may be used in the sugar industry. Of these, only "Aldicarb" was detected at

<sup>1</sup> BUCHANAN: *S. African Sugar J.*, 1966, 50, 1049-1059.

higher than the tolerance level (0.12 ppm vs. 0.10 ppm) in 6-months-old immature cane, but no residue was found in harvestable cane. Small amounts of DDT, EDB and DBCP were detected, all within acceptable tolerance limits.

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**Analyses of composite samples of filter cake from South African sugar factories.** K. E. F. ALEXANDER. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 224-225.—Measurements of the plant nutrients in filter cake collected in 1971 from South African sugar factories are tabulated, and their value expressed in the fertilizer cost equivalent to the N-P-K contents.

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**Effects of nematocides and methods of applying them on field-grown sugar cane.** R. H. G. HARRIS. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 226-229.—Comparison of several chemicals showed that highest cane yield was obtained using "Aldicarb". At the rates employed, no difference was found between application (i) three weeks before planting, using a tine-mounted injector, along a line on which the planting furrow was to be drawn and (ii) into the base of drawn planting furrows. Both applications were more effective than overall injection using multiple tines 38 cm apart. Nematodes found in the experiment are identified.

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**Deep tillage investigations on five soil types of the South African sugar belt.** P. K. MOBERLY. *S. African Sugar J.*, 1972, 56, 415-423.—See *I.S.J.*, 1973, 75, 382.

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**Whole-stick cutters vs. combine chopper harvesters.** ANON. *S. African Sugar J.*, 1972, 56, 483-484. Advantages and disadvantages of both types of machine are listed. Reference is made to the development of green cane harvesters in Australia, and factors affecting the choice of a harvester for South African conditions are summarized and discussed, as are the size and cost of the machinery.

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**The Louisiana sugar cane variety census for 1972.** R. J. MATHERNE. *Sugar Bull.*, 1972, 51, (2), 6-7.—The acreage planted to individual varieties in Louisiana changes rapidly and seldom does one variety remain a major choice for more than 10 years. In 1972 no single variety was dominant, the highest percentage of the total area being that of L 60-25 (25.2%) while CP 52-68 occupied 24.7%, CP 61-37 19.0%, L 62-96 11.2% and N:Co 310 10.1%, the balance being made up of other varieties. L 62-96 is the variety showing the most marked increase compared with 1971.

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**Prospect of autumn planting of sugar cane in the Punjab.** R. S. KANWAR. *Sugar News (India)*, 1972, 4, (5), 15.—By planting in autumn, a higher cane yield is achieved at the expense of a lost rabi crop, e.g. wheat, so that it is unattractive to farmers. By inter-

planting the autumn-planted cane with another crop such as potato, onion or wheat, the practice becomes profitable.

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**It is beneficial to apply pesticides to the soil.** R. S. KANWAR. *La Ind. Azuc.*, 1972, 79, 153.—See *I.S.J.*, 1972, 74, 172.

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**Sugar cane mosaic strains E and C in India and new sorghum differentials.** S. M. P. KHURANA and S. SINGH. *Sugarcane Pathologists Newsletter*, 1972, (9), 6-8.—Cane mosaic virus Strains E and C are reported for the first time from India. Sorghum AKS 614 and 633 were found to be new local lesion indicators for Strain C which can be identified by round lesions on these and systemic infection on sorghum Atlas, the local lesion indicator for Strain E.

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**Additional hosts for red stripe disease of sugar cane.** S. R. S. DANGE and M. M. PAYAK. *Sugarcane Pathologists Newsletter*, 1972, (9), 8.—The causal agent of this disease, wrongly named *Xanthomonas rubrilineans* by many previous workers, is *Pseudomonas rubrilineans* (Lee *et al.*) Stapp. It has been common on maize in India and during 1971 was observed for the first time on *Euchlaena mexicana*.

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**Effect of smut incidence in plant and ratoon crops on yield and quality.** K. T. S. RAJA, S. NATARAJAN, N. J. AHMED and D. PADMANABHAN. *Sugarcane Pathologists Newsletter*, 1972, (9), 9-10.—The incidence of smut in Co 419—a susceptible variety—rose from 1.56% in plant cane to 40-40% in the third ratoon, while the yield decreased by 67%. Three other varieties showed similar effects. The increase is attributed to spread of the fungus from one stool to another with infection of young shoots by spores from an adjacent stool.

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***Aphis nerii* Boyer, an additional vector of sugar cane mosaic virus.** K. M. LAL and K. S. BHARGAVA. *Sugarcane Pathologists Newsletter*, 1972, (9), 10-11. After plants of *Calotropis procerca*, a common weed found near cane fields, were found to be infested with *Aphis nerii*, transmission experiments were conducted in which *A. nerii* was cultured on the weed and then fed for 2 minutes on maize and cane donor plants infested with cane mosaic virus. The aphids were then transferred to maize seedlings, which were subsequently found to be infected with the disease; with maize as donor plant, 40% of the seedlings were infected, while with cane as donor the rate was 20%.

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**Entomogenous fungus on *Pyrilla* sp. in Uttar Pradesh (India).** K. KAR and S. C. GUPTA. *Sugarcane Pathologists Newsletter*, 1972, (9), 11.—A description is given of a fungus, similar to *Metarrhizium anisopliae* (Metsch) Sorokin, which has recently been found as a parasite on large numbers of *Pyrilla* sp. (leafhopper)

adults in cane fields of Uttar Pradesh. The possibility of establishing the fungus in the field for leafhopper control is being studied.

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**Corn, sorghum and Fiji disease.** P. B. HUTCHINSON, G. N. R. FORTEATH and A. W. OSBORN. *Sugarcane Pathologists Newsletter*, 1972, (9), 12-13.—Preliminary results of experiments indicate that corn and sorghum are alternative Fiji disease hosts and could transmit the disease to cane if grown as an intercrop or in plots adjacent to cane fields. The disease is transmitted by the leafhopper *Perkinsiella saccharicida*, which is capable of wind-borne flights over many miles, so that isolated plots of susceptible corn or sorghum could serve as stepping stones in transmission of the disease to distant cane-growing areas. Transmission through corn or sorghum seed is unlikely, but remains to be confirmed.

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**Strain E of sugar cane mosaic virus infecting St. Augustine grass in Florida.** J. L. SALADINI and F. W. ZETTLER. *Sugarcane Pathologists Newsletter*, 1972, (9), 14.—Aphid transmission of the strain found on St. Augustine grass (*Stenotaphrum secundatum*)<sup>1</sup> was found in experiments with the grass, corn and cane to be low. While the grass was less susceptible than corn to infection by manual inoculation of adaxial leaf surfaces, once infection took place the symptoms persisted.

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**Insect transmission of mosaic virus in sugar cane.** H. DAVID, K. C. ALEXANDER and K. ANANTHANARAYANA. *Sugarcane Pathologists Newsletter*, 1972, (9), 15-16.—Five vectors of cane mosaic occurring in Coimbatore (South India) are: *Rhopalosiphum maidis*, *Melanaphis (Longiunguis) sacchari*, *M. indosacchari*, *Hysteronera setariae* and *Assamia moesta*. The last two are newly recorded as vectors in India; *H. setariae*, which is found in sorghum, maize and a number of grasses around cane fields, infected 40-60% of plants in transmission tests, while *A. moesta*, which probably acts more as a mechanical carrier than true vector and occurs only in cane, infected 6-10% of the plants.

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**Culmicolous smut of sugar cane in Taiwan.** L. S. LEU. *Sugarcane Pathologists Newsletter*, 1972, (9), 16-17. Work on germination and storage of teliospores of *Ustilago scitaminea* Sydow, the causal fungus of culmicolous smut of sugar cane, is reported. Germination did not decline after 1 year's storage under dry conditions, and even after 4 years 92% germination occurred in cold conditions, whereas under wet conditions no germination was observed after only half a month. Teliospores germinating after storage had the potential to induce smut, as confirmed by inoculation.

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**Mosaic testing methods.** J. DICK. *Sugarcane Pathologists Newsletter*, 1972, (9), 17.—While artificial methods of cane mosaic inoculation led to significantly

higher levels of infection than did natural field transmission tests, even with the artificial methods there were marked differences between the responses of different cane varieties. Hence, artificial methods are considered unsuitable.

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**Fiji disease blows up in the Bundaberg District.** B. T. EGAN. *Sugarcane Pathologists Newsletter*, 1972, (9), 18.—Reference is made to the outbreak of the disease in the Bundaberg area of Queensland, where 35% of the farms have infected cane and the situation is worsening. Two factors of significance are the huge increase in the numbers of insect vectors transmitting the disease, and the rather high tolerance of N:Co 310 cane (constituting nearly 90% of the cane grown in the district) to the disease, with the result that marked symptoms or stunting do not occur until after a long time and field inspections are inadequate, making risky the planting of cane from within a diseased area.

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**Association of ants and aphid vectors of sugar cane mosaic.** S. M. A. RIZVI, K. S. BHARGAVA and R. D. JOSHI. *Sugarcane Pathologists Newsletter*, 1972, (9), 21.—Four species of ants (*Polyrhancis binghami*, *Lophomyrmex bedoti*, *Camponotus* sp. and *Crematogaster politula*) were found, in studies, to be associated with colonies of *Melanaphis (Longiunguis) sacchari*, *M. indosacchari* and *Rhopalosiphum maidis*, aphid vectors of cane mosaic. The ants carry the aphids from one cane plant to another and from cane to alternative hosts and vice versa.

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**Leaf scald at Mackay, Queensland.** C. G. HUGHES. *Sugarcane Pathologists Newsletter*, 1972, (9), 22.—An outbreak of leaf scald at Mackay, infecting cane (mostly Q 63) on a large number of farms, is reported.

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**Effect of saline water irrigation on N:Co 310 and H 50-7209 cultivars of sugar cane. I. Growth parameters.** M. M. SYED and S. A. EL-SWAIFY. *Trop. Agric. (Trinidad)*, 1972, 49, 337-346.—The cultivars were irrigated with solutions of NaCl, Na<sub>2</sub>SO<sub>4</sub> and seawater (at concentrations adjusted to give required electrical conductances in the range 2-8 mmho cm<sup>-1</sup>) during growth in a low humic latosol structurally resistant to salinity and sodium effects. Salt accumulation was minimized by permitting water excesses to leach through the soil with each irrigation. Increasing salinity in the solutions caused dry matter and green weights to fall compared with the controls irrigated with fresh water. The loss in dry matter ranged from 10% at low salinity to 35% at high salinity, the effects being greater with N:Co 310 than with H 50-7209, especially at lower salinities. Salinity also adversely affected stalk elongation, sheath weights and sheath moisture contents. The effects on stalk elongation agreed with published data on moisture stress effects, suggesting that the osmotic component of salinity was more responsible for the reduction in cane yield than were specific ion effects.

<sup>1</sup> See also *I.S.J.*, 1973, 75, 383.





# Sugar beet agriculture

**Beet research in respect of progress achieved and future problems.** M. MARTENS. *Publ. Trimest. Inst. Belge Amél. Betterave*, 1972, 43-78.—See *I.S.J.*, 1973, 75, 350.

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**Harvesting losses and their significance.** G. L. MAUGHAN. *British Sugar Beet Rev.*, 1972, 40, 215-217. Investigations conducted during the 1971/72 campaign in the UK revealed that an average of 1.17 tons of beet per acre was lost in mechanical harvesting by being left undug in the ground or falling from the harvester, the former category constituting 63% (0.74 tons) of the loss. The total loss represents nearly 7% of the beet crop, and the author calls for greater attention to setting of the machines and their operation.

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**Weed control.** R. A. FOGG. *Sugar Beet J.*, 1972, 36, (1), 2-4.—Control of perennial weeds in beet fields, which have been on the increase in the author's area of Michigan, USA, particularly where crop rotation is used, is discussed and recommendations offered.

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**Efficiency in sugar beet harvest.** F. B. RUSSELL. *Sugar Beet J.*, 1972, 36, (1), 5-6.—Information is given on the system of beet delivery to Buckeye Sugars Inc., Michigan, USA, whereby the total number of road trucks used has been reduced.

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**The total fertilization programme.** G. E. NICHOL. *Sugar Beet J.*, 1972, 36, (1), 7.—The author recommends determining the next year's nitrogen fertilizer requirements for beet well in advance, considering any nitrogen in fertilizer ploughed into the soil in the autumn as being available in the following season.

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**Soil sampling and soil testing.** J. C. SCHICKLUNA. *Sugar Beet J.*, 1972, 36, (1), 8-10.—A procedure for soil sampling in Michigan beet fields is described.

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**An evaluation of soil testing today and the soil fertility conditions in the major sugar beet-producing areas of Michigan.** L. S. ROBERTSON and E. C. DOLL. *Sugar Beet J.*, 1972, 36, (1), 11-14.—Soil testing at Michigan State University is described and results given for lime requirements and P, K and Mg levels in soils of the major beet-growing areas as well as the average for the state.

**Systemic activity of triphenyl tin chloride in sugar beet seedlings.** A. N. MUKHOPADHYAY and R. P. THAKUR. *Plant Disease Reporter*, 1972, 56, 776-778.—Triphenyl tin chloride (TPTC) dissolved in potato-dextrose agar to give concentrations of 100 and 300 µg/ml was used in bioassay studies on *Alternaria tenuis* control *in vitro*. Extracts from beet leaf, petiole and root tissues dipped in the TPTC all inhibited growth of the fungus compared with untreated controls, the root extracts exhibiting greater control than the others. Positive correlation was found between TPTC uptake and translocation and between its concentration and time of exposure. TPTC has already demonstrated its fungicidal properties in field control of *Cercospora* leaf spot.

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**New means of controlling the pygmy mangold beetle (*Atomaria linearis* Steph.) in beet.** K. KÜTHE. *Zucker*, 1972, 20, 657-661.—Results of field trials on chemical control of this beet pest are reported, showing the efficacy of applying granular insecticides at or after sowing without the need for preliminary seed dressing. In some cases, the beet fly (*Pegomya betae*) was also controlled, almost complete elimination being achieved with granule treatment after spraying with "Mercaptodimethur", which was also highly effective against *A. linearis* when used in granular form.

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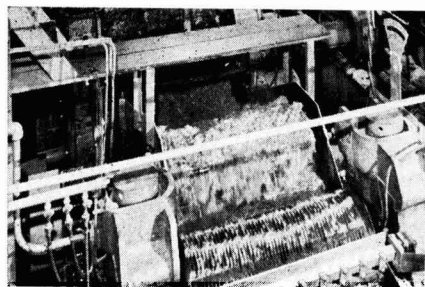
**Effect of planting density and N fertilization on sugar beet performance. II. K, Na and  $\alpha$ -amino-N.** K. H. BAROCKA, H. GEIDEL and W. MÜLLER. *Zeitsch. Zuckerind.*, 1972, 97, 556-565.—Further results of tests to determine the effects of planting density and N are reported<sup>1</sup>. While increased applications of N caused increase in K, Na and  $\alpha$ -amino-N, increase in planting density had an opposite effect. Hence, in order to reduce molasses sugar it is preferable to reduce N application and increase planting density, which has an even greater effect at low N applications. The K: $\alpha$ -amino-N ratio can be used to predict molasses sugar.

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**Soil and climatic factors in Irish sugar beet yields.** J. LEE and C. K. COMERFORD. *Sugar J.*, 1972, 35, (4), 17-21.—The results of the preliminary phase of a long-term project concerning possible relationships between beet yields and soil and climatic factors in Ireland are discussed for the 3-year period 1966-68.

<sup>1</sup> See *I.S.J.*, 1973, 75, 250.

# Cane sugar manufacture



**A modern sugar mill in the Philippines today.** A. GELLY. *Sugarland* (Philippines), 1972, 9, (1, 2, 3), 10-17, 28, 46.—Details are given of the layout of Tolong sugar factory and of its equipment. The factory, which started operations in 1970, was built by Soc. Fives Lille-Cail for a daily capacity of 3000 t.c.d. expandable to 6000 t.c.d. The equipment includes four self-setting mills and four horizontal vacuum pans of Fives Lille-Cail design and construction.

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**The progressive liming tank in cane sugar factories.** J. DE CRÉMOUX. *Ind. Alim. Agric.*, 1972, 89, 1033-1035. Details are given of a vertical progressive liming tank with top juice feed and bottom milk-of-lime feed. Mixing is carried out by means of rotary paddles fitted to a central shaft, one paddle in each of 2 to 5 compartments. The limed juice leaves at the bottom of the tank.

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**Gur from sweet sorghum.** A. K. GHOSH. *Indian Sugar*, 1972, 22, 11-12.—Preliminary experiments are reported for using sorghum in gur manufacture in India, subject to a suitable method of removing the starch. Gur prepared from sorghum in the laboratory at the Indian Institute of Sugarcane Research, Lucknow, compared favourably with gur prepared from sugar cane.

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**A comparison of the processing of burned and unburned sugar cane.** G. E. SLOANE and L. J. RHODES. *Hawaiian Planters' Record*, 1972, 58, 173-182.—Comparisons were made between the advantages of cane burning and non-burning in a series of five tests. Results showed that processing unburnt cane caused a substantial increase in harvesting and hauling requirements in terms of both men and equipment; a moderate to substantial reduction in factory operating rates with existing facilities; almost the same extraction at reduced grinding rates as with burnt cane, but a slight reduction in boiling house recovery and slightly lower overall recovery; a small but significant improvement in sugar yield per acre (apparently a result of smaller losses in the cleaning plant); and considerably poorer sugar refining properties in terms of colour and filtrability.

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**Stale cane.** G. H. RICHARDS. *Producers' Rev.*, 1972, 62, (6), 23.—Research work on cane deterioration by *Leucanostoc mesenteroides* at James Cook University in Queensland is reported. In efforts to find suitable

enzymes (dextranases) which would be capable of destroying the dextran formed by the *L. mesenteroides*, four have been isolated, but all have maximum activity at 45°C, whereas a temperature of at least 65°C is required for use in a cane sugar factory.

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**A new approach to the exhaustion of cane final molasses.** R. M. MORRIS and L. W. ROBERTS. *S. African Sugar J.*, 1972, 56, 407.—Two hypotheses are put forward to describe why cane molasses exhaustion is limited with the use of conventional equipment. The first argues that, since the density difference between the sugar crystal and molasses is negligible, the relative shear between the two will also be negligible, except in high gravitational and centrifugal fields. During crystal growth, the layer of molasses will become progressively depleted of sucrose with no surface renewal or local turbulence to restore its concentration, so that conventional crystallization may not be adequate and a high shear technique may be desirable. The second theory postulated concerns polysaccharides or other long-chain organic molecules in the molasses which may coat the sugar crystal and inhibit further growth. Separation of the layer and re-seeding may be necessary to increase the degree of exhaustion. Further dilution of the molasses may be possible without reaching a concentration below the equilibrium solubility of the molasses sucrose.

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**The cane sugar factory/refinery in Cameroun.** A. BERNARD. *Ind. Alim. Agric.*, 1972, 89, 1115-1124. Details are given of the sugar factory/refinery built by Soc. Fives Lille-Cail at M'Bandjock, 90 km from Yaoundé in Cameroun<sup>1</sup>. Information is also given on the cane agriculture.

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**Chemical cleaning of evaporator vessels.** R. R. TROTT and R. MALONEY. *Sugar J.*, 1972, 35, (4), 13-15. Investigations at the end of the season at Haymans sugar factory, Barbados, in 1970 and 1971 are reported in which the 3rd effect of a quadruple-effect evaporator was boiled out with NaOH solution and then treated with Hodag "PH-2" descaling chemical. The treatment was highly successful in scale removal, completely clean tubes being obtained with subsequent mechanical cleaning, while alkali treatment of the 4th effect followed by mechanical cleaning was not adequate but improved the condition of the vessel

<sup>1</sup> See also DELAVIER & HIRSCHMÜLLER: *I.S.J.*, 1972, 74, 215.

compared with that before the start of the crop. However, mechanical cleaning caused significant damage to the tube surfaces. Comparison of the direct and indirect costs of manual and chemical cleaning favours the latter treatment.

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**Brazil inaugurates modern bulk sugar and molasses terminal at Recife.** D. SMITH. *Sugar y Azúcar*, 1972, 67, (9), 15-17.—See *I.S.J.*, 1971, 73, 384; 1972, 74, 384; 1973, 75, 57, 151.

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**Chemical cleaning of evaporator vessels.** R. R. TROTT and R. MALONEY. *Sugar y Azúcar*, 1972, 67, (9), 18-20.—See *I.S.J.*, 1973, 75, 386.

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**Development of sugar machinery manufacture in India.** A. C. CHATTERJEE. *Indian Sugar*, 1972, 22, 273-275. Development of sugar machinery manufacture by Indian companies has been rapid since its start in 1955 and stimulation by the foreign currency crisis of 1957. As a result, the country now has the capability of providing a wide range of equipment up to and including complete cane sugar factories.

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**A critical assessment of the working of DDS diffusers in India: comparison with the results achieved by milling alone.** S. K. D. AGARWAL, B. K. GUPTA, R. K. DIXIT and R. P. SHUKLA. *Indian Sugar*, 1972, 22, 277-312.—The three DDS diffusers in operation in India were each designed for a throughput of 2000 t.c.d. but have worked at 1400, 1500 and 1800 t.c.d., respectively. Extraction has been 95-97%, achieved by increasing maceration from 20-25% to 30-35% on cane. The Brix of last mill juice is higher than with milling alone while its purity is lower, the latter possibly owing to low pH (4-4.5) which might have caused inversion. Suggestions are made (diffusion juice recirculation to the primary bagasse hopper, reducing the temperature in the latter part of the diffuser, using cold maceration at the dewatering mills) whereby diffuser performance may be improved.

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**High sugar recovery in Maharashtra for the season 1970/71.** R. K. KULKARNI and P. B. LONDHE. *Indian Sugar*, 1972, 22, 339-342.—Higher sugar recovery compared with the previous season was found by comparison of factory data to have been due to higher cane quality, higher crushing rates and shorter season, and to lower process losses.

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**Scale control in multiple-effect evaporators.** C. K. CLONINGER. *Sugar J.*, 1972, 35, (5), 9-11.—Trials are reported on the use of "Busperse 49" (Buckman Laboratories Inc.) for control of scale formation. Addition to first expressed or clear juice in amounts of 5-30 ppm (usually 10-15 ppm) reduced scaling in evaporators and heaters, so increasing the time between cleaning. Addition of 2 litres of "Busperse 49", diluted with 6 litres of water, for each 1000 ft<sup>3</sup> (28 m<sup>3</sup>

or 28,000 litres) of massecuite decreased its viscosity, improved heat transfer and reduced scaling. Case histories are recorded from a number of countries. Another material, "Busperse 47", when added in 0.1% concentration to caustic solutions and in 1% concentration to acid solutions, improved their power to penetrate and remove scale.

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**Sugar research in Australia.** J. R. ALLEN. *Sugar Research Inst. (Mackay, Queensland) Ann. Review*, 1971-72, 20 pp.—A computer programme has been prepared and used to establish schedules for cane transport to mills on a basis of delivery point activity, trucks available, etc. Evaluation of the performance of milling trains is provided for mills which are members of Sugar Research Institute Ltd. and the basic programmes have been updated to allow for changes in cane preparation. Trials have been made with new blocks for the brakes of cane transport locomotives, while train resistances have been studied using a dynamometer truck. Investigation of losses in milling and diffusion has shown that both are small and much the same for both processes. Molasses crystallization rates, viscosities and exhaustibilities were little different from diffuser and milling plants and were what would have been expected from the reducing sugars:ash ratio. Investigations were made on noise problems and their alleviation in locomotive cabins, near the shredders and gearboxes, etc. Special truck wheels and automatic roller arcing machines have been developed, while trials on a bactericide marketed world-wide for several years were repeated, again indicating no effect on mill train microflora. Effluent aeration treatment has been adopted at a number of member mills but in some they were operated above capacity; a primary settling vessel is recommended to give reliable and regular performance of the aeration unit. Flocculants have been found to vary from their stated specification and it is thought desirable to establish standards and ensure that supplied materials meet these. Bagasse pulp manufacture was the theme of a seminar held in Mackay in November 1970; this showed up areas where more knowledge was needed and a feasibility study was begun. A complete instrument system has been devised which monitors mill juice flow, buffer tank level, etc., and has produced a smoothed juice flow from the mill. Investigation of very short billets being produced by some harvesters showed that the increased surface area exposed to infection results in appreciable sugar losses and dextran formation. An experimental shredder has been built of full-scale diameter but with a width of only 18 inches; it is equipped for studies of shredder operation and has been used at rates equivalent to 450 t.c.h. for a 7-foot full-scale unit. Experiments have continued with a 3000-gal continuous vacuum pan; operation and control were found to be quite easy and modifications have been made to increase throughput. A pan at one member mill was modified to permit computer control tests during the 1972 season. A new massecuite resistance heater has been developed with stainless steel scroll

electrodes. Data logging equipment has been improved and a radio transmitter, encapsulated inside a ball and having the same density as massecuite, has been developed for use in pan circulation studies. Computer control installations have been made at a number of member mills.

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**Automatic regulation of feed to the first body of a multiple-effect evaporator.** G. K. CHETTY. *Sugar News* (India), 1972, 4, (3), 11-13.—Juice feed to the evaporator first body from the clear juice tank is via a device which includes a telescopic tube within a tank, the upper (overflow) level of the tube being set to a height (about 30% of the tube height above the bottom tube plate) such as to maintain a proper juice level in the body. The juice is pumped from the clear juice tank to the evaporator; if the evaporation rate is too low the excess juice flows over the top of the tube into the surrounding tank from which it is pumped back to the clear juice tank.

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**Rôle of improper mill house sanitation leading to the production of *Leuconostoc* on the overall recovery in sugar factories.** S. C. GUPTA and S. K. D. AGARWAL. *Sugar News* (India), 1972, 4, (3), 14-18.—Examination of erratic juice analyses at two factories showed that they were attributable to high and variable invert content arising from microbial contamination of the mills. Methods of countering such contamination are briefly surveyed; their application at the two factories caused a rise in juice purity and eliminated the erratic behaviour. The savings resulting are calculated.

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**Benefits of the defeco-melt-phosphotation process over the sulphitation process.** A. C. CHATTERJEE. *Sugar News* (India), 1972, 4, (4), 6-8.—The process referred to is similar to the defeco-melt crystallization process<sup>1</sup> but involves clarification of the melt liquor by the phosphatation-flotation process employed in sugar refining. Sulphur usage is eliminated and recovery is higher, with reduced molasses and undetermined losses, lower chemical costs for the process and for evaporator cleaning (the reduced scaling also permits a higher crushing rate and shortening of the crushing season), etc.

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**Operation and control of the molasses mixing plant at the South African sugar terminals.** A. J. RADFORD and B. C. E. GORDON. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 27-29.—Addition of molasses to high-pol raw sugar to produce the desired shipment sugar<sup>2</sup> originally employed final molasses but this has been changed to high-test molasses. Moisture addition to maintain a suitable safety factor could be discontinued, as could the washing of the pipes with water after each loading run—the pipes were left with a coating of molasses and corrosion was eliminated. By running the pumps at lower

speed the molasses could be pumped cold in the summer although some direct steam injection heating is needed in the winter. The original single manifold for molasses distribution has been replaced by a double unit to give better curtains and more uniform mixing. Control of the operation by computer is to be replaced by a simpler ratio controller. Calculation of the weights of molasses required from the weight of sugar and the pol analyses show discrepancies with the actual weight used, and the method of analysis requires investigation.

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**Gradual enlargement of evaporator capacity.** A. VAN HENGEL. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 30-32.—A method for gradually increasing the capacity of a quintuple-effect evaporator is explained; it involves adding a new vessel and running the two last vessels as a fifth effect with steam flow in parallel but juice flow in series; this raises capacity by 25%. Repeating this to give a two-vessel fourth effect increases capacity by a like amount and by adding more vessels the evaporator capacity can be doubled in stages.

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**Specification and evaluation of boiler plant tenders in the sugar industry.** H. BIEBER. *Proc. 46th Congr. S. African Sugar Assoc.*, 1972, 33-36.—A guide is presented to compilation and assessment of tenders for new boiler plant; this covers aspects of the specification including plant capacity, temperature and pressure conditions, fuels, performance at various loads, efficiency and heat-trap equipment, duplication and backtrap equipment, scope of supply and purchasing specification. For evaluation, consideration should be given to scope of supply and services, operational cost, ease of operation, maintenance cost, design and construction, service and spares facilities as well as prices and terms.

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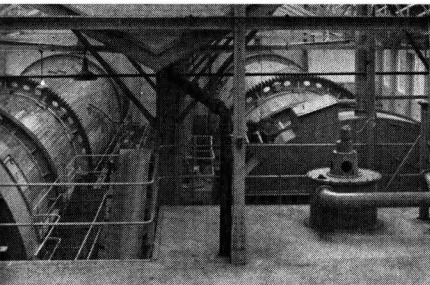
**Dunder disposal.** L. L. RENNIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 37-39.—It is recommended that factory waste water be collected, oil and suspended matter removed and the pH adjusted to make it acceptable for irrigation and that it should be pumped continuously to a dam serving a spray irrigation system and with several days' capacity. It should then be used for irrigation during daylight for disposal combined with the reclamation of its plant nutrient content. Only if spray irrigation is impossible to provide or too expensive need biological treatment be considered.

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**First impressions of a wet type scrubber on a bagasse-fired boiler.** B. S. C. MOOR. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 100-101.—General observations are made on a Peabody wet scrubber for flue gas installed at Tongaat sugar factory.

<sup>1</sup> GUPTA et al.: *I.S.J.*, 1966, 68, 340.

<sup>2</sup> See ALEXANDER: *ibid.*, 1972, 74, 227-230.



# Beet sugar manufacture

**Application of ion exchange membranes in the sugar industry.** K. ČIŽ. *Ind. Alim. Agric.*, 1972, **89**, 1037-1042.—Electrodialysis applications in the sugar industry are discussed, including juice demineralization, making sugar solution alkaline, sugar solution inversion, adjustment of condenser water pH for diffusion and treatment of regenerant solutions from ion exchange units. Diagrams of an electro-dialysis test scheme and of the components of an electro-dialyser are given. Some test results are briefly mentioned.

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**Corrosion of sugar industry evaporators.** A. LEMAITRE. *Ind. Alim. Agric.*, 1972, **89**, 1049-1056.—Aspects of the subject discussed include types, causes and detection of corrosion and possible means of reducing it from the processing side or from the tube manufacturing side. Results from French sugar factories are cited, and tabulated values given of the iron content in thin juice, juice from a 2nd evaporator effect and thick juice as determined by colorimetry and atomic absorption.

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**Thick juice storage—syrup processing plant.** M. BEAUVISAGE. *Ind. Alim. Agric.*, 1972, **89**, 1059-1065.—A beet sugar factory can increase its daily throughput by increasing the capacity of all its processing plant or by storing thick juice for post-campaign processing and increasing only the plant preceding the pan house. In this study the author calculates the capital, fuel and labour costs involved in sugar manufacture to permit comparison of the two possible solutions and find the threshold at which thick juice storage is the more economical solution. The calculations are based on a campaign of 80 days, a beet sugar content of 16.7% and a sugar yield of 14%.

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**Automation of vacuum pans.** M. GARABET. *Ind. Alim. Agric.*, 1972, **89**, 1067-1071.—After a brief discussion of automatic boiling, the author gives details of the system used in the Fives Lille-Cail horizontal vacuum pan. A chart, showing conductivity, massecuite level and vacuum during five strikes, is reproduced.

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**Washing devices in sugar centrifugals.** R. CRABEL and J. M. VICAIGNE. *Ind. Alim. Agric.*, 1972, **89**, 1073-1078.—Experiments conducted on a test bench and in centrifugals to compare various types of washing devices are reported.

**Graphical control of low-grade products in a beet sugar factory.** J. GENOTELLE. *Ind. Alim. Agric.*, 1972, **89**, 1089-1093.—Formulae and graphs are given for rapid determination of low-grade massecuite mother-liquor purity, non-sugars:water ratio, supersaturation and temperature when the saturation coefficient in terms of the non-sugars:water ratio is known. Graphs are also given for rapid calculation of the non-sugars:water ratio and massecuite crystal content.

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**Auto-degradation of molasses in storage.** M. FRIML. *Ind. Alim. Agric.*, 1972, **89**, 1095-1097.—Spontaneous decomposition of 780 tons of beet molasses and subsequent explosion are reported and the molasses analysis tabulated. Possible means of avoiding the problem are briefly discussed.

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**The electro-magnetic flow meter in the sugar industry.** B. LEPENNE and J. P. MERLET. *Ind. Alim. Agric.*, 1972, **89**, 1099-1112.—The fundamentals of electro-magnetic flow measurement are explained and possible applications in the sugar industry described. More detailed reports are given on concrete examples, including RT diffusion, juice purification and the filling of road tankers with thick juice at a juice station.

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**Continuous centrifugalling of low-grade products.** O. ADRIAENSEN. *Sucr. Belge*, 1972, **91**, 427-431. Tests at Moerbeke-Waes factory are reported, in which centrifugalling of low-grade massecuite in continuous and batch machines was compared. Despite higher molasses sugar in the case of the continuous machines (30.4 kg/100 kg massecuite compared with 29 kg/100 kg for the batch centrifugals), they are preferred because of the lower investment and operating costs and for a number of other reasons given.

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**Boiling low-grade massecuite with "Intrasol FK" surface-active additive.** O. KRIEGER. *Zucker*, 1972, **25**, 688-691.—See *I.S.J.*, 1973, **75**, 288.

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**Generalization of data on heat exchange during boiling of sugar solutions in annular ducts.** YU. D. PETRENKO and I. I. SAGAN'. *Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 156-159.—An empirical equation, derived from experiments in which aqueous sugar solution was



boiled in a vertical annular duct, is shown to be applicable to calculation of heat transfer under optimum conditions.

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**Effect of frequency and amplitude of fluctuations in temperature of supersaturated sucrose solution on crystal formation intensity.** I. S. GULYI *et al.* *Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 163-166.—Experiments are reported which showed that deliberate fluctuations in boiling temperature to either side of a "constant average" increased the rate of crystal formation; increase in the frequency and amplitude of such fluctuations reduced the length of the latent period and boiling "semi-period".

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**Molasses sugar extraction.** A. KACIMI. *Sucr. Maghrebine*, 1972, (2), 14-18.—Using data from Beni-Mellal beet sugar factory, where an experimental Asahi ion exchange plant has been used to demineralize 2nd strike raw syrup, the author compares the technological and economic advantages and disadvantages of molasses sugar extraction by the Steffen process and by ion exchange treatment and decides in favour of a Steffen plant annexed to the factory.

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**Use and growth of protococeae for sugar factory waste water treatment.** Z. D. ZHURAVLEVA and K. P. GONCHAROVA. *Sakhar. Prom.*, 1972, (9), 17-20.—The use of algae for waste water treatment<sup>1</sup> is discussed. Targets set for treated water are: pH 7-8; BOD 2-15 mg O<sub>2</sub>/litre; dissolved oxygen content 5-10 mg/litre; and complete absence of smell and colour. Advice is given on how to grow the necessary quantity of algae, and on disposal of the treated water.

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**Decomposition of sugars in juices and syrups.** A. R. SAPRONOV and R. G. ZHIZHINA. *Sakhar. Prom.*, 1972, (9), 24-27.—A method of calculating the kinetics of sucrose and invert destruction<sup>2</sup> at varying pH and temperatures was applied to comparison of conventional carbonation with a scheme involving predefecation mud removal before further juice processing. Results indicated that in both cases 0.035% sucrose (by weight) was decomposed during evaporation, while the reducing sugar content in thick juice resulting from conventional carbonation was 24.3% compared with 19.6% in the other, and differences in colour increase occurred accordingly. Hence, the new carbonation scheme gives a juice of greater thermal stability.

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**Effect of juice circulation on KDA diffuser performance.** N. S. KARPOVICH. *Sakhar. Prom.*, 1972, (9), 27-29. Difficulties are frequently encountered as a result of the inability of side screens in the pre-scalding attached to the Soviet KDA tower diffuser to allow passage of sufficient juice used for cossette scalding. Thus, to maintain the necessary juice:cossette ratio and heat the cossettes to the required temperature, a greater

quantity of raw juice must be withdrawn from the tower, putting greater load on the diffuser screens and adversely affecting diffuser performance. Greater attention to scalding screen maintenance is required.

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**Distribution of alkali concentrations in juice in the standard 1st carbonation vessel.** I. M. FEDOTKIN *et al.* *Sakhar. Prom.*, 1972, (9), 29-33.—Investigations using a specially modified carbonation vessel to allow juice samples to be taken from a number of points up and across the juice space showed irregularities in gas-juice mixing where gas was fed tangentially. Discrepancies in juice residence time were also discovered.

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**Method of calculating sugar losses as a function of campaign length.** B. E. GRABOVETSKII, V. V. DMITRASH and T. S. SHKOL'NIKOVA. *Sakhar. Prom.*, 1972, (9), 45-47.—From statistical evaluation of data obtained at two Soviet sugar factories, a formula has been developed which relates sugar losses to campaign length. Comparison of curves describing the relationship for calculated and true values for factories in the group shows very close agreement.

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**Energy production in the export of Polish sugar factories. II.** W. FACHNETTI. *Gaz. Cukr.*, 1972, 80, 250-260.—Details and diagrams are given of boilers of various types supplied by Polimex-Cekop as equipment in sugar factories built by the Polish concern in various countries. Heating schemes are also shown.

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**Theoretical questions of juice purification in the sugar factory.** K. VUKOV. *Cukoripar*, 1972, 25, 137-146, 163-171.—Facets of carbonation examined in this survey include: the colloidal and physical properties of the system sucrose-lime-water-CO<sub>2</sub>; conversion of invert, pectins and amides; formation and properties of non-sugar precipitates and non-sugar absorption by them; the effects of ash, amino-acids, invert, pectins and dextran on the quality of juice and mud; and the effects of basic parameters on juice purification, the major stages of which are described. Thin juice sulphitation is also discussed.

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**Centrifugal basket of glass fibre-reinforced plastic.** K. PAUSE. *Zucker*, 1972, 25, 719-727.—Details are given of a glass fibre-reinforced plastic centrifugal basket constructed by Maschinenfabrik Buckau R. Wolf AG and used during the 1971/72 campaign for *B*-massecuite at Wevelinghoven sugar factory in West Germany, during which it handled 30,000 charges. Advantages of the material used include its great strength and durability, low specific weight, high chemical and thermal stability, high elasticity modulus and low price compared with special steels of similar properties.

<sup>1</sup> *I.S.J.*, 1972, 74, 118.

<sup>2</sup> WOOTTON: *ibid.*, 1958, 60, 24.

**Theory of cell-type diffusers—application.** J. C. GIORGI. *Sucr. Franç.*, 1972, 113, 455–460, 513–517. The laws of diffusion resulting from the theory of SILIN are considered only approximately valid for the cell-type diffuser such as the De Smet and RT units. The conditions applying to a perfect or theoretical cell (where juice and cossettes leaving are in equilibrium) are therefore examined afresh and a new equation developed which also allows for possible recycling of press water. The second part of the article adopts two coefficients to allow for practical rather than theoretical circumstances and applies the theory to practical experience in the laboratory and in industry. A series of graphs are presented from which the effects of a change in one of the parameters may be observed.

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**The development of sugar factory beet yards during the past 35 years (1937–1972).** H. BRUNKE. *Zeitsch. Zuckerind.*, 1972, 97, 435–439, 639–644.—Beet unloading devices, particularly tipping platforms and beet conveying systems, are surveyed and a number of photographs of the equipment reproduced.

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**Certain aspects of the theory of continuous sectioned vacuum pans.** I. S. GULYI and I. M. FEDOTKIN. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 144–150.—Continuous boiling is examined mathematically and an equation derived for calculation of massecuite residence time distribution. Comparison of calculated values with experimental data obtained in a laboratory and full-scale B-masseccuite pan shows satisfactory agreement.

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**Generalization of experimental data on heat transfer during sugar massecuite boiling in tubes.** V. T. GAR-YAZHA and V. I. PAVELKO. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 156–159.—A formula which generalizes experimental data obtained by the authors of the present article and by other authors is presented for calculation of heat transfer to massecuite under optimum boiling conditions.

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**Reversibility of adsorption of colorants in sugar production.** M. I. DAISHEV and V. M. SHCHERBAK. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 179–181.—Experiments with beet juice, syrup and molasses as well as colorant solutions showed that dilution with water and 1 hour's thorough mixing after the product had been subjected to decolorization by bone char or active carbon (the adsorbent was not removed during dilution and mixing) did not increase the colour content of the product, indicating irreversibility of colour adsorption. During a given contact period sucrose prevented complete utilization of the adsorptive properties of the char or carbon, this effect increasing with sucrose concentration.

**Processing of sugar beet.** D. P. KULKARNI, J. R. UNDE and V. A. KETKAR. *Sugar News (India)*, 1972, 4, (5), 5–10.—Based on experience gained at Phaltan Sugar Works Ltd., Sakharwadi, where a DDS diffuser bought for cane extraction was also used for beet sugar processing, the differences between beet and cane as a raw material and between the two kinds of juices and their treatment are surveyed. Separate beet juice treatment requires additional plant and very much more lime; 10% of beet juice added to cane juice can be satisfactorily treated without changes, while 20% beet juice requires 25% more lime for good clarification using the sulphitation process. The unsuitability of beet pulp as a fuel means that vapour economy must be practised. While beet supply is low, the above methods will continue at Sakharwadi; separate processing will await development of beet cultivation, and will require beet varieties coming to maturity at the desired time and having a high sugar content and juice purity.

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**Spray mixers and prospects of their use in the sugar industry.** V. M. ROSINSKII, I. M. FEDOTKIN and L. P. ZARUDNEV. *Sakhar. Prom.*, 1972, (10), 23–27.—The advantages of spray processing are discussed and details given of experiments at Soviet sugar factories involving spray sulphitation (with SO<sub>2</sub> in liquid or gaseous form) of juice and syrup, and spray heating of press and fresh water for diffusion using evaporator vapour.

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**Treatment of water for sugar extraction from beet cossettes.** A. A. LIPETS and I. A. OLEINIK. *Sakhar. Prom.*, 1972, (10), 27–31.—Addition of aluminium sulphate to condenser and press water before use in diffusion caused a marked reduction in the colloid content while the pH after 30 minutes' heating at 70°C increased in contrast to the fall when SO<sub>2</sub> was used for water treatment. Aluminium sulphate also led to a higher purity 2nd carbonation juice compared with SO<sub>2</sub>. A diagram is presented showing a scheme for water treatment with aluminium sulphate.

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**Preliminary establishment of an algorithm for the technological process in a KDA-25-59 tower diffuser.** V. G. DRYNOV and V. G. DMYSHKO. *Sakhar. Prom.*, 1972, (10), 32–34.—Use of an algorithm derived from experimental data obtained during the previous campaign led to a fall in diffusion losses of 0.05% (absolute) on weight of beet during the subsequent campaign at the same factory.

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**Effect of ultrasonics on scale deposition in sugar factory evaporators.** I. M. FEDOTKIN, M. N. CHEPURNOI, M. I. KLIMENKO and V. E. SHNAIDER. *Sakhar. Prom.*, 1972, (10), 40–43.—The use of magneto-striction devices placed at the bottom of evaporator bodies to produce an ultrasonic effect reduced scale formation and would, it is calculated, permit evaporator operation to continue a further 57 days before cleaning was needed (an increase of 80% on the time where ultra-

sonic treatment was not used). The heat transfer coefficients in untreated evaporator effects fell at a rate which was 1.6–1.8 times greater than in the treated vessels.

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**Method of juice deliming by means of ammonia and soda.** H. ZAORSKA and S. ZAGRODZKI. *Zucker*, 1972, 25, 753–756.—See *I.S.J.*, 1973, 75, 254.

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**Automatic thyristor drive of a sugar centrifugal.** M. TONDOS and H. WIDLAK. *Gaz. Cukr.*, 1972, 80, 279–284.—Details are given of an automatic thyristor drive for a centrifugal of 1000-kg capacity developed in Poland. Advantages include better control of individual stages and of individual centrifugals independently in a battery, as well as ease of maintenance.

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**Suspension thickening after partial filtration of muddy carbonation juice.** S. M. ZAGRODZKI. *Zucker*, 1972, 25, 778–781.—Tests on filtration of 1st and 2nd carbonation juice using three different types of filter-thickeners are reported; the best results were obtained with a continuous model provided with rod elements from which the mud was removed by vibration. At a throughput of 43–44 m<sup>3</sup> hr<sup>-1</sup> (equivalent to a 3-minute retention) the suspension solids content was raised from 0.14 g per 100 cm<sup>3</sup> in 1st carbonation juice to 7.32 g per 100 cm<sup>3</sup>, giving a filtrate volume of 42.6 m<sup>3</sup> hr<sup>-1</sup>. The filtrate was absolutely clear.

\* \* \*

**Operative parameters of a plant for decolorization by ion exchange in a sugar factory.** S. LANDI and G. MANTOVANI. *Ind. Sacc. Ital.*, 1972, 65, 132–137.—A detailed description is given of a plant installed at San Pietro in Casale sugar factory and its operation in the treatment of remelt liquor before boiling as a 1st refined strike. The plant includes five columns of “Kastel A-501D” resin (Montecatini Edison S.p.A.), only four of which were used in 1971. Results from that campaign are compared with those from 1968–70. The feed liquor colour was higher (9.2°St % Brix vs. 4.46–5.9°) and the number of cycles was higher (102 vs. 37–65) so that decolorization was poorer (81.7% vs. 81.4–88.8%) but the colour removal capacity was greater (3354 colour units/litre of resin vs. 2870–2980). The importance of the composition of the colouring matter is emphasized.

\* \* \*

**Laboratory and factory tests on juice purification with mud removal before main liming during the processing of Kuban' beet.** G. A. VOVK and L. P. BUKETOVA. *Sakhar. Prom.*, 1972, (11), 19–21.—In the system described, 1st carbonation is divided into three stages of simultaneous liming and gassing. The juice pH is adjusted to 8.8–9.5, 10.8–11.0 and 11.2–11.5, respectively, and 7–8 volumes of juice

from stage 2 (per volume of stage 1 juice) is returned to stage 1, while 1 volume of stage 2 juice is settled and the mud removed before stage 3. Stage 1 replaces preliming whereby 25–35% of the total amount of lime used in carbonation is added to the juice to which thickened suspension from 2nd carbonation settlers has already been added; 15–20% of the lime is added at stage 2, and the remainder at stage 3. The juice is subjected to 2nd carbonation as normally. Despite a number of setbacks and the processing of poor quality beet in 1971, juice purity rise was greater than in the previous two campaigns using the BMA carbonation system, while juice and syrup colour was considerably lower than in 1966 when beet of about the same quality were processed.

\* \* \*

**Effect of interbody sulphitation of thick juice on wear of heat exchange tubes in evaporators.** B. I. KATS. *Sakhar. Prom.*, 1972, (11), 26–27.—Investigation showed that sulphitation of thick juice withdrawn from the 3rd effect followed by further concentration in the 4th effect of a quadruple-effect evaporator (having brass tubes) led to an increase in corrosive wear of evaporator walls, tubes and tube plates as a result of the free SO<sub>2</sub> present. Only in the case of stainless steel tubes was there no deterioration, so that this metal is recommended for such circumstances.

\* \* \*

**Re-pollution of waste waters.** N. F. ERMOLOV and V. G. ZAMANAEV. *Sakhar. Prom.*, 1972, (11), 27–29. The argument that algae used to treat factory effluent will later die and recontaminate the treated water is examined and found to be mainly groundless.

\* \* \*

**Biological treatment of waste waters at Chervonoznamensk sugar factory.** A. P. LAPIN and I. M. TAVARTKILADZE. *Sakhar. Prom.*, 1972, (11), 29–32.—Details, including costs, are given of the waste water treatment plant which includes biological filter towers, biological treatment ponds and normal settling ponds. The final BOD<sub>5</sub> is no higher than 2–3 mg/litre.

\* \* \*

**Determination of the strength of bags for sugar packing.** S. A. BRENMAN, I. I. PRILUTSKII and V. F. EVFIMENKO. *Sakhar. Prom.*, 1972, (11), 33–37. The strength of jute sugar bags as used in the USSR is discussed in view of the greater heights to which bagged sugar may be stacked and the ways in which a bag is used.

\* \* \*

**Selection of optimum juice draft for KDA (tower) diffusers.** B. A. EREMENKO and B. N. VALOVOI. *Sakhar. Prom.*, 1972, (11), 43–46.—A mathematical model is presented describing the process in a KDA tower diffuser; this can be used to establish optimum diffusion conditions and juice draft. How to use a trial-and-error method to introduce optimum diffusion using thinnest practical cosettes is explained.

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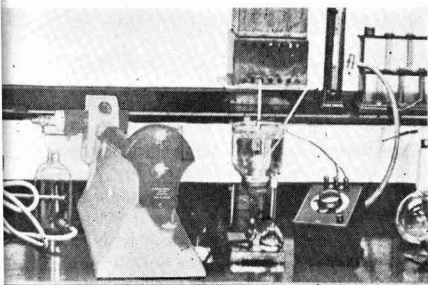
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## Laboratory methods & Chemical reports

**Polarographic determination of iron.** K. Číž and V. ČEKOVÁ. *Listy Cukr.*, 1972, **88**, 235-238.—Polarographic determination of iron in thin and thick juice, refined sugar and condensate showed that juice from DDS diffusers contained considerably more iron than did juice from battery diffusers, although half of this was removed by carbonatation and a third was included in incrustation or was removed by ion exchange softening of thin juice. Iron and other heavy metals (Zn, Cu and Pb) were determined after their isolation by cation exchange resin in  $H^+$  form and elution with N HCl. For polarographic determination,  $Fe^{+++}$  was reduced in a strongly alkaline medium (KOH) in triethanolamine.

\* \* \*

**Anion analysis in sugar factory products—a rapid method.** F. NEUBRUNN. *Zeitsch. Zuckerind.*, 1972, **97**, 507-513.—The numbers of anions in groups having the same dissociation constants were calculated from potentiometric titration carried out with HCl on beet sugar factory products from press juice to final molasses. The rapid method used is described and the results tabulated. The procedure is applicable to process control where buffering is affected by the anions, such as in demineralization by ion exchange or dialysis, to comparison between different carbonatation systems, and to investigations on diffusion.

\* \* \*

**Grain size distribution in isothermally conducted sucrose crystallization.** S. ORLOWSKI and D. SCHLIEPHAKE. *Zucker*, 1972, **25**, 619-633.—A vertical moving bed "crystallizer" is described which was used in semi-commercial tests to investigate sucrose crystal size distribution. Crystals were injected into an ascending solution, thus permitting production of a homogeneous suspension. Under otherwise constant conditions, grain size scatter increased more rapidly with rise in crystallization temperature or with increase in the initial crystal content. Different environmental conditions in the crystallizer led to variations between the crystal growth along the  $b$ -axis relative to the  $c$ -axis and to the mass equivalent diameter; this is to be further investigated. Variation in grain size distribution with temperature was used as the basis of a method for calculating crystal growth rate. Linear growth numbers and their reciprocals were calculated and plotted against temperature, crystal content and length of the  $c$ -axis. The effects of resistance to mass transfer and to diffusion were examined. An activation energy mean of 78.3 kJ/mol

was calculated for the surface reaction using the Arrhenius equation. Results of factory-scale boiling are briefly discussed in terms of grain size distribution.

\* \* \*

**The standard criteria of raw sugar and the premium and penalty involved.** A. H. HIŃOLA. *Sugar News* (Philippines), 1972, **47**, 255-256.—See *I.S.J.*, 1973, **75**, 222.

\* \* \*

**Determination of sugar losses in beet fluming and washing.** J. F. T. OLDFIELD, J. V. DUTTON, N. D. MORGAN and H. J. TEAGUE. *Sucr. Belge*, 1972, **91**, 433-441.—See *I.S.J.*, 1973, **75**, 289.

\* \* \*

**Application of radio-isotopes in sugar technological practice and research.** H. HIRSCHMÜLLER. *Proc. 46th S. African Sugar Tech. Assoc.*, 1972, 21-26.—A review is presented, with 26 references to the literature, of applications of radio-active materials in the sugar industry, including detection of evaporator tube corrosion, hopper level measurement and control, continuous weighing of sugar and bagasse on a belt conveyor, milk-of-lime concentration measurement, pan circulation research, measurement of retention in clarifiers, etc.

\* \* \*

**The determination of nitrogen-free organic acids in Natal cane molasses.** J. BRUIJN and M. VANIS. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 64-68. Diluted molasses from eight Natal sugar factories were deionized, concentrated *in vacuo*, and analysed by gas-liquid chromatography. Volatile acids were determined by the gas chromatography method of KIELY and O'DRISCEOIL<sup>1</sup>. The results showed that there were no major differences between the acids present in molasses from diffuser factories and those using only milling, four samples of each being examined.

\* \* \*

**Exhaustion of South African final molasses.** J. BRUIJN, J. R. FITZGERALD, S. KOENIG and A. W. MACGILLIVRAY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 103-109.—By equilibrating molasses with sucrose at 40°C and a viscosity of approximately 1000 poises, a relationship has been established for South African molasses between true purity ( $p$ ), reducing sugar ( $r$ ) and ash ( $a$ ), namely  $p = 51.02 - 10.89 r/a$ . The relationship gives a better indication of actual molasses exhaustion than the DOWES

<sup>1</sup> *I.S.J.*, 1971, **73**, 135.

DEKKER formula currently used in South Africa, although the possibility of a logarithmic form is to be investigated instead of the present linear one because of deviations above an  $r:a$  value of 1.35. Further work is to be done on validity of the relationship at different periods of the crushing season and on the influence of individual organic components.

\* \* \*

**Sugar factory material balance calculations with the aid of a digital computer.** A. M. GUTHRIE. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 110–115. The mathematical models used to compute the materials balance at the various stations in a sugar factory are described and the overall logic of the computer programme to prepare a factory materials balance is discussed. The use of the programme to study the effect on the factory of varying one process parameter is illustrated and other applications of the programme are discussed.

\* \* \*

**Filtering quality of raw sugar. Influence of starch and insoluble suspended matter.** J. P. MURRAY. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 116–132.—The filtrability of dissolved raw sugar was examined before and after carbonatation and related to the insoluble solids content and starch content of the melt; it was found that the suspended matter affected the filtrability of unprocessed raw liquor, starch having a minimal effect, while it was starch which profoundly affected the filtrability of carbonatated liquor, suspended insoluble matter being of much less importance. The mechanism by which starch affects the carbonate precipitate, so reducing filtrability, is discussed.

\* \* \*

**Use of statistical quality control at the Durban sugar terminal.** A. J. RADFORD. *Proc. 46th Congr. S. African Sugar Tech. Assoc.*, 1972, 133–137.—Multiple analyses have been made of sugars for pol and moisture, starch, colour, reducing sugars, ash, filtrability, gums and phosphate, in order to establish means and standard deviations as a guide to the reliability of the different analyses. Where the standard deviations are high they are to be used to investigate the possibility of improving the accuracy and precision of the method and its application.

\* \* \*

**Flow anomalies of cane sugar factory molasses.** D. H. SMOLNIK and H. J. DELAVIER. *Zeitsch. Zuckerind.*, 1972, 97, 498–506, 615–628.—After a brief explanation of the fundamentals of viscosity measurement, with particular reference to impure sugar solutions, the authors discuss the rheological properties of beet molasses and cane molasses. While beet molasses are generally Newtonian fluids, measurements carried out with a rotary viscometer on 62 cane molasses samples from 14 countries showed that all but 8 were non-Newtonian in contrast to most findings which indicate that cane molasses exhibit Newtonian visco-elasticity. Values of the pseudo-plasticities and of the statistical means are given for temperatures

in the range 20–80°C at 10° intervals. A marked correlation was found between temperature and pseudo-plasticity, which was unaffected, however, by the dry solids content. Dissolving of gums in the molasses with ethanol caused pseudo-plasticity to disappear. Air suspended in the molasses also induced pseudo-plasticity. A nomogram is presented for calculation of pressure drop in cane molasses flow along pipe-lines, and 154 references are given to the literature.

\* \* \*

**Chromatography of sugars and raffinose determination.** M. ROCHE. *Ind. Alim. Agric.*, 1972, 89, 1001–1006. The use of thin-layer chromatography for sugars separation is described and the various stages explained.  $R_f$  values obtained with various layers and solvents are given. While sucrose-raffinose separation is easy, trioses can interfere in raffinose quantitative determination; to avoid this, double development is used which gives better separation.

\* \* \*

**Heat of solution of sucrose and specific heat of aqueous sugar solutions.** YA. V. ZEL'TSER and B. M. MALYAROV. *Izv. Vuzov, Pishch. Tekh.*, 1972, (4), 49–52.—From experiments a relationship was found between heat of mixing of amorphous sucrose and water and change in volume of the components as a solution. Heats of mixing are tabulated for sucrose concentration in the range 5–50% by weight, calculated values being compared with experimental data in the temperature range 10–40°C. Specific heats calculated from two formulae are compared for sucrose of 10–50% concentration by weight at 10–40°C.

\* \* \*

**Effect of sodium chloride on sucrose crystallization kinetics at different temperatures.** V. F. DOBROMIROVA, V. M. KHARIN and S. E. KHARIN. *Sakhar. Prom.*, 1972, (10), 20–21.—In laboratory tests at 50, 60, 70 and 80°C NaCl caused a marked reduction in the number of sucrose crystals formed per g of sucrose and in a given volume of solution, as well as a noticeable increase in crystal size, compared with results obtained in the absence of NaCl.

\* \* \*

**Melassigenic capacity of sulphite and sulphate ions and their effect on molasses viscosity.** L. D. BOBROVNIK, G. P. VOLOSHANENKO and A. R. SAPRONOV. *Sakhar. Prom.*, 1972, (10), 22–23.—Experiments in which sodium sulphite and sulphate were added, respectively, to molasses before crystallization of its sugar during 4 days at 40°C showed that both sulphite and sulphate were slightly melassigenic, the sulphate being less so than the sulphite. Both reduced molasses viscosity.

\* \* \*

**Determination of alpha-amino-nitrogen in beet and raw juice.** R. BRETSCHNEIDER, J. ČOPÍKOVÁ, P. KADLEC and E. FIALOVÁ. *Listy Cukr.*, 1972, 88, 252–257.—In colorimetric determination of  $\alpha$ -amino-N in press and raw juice by the method of STANĚK & PAVLAS, colorants and other non-sugars present had a reducing

effect on the intensity of the blue colour formed. However, the error can be minimized by adding an aqueous solution containing asparagine, glutamine, aspartic acid and glutamic acid in given proportions and correcting the measured absorbancy value.

\* \* \*

**Application of ion exclusion in the sugar industry. III.** K. ČÍŽ, V. ČEJKOVÁ and V. HOBIKOVÁ. *Listy Cukr.*, 1972, **88**, 257–260.—Comparison of gel-type and macroporous resins used in ion exclusion treatment of model sucrose-KCl solutions showed that while the former type had greater separating power than did the latter type, flow through the column was slower, and so macroporous resins are considered more suitable. Separation of molasses components was more difficult. For ion exclusion treatment of eluates obtained after regeneration of decolorizing resins, the fraction having only a moderate colour content is more suitable than the low or high colour fractions.

\* \* \*

**Sugar losses in flume water and their analytical determination.** W. UHLENBROCK. *Zucker*, 1972, **25**, 771–773.—Relationships have been established between beet maturity and storage, degree of mechanical injury and sugar losses in flume water. Enzymatic analysis has proved suitable as an accurate and rapid method of determining flume water sugar content. The efficiency of any measures taken to reduce flume losses can only be gauged by continuous analysis.

\* \* \*

**Effect of dilution on exchange of alkali ions in green syrup for magnesium ions.** S. LANDI and G. MANTOVANI. *Zucker*, 1972, **25**, 774–777.—Laboratory experiments are reported which were aimed at establishing whether it is possible, and to what extent, to improve the effective exchange capacity of a resin in the Quentin process by (i) reducing the flow rate to below the usual rate of 2 bed volumes per hour, or (ii) lowering the viscosity without detriment to the efficiency. Each measure studied individually was found to have a favourable effect by increasing  $K^+$  and  $Na^+$  and total ( $K + Na$ ) exchange, although it is emphasized that there are practical disadvantages in a reduced flow rate and in the larger amount of dilution water to be evaporated (although the second factor can be partially balanced against a greater quantity of sweetening-off water for recycling).

\* \* \*

**Determination of polysaccharides in cane juice and the products of the sugar industry.** L. E. LEAL G. and S. G. KARA-MURZA. *Sobre los derivados de la caña de azúcar*, 1972, **6**, (2), 25–30.—The method proposed involves the separation of polysaccharides (as dextran) by gel filtration through a column of a Hungarian product “Akrilex 0-10” which has an upper passage limit of 10,000 M.W. The polysaccharide fractions are collected and the dextran content measured colorimetrically using the anthrone-sulphuric acid method.

**Determination of the sucrose content in sugar cane.** M. DEMAUX. *Brasil Açuc.*, 1972, **80**, 441–458.—An illustrated account is given of the direct analysis of cane by means of a FAPMO sampler, disintegration of the sample by a “Jeffco” or Waddell shredder, extraction of the juice with a Pinette Emidecau hydraulic press, and analysis of the juice using a Gallois automatic saccharimeter.

\* \* \*

**Determination of the flow rate of supersaturated sucrose solutions during crystallization on the basis of a heat balance.** S. ZAGRODZKI and Z. SUDOMIR. *Gaz. Cukr.*, 1972, **80**, 273–278.—Tests and the experimental equipment used are described in which the effects of circulation, temperature and purity on crystallization rate were studied in artificial masecuite, which passed from a heating chamber via a saturation chamber, pipeline and cooler to a crystallization chamber. Supersaturation was maintained constant. Flow rate in the heater and cooler was measured from the temperature differences. The method permitted the crystallization rate to be calculated by relating the flow rate to the area of the cross-section of the free space between the crystals in the crystallizer.

\* \* \*

**Amino-acid content in press juices.** H. GRUSZECKA. *Gaz. Cukr.*, 1972, **80**, 288–291.—Ion exchange chromatography was used to determine amides and amino-acids in clarified press juice, and measured values are given for 1969/70 (after hydrolysis) and 1971/72 (without hydrolysis).

\* \* \*

**Phenolic compounds in sugar beet and their physiological rôle.** J. TRZEBIŃSKI. *Gaz. Cukr.*, 1972, **80**, 292–293, 296 (a).—The distribution of phenols in the sugar beet, their reactions and their rôles in preventing rotting are discussed.

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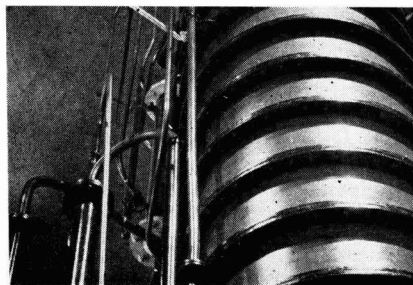
**Boiling point elevation of sugar factory solutions and their supersaturation. II. Tabulated data and simplified equations.** G. VAVRINECZ. *Cukoripar*, 1973, **26**, 19–22.—Tables are presented showing supersaturation coefficients for boiling point elevation in the range 60–110°C. The data are applicable to purities in the range 80–94, and simplified equations are given for calculation of the correction factor to be applied at each purity to the calculation of supersaturation as a function of BPE.

\* \* \*

**Physico-chemical fundamentals of sugar technology.** S. E. KHARIN. *Izv. Vuzov, Pishch. Tekh.*, 1972, (6), 51–60.—The thermodynamics of aqueous sucrose solutions are investigated and equations derived for calculation of the coefficient of activity, heat of solution and heat of dilution as a function of solution composition and temperature. Calculated values of the activity coefficient of sucrose agree closely with experimental values obtained by PERMAN<sup>1</sup>, while sucrose solubility values in the range 20–80°C were in close agreement with those of HERZFELD and somewhat less so with those of GRUT.

<sup>1</sup> *Trans. Faraday Soc.*, 1928, **24**, 330.

# By-products



**A molassed sugar beet pulp nut containing added urea, phosphate, trace elements and vitamins.** R. G. HEMINGWAY and J. J. PARKINS. *British Sugar Beet Rev.*, 1972, **40**, 207-212, 214.—“Triple Nuts”, a product containing beet molasses, pulp, 17% crude protein, 2.8% urea and 4.0% dicalcium phosphate, was used in animal feeding tests. Full details are given of the tests and their results, indicating generally that “Triple Nuts” can be incorporated in animal diets to a certain degree without any adverse effects on milk composition (50% inclusion of “Triple Nuts” reduced yield very slightly) or daily liveweight gain of growing cattle and for ewe nutrition in late pregnancy and early lactation.

\* \* \*

**Bagasse for paper.** L. GALEAZZI. *Sugar y Azúcar*, 1972, **67**, (8), 16.—Reference is made to bagasse and paper pulp production at Cia. Industrial de San Cristóbal S.A. using the Cusi process, on the basis of which the firm was established in 1951 by the inventors. The types of paper for which bagasse is most suitable are mentioned, and it is emphasized that close attention must be paid to technological and economic requirements of bagasse pulp and paper production to make it a competitive raw material.

\* \* \*

**Relationship between the tangent of the angle of beet pulp (dielectric) losses and the moisture and composition of the mixture.** M. G. PARFENOPULO and N. E. KARAUOV. *Izv. Vuzov, Pishch. Tekh.*, 1972, (3), 76-79.—A special cylindrical capacitor was used in experiments on beet pulp and pulp-molasses mixtures to determine the relationship between the tangent of the angle of dielectric loss and moisture content (as well as molasses content in mixtures) for application to selection of optimum drying conditions in an electric field.

\* \* \*

**Molasses—spray feeding improves palatability of roughage.** T. O. BELL. *Sugar J.*, 1972, **35**, (4), 9-11. Use of the patented “Sifon” spray system to apply molasses solution to pasturage is described and results given of tests showing the number of cattle consuming the various concentrations of molasses per hour. Advantages of the system are discussed.

\* \* \*

**Molasses—its economical utilization and future possibilities.** K. N. PAUL. *Sugar News (India)*, 1972, **4**, (3), 19-21.—A history is given of the production of ethyl alcohol in India on a basis of molasses, and it

is pointed out that more could be produced whereas alcohol had to be imported to meet the country's requirements at a higher price than local production cost. A brief summary is given of other outlets for molasses utilization.

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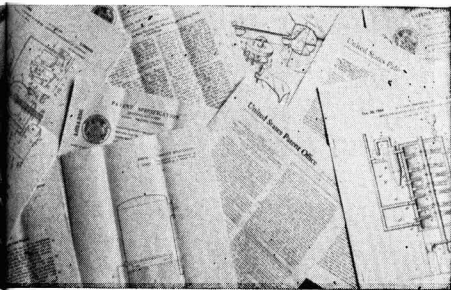
**The sulphite content in dry pulp and possible ways of affecting it.** H. SCHIWECK, L. BÜSCHING and G. STEINLE. *Zucker*, 1972, **25**, 743-748.—Three-year investigations showed that the sulphite content of beet pulp is governed by the sulphite content of the heating medium, pulp dry solids, the quantity of SO<sub>2</sub> used for diffusion water treatment, molasses sulphite content and the mixing of boiler flue gases with gas used for drying of the pulp. While it has been found impossible to reduce the pulp sulphite content to below 400 mg/kg dry solids, an upper limit proposed by the EEC Commission, the author does not feel that a reduction is justifiable from the viewpoint of the animal's physiology.

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**Study of the action of sodium hydroxide on nitrated bagasse.** L. HERNÁNDEZ C. and R. SUÁREZ R. *Sobre los derivados de la caña de azúcar*, 1972, **6**, (2), 60-73. During the production of  $\alpha$ -cellulose from bagasse with nitric acid, the nitrated lignin and pentosans are removed by treatment of the bagasse with sodium hydroxide. The investigation records the effects of such extraction on the laboratory scale using NaOH concentrations of 0.8-18.8 g/litre and temperatures of about 50° to about 90°C. The two factors affected pentosan extraction to a much greater extent than delignification which occurred mainly in the first minutes of treatment. The limit of worthwhile concentration for the NaOH was 4.59%.

\* \* \*

**The efficiency of producing fat and lean meat in Yorkshire and Duroc Jersey pigs fed to 150 kg live weight on molasses-based diets. I. Performance to different live weights.** M. VELÁZQUEZ, T. R. PRESTON and M. B. WILLIS. *Rev. Cubana Cienc. Agríc.*, 1972, **6**, 167-172. Daily gains with pigs fed on restricted high-test molasses plus fishmeal diets increased with slaughter weight up to 150 kg while animals fed *ad lib.* showed a reduced daily gain after 90 kg. In both cases intake increased and conversion deteriorated with increase in slaughter weight but protein conversion deteriorated only under *ad lib.* feeding. Differences in traits such as fat, bone, etc. proportions were observed between intermediate slaughter weights and between breeds.



# Patents

## UNITED STATES

### Inhibition of inversion of sucrose in sugar cane juice.

A. G. ALEXANDER, of Rio Piedras, Puerto Rico, *assr.* COMMONWEALTH OF PUERTO RICO. **3,698,950**. 18th March 1971; 17th October 1972.—Inversion in cane juice is inhibited by (filtering and treating with  $ZnSO_4$  and  $Ba(OH)_2$  before) adding [(40–60 (10–12) (2–3) moles. $cm^{-3}$ )] sodium metasilicate.

\* \* \*

### Joint production of furfural and levulinic acid from bagasse.

E. RAMOS R., of San Juan, Puerto Rico, *assr.* COMMONWEALTH OF PUERTO RICO. **3,701,789**. 15th October 1970; 31st October 1972.—(One part of comminuted and acid-impregnated) Bagasse is heated in a closed reaction vessel under saturating pressure with (8–12 parts of) [1.0–1.62% (1.33% v/v) aqueous sulphuric acid liquor to 160–170°C over a time ( $\geq$  70 minutes) and at such a rate that extensive depolymerization of carbohydrate polymers occurs but less than 20% and 55%, respectively, of the potential hexoses and pentoses are present in monomeric form. The furfural present and being formed is distilled off at a temperature within the above range (at 168°C) until substantially all the pentoses and pentose-producing carbohydrates have been consumed ( $\geq$  55 minutes) when the volume is reduced to give a 3–6 times higher concentration of  $H_2SO_4$  than the original (about 4%) and 30–75% of the total possible amount of levulinic acid has been formed from the hexose-producing carbohydrates. The vessel is again closed and the temperature raised to 185–210°C (195°C) (in less than 8 minutes), maintaining this [for 5–20 (5) minutes] until production of levulinic acid is substantially complete (followed by rapid cooling) [and return of the mixture to the first stage until the mixture produced eventually contains  $>$  10% of levulinic acid which is then recovered by solvent extraction (as the Ca salt)].

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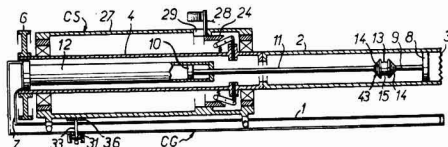
**Drying of sugar solution.** E. T. WOODRUFF and V. S. ANDERSEN, *assrs.* W. R. GRACE & Co., of New York, N.Y., USA. (A) **3,704,169**. 3rd May 1971; 28th November 1972. (B) **3,706,599**. 3rd May 1971; 19th December 1972.—(A) Droplets of a sucrose-containing solution (affination syrup or the last strike liquor from conventional sugar refinery crystallization) are continuously dried in a current of heated air in

the presence of 0.4–5 parts by weight of separately and continuously introduced recycled solids on weight of solids in the solution, the recycled solids being of average particle size  $200\mu$  or less (50–150 $\mu$ ) which inhibits or prevents accumulations on the dryer walls. The size of the recycle solids may be maintained by deagglomeration of the product in the dryer recycle system. Alternatively the solids may be dispersed in the heated air current and 0.25–2 parts on weight of recycle solids of sucrose solution dispersed as droplets in the air separately and continuously. (B) Equipment for the process is described.

\* \* \*

**Sugar cane sampler.** P. E. BEAUDOUX, of Dieppe, France. **3,704,627**. 30th August 1971; 5th December 1972.

The probe cylinder 2 is formed with a circumferential saw blade mouth 3 and fixed rigidly to the coaxial hollow shaft 4 which rotates in the probe chassis CS as a result of an electric motor driving pulley 6. The chassis is mounted so that it can slide parallel to the axis of the probe in a guide track 1 formed on the guide chassis CG. Concentric with the shaft 4 and mounted on the end 7 of the guide chassis is a hydraulic casing 12 holding a jack 10 carrying a



rod 11 connected to another rod 9 and piston 8 by means of a sleeve 13 in the form of two collars 14 separated to form a circular groove 15. A system of pins engaging with the groove, abutments, etc. allow the probe to move forward and rotate into the cane, accumulating a sample within it; the probe and chassis CS return and the rod 9 and piston then eject the sample. They then return to their original position, when the probe is ready to take another sample.

\* \* \*

**Cane harvester topping device.** H. A. WILLET, of Thibodaux, La., USA, *assr.* CANE MACHINERY & ENGINEERING CO. INC. **3,705,481**. 28th December 1970; 12th December 1972.

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).



# 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.

**Cane unloading.** Muir-Hill, Bristol Rd., Gloucester, England.

Cane is unloaded from cane carts at a Jamaican sugar factory by means of chains fixed to one side of the cart and to a loosely laid bracket on the top of the other side. The chains are laid around the inside edge of the cart before the cane is loaded; on arrival at the yard, the bracket is raised by a gantry crane and the complete cane load is lifted by the chains over a specially-constructed wall and then falls free. The cane is then picked up by one of two A6000 Muir-Hill loading shovels fitted with Rockland grabs. The system replaces one in which the cane was unloaded in individual chained bundles and had to be released manually before being fed by crane grab to the mill. Use of the Muir-Hill units has permitted savings in manpower and increased throughput.

\* \* \*

**Hydraulic cane loading.** T. T. Boughton & Sons Ltd., Bell Lane, Amersham, Bucks., England.

The illustration depicts a new "Mas cane" 4-wheel-drive, hydraulic loading unit built by T. T. Boughton for Tate & Lyle Technical Services Ltd. Twenty such units have been despatched to the Philippines to solve a difficult handling problem, and the system



is expected to find application in the cane industry wherever the terrain does not permit full mechanical harvesting.

In the new semi-mechanized system, a 5-ton pile of hand-cut cane is formed into a compact bundle (held by a pair of sling chains) by a tractor fitted with the "Mas cane" winch loading system securely mounted on a reinforced safety frame and is then drawn up ramps onto a side-loading trailer, movement of which is restrained by two hydraulically-controlled front arms during loading. The quantity of extraneous matter accompanying the cane from the field is substantially reduced, and far more cane can be cut during each working period.

## PUBLICATIONS RECEIVED

**WORM GEAR UNITS.** Renold Ltd., Renold House, Wythenshawe, Manchester, England.

A new 60-page brochure gives full details of Holroyd and Crofts single-reduction worm gear units, covering a range from small fractional hp units to large sizes capable of output torques up to 1,000,000 lb-ft/in (more in certain cases) and with ratios ranging from 5:1 to 70:1.

\* \* \*

**"CHEMICALS FOR PLANT PROTECTION, VETERINARY USES AND PUBLIC HEALTH."** Shell International Chemical Co. Ltd., Shell Centre, London SE1 7PG, England.

A new 152-page brochure gives full details of Shell products covered by the above title, including chemical and physical properties, formulations, biological action, recommendations on use, residues, toxicology, handling precautions and medical advice. Of interest to beet and cane farmers are "Aldrin", "Dieldrin", "Endrin", "Azodrin", "Bidrin", "Gardona" and "Phosdrin" insecticides, D-D pre-emergence soil fumigant for nematode control, and "Bladex" herbicide for control of broad-leaved and grass weeds.

\* \* \*

**MAGNETIC SEPARATORS.** Electromagnets Ltd., Boxmag Works, Bond St., Birmingham B19 3LA, England.

An 11-page brochure (No. 100) gives information on magnetic separators and lifting magnets produced by Electromagnets Ltd.

\* \* \*

**Steam turbines for the sugar industry.**—Amalgamated Power Engineering Ltd., of Queens Engineering Works, Bedford, England, have received orders worth £559,000 for the supply of 19 steam turbines to sugar factories in Australia, Cuba, Indonesia, Iran, Malawi, Malaysia and South Africa. Of the turbines, 10 are single-stage Allen KKK machines and 9 are multi-stage Allen SLC machines. The units for Cuba are intended to drive pumps, while most of the others are back-pressure sets for driving alternators. Some of the machines for South Africa are to drive cane shredders, and the Malaysian order will include cane mill drive turbines.

# International Society of Sugar Cane Technologists 15th Congress 1974

NINE months before the 15th Congress of the ISSCT membership had reached 1048, of which 924 are from outside South Africa. The indications are, therefore, that the Golden Jubilee Congress will be the biggest and most successful in the Society's history. The programme for the Congress is almost finalized, according to the latest ISSCT *Newsletter*, which emphasizes the opportunity for delegates to get together at cocktail parties and other functions arranged by the Organizing Committee in addition to the programme of work reported earlier<sup>1</sup>.

A static display of the latest sugar industry equipment and materials is being arranged and will be held either in the Elangeni Hotel, Durban—headquarters of the Congress—or at a nearby site.

The Ladies' Programme has now been announced; while their menfolk are visiting the factory and field demonstrations at Transvaalse Suiker Bpk., the ladies will participate in a special tour, to be followed in the evening by a party and barbecue at the Kruger National Park where wildlife observation tours are arranged for the whole party. After journeying to Pretoria, members and their ladies will visit places of interest in the city before departing for Durban via Johannesburg.

In Durban the ladies will be given a display of African art and handicrafts with films and introductory talks and they will be presented with a booklet of information to aid them in shopping and visits to Durban's places of interest on their free days. An outing is arranged to the Tongaat sugar estate and there will also be a floral demonstration, a visit to the Durban-Westville University for Indians and the M. L. Sultan Indian Technical College with a parade of models of Indian saris. A day will be spent at the Clairwood Turf Club racecourse and a visit made to the Huletts Country Club with a display of Zulu dancing and a barbecue.

The ladies will also tour the Durban sugar terminal and enjoy a boat trip round the bay, with a visit to the Oceanarium and another to the Valley Trust health centre. Ladies will have tea at Mrs. JOHN CHANCE's farm at Gingindlovu and visit a Zulu kraal, while at the hotel in Durban there will be a fashion show and a special lecture and demonstration on African music.

Throughout the Congress there will be luncheons and cocktail parties, and delegates and their ladies will be invited to spend an evening with private hosts so that they can see typical South African homes and farms. The Congress will end with a final banquet in the sugar terminal before departure for home or for the post-Congress visit to Mauritius.

The Organizing Committee have obviously done a great deal to ensure the success of the 15th Congress from both technical and social aspects and it should prove both professionally instructive and entertaining

for all participants. Members who have not yet registered should ensure that they complete and submit application forms no later than 31st December 1973. These may be obtained from their Regional Vice-Chairmen or from Mr. J. L. DU TOIT, General Secretary/Treasurer, ISSCT 15th Congress, P.O. Box 507, Durban, South Africa.

The cost of ISSCT membership is US \$20.00 while that of the package tour for the Congress is R525 (single) or R475 (shared accommodation) and the cost of the post-Congress tour in Mauritius from 30th June to 4th July is 740 (single) or 620 (shared) Mauritius rupees. Travel costs to South Africa and Mauritius are not included, of course, and members will have to make their own arrangements for air travel.

---

**French sugar factories and water pollution**<sup>2</sup>.—French sugar factories have signed a formal undertaking to cut pollution by three-quarters by 1976. The companies will have to invest up to 100 million francs. The importance of the decision lies in the fact that the country's 71 factories account for an estimated 16% of water pollution in France.

\* \* \*

**US sugar factory closure plans**<sup>3</sup>.—The Smithfield and Poplar Grove sugar factories in Louisiana are now both operated by a new cooperative, The Smithfield Sugar Cooperative Inc. Both of the factories will operate during the 1973 crop but thereafter the Poplar Grove plant will close and most of its equipment will be transferred to Smithfield which is being expanded.

\* \* \*

**Syria sugar imports, 1972**<sup>4</sup>.—Imports of sugar by Syria in 1972 totalled 134,135 metric tons, raw value, of which Cuba supplied 101,147 tons, Brazil 32,825 tons and the remaining 163 tons came from the EEC. In 1971 imports had reached 217,017 tons; Cuba again was the major supplier with 113,705 tons while 25,000 tons came from Brazil and 14,414 tons from the EEC. Other suppliers included Yugoslavia with 38,072 tons, East Germany with 17,391 tons and the USSR with 4170 tons while the remainder came from other sources.

\* \* \*

**New cane varieties in Trinidad**<sup>5</sup>.—A new variety of cane, HJ5741, with a yield which is substantially superior to the well-entrenched B41227, is currently being extensively tested through Caroni Ltd.'s lands. As part of a drive to improve the yield of sugar per acre, Caroni's Research Station at Carapichaima is now in the final stages of exhaustive tests on a further four new cane varieties which should be ready for commercial extension in two or three years and which, on present indications, may also outstrip the standard B41227.

\* \* \*

**New sugar factory for Iran**<sup>6</sup>.—The Czechoslovakian firm Technoexport is to build a new sugar factory in Iran for the 1975 campaign. It will have a daily capacity of 1000 tons of beet.

---

<sup>1</sup> *I.S.J.*, 1973, **75**, 295.

<sup>2</sup> F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), 22.

<sup>3</sup> *Sugar Bull.*, 1973, **51**, (19), 4.

<sup>4</sup> F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), x.

<sup>5</sup> *W. Indies Chron.*, 1973, **88**, 393.

<sup>6</sup> F. O. Licht, *International Sugar Rpt.*, 1973, **105**, (25), 24.

## Brevities

**French sugar company merger<sup>1</sup>.**—The Boards of Société Nouvelle de Raffinerie Lebaudy-Sommier and Société des Raffineries de Sucre St.-Louis, both sugar refiners, have approved the terms of a merger, subject to shareholder approval, which involves exchange of shares.

\* \* \*

**Colombia sugar exports suspension<sup>2</sup>.**—In August the Colombian Government decided to suspend exports to the world market. The exports figure was originally set at 230,000 tons, including the US quota of some 72,000 tons, but this has now been reduced to 130,000 tons. About half the US quota has been supplied while 61,470 tons has been sold on the world market; the balance of the US quota will be met, but world market sales will be suspended until supplies are secured.

\* \* \*

**Tanzania sugar expansion plans<sup>3</sup>.**—Tanzania is to invest some 326 million shillings over the next nine years in an effort to make the country self-sufficient in sugar, the National Agricultural and Feed Corporation has announced. The aim is to raise production to 75,000 tons a year by 1982 from the present level of 6000 tons.

\* \* \*

**Cameroun sugar industry expansion loan<sup>4</sup>.**—The European Investment Bank will make a loan of 1.8 million units of account to the Société Sucrière du Cameroun in order to double the production capacity of the company to 30,000 tons per year. Production is entirely earmarked for domestic requirements. The entire project is understood to involve 6.54 million units of account.

\* \* \*

**Jamaica sugar production, 1973<sup>5</sup>.**—The final production of 1973 crop sugar amounted to 337,088 tons, compared with 377,765 tons for the 1972 crop. The average sucrose content of the cane was slightly higher, requiring 10.47 tons of cane per ton of 96° sugar in 1973 as against 10.52 tons in 1972.

\* \* \*

**Indonesia sugar imports, 1973/74<sup>6</sup>.**—Indonesia is to import 200,000 tons of sugar for the 1973/74 fiscal year in order to stabilize domestic prices.

\* \* \*

**St. Kitts sugar crop.**—The 1973 sugar crop ended with a production of 23,364 tons as against 25,931 tons in 1972, the cane crushed having been reduced from 243,295 tons to 210,501 tons. The continuous drought during part of the 1973 crop hindered the replanting programme and it is anticipated that 1974 sugar production, although greater than that of 1973, will not exceed 25,000 tons. At this level sugar production is still not profitable but the new centralized field administration is aiming to increase both the acreage and tonnage of cane in 1975.

\* \* \*

**Greece sugar factory contract<sup>7</sup>.**—The Polish trade organization Polimex-Cekop is to build the fifth Greek sugar factory at Orestias in the Province of Thrace. It should be completed in 1975 and will have a slicing capacity of 3000 tons of beet per day.

\* \* \*

**New Bulgarian sugar factory<sup>8</sup>.**—A new sugar factory is to be built, with Polish help, at Dolna Metropoliya in the Pleven district of Bulgaria. The first stage will be completed in 1975 and will have a capacity of 3000 tons of beet per day.

## US sugar supply quotas 1973

	Initial quotas	Increases/ Shortfalls/ Redistributions	Quotas in effect
	(short tons, raw value)		
Domestic Beet	3,500,000	0	3,500,000
Mainland Cane	1,591,000	17,333	1,608,333
Texas Cane	20,000	—15,000	5,000
Hawaii	1,143,000	0	1,143,000
Puerto Rico	90,000	0	90,000
Philippines	1,440,052	0	1,440,052
Argentina	85,459	0	85,459
Australia	204,016	41,177	245,193
Belize	37,981	5,746	43,727
Bolivia	7,261	0	7,261
Brazil	616,641	0	616,641
Colombia	75,963	0	75,963
Costa Rica	81,299	14,811	96,110
Dominican Republic	714,946	17,510	732,456
Ecuador	91,046	0	91,046
Fiji	44,705	0	44,705
Guatemala	69,517	—250	69,267
Haiti	15,295	0	15,295
Honduras	0	0	0
India	81,688	0	81,688
Ireland	5,351	0	5,351
Malagasy Republic	12,192	0	12,192
Malawi	15,037	0	15,037
Mauritius	30,074	14,544	44,618
Mexico	632,280	0	632,280
Nicaragua	75,000	723	75,723
Panama	52,500	0	52,500
Paraguay	7,261	—106	7,155
Peru	426,245	0	426,245
Salvador	50,666	—182	50,484
South Africa	57,709	2,934	60,643
Swaziland	30,074	264	30,338
Taiwan	84,939	0	84,939
Thailand	18,694	496	19,190
Venezuela	31,902	0	31,902
West Indies	60,207	0	60,207
	11,500,000	100,000	11,600,000

**Bulk silo completed at Durban.**—Completion of the third silo of the bulk sugar terminal at Maydon Wharf at Durban came near when a roof-wetting ceremony was organized recently by the consultant engineers and the construction contractors. The new silo has a floor area of more than 2½ acres and has cost nearly R 15,000,000 to date. With the building of the new silo the site of the terminal is now completely occupied and it is understood that any future terminal buildings in South Africa will be constructed at the new port of Richards Bay in Zululand.

\* \* \*

**Bagasse furfural plant in South Africa<sup>9</sup>.**—A plant is being established close to Sezela sugar factory in Natal, to be run by a newly-formed company, Smithchem (Pty.) Ltd. The overall cost of the project is R 2,000,000 and the plant will be the first continuous digestion plant in the world using bagasse as raw material. It is anticipated that commercial production will start in May 1974.

<sup>1</sup> *The Times*, 19th September 1973.

<sup>2</sup> F. O. Licht, *International Sugar Rpt.*, 1973, 105, (24), 7.

<sup>3</sup> *Public Ledger*, 22nd September 1973.

<sup>4</sup> F. O. Licht, *International Sugar Rpt.*, 1973, 105, (26), 6.

<sup>5</sup> *Willett & Gray*, 1973, 97, 339.

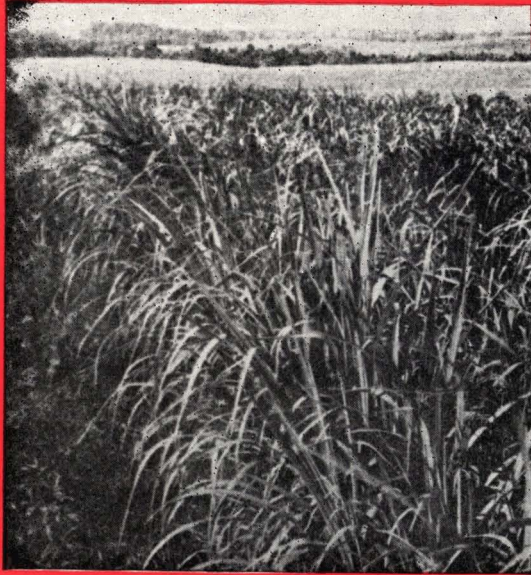
<sup>6</sup> *Public Ledger*, 20th October 1973.

<sup>7</sup> *Zucker*, 1973, 26, 574.

<sup>8</sup> *Zeitsch. Zuckerind.*, 1973, 98, 589.

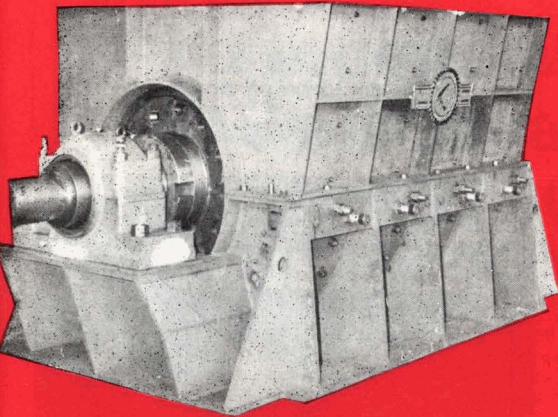
<sup>9</sup> *S. African Sugar J.*, 1973, 57, 379.



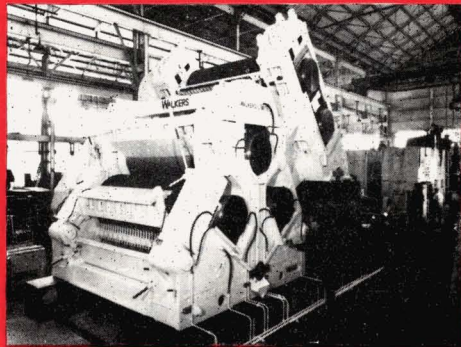


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# Index to Advertisers

	PAGE
Australian Sugar Journal . . . . .	xxiv
Brasil Açucareiro . . . . .	xix
Braunschweigische Maschinenbauanstalt . . . . .	xvii
Brill Equipment Co. . . . .	xxii
Thomas Broadbent & Sons Ltd. . . . .	ix
Gebr. Claas Maschinenfabrik G.m.b.H. . . . .	xviii
M. Dedini S.A. Metalurgica . . . . .	vii
Dorr-Oliver Inc. . . . .	xii
Fives Lille-Cail . . . . .	Inside Front Cover
Fletcher and Stewart Ltd. . . . .	iii, x
Fontaine & Co. G.m.b.H. . . . .	xix
Gilmore Sugar Manuals . . . . .	xx
Gründler Crusher & Pulverizer Co. . . . .	xi

	PAGE
Hein, Lehmann AG. . . . .	ii
Houttuin Pompen B.V. . . . .	vi
Institut für Zuckerindustrie . . . . .	xxiii
May & Baker Ltd. . . . .	i
Mirrlees Watson Co. Ltd. . . . .	xiv
MSL International . . . . .	xxiii
F.C. Schaffer & Associates Inc. . . . .	xxii
A. & W. Smith & Co. Ltd. . . . .	xiv
Soc. Sucrière d'Etudes et de Conseils S.A. . . . .	xxiii
South African Airways . . . . .	xx
Stork-Werkspoor Sugar B.V. . . . .	viii
Sugar Manufacturers' Supply Co. Ltd. . . . .	Outside Back Cover
Sugar News . . . . .	xix
Wabash Power Equipment Co. . . . .	xxii
Walkers Ltd. . . . .	xxi
George Waller & Son Ltd. . . . .	xxiv
Western States Machine Co. . . . .	iv, v


FOR THE BUYERS' GUIDE SEE JULY ISSUE pp. xxxi-I

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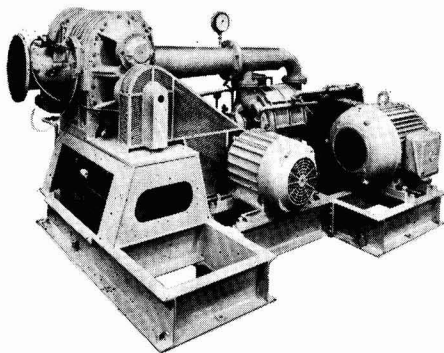
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Production Director, British Sugar Corporation Ltd.

## ERRATA AND CORRIGENDA

- Page 19. Line 9 of column 1. Read "in" for "from".  
Page 22. Line 41 of column 2. Read "NARASIMHAM" for "MARASIMHAM".  
Page 82. Line 34 of column 1. Read "G. M. AZZI" for "A. G. AZZI".  
Page 83. Line 35 of column 1. Read "for" for "of".  
Page 85. Line 29 of column 2. Read "1972" for "1971".  
Page 111. Line 11 of column 2. Read "J. D. MILLER" for "D. J. MILLER".  
Page 112. Line 19 of column 2. Read "1970" for "1971".  
Page 118. Line 15 of column 1. Read "resins" for "granular carbons".  
Page 118. Line 16 of column 1. Read "resin" for "carbon".  
Page 118. Line 19 of column 1. Read "resins" for "carbons".  
Page 150. Line 9 of column 1. Read "R. J. LEFFINGWELL" for "J. R. LEFFINGWELL".  
Page 150. Line 32 of column 2. Read "ONOV" for "BONOV".  
Page 151. Line 30 of column 2. Read "Guanabara" for "Guanagara".  
Page 174. Lines 10, 11 of column 2. Read "S. FLORES C." for "S. F. CACRRS".  
Page 174. Line 27 of column 1. Read "C. N. BABU" for "G. N. BABU".  
Page 182. Line 44 of column 2. Read "computer" for "diffuser".  
Page 185. Line 31 of column 1. Read "S. N. FLEITES" for "S. H. FLEITES".  
Page 213. Line 34 of column 2. Read "cone-feed" for "cone-fed".  
Page 216. Line 11 of column 1. Read "(11, 4-9; (12), 22-26" for "(12), 4-9, 22-26".  
Page 218. Line 39 of column 2. Read "I. M." for "N. M.".   
Page 222. Line 36 of column 1. Read "S. N. FLEITES" for "S. H. FLEITES".  
Page 237. Line 14 of column 1. Read "formation, the ballooning" for "formation, and the ballooning".  
Page 238. Line 6 of column 2. Read "type cultures of *Clostridium*" for "type *ostroidium* cultures of *CP*".  
Page 244. Line 45 of column 2. Read "MEADE" for "MEADS".  
Page 245. Line 41 of column 2. Read "C. J. MONGELARD" for "J. G. MONGELARD".  
Page 246. Line 29 of column 1. Read "L. J. LIU" for "L. U. LIU".  
Page 251. Line 40 of column 1. Read "leaf-inhabiting" for "leaf-inhibiting".  
Page 253. Line 17 of column 2. Read "ARORA" for "AURORA".  
Page 290. Line 14 of column 1. Read "DELGADO" for "DELGARDO".  
Page 292. Line 31 of column 1. Read "PROCTER & GAMBLE" for "PROCTOR & GAMBLE".  
Page 328. Line 15 of column 1. Read "Portuguese West Africa" for "Portuguese East Africa".  
Page 358. Line 50 of column 2. Read "6500-tons" for "65-ton".

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BY

JOHN ROBERTS & SONS

SALFORD

MANCHESTER



# INDEX TO VOLUME LXXV

## SOME REMARKS ON ITS USE

In using this Index it should be noted that the principal entries cover the several stages of production: CULTIVATION (see Beet; Cane; Diseases; Fertilizer; Irrigation; Mechanization; Pests; Soil; Transport; Varieties; Weeds, etc.); SUGAR PROCESSING (see Bagasse; Boilers; Boiling; Carbonation; Centrifugals; Clarification; Crystallization; Diffusion; Evaporators; Filter; Massecuite; Milling; Mills; Molasses; Pans, Vacuum; Scale; Sucrose; Sugar; Sulphitation; Water, etc.); REFINING (see Bone Char; Carbon; Refining; etc.); and BY-PRODUCTS (see Alcohol; Animal Fodder; By-Products; Fermentation; Paper; Pulp; Yeast, etc.).

Subjects covered separately include Ash; Bulk handling and storage; Colour; Control, Automatic and Chemical; Countries; Ion exchange; Juice; Micro-organisms; pH; Polarization; Transport; Weighing, etc. Glucose and Fructose are to be found under Dextrose and Levulose. Obituaries, Statistics and Trade Notices are collected together under those headings. "Sucrose" implies the pure chemical; "Sugar" the commercial product; and "Sugars" the chemical family, rather than grades of sugar. When looking under the author's name, it should be remembered that the surname may be the penultimate in Spanish.

(Abs.) indicates *Abstract*; (Brev.), *Brevity*; (N.B.), *New Books*; (Corr.), *Correspondence*; (N.C.), *Note and Comment*; (Pat.), *Patent*; (Stat.), *Statistics*; (T.N.), *Trade Notice*.

## SUBJECT MATTER

PAGE	SUBJECT MATTER	PAGE	SUBJECT MATTER	PAGE
	Argentina:		Ash:	
	cane agriculture research. Anon. . . . .	256	<i>see also</i> Bone char; Furnaces; Ion	
	- breeding. F. Guillermo L. (Abs.) . . . . .	207	exchange and Ion exclusion	
	- harvesters. (Brev.) . . . . .	263	Australia: cane agronomy research.	
	- mill order. (T.N.) . . . . .	30	- R. B. Moller. (Abs.) . . . . .	343
	- sugar expansion. (Brev.) . . . . .	329	- breeding. Anon. (Abs.) . . . . .	281
	- exports 1972. (Brev.) . . . . .	190, 328	- J. C. Skinner. (Abs.) . . . . .	83
	- production 1972. (Brev.) . . . . .	192	- burning. E. W. Healy. (Abs.) . . . . .	343
	- quotas. (Brev.) . . . . .	123	- damage by cockatoos. L. G. W.	
	Ash: beet content, effect of trace ele-		Tilley. (Abs.) . . . . .	343
	ments as fertilizers. K. G. Mazepin	286	- pigs. P. J. Amiet. (Abs.) . . . . .	348
	<i>et al.</i> (Abs.) . . . . .	286	- C. M. McAleese. (Abs.) . . . . .	176
	- molasses content and purity		- rata. R. E. Kerkwyk. (Abs.) . . . . .	343
	determination. N. P. Silina		- T. D. Redhead. (Abs.) . . . . .	19
	and E. L. Lyakhtsik. (Abs.) . . . . .	184	- diseases. Anon. (Abs.) . . . . .	345
	- yield. M. Klimeš. (Abs.) . . . . .	153	- C. G. Hughes. (Abs.) . . . . .	109
	- calcium determination in beet sugar		- C. G. Hughes and D. R. L.	
	products. E. A. Grivaseva <i>et al.</i> . . . . .	122	- Steindl. (Abs.) . . . . .	141
	- electrode readings, effect of sucrose		- equipment manufacturers' merger	230
	solution structure. M. A. Clarke	152	- fungal disease. P. Holliday. (Abs.)	143
	- transfer from carbonation mud		- harvesters. L. G. Vallance. . . . .	145, 207
	to juice in over-saturation. S. P.		- mechanical harvesting. R. F.	
	Olyanskaya <i>et al.</i> (Abs.) . . . . .	354	- Spargo. (Abs.) . . . . .	141
	cane juice in Brazil. G. E. Serra		- L. G. Vallance. (Abs.) . . . . .	249
	<i>et al.</i> (Abs.) . . . . .	281	- and transport. G. A. Willis	
	- effect of potassium fertilizer.		- payment. Anon. (Abs.) . . . . .	116
	A. P. Gupta and S. P. Shukla	82	- pests. B. E. Hitchcock. (Abs.) . . . . .	83
	determination in beet. K. Kaniewski		- planting. I. T. Freshwater. (Abs.)	175
	and T. Hrycak. (Abs.) . . . . .	122	- railway. A. K. Roseler and R. N.	
	- cane molasses. S. N. Fleites <i>et al.</i>	58	- Mazlin. (Abs.) . . . . .	281
	- with ion-selective electrodes. T.		- scheduling. B. E. Shepherd and	
	Henscheid <i>et al.</i> (Abs.) . . . . .	119	- R. A. James. (Abs.) . . . . .	281
	- extraction in cane diffusion, effect of		- sugar contents. Anon. (Abs.) . . . . .	173
	pH. D. P. Kulkarni and J. R. Unde	216	- varieties. Anon. (Abs.) . . . . .	30, 316, 344
	magnesium determination in cane		- N. J. King. (Abs.) . . . . .	176
	molasses. V. A. Soffiantini. (Abs.)	153	- choice, effects of mechanical	
	phosphate in cane juice. J. Studnický		harvesting and irrigation.	
	<i>et al.</i> (Abs.) . . . . .	58	- L. K. Izait. (Abs.) . . . . .	249
	- potassium in beet and citric acid		- performance evaluation. D.	
	content. M. Burba and U. Nitz-		- Garioch. (Abs.) . . . . .	249
	schke. (Abs.) . . . . .	350	- yield. I. T. Freshwater. (Abs.) . . . . .	380
	- and sodium in beet. F. W. Snyder	284	- D. M. Hogarth. (Abs.) . . . . .	249
	- L. Wiklky. (Abs.) . . . . .	58	- yellow spot. B. T. Egan. 143, 173,	280
	- effect of growth factors. A.		- cicada infestation. K. J. Chandler. . . . .	280
	Graf. (Abs.) . . . . .	218	- drought. B. Gordon. (Abs.) . . . . .	279
	- nitrogen and planting density.		- fertilizer economics. Anon. (Abs.) . . . . .	141
	K. H. Barocka <i>et al.</i> (Abs.) . . . . .	385	- Fiji disease. B. T. Egan. (Abs.) . . . . .	349, 384
	- and calcium determination in		- C. G. Hughes. (Abs.) . . . . .	280
	cane molasses. S. N. Fleites	185, 222	- C. L. Toohy and P. J. Nielsen	
	<i>et al.</i> (Abs.) . . . . .	185, 222	- control. Anon. (Abs.) . . . . .	141, 249
	- effects on sucrose solubility.		- isolation plot. C. L. Toohy. . . . .	380
	N. P. Silina <i>et al.</i> (Abs.) . . . . .	322	- transmission trial. A. G. Hayes	280
	- ratio to cane juice reducing sugars		- fodder cane varieties. N. J. King	176
	and molasses purity prediction.		- irrigation. Anon. (Abs.) . . . . .	278
	J. P. Gupta <i>et al.</i> . . . . .	275	- J. S. Chapman and W. J. Nicholson	
	- raw sugar standards for US refiners.		- G. Kingston. (Abs.) . . . . .	279
	A. H. Hinoia. (Abs.) . . . . .	222, 393	- research. K. C. Leverington. . . . .	83
	- refined sugar, effect on colour. M.		- land classification. H. S. Pink. (Abs.) . . . . .	279
	Marounek. (Abs.) . . . . .	59	- leaf hopper. R. M. Bull. (Abs.) . . . . .	280
	- removal from cane wax. K. K. Nigam		- scald. C. G. Hughes. (Abs.) . . . . .	384
	and A. C. Raha. (Abs.) . . . . .	123	- Mexican clover and calopo weeds.	
	- and starch content in cane. M. A. A.		- J. F. Usher. (Abs.) . . . . .	175
	Cesar and M. R. Mazzari. (Abs.)	377	- raton stunting disease. Anon. (Abs.)	377
	sulphated ash-conductivity relation-		- soil drainage. L. G. Vallance. (Abs.)	144
	ship in demerara and white sugar.		- steam turbine orders. (Brev.) . . . . .	398
	I. E. de Castro and J. de O. Barbosa	90	- sugar companies merger. (Brev.) . . . . .	190
	white sugar, effect of double curing.		- factory equipment and perform-	
	P. Devillers <i>et al.</i> (Abs.) . . . . .	222	- ances. P. G. Asherton. (Abs.) . . . . .	20
	- storage. P. Devillers and J.		- research. J. H. Allen. (Abs.) . . . . .	387
	Roger. (Abs.) . . . . .	223	- industry. O. Mont'alegre. (Abs.) . . . . .	85

INDEX

	PAGE
Australia; sugar year book 1972. Anon.	57
tractor accidents. G. L. McDonald	279
water insecticide residues. Anon.	251
<i>see also</i> British Commonwealth and Colonial Sugar Refining Co. Ltd.	
Austria sugar production 1972/73	263
Azores, <i>see</i> Portugal	
<b>Bag:</b> strength and stacking. S. A.	
Brennan <i>et al.</i> (Abs.)	392
-- N. M. Kichigh and I. L. Novogurskii	182
sugar storage. M. B. Yarmolinskii	220
Bagacillo removal from cane juice. K. E. Steppe and A. L. Webre	325
<b>Bagasse:</b> active carbon manufacture. M. Kutz and C. Rolz	186
animal fodder. S. Matsuoaka. (Pat.)	124
board manufacture. J. A. López H. and H. A. Paz. (Abs.)	186
-- B. B. Paul. (Abs.)	123
-- J. A. Rionda. (Pat.)	259
-- in Jamaica. K. Ruckstuhl	125
Peru. (Brev.)	192
-- Puerto Rico. (Brev.)	327
-- South Africa. J. T. Baird. (Abs.)	154
-- Taiwan. P. C. Kwan and C. S. Lu. (Abs.)	154
-- Trinidad. R. Hesch. (Abs.)	154
carboxymethyl cellulose production. C. J. Triana F. and A. A. López D.	290
cellulose additive for icing sugar. J. M. Mickiewicz. (Pat.)	258
-- production, delignification and pentosan removal. L. Hernández C. and R. Suárez R. (Abs.)	396
-- reactivity. Y. A. Kostrov <i>et al.</i>	225
charcoal briquette manufacture. A. E. Veloso. (Pat.)	292
composition. E. Batlle and J. A. Espinosa. (Abs.)	174
compost as fertilizer. J. Friedrichsen and C. G. Wei. (Abs.)	50
-- and gas manufacture. S. C. Gupta and A. P. Gupta. (Abs.)	224
drying. J. V. Ellison. (Abs.)	351
disposal. F. Grobhart and Y. Terentiev	116
extract composition. S. R. Pathak and Y. R. Srinivasan. (Abs.)	289
fermentation gas mixture, yeast cultivation. K. A. Aroj and K. A. Prabhu. (Abs.)	290
fibre separation. R. Botz. (Pat.)	324
-- K. M. Gunkel. (Pat.)	156
-- E. J. Villavieja. (Pat.)	27
-- hammer mill. K. Ruckstuhl	223
fuel consumption reduction in Taiwan. Y. P. Yu. (Abs.)	21
fungicide treatment. C. L. Wright	260
furfural and levulinic acid manufacture. E. Ramos B. (Pat.)	397
-- production. A. Milovanov and B. Corona. (Abs.)	225
-- in Bolivia. (Brev.)	323
-- Philippines. (Brev.)	323
-- South Africa. (Brev.)	400
heat economy and paper manufacture. K. B. Pundir. (Abs.)	217
pentosans hydrolysis. L. Hernández C. (Abs.)	225
pith as animal fodder. M. H. Butterworth. (Abs.)	154
-- factory in Jamaica. (Brev.)	327
-- U.S. (Brev.)	232
press. C.F. & I Engineering Inc.	187
-- A. W. French. (Pat.)	91
-- French Oil Mill Machinery Co.	226
-- C. R. Steele <i>et al.</i> (Pat.)	325
-- cage. O. G. Braten. (Pat.)	250
-- performance. F. Cordover. (Abs.)	147
soil mulching. Anon. (Abs.)	80
-- M. T. Chen and C. T. Huang.	347
-- and cane quality. J. C. P. Chen and R. W. Picou. (Abs.)	116
-- yield. Anon. (Abs.)	131
sterilization. Y. W. Hsu <i>et al.</i> (Abs.)	188
sugar content. S. Srinivasan and M. Muthujothi. (Abs.)	351
-- effect of cane burning. Anon.	319
-- determination. C. Bayma. (Abs.)	223
utilization. D. B. Batstone. (Abs.)	123
-- E. Velázquez. (Abs.)	154
weighing. H. Hirschmüller. (Abs.)	393
<i>see also</i> Furnaces; Paper and Pulp	
Bahamas cane borer control. M. N. Beg and F. D. Bennett. (Abs.)	16
Bangladesh sugar industry. (Brev.)	172
Barbados: cane mechanization. Anon.	304
-- separation plant.	160, 244

	PAGE
Barbados:	
sugar production 1972	96, 234
West Indies sugar technologists meeting. (Brev.)	190
<b>Beet:</b> agriculture in India. S. C. Gupta <i>et al.</i> (Abs.)	52
-- N. Mukerji. (Abs.)	214
-- and juice composition. R. E. Wyse and S. T. Dexter. (Abs.)	213
-- in Poland. H. W. Byszewski. (Abs.)	214
-- project in Iran. (Brev.)	128
-- research in Belgium. M. Martens	350
-- France. Anon. (Abs.)	350
-- and root diseases. W. R. Schäufele and C. Winner. (Abs.)	214
-- in Spain. R. J. Alvarez. (Abs.)	214
-- UK. G. H. Battle. (Abs.)	350
-- A. P. Draycott and D. C. Thomson. (Abs.)	286
albumin-dryness separation. S. S. Miroschnichenko <i>et al.</i> (Abs.)	356
amino-nitrogen determination. R. Bretschneider <i>et al.</i> (Abs.)	394
-- M. Burba and B. Lutz. (Abs.)	322
-- N. Kubadinov and L. Wieninger	90
anion analysis. F. Neubrunn. (Abs.)	393
betaine formation. W. Steinmetzer	90
boron deficiency symptoms. J. Vlamis and A. Ulrich. (Abs.)	213
breeding. J. Christmann. (Abs.)	52
-- J. Deneuch. (Abs.)	52
-- E. Knapp. (Abs.)	350
-- double cross performance prediction. G. A. Smith and R. J. Hecker. (Abs.)	84
-- general combining ability estimation. G. A. Milliken <i>et al.</i> (Abs.)	52
-- impurity index. G. K. Ryser and J. C. Theurer. (Abs.)	213
-- inbreeding and root yield. R. J. Hecker. (Abs.)	285
-- pollen fertility inheritance. J. C. Theurer. (Abs.)	146
brei preparation. A. Y. Zagorul'ko <i>et al.</i> (Abs.)	122
campaign length and sugar factory losses. B. E. Grabovetskii <i>et al.</i>	390
citric, malic and ketoglutaric acid contents. M. Burba and U. Nitzschke. (Abs.)	350
dirt rate reduction. P. Boyle. (Abs.)	286
enzymes and disease resistance. G. S. Rautela and M. G. Payne. (Abs.)	284
extraneous matter removal. G. Malatinsky. (Abs.)	118
flume stone catches. S. Dušek. (Abs.)	149
-- W. Peters <i>et al.</i> (Pat.)	29
-- water and washing losses. J. F. T. Oldfield <i>et al.</i> (Abs.)	289, 393
-- W. Uhlenbrock. (Abs.)	393
injury by herbicides. J. D. Pasih	284
intercropping with cane. S. Pasih <i>et al.</i> (Abs.)	145
leaf silage as animal fodder. A. Devuyt <i>et al.</i> (Abs.)	123
-- water vapour transfer. P. V. Biscoe. (Abs.)	285
-- N. Terry <i>et al.</i> (Abs.)	284
micro-organisms. V. Z. Nakhodkina	122
pesticide residues. L. van Steyvoort <i>et al.</i> (Abs.)	26
physiology and growth. D. K. D. Gupta. (Abs.)	212
plant population and nitrogen effect on yield. K. H. Barocka <i>et al.</i>	250
-- and irrigation, effect on yield. A. P. Draycott and D. J. Webb. (Abs.)	84
-- uptake. A. P. Draycott and M. J. Durant. (Abs.)	114
-- and potassium, sodium and amino-nitrogen content. K. H. Barocka <i>et al.</i> (Abs.)	385
-- soil water consumption. A. P. Draycott and M. J. Durant	114
processing compared with cane. D. P. Kulkarni <i>et al.</i> (Abs.)	391
-- quality. K. Vukov. (N.B.)	56
-- and boiling house performance. K. Wagnerowski. (Abs.)	118
-- effect of growth factors. A. Graf	213
-- nitrogen fertilizer. L. Willicky. (Abs.)	58
-- ripeness. J. Trzebiński. (Abs.)	55
-- root cavity formation. S. G. Enikeev and L. Z. Meshkova	223
-- seed irradiation. G. Mantovan <i>et al.</i> (Abs.)	250
-- trace elements. K. G. Mazeppin <i>et al.</i> (Abs.)	286

	PAGE
<b>Beet:</b> processing quality relationships. L. Schmidt and J. Zahradníček	121
-- and undermilling losses. A. Y. Zagorul'ko. (Abs.)	320
-- in U.S. F. W. Snyder. (Abs.)	284
ripening with chemicals. B. Quebedeaux. (Pat.)	125
-- W. H. Ziek. (Pat.)	125
sampling. M. Burba and W. Hause	122
-- M. Z. Khelemski <i>et al.</i> (Abs.)	90
-- K. Metelski. (Abs.)	293
-- A. B. Popov and S. K. Mezentsev	59
-- in Poland. B. Swiatkowski. (Abs.)	22
seed germination in Canada, effect of drought. Anon. (Abs.)	52
-- effect of herbicides. A. E. Deppeyre and P. A. Sement. (Abs.)	284
-- salinity and temperature. L. E. Francois and J. R. Goodin	286
-- soil condition. E. Dalleinne	214
-- and emergence. J. Christmann	178
-- effect of chemical treatment. D. M. VanDoren and J. B. Henry. (Abs.)	251
-- monomer failures. L. R. Schweitzer and E. E. Hardin	84
irradiation effects. M. P. Pasulo <i>et al.</i> (Abs.)	214
-- pelleting. E. Nicholl. (Abs.)	285
-- and germination. R. Vanstallen	250
-- production in India. (Brev.)	128
-- rubbing and grading. J. Christmann. (Abs.)	52
seedling emergence, effect of temperature and phosphorus application. K. M. Siptanovs and A. Ulrich	213
slicer automatic control. K. E. Reznik and Z. L. Ziman. (Abs.)	119
-- N. F. Shurbovanyi <i>et al.</i> (Abs.)	181
-- knife sharpening. A. D. Baguyuk	218
-- operation. M. I. Rybalkin. (Abs.)	219
sugar and ash determination. K. Kanlewski and T. Hrycak. (Abs.)	122
-- control, effect of weeds. J. Simon	88
-- determination. H. Gruszecka. (Abs.)	323
-- A. Y. Zagorul'ko <i>et al.</i> (Abs.)	59
-- effect of juice clarification with aluminum salts. A. Lipets and I. A. Oleinik. (Abs.)	323
-- factory products. V. A. Pronina and S. Z. Ivanov. (Abs.)	152
sugars content, effect of deterioration. H. Gruszecka. (Abs.)	323
tarehouse. G. Dosedla. (Abs.)	152
unloaders. H. Brunke. (Abs.)	391
volunteer beet. M. Deprez. (Abs.)	284
washer. (T.N.)	230
-- G. Denis. (Abs.)	255
-- operation. A. J. Kiselev. (Abs.)	150
-- and juice quality and starch consumption. S. Zagrodzki	321
yield, effect of defoliation. R. A. Dunning and G. H. Winder. (Abs.)	250
-- gibberellic acid and growth inhibitors. I. Poostchi and W. B. Schmelz. (Abs.)	146
-- irrigation. A. Aboukhaled <i>et al.</i>	251
-- and fertilizers. A. P. Draycott and R. F. Farley. (Abs.)	178
-- light reduction by <i>Kochia scoparia</i> weed. A. D. Dotzenko and A. L. Arp. (Abs.)	252
-- petiole nitrogen. J. N. Carter <i>et al.</i> (Abs.)	215
-- M. C. Saxena <i>et al.</i> (Abs.)	215
-- ploughing time. A. Vez and P. Vuilloud. (Abs.)	215
-- soil nitrate. J. O. Reuss and P. S. O. Rao. (Abs.)	252
-- weather and soil in Ireland. J. Lee and C. K. Comerford	385
-- wind protection. K. W. Brown and N. J. Rosenberg. (Abs.)	251, 285
<i>see also</i> Animals; Fodder; Diffusers; Diffusion; Diseases; Factory; Fertilizers; Juice; Mechanization; Molasses; Payment; Pectin; Pests; Pulp; Saponin; Storage; Transport; Varieties and Water, Waste	
Belgium: beet agriculture and yield. M. Mariens. (Abs.)	350
-- varietal trials. N. Roussel <i>et al.</i>	250
-- environmental chemistry symposium	231
Belize: sugar production 1971/72	32, 130
-- Tower Hill factory. J. H. Milliner	116
Betaine occurrence and applications. W. Steinmetzer. (Abs.)	90
Boilers. W. Fachinetti. (Abs.)	390
off-season protection. A. K. Basu	217
selection. H. Dieber. (Abs.)	388

# INDEX

<b>Boilers:</b>		<b>Boiling:</b> surface-active additive, N. R. Twaiete. (Abs.)	254
vacuum breakers, R. Velázquez R. <i>see also</i> Power; Scale; Steam and Water	352	three-masseccute scheme, M. I. Daishev and I. F. Golubov. (Abs.)	220
<b>Boiling:</b> B. N. Kankarej. (Abs.)	253	- R. R. Diago. (Abs.)	85
A. Singh and K. Mohror. (Abs.)	253	- A. K. Kalinichenko <i>et al.</i> (Abs.)	182
K. Wagnerskoi. (Abs.)	149	variables calculation, J. Genotelle. <i>see also</i> Crystallization; Masseccute and Pans, Vacuum	389
automatic control. (T.N.)	94	<b>Bolivia:</b> bagasse furfural plant. (Brev.)	328
- R. J. Batterham <i>et al.</i> (Abs.)	180	new sugar factory. (Brev.)	296, 360
- M. Garabet. (Abs.)	389	sugar expansion. (Brev.)	64
- S. Ginal. (Abs.)	87	<b>Bone char:</b> bulk density and performance index. J. C. Abram and P. S. Warren	235
- H. L. Oliveira. (Abs.)	53	colour adsorption irreversibility. M. I. Daishev and V. M. Shcherbak comparison with adsorbent resins. Anon. (Abs.)	120
beet syrup vapour volatile substances, G. Steinfle. (Abs.)	121	liquor decolorization, C. C. Chou and K. R. Hanson. (Abs.)	221, 355
bleaching additive, T. P. Saksena <i>et al.</i> (Abs.)	54	- ash removal efficiency, J. C. Abram <i>et al.</i> (Abs.)	201
continuous, Whiting Corporation. - S. Zagrodzki. (Abs.)	227, 354	- costs and sweetening-off, F. M. Chapman. (Abs.)	221
- V. P. Zubchenko <i>et al.</i> (Abs.)	55	- pH drop, effect of inorganic ions, K. Amako. (Abs.)	355
- in Fives Lille-Cail pan, N. Barkow and G. Witte. (Abs.)	23	porosity structure, C. C. Chou. (Abs.)	220
- masseccute residence time calculation, I. S. Gulyi and I. M. Fedotkin. (Abs.)	391	<b>Brazil:</b> bulk handling terminal, Anon. - D. Smith. (Abs.)	57
- recirculation number and masseccute Brix, I. S. Gulyi and I. M. Fedotkin. (Abs.)	218	cane mills. (Brev.)	296
- S. W. S. Sulker Unie pan, G. C. de Bruyn <i>et al.</i> (Abs.)	23	- molasses analysis, J. P. Stupiello <i>et al.</i> (Abs.)	85
crystallization rate calculation and supersaturation limit, R. Broadfoot and P. G. Wright. (Abs.)	222	- pests, H. D. de Souza. (Abs.)	346
- effect of juice active carbon treatment, H. Zaorska. (Abs.)	254	- P. Guagliumi and E. J. Marques - control, Anon. (Abs.)	174
- masseccute circulation, L. G. Belostotskii and V. A. Sheshtakovskii. (Abs.)	22	- smut, J. P. S. L. Netto. (Abs.)	377
- F. Schneider. (Abs.)	152	- varieties, W. Carneiro. (Abs.)	109
- cutting, M. I. Daishev and N. A. Lyusy. (Abs.)	210	- processing quality, G. E. Serra <i>et al.</i> (Abs.)	281
- temperature fluctuations, I. S. Gulyi <i>et al.</i> (Abs.)	390	- in Sao Paulo, G. M. Azzi. (Abs.)	82
<b>C-sugar quality.</b> S. C. Gupta and S. K. D. Agarwal. (Abs.)	351	drought and sugar reduction. (Brev.)	192
grain size distribution, S. Orliowski and D. Schliephake. (Abs.)	393	fertilizer trials, A. A. Petxoto. (Abs.)	377
heat transfer, I. I. Sagan' and V. A. Karas'. (Abs.)	320	frogopper, A. K. Dodson. (Abs.)	346
- calculation, V. K. Garyazha and V. Pavelko. (Abs.)	391	- control, Anon. (Abs.)	346
- Y. D. Petrenko and I. I. Sagan'. (Abs.)	389	- P. Guagliumi. (Abs.)	246
house balance errors, J. M. Tamargo T. and J. Rodriguez L. (Abs.)	185	irrigation, C. Bayma. (Abs.)	245
- performance assessment, A. C. Chatterjee. (Abs.)	253	new sugar factories. (Brev.), 190, 295, 327	327
- B. S. Gurumurthy. (Abs.)	217	sugar exports 1972. (Stat.)	326
- T. T. Oommen. (Abs.)	253	- finances (Brev.)	232
- effect of cane burning, G. E. Sloane and L. J. Rhodes	386	- factory closures. (Brev.)	296
- deterioration, C. S. Henderson	179	- industry, Anon. (N.B.)	151
- S. K. Kulkarni. (Abs.)	86	- plans 1973/74. (N.C.)	162
- diffusion, J. P. Lamusse	118	<b>British Commonwealth:</b> EEC commitment and International Sugar Agreement. (C.G.)	161
- non-sugars, K. Wagnerskoi laboratory, T. Moritsugu. (Abs.)	356	UK sugar imports and the EEC 97, 161, 265	256
- M. Sugiyama <i>et al.</i> (Abs.)	356	- S. N. Girwar. (N.B.)	256
large grain sugar, N. C. Jain and V. Kumar. (Abs.)	253	<b>British Honduras, see</b> Belize	
- D. R. Parashar. (Abs.)	217	<b>British Sugar Corporation Ltd.:</b> beet diffuser gears and path rings	95
losses calculation, K. K. Fai and S. Z. Ivanov. (Abs.)	220	- juice ion exchange treatment and resin deterioration, J. F. T. Oldfield <i>et al.</i>	70, 103
- A. Y. Zagorul'ko <i>et al.</i> (Abs.)	320	budgetary control, O. H. Phipps <i>et al.</i> (Abs.)	255
masseccute circulation measurement, H. Hirschmuller. (Abs.)	393	Enviro-Clear clarifier performance, D. B. Ash	170
- temperature, V. I. Pavelko and V. T. Garyazha. (Abs.)	320	Factory Agricultural Development Officer, N. V. Turner. (Abs.)	252
point elevation and supersaturation, G. Vavrincez. (Abs.)	395	maintenance planning, W. M. Lanyon and P. Tory. (Abs.)	254
refinery materials balance, F. Garcia L. (Abs.)	355	masseccute electrical heating trials, R. J. Bass <i>et al.</i>	10, 40
- schemes in USSR, E. G. Golsman seed slurry mills. (T.N.)	120, 94	oil-fired lime kiln, D. E. Ash. (Abs.)	128
- preparation, T. C. Jhingan and S. C. Arora. (Abs.)	216, 253	sugar factory closure postponed	297
- A. D. Randolph and R. W. Crawford. (Pat.)	325	UK future sugar industry structure	297
- quality determination, V. V. Valtov and J. Horniková. (Abs.)	323	Wisconsin sugar factory, Anon.	287
- sugar particle size determination, J. Lodos and G. la Serna. (Abs.)	59	- L. S. Higgins <i>et al.</i> (Abs.)	254
seedling, J. de Crémoux. (Pat.)	229	<b>Brix:</b> beet juice, effect of raw cane sugar melting, G. Garcia. (Abs.)	321
- M. A. Mancillas (Abs.)	54, 118	- and syrup measurement, V. Valtov <i>et al.</i> (Abs.)	321
steam consumption, V. Szavayk, sugar incrustation on pan walls, I. S. Gulyi <i>et al.</i> (Abs.)	88	cane juice in Brazil, G. E. Serra <i>et al.</i> (Abs.)	281
surface-active additive. (T.N.)	30, 262	- measurement, P. J. Nielsen	380
- O. Krieger. (Abs.)	389	- selection criterion, N. I. James and J. D. Miller. (Abs.)	314
- O. Krieger and I. Csilek. (Abs.)	288	evaporator thick juice, effect of steam compressors, B. A. Eremenko <i>et al.</i>	288
- T. P. Saxena <i>et al.</i> (Abs.)	85	masseccute, effect of recirculation in boiling, I. S. Gulyi and I. M. Fedotkin. (Abs.)	218
- S. Srivastava and T. S. Thiyagarajan. (Abs.)	217	- permissible value calculation, I. N. Akindinov. (Abs.)	218
		- and run-off calculation, E. Benz syrup automatic control, A. M. Bunyak <i>et al.</i> (Abs.)	288
		tables, I. N. Akindinov. (Abs.)	288
		- see <i>also</i> Control; Chemical and Density	
		Bulgaria: new sugar factories	159, 400
		<b>Bulk handling:</b> new company division in U.K. (Brev.)	126
		sugar dust formation in conveying, G. N. Allan and J. R. Fitzgerald	86
		- properties, J. Mather. (Abs.)	219
		terminal in Brazil, Anon. (N.B.)	57, 151
		- D. Smith. (Abs.)	389
		- Mexico, I. Gurza I. (Abs.)	287
		- Philippines. (Brev.)	32
		white sugar pneumatic conveying, V. I. Bereznyak. (Abs.)	117
		<i>see also</i> Conveyors	
		<b>Bulk storage:</b> site in Mozambique	192
		- South Africa. (Brev.)	409
		- weighing. (T.N.)	262
		sugar properties, J. Mather. (Abs.)	219
		white sugar, A. A. Ivanova <i>et al.</i>	354
		- preparation, J. Mlynár. (Abs.)	117
		<b>Bulk transport:</b> sugar shipment from Cuba, G. Gonzalez. (Abs.)	287
		Burma cane diseases, M. M. Thang By-products; distillery, K. A. Prabhu	143, 123
		<i>see also</i> individual by-products	
		<b>Calcium, see</b> Ash and Lime	
		<b>Cameroon:</b> M'Banlock sugar factory/refinery, A. Bernard. (Abs.)	386
		sugar industry expansion loan	400
		<b>Canada:</b> beet sugar crop 1972/73	328
		drought effect on beet seed germination and herbicides, Anon.	52
		new liquid sugar plant. (Brev.)	328
		Redpath Sugars Ltd. (N.C.)	130
		refinery affination and carbonatation stations, R. Valkers <i>et al.</i> (Abs.)	221
		sugar imports. (Stat.)	190
		<b>Cane:</b> agriculture, B. M. Hajarnis	342
		- in Cameroon, A. Bernard. (Abs.)	386
		- computer simulation, R. H. Farquhar. (Abs.)	275
		- data processing, O. W. Sturgess and R. J. Hampson. (Abs.)	279
		- "no-plough" farming in Taiwan, Anon. (Abs.)	210
		- in Puerto Rico and US, E. S. Kanwar. (Abs.)	379
		- research in Argentina, Anon.	256
		- Australia, K. C. Leverington	83
		- India, Anon. (N.B.)	151
		- Jamaica. (Brev.)	296
		- South Africa, G. D. Thompson	111
		- US, S. J. P. Chilton. (Abs.)	141
		analysis, P. Atherton. (Abs.)	20
		- M. Demaux. (Abs.)	395
		- and sampling, A. C. Barnes. (Pat.)	141
		animal fodder, R. W. Bishop. (Abs.)	61
		ash and starch content, M. A. A. Cesar and M. R. Mazzari. (Abs.)	377
		breeding in Argentina, F. Guillermo L. (Abs.)	207
		- Australia, Anon. (Abs.)	281
		- D. Garioch. (Abs.)	249
		- J. C. Skinner. (Abs.)	83
		- bunch planting, B. O. Cesnik	111
		- character correlations, J. A. Mariotti. (Abs.)	142
		- inheritance, M. Lakshmi-kantham <i>et al.</i> (Abs.)	176
		- J. A. Mariotti. (Abs.)	142
		- delayed flowering, P. H. Moore and D. J. Heinz. (Abs.)	111
		- for eye spot disease resistance, R. S. Byther and G. W. Steiner	245
		- Fiji disease resistance, Anon.	249
		- C. L. Toohy. (Abs.)	380
		- in India, C. N. Babu and K. L. Behl. (Abs.)	379
		- irradiation and genetic changes, Anon. (Abs.)	109
		- for leaf scald resistance, B. T. Egan. (Abs.)	19
		- mass selection, A. H. D. Brown <i>et al.</i> (Abs.)	209
		- in Mauritius, P. R. Hornel. (Abs.)	80
		- J. A. Lalouette. (Abs.)	80
		- morphology and enzymes, D. J. Heinz and G. W. P. Mee. (Abs.)	111
		- ratooning ability, J. A. Mariotti and O. Ghimenez L. (Abs.)	82
		- for resistance to gummosis, C. Ricard. (Abs.)	141
		- in Réunion, Anon. (Abs.)	34
		- selection criteria, N. I. James and J. D. Miller. (Abs.)	111, 314
		- for mechanical harvesting, Anon.	112
		- in US, B. V. Abbott. (Abs.)	141
		- L. P. Hebert. (Abs.)	141
		- N. I. James and J. D. Miller.	377

# INDEX

Cane:	PAGE	Cane: growth, effect of spacing, planting depth and irrigation. J. C. Mongelard <i>et al.</i> (Abs.)	PAGE	Cane: planting date and yield. F. M. Ramos and J. S. Melo. (Abs.)	PAGE
bud auxins and sprouting. T. Inadome and M. Hayashi. (Abs.)	248	--- subsoling. Anon. (Abs.)	344	--- dense $\times$ single planting. C. Y. Kwo and B. C. Mok. (Abs.)	51
--- ribonucleic acid extraction. C. C. Lo. (Abs.)	347	--- temperature and rainfall. W. H. Tung. (Abs.)	50	--- double drills and stalk population. E. J. Hicks. (Abs.)	377
bulshoots retention and ratooning. Anon. (Abs.)	282	--- water. Anon. (Abs.)	281	--- and harvesting time trials. R. B. Moller. (Abs.)	348
burning after desiccation. Anon. --- and atmospheric pollution. Anon.	211	--- table level. J. M. Gosnell. (Abs.)	135	--- in India. R. B. Prasad. (Abs.)	208
--- in Australia. R. W. Healy. (Abs.)	348	--- waterlogging. D. R. Ridge and processing. effect of drought. H. A. Naqvi and R. ul-Qayyum	249	--- Jamaica. J. S. Ralston. (Abs.)	211
--- effect on deterioration after harvesting. Anon. (Abs.)	283	--- yield possibilities. H. Rostron. handling. J. C. van Groeningen. (Abs.)	168	--- rate and yield. B. K. Mathur and A. Singh. (Abs.)	314
--- R. A. Wood <i>et al.</i> (Abs.)	381	--- at Taitung. L. S. Kuo. (Abs.)	211	--- quality, effect of bagasse mulching. J. C. P. Chen and R. W. Plocou	116, 319
--- of flooding. J. Wright. (Abs.)	348	--- date determination. L. Castañedo B. (Abs.)	206	--- on factory losses. E. J. Buchanan.	299, 337
--- on processing. Anon. (Abs.)	319	--- from juice composition. S. C. Sharma and N. S. Gupta.	347	--- S. K. Kulkarni. (Abs.)	209
--- E. Batule D. (Abs.)	147	--- and sugar yield. L. A. Rossler and P. K. Moberly. (Abs.)	83	--- ratooning, effect of soil water content. T. P. Pao. (Abs.)	319
--- J. M. Tamargo T. (Abs.)	85	--- effect of rainfall. L. L. Landen. (Abs.)	392	--- ripeness determination. L. Castañedo	205
--- raw sugar filtrability and colour. G. E. Sloane and L. J. Rhodes	386	--- intercrop protection against herbicides. S. Y. Peng. (Abs.)	204	--- with chemicals. L. M. Ellis. (Pat.)	260
--- sugar yield. Anon. (Abs.)	113	--- intercropping. M. Lakshimikantham <i>et al.</i> (Abs.)	209	--- H. R. Julien and G. McIntyre	280
cellulose for icing sugar manufacture. J. M. Micekovic. (Pat.)	258	--- in Cuba. G. González. (Abs.)	344	--- L. G. Nickell. (Pat.)	259, 260
cleaner. M. W. Chapman. (Pat.)	229	--- in J. Vázquez. (Abs.)	248	--- L. G. Nickell and D. T. Takahashi. (Abs.)	349
cleaning. Anon. (Abs.)	209	--- effect of mechanical harvesting. R. P. Humbert. (Abs.)	311	--- C. A. Porter and L. E. Alhrichs	349
--- G. F. Durbin. (Abs.)	209	--- Taiwan. C. C. Chow. (Abs.)	352	--- B. Quebedeaux. (Pat.)	125
--- A. C. Steen and J. W. Steen. (Pat.)	155	--- US. Anon. (Abs.)	113	--- S. C. Srivastava <i>et al.</i> (Abs.)	318
--- R. T. Symes. (Abs.)	281	colorants. L. Farber and F. G. Carpenter. (Abs.)	26	--- R. A. Yates. (Abs.)	316
--- in J. Vázquez. (Abs.)	248	croplogging. R. A. Kale <i>et al.</i> (Abs.)	342	--- root growth and soil fungal population. Anon. (Abs.)	113
--- effect of mechanical harvesting. R. P. Humbert. (Abs.)	311	--- R. B. Moller. (Abs.)	348	--- waterlogging resistance. O. P. Negi <i>et al.</i> (Abs.)	15
--- Taiwan. C. C. Chow. (Abs.)	352	--- on steep slopes. Anon. (Abs.)	282	--- sampler. P. E. Beauloux. (Pat.)	397
--- US. Anon. (Abs.)	113	--- and yield in US. R. Ricard. (Abs.)	15	--- sampling. S. C. Grinley. (Pat.)	222
colorants. L. Farber and F. G. Carpenter. (Abs.)	26	--- damage by lightning. Anon. (Abs.)	173	--- and sugar determination. A. C. Barnes. (Abs.)	90
croplogging. R. A. Kale <i>et al.</i> (Abs.)	342	deterioration after harvest. S. Chandra. (Abs.)	180	--- "scrapping". Anon. (Abs.)	142
--- R. B. Moller. (Abs.)	348	--- M. N. Gokhale. (Abs.)	253	--- L. L. Landen. (Abs.)	142
--- on steep slopes. Anon. (Abs.)	282	--- C. S. Henderson. (Abs.)	179	--- screw press. K. Heinrich. (Pat.)	61, 91
--- and yield in US. R. Ricard. (Abs.)	15	--- L. K. Kirby. (Abs.)	380	--- J. Shann and D. V. Bessant.	81
--- damage by lightning. Anon. (Abs.)	173	--- S. Srinivasan and M. Muthu-solthi. (Abs.)	351	--- seed cane production. M. Pineda L.	83
--- deterioration after harvest. S. Chandra. (Abs.)	180	--- leaf sterilization to prevent gummosis spread. C. Ricard. (Abs.)	81	--- and approval in South Africa. G. M. Thomson. (Abs.)	312
--- M. N. Gokhale. (Abs.)	253	--- H. Hais and P. Valdesing. (Abs.)	315	--- seedbed and pre-planting treatments. J. P. Agrawal and N. K. Jain. (Abs.)	110
--- C. S. Henderson. (Abs.)	179	--- analysis. Y. W. Y. Cheong. (Abs.)	80	--- set coating and germination. R. V. Osgood. (Abs.)	376
--- L. K. Kirby. (Abs.)	380	--- F. A. Fogliata and R. A. Dip. (Abs.)	246	--- and foliage treatment with molasses. U. S. Singh <i>et al.</i> (Abs.)	174
--- S. Srinivasan and M. Muthu-solthi. (Abs.)	351	--- J. M. Gosnell and A. C. Long. (Abs.)	206	--- germination, effect of bud number and position. R. R. Panje <i>et al.</i>	175, 314
--- detran. detran research. G. H. Richards. (Abs.)	286	--- A. C. Long. (Abs.)	206	--- <i>Fusarium</i> stem rot. L. J. Liu and J. Mignucci. (Abs.)	246
--- effect of billet length. Anon. (Abs.)	382	--- for nitrogen requirement. P. Hais and P. Valdesing. (Abs.)	80	--- heat treatment for disease control. A. Harding-Goodman and G. M. Thomson.	312
--- P. C. Ivin. (Abs.)	179	--- canopy and <i>Pyrrilla perpusilla</i> population. K. M. Gupta <i>et al.</i> (Abs.)	318	--- G. L. James. (Abs.)	206
--- N. J. King. (Abs.)	377	--- chlorosis, effect of fluoride. R. A. Wood. (Abs.)	112	--- C. C. Ricard and C. C. Chu. (Abs.)	347
--- trash removal and storage. F. V. Novaes. (Abs.)	53	--- herbicides. F. S. de Almeida	247	--- sheath moisture and sugar yield. T. R. Srinivasan and A. Mariakulandai. (Abs.)	376
--- in Jamaica. R. Tilby. (Abs.)	116	--- dark respiration and apparent photosynthesis. L. K. King and C. C. Chu. (Abs.)	347	--- sucrose secretion. J. Edelman and A. I. Schoolar. (Abs.)	175
--- and payment in India. D. P. Sharma. (Abs.)	343	--- sulphur determination. Anon. lodging prevention by trash twisting. M. C. Hosur. (Abs.)	248	--- A. I. Schoolar and J. Edelman	247
--- prevention. S. Bose <i>et al.</i> (Abs.)	82	--- testing. P. J. Nielsen. (Abs.)	380	--- sulphur determination. Anon. lodging prevention by trash twisting. M. C. Hosur. (Abs.)	248
--- and raw sugar filtrability. G. P. James. (Abs.)	148	--- R. D. Truen. (Abs.)	382	--- maturity and harvesting in India. A. P. Gupta. (Abs.)	343
--- G. P. James and A. M. Cameron. (Abs.)	53	--- optimum replanting time. N. W. Simmonds. (Abs.)	107	--- pesticide residues. A. J. M. Carnegie and R. A. Wood. (Abs.)	382
--- disintegrator. (T.N.)	262	--- phosphorus translocation. C. C. Chu. (Abs.)	316	--- Hartt. (Abs.)	316
--- maintenance. R. Dadant. (Abs.)	289	--- photosynthesis. C. C. Chu and L. K. Kong. (Abs.)	50	--- photorepiration. C. C. Chu and L. K. Kong. (Abs.)	50
--- drought resistance. M. Lakshimikantham <i>et al.</i> (Abs.)	344	--- photosynthate translocation, effect of soil salinity. A. Maretzki <i>et al.</i>	344	--- pith animal fodder. H. G. Dion	244
--- extraneous matter as animal fodder. W. W. Worden. (Pat.)	124	--- in Barbados. (Brev.)	160	--- and fibre separation. S. E. Tilby	324
--- disposal. J. V. Ellison. (Abs.)	351	--- and juice extraction. S. R. Tilby. (Pat.)	325	--- in Barbados. (Brev.)	160
--- as fertilizer. Anon. (Abs.)	80	--- planting. L. L. Landen. (Abs.)	378	--- and juice extraction. S. R. Tilby. (Pat.)	325
--- S. S. Yang. (Abs.)	79	--- in Australia. I. T. Freshwater.	175	--- date, pest incidence and juice quality. G. Y. Bhadke <i>et al.</i>	318
--- and gas manufacture. S. C. Gupta and A. P. Gupta.	224	--- variation for borer control. M. T. Kira and H. el-Sherif. (Abs.)	16	--- variation for borer control. M. T. Kira and H. el-Sherif. (Abs.)	16
factory reception and piling. Anon. fibre and processing. W. S. Graham and J. R. Gunn. (Abs.)	86				
field carbon dioxide concentration. C. C. Chu. (Abs.)	79				
--- fire appliance. Anon. (Abs.)	110				
--- microclimate. W. H. Tung. (Abs.)	79				
--- flowering. P. H. Moore. (Abs.)	175				
--- control. S. S. Garrueho. (Abs.)	207				
--- P. H. Moore and D. J. Heinz.	344				
--- M. A. Sant and S. V. Chinchorkar. (Abs.)	348				
--- P. G. Yassthesis. (Abs.)	210				
--- in Egypt. J. T. Rao <i>et al.</i>	81				
--- photoperiod effects. R. Julien.	240				
--- fluoride determination. C. W. Louw and J. F. Richards. (Abs.)	185				
growth, effect of heating by solar radiation. T. T. Yang and C. H. Chang. (Abs.)	109				
--- irrigation water salinity. M. M. Syed and S. A. el-Swaly.	247				
--- root and air temperature. J. C. Mongelard and L. Mimura.	245				
--- soil compaction. L. G. Vallance	378				
--- and water table level. T. C. Juang. (Abs.)	345				

# INDEX

	PAGE		PAGE
Cane:		Carbonation:	
water consumption. Y. T. Chang..	51	colorant adsorption by CaCO <sub>3</sub> effect	
-- effect of air and root tempera-		of sucrose. S. E. Kharin and V. V.	
tures. J. C. Mongelard. (Abs.)	349	Maslava. (Abs.)	181
-- intercropping. H. Chang <i>et al.</i>	51	colour formation, effect of tempera-	
-- evapotranspiration, effect of lodg-		and alkalinity. J. F. Bugaenko	182
ing. G. D. Thompson and J. P.		and M. Mukhamed. (Abs.)	
Boyce. (Abs.)	205	effect on boiling house performance.	
weight loss after harvest. S. R.		K. Wagnerowski. (Abs.)	118
Chowdappan and Y. B. Morachan	111	gas from gas-fired lime kiln. G.	
and sugar content, effect of lodging.		Vernois. (Abs.)	225
M. Lakshmiikantham <i>et al.</i> (Abs.)	210	heat of reaction. L. Zavodsky. (Abs.)	55
winch. Anon. (Abs.)	282	lime consumption reduction. A. M.	
yield in Australia. T. P. Freshwater	380	Grebennyuk. (Abs.)	117
-- D. M. Hogarth. (Abs.)	249	middle juice. S. C. Sharma. (Abs.)	253
-- effect of bagasse mulching. M. T.		milk-of-lime sucrose content. J.	
Chen and C. T. Huang. (Abs.)	347	Vašátko and A. Dandár. (Abs.)	353
-- biennial harvesting. F. A. J.		mud level indicator. V. G. Belik <i>et al.</i>	181
Leonardi <i>et al.</i> (Abs.)	248	-- removal by hydrocyclone. H. J.	
-- growth regulators and herbici-		Delavler. (Abs.)	149
cides. S. Y. Peng. (Abs.)	209	non-sugar adsorption mechanism.	
-- herbicide. Anon. (Abs.)	282, 283	L. D. Bobrovnik <i>et al.</i> (Abs.)	353
-- G. K. Patro <i>et al.</i> (Abs.)	314	-- removal. S. Zagrodzki and K.	
-- irrigation. V. O. Mahajan and		Szwajcowska. (Abs.)	119, 321
D. G. Dakshindas. (Abs.)	343	pH and colorant and lime salts trans-	
-- nematocidal application. K.		fer from mud to juice. S. F.	
Singh and S. R. Misra. (Abs.)	335, 369	Olyanskaya <i>et al.</i> (Abs.)	354
-- position in row or end-row.		-- and colour formation. W. Chen.	26
P. Y. Jiang. (Abs.)	51	pre-carbonation. S. Zagrodzki.	139
-- rainfall, land slope and soil type.		predewatering mud albumin and	
B. J. White. (Abs.)	279	amino-nitrogen. K. D. Zhura <i>et al.</i>	218
-- and nitrogen. F. A. Fogliata		-- removal. A. R. Saprionov and	
and R. A. Dip. (Abs.)	82	R. G. Zhizlina. (Abs.)	390
-- sandy soil. Anon. (Abs.)	311	-- G. A. Vovk and L. P. Buketova	
-- sett fungicide treatment. K.		refinery syrup colour removal. F. H. C.	
Singh <i>et al.</i> (Abs.)	315	Kelly <i>et al.</i>	308
-- sloping land. M. C. Liao. (Abs.)	347	-- effect of starch. J. P. Murray	
-- soil compaction. M. A. Johnston		undetermined losses. A. Y. Zagorul-	
and R. A. Wood. (Abs.)	207	ko <i>et al.</i> (Abs.)	320
-- stubble shaving. Anon. (Abs.)	282	see also Clarification and Juice, Beet	
-- improvement needs in India. K.		Caribbean sugar industries. Anon.	57
Kar. (Abs.)	82	Caroni Ltd. report 1971/72. (N.C.)	2
-- in India. V. G. Vaidya. (Abs.)	347	Centrifugals. W. Steprath. (Abs.)	125
-- Jamaica, effect of temperature and		F. Urbano G. (Pat.)	226
rainfall. Anon. (Abs.)	112	automatic. (T.N.)	95
-- potential in South Africa. J.		-- APN-1250. M. V. Bakst and	
Glover. (Abs.)	381	A. G. Podolskii. (Abs.)	117
-- reduction in India. J. A. Gumaste	83	-- ARO. Z. Krajčovič. (Abs.)	149
-- relationship with cane character-		-- BMA. (T.N.)	126
istics. P. Y. Juang. (Abs.)	51	-- orders from Cuba. (Brev.)	95
-- B. V. Singh and A. S. Sangha	110	-- Trinidad and Zambia. (T.N.)	30
see also Animal fodder; Diffusers;		-- refinery operation. E. M. Karnise-	
Diffusion; Diseases; Factory; Fer-		vich and I. A. Deonag. (Abs.)	120
tilizers; Irrigation; Juice; Mechan-		ization. K. Pause	259, 390
ization; Molasses; Payment; Pests;		-- deflection prevention. Braunsch-	
Soil; Transport; Varieties and Wax		weigsche Maschinenbauanstalt	201
Carbon. Active: beet juice treatment.		Bosco performance. (Brev.)	30
H. Zaorska. (Abs.)	149, 254	Buckan-Wolf feed distributor. P. G.	
colour adsorption irreversibility. M. I.		Atherton. (Abs.)	20
Daishev and V. M. Sichenbak.	391	continuous. Bird Machine Co. (Pat.)	227
comparison with adsorbent resins.		-- Braunschweigsche Maschinenbau-	
Anon. (Abs.)	120	anstalt. (Pat.)	257
manufacture from bagasse. M. Ruiz		-- F. X. Ferney. (Pat.)	28
and C. Rolz. (Abs.)	186	-- González P. and O. L. Garcia H.	319
oxygen content and adsorption. V. B.		-- M. J. Irlin <i>et al.</i> (Abs.)	219
Deitz and J. L. Bitner. (Abs.)	183	-- E. Rüegg. (Pat.)	28, 60
Deitz and J. L. Bitner. (Abs.)	183	-- acceleration cup height and separa-	
Deitz and J. L. Bitner. (Abs.)	183	tion rate. S. M. Grebennyuk	
Deitz and J. L. Bitner. (Abs.)	183	<i>et al.</i> (Abs.)	288
Deitz and J. L. Bitner. (Abs.)	183	-- ss. batch. O. Adriaensens. (Abs.)	389
Deitz and J. L. Bitner. (Abs.)	183	-- BMA. L. E. Kirby and E. J.	
Deitz and J. L. Bitner. (Abs.)	183	Stewart. (Abs.)	148
Deitz and J. L. Bitner. (Abs.)	183	-- maseucite feeding. (T.N.)	126
Deitz and J. L. Bitner. (Abs.)	183	-- Fives Lille-Cail order. (Brev.)	189
Deitz and J. L. Bitner. (Abs.)	183	-- maseucite feeding. Braunschwe-	
Deitz and J. L. Bitner. (Abs.)	183	igsche Maschinenbauanstalt. (Pat.)	227
Deitz and J. L. Bitner. (Abs.)	183	-- molasses discharge. Soc. Fives	
Deitz and J. L. Bitner. (Abs.)	183	Lille-Cail. (Pat.)	291
Deitz and J. L. Bitner. (Abs.)	183	-- A. Mercier. (Pat.)	229
Deitz and J. L. Bitner. (Abs.)	183	-- performance analysis. G. F. East-	
Deitz and J. L. Bitner. (Abs.)	183	oughite. (Abs.)	148
Deitz and J. L. Bitner. (Abs.)	183	-- screens. B. B. Pawar. (Abs.)	53
Deitz and J. L. Bitner. (Abs.)	183	-- reclamation. J. P. Mukherjee	
Deitz and J. L. Bitner. (Abs.)	183	and G. K. Chetty. (Abs.)	115, 216
Deitz and J. L. Bitner. (Abs.)	183	-- tilting prevention. A. Mercier.	
Deitz and J. L. Bitner. (Abs.)	183	-- "Wal-Konti". J. P. Mukherji	
Deitz and J. L. Bitner. (Abs.)	183	<i>et al.</i> (Abs.)	54, 216
Deitz and J. L. Bitner. (Abs.)	183	-- West Indies order. (T.N.)	30
Deitz and J. L. Bitner. (Abs.)	183	-- influence on molasses purity.	
Deitz and J. L. Bitner. (Abs.)	183	M. Otalora B. (Abs.)	54
Deitz and J. L. Bitner. (Abs.)	183	drive. J. W. Khanna. (Abs.)	180
Deitz and J. L. Bitner. (Abs.)	183	-- M. Tondos and H. Widlok. (Abs.)	392
Deitz and J. L. Bitner. (Abs.)	183	-- modernization in refinery. (Brev.)	
Deitz and J. L. Bitner. (Abs.)	183	steam turbine. (T.N.)	189
Deitz and J. L. Bitner. (Abs.)	183	spindle. K. Pause. (Pat.)	260
Deitz and J. L. Bitner. (Abs.)	183	water washing. R. Grubel and J. M.	
Deitz and J. L. Bitner. (Abs.)	183	Vicaigne. (Abs.)	389
Deitz and J. L. Bitner. (Abs.)	183	wash water requirements calculation.	
Deitz and J. L. Bitner. (Abs.)	183	E. Benz. (Abs.)	288
Deitz and J. L. Bitner. (Abs.)	183	Centrifuge treatment of filter cake.	
Deitz and J. L. Bitner. (Abs.)	183	K. J. Nix <i>et al.</i> (Abs.)	20
CaCO <sub>3</sub> particle size and shape.	131		
F. H. C. Kelly <i>et al.</i>	219		
colloid coagulation. J. Vašátko <i>et al.</i>	219		
		Chains. (T.N.)	30, 95, 358
		Chile: beet production 1972/73. (Brev.)	192
		International Sugar Agreement mem-	
		bership. (Brev.)	160
		sugar statistics. (Brev.)	328
		China: Bei Tse sugar factory. S. Gielz-	
		ynski. (Abs.)	319
		Chromatography. Thin-layer: cellose	
		column: molasses colorants separa-	
		tion. I. F. Bugaenko and M.	
		Mukhamed. (Abs.)	289
		Chromatography. Gas-liquid: organic	
		acids in cane molasses. J. Brujin	
		and M. Vanis. (Abs.)	393
		phosphoric acid and organic acids	
		determination. J. F. T. Oldfield	
		<i>et al.</i>	3, 44
		sugars determination. H. Gruszecka	
		and S. Kubacki. (Abs.)	322
		-- V. S. Velasco <i>et al.</i> (Abs.)	122
		Chromatography. Thin-layer: oligo-	
		saccharides determination in cane	
		molasses. K. J. Schäffer and	
		A. H. Jukes. (Abs.)	153
		organic acids determination in beet	
		juice and molasses. F. Schneider	
		<i>et al.</i> (Abs.)	322
		sugars in beet juice. H. Gruszecka	
		-- separation. M. Roche. (Abs.)	394
		Citric acid: in beet, effect of sugar and	
		potassium contents. M. Burba	
		and U. Nitzschke. (Abs.)	350
		-- manufacture from cane molasses.	
		J. H. Fried. (Pat.)	188, 260
		Clarification. Anon. (Abs.)	115
		A. L. Canevero. (Abs.)	147
		U. P. Singh and R. K. Gupta. (Abs.)	217
		ATV clarifier performance. R. E.	
		Biekle <i>et al.</i> (Abs.)	179
		automatic control. A. M. Bunyak	
		<i>et al.</i> (Abs.)	218
		cane deterioration effect. E. Bataule	
		D. (Abs.)	147
		clarifier performance. K. J. Nix <i>et al.</i>	
		deteco-melt-phosphotation. A. C.	
		Chatterjee. (Abs.)	388
		efficiency determination. A. Aziz.	185
		Enviro-Clear clarifier performance.	
		D. E. Ash	170
		with flocculation aid. (T.N.)	157, 262
		-- S. K. D. Agarwal <i>et al.</i> (Abs.)	115
		-- E. J. Nix <i>et al.</i> (Abs.)	20
		juice from burnt cane. J. M. Tamargo	
		T. (Abs.)	85
		-- retention determination. H. Hirsch-	
		müller. (Abs.)	393
		liming tank. J. de Crémoux. (Abs.)	386
		with magnesium oxide. S. C. Gupta	
		<i>et al.</i> (Abs.)	253
		-- A. J. Margabandhu. (Abs.)	180
		model clarifier tests. K. J. Nix. (Abs.)	272
		mud density calculation. K. J. Nix	175
		-- filtrate. J. H. Chen. (Abs.)	115
		-- effect of flocculation aid. A. G.	
		Noble. (Abs.)	179
		with phosphate. S. L. Sang. (Abs.)	21
		-- M. A. A. Cesar <i>et al.</i> (Abs.)	356
		-- uptake by cane. S. S. Garrucho	
		and J. L. T. Raminantan. (Abs.)	86
		see also Clarifiers and Juice, Cane	
		Clarifier. American Sugar Co. (Pat.)	226
		D. J. Hale and E. Whayman. (Abs.)	148
		Dorr-Oliver. B. Rao and G. V. S.	
		Rao. (Abs.)	180
		juice disinfection during evaporator	
		cleaning. A. P. Lapin. (Abs.)	218
		Colombia: new sugar factory. (Brev.)	159
		sugar exports. (Stat.)	460
		-- suspension. (Brev.)	400
		Colonial Sugar Refining Co. Ltd.: cane colorants analysis. P. Smith and	
		P. E. Gregory. (Abs.)	25
		refining research. M. C. Bennett	
		<i>et al.</i> (Abs.)	355
		report 1972/73. (Brev.)	295
		Colour: cane juice colorant composition.	
		P. Smith and P. E. Gregory. (Abs.)	25
		-- effect of diffusion pH. D. P. Kul-	
		darni and J. E. Unde. (Abs.)	216
		-- molasses brownin polymers	
		structure. W. W. Binkley	58
		carbonation juice, effect of predew-	
		atering mud removal. G. A. Vovk	
		and L. P. Buketova. (Abs.)	392
		colorants adsorption by Al(OH) <sub>3</sub> .	
		effect of sucrose. S. E. Kharin and	
		V. V. Maslova. (Abs.)	223
		-- CaCO <sub>3</sub> , effect of sucrose. S. E.	
		Kharin and V. V. Maslova.	181
		-- in cane and refined sugar. L.	
		Farber and F. G. Carpenter	26



# INDEX

	PAGE
Colour: colorants effect on amino-nitrogen determination. R. Bretschneider <i>et al.</i> (Abs.).....	394
- in raw sugar, determination. V. S. Velasco <i>et al.</i> (Abs.).....	122
- - - removal by ion exchange. D. Cookson <i>et al.</i> (Abs.).....	122
- separation from ion exchange column eluate. K. Ciz <i>et al.</i> .....	121
- transfer from carbonatation mud to juice, effect of. P. S. P. Olyanskaya <i>et al.</i> (Abs.).....	354
- in white sugar. I. F. Bugaenko <i>et al.</i> (Abs.).....	89
formation in beet juice, effect of evaporator residence time. M. A. Geishkovt <i>et al.</i> (Abs.).....	218
- - - of predefecation mud removal. A. B. Sapronov and R. G. Zhizhina. (Abs.).....	390
- cane juice, effect of nitrogen fertilizer. A. P. Gupta <i>et al.</i> .....	89
- carbonatation, effect of temperature and alkalinity. I. F. Bugaenko and M. Mukhamed. (Abs.).....	182
- evaporators. M. A. Geishkovt <i>et al.</i> with iron. I. F. Bugaenko and M. Mukhamed. (Abs.).....	322
- stored liquid sugars. C. Kriger and W. Stumtzer. (Abs.).....	218
- white sugar manufacture. W. Chen. (Abs.).....	26
glycine and lysine colorants and sucrose crystallization. W. M. Nicol and C. L. Farmer. (Abs.).....	152
measurement compared with fluorescence measurement. J. H. Wall and F. G. Carpenter. (Abs.).....	122
- of white sugar. S. K. D. Agarwal and R. C. Gupta. (Abs.).....	323
melanoidin formation from invert sugar. I. F. Bugaenko and M. Mukhamed. (Abs.).....	90
- - - V. F. Selemenev <i>et al.</i> (Abs.).....	153
molasses colorants separation. I. F. Bugaenko and M. Mukhamed.....	289
- and syrup, effect of noxious nitrogen. A. Y. Gadzhiev <i>et al.</i> raw and refined sugar colorants. L. Farber and F. G. Carpenter. (Abs.).....	152
- sugar from burnt vs. unburnt cane. G. E. Sloane and L. J. Rhodes - US refiners' standard. A. H. Hlola. (Abs.).....	222, 393
refined sugar coloration with ash content. M. Marounek. (Abs.).....	59
removal with active carbon. S. A. Brennan and I. L. Zdanovich.....	120
- - - Y. O. Kravets <i>et al.</i> (Abs.).....	120
- - - S. B. Smith <i>et al.</i> (Abs.).....	183
- A. Vera Z. (Abs.).....	221
- H. Zaorski. (Abs.).....	254
- manufactured from.....	186
- M. Ruiz and C. Bolz. (Abs.).....	186
- adsorbent resins. Anon. (Abs.).....	120
- G. Assalini and G. Brandoli.....	119
- D. F. Bagster. (Abs.).....	120
- N. M. Kodenko and D. M. Lebovich. (Abs.).....	118
- S. Landi and G. Mantovani.....	392
- K. J. Parker. (Abs.).....	355
- J. E. Rader and E. E. Anderson. (Abs.).....	220
- Rohm & Haas Co. (Pat.).....	257
- W. R. Tison <i>et al.</i> (Abs.).....	221
- - - adsorption mechanism. J. C. Abram <i>et al.</i> (Abs.).....	90
- - - column explosion. F. Juračka <i>et al.</i> (Abs.).....	355
- instrumentation. H. Hashimoto. (Abs.).....	355
- resin adsorption. J. F. Zievers and C. J. Novotny.....	61
- bone char. J. C. Abram <i>et al.</i> .....	201
- C. C. Chou and K. B. Hanson.....	221, 355
- and active carbon. M. I. Dalshev and V. M. Sheherdakh. (Abs.).....	391
- bulk density and performance. J. C. Abram and P. S. Warren.....	235
- effect of inorganic ions. K. Amako. (Abs.).....	355
- optimum sweeten-off. F. M. Chapman. (Abs.).....	221
- carbonatation. G. Garcia. (Abs.) - compared with sulphitation. F. H. C. Kelly <i>et al.</i> .....	308
- hydrogenation. S. Iwashina and T. Nagassaka. (Abs.).....	356

	PAGE
Colour: removal by ion exclusion. K. Ciz <i>et al.</i> (Abs.).....	395
- kinetics. M. Friml <i>et al.</i> (Abs.).....	221
- with polyamide. Colonial Sugar Refining Co. Ltd. (Pat.).....	257
- surface-active agent. M. C. Bennett - W. B. Hill. (Abs.).....	183, 220
sugars irradiation and browning reaction. W. W. Binkley <i>et al.</i> .....	223
white sugar, effect of double curing. P. Devillers <i>et al.</i> (Abs.).....	222
- - - storage. P. Devillers and J. Roger. (Abs.).....	223
see also Bone char; Carbon, Active and Refining	
Commission Internationale Technique de Sucre: 14th General Assembly Proceedings. (N.B.).....	24
- 15th General Assembly 1975.....	159
Computers: applications. K. Szezo. - in beet breeding. G. A. Milliken <i>et al.</i> (Abs.).....	52
- - - payment. T. G. Meyer. (Abs.).....	150
- - - pulp drying. P. Thelen. (Abs.).....	154
- cane sugar factory. H. L. Oliveros automatic control of beet diffusion. B. A. Eremenko <i>et al.</i> (Abs.).....	88
- - - materials flow. B. A. Eremenko <i>et al.</i> (Abs.).....	182
cane agriculture data processing. O. W. Sturgess and R. J. Hampson - simulation. R. H. Farquhar.....	279, 279
- data processing in South Africa. E. J. Buchanan.....	299, 337
- payment system in Australia. Anon. (Abs.).....	116
- railway scheduling. E. E. Shepherd and R. A. James. (Abs.).....	281
data processing. E. Svoboda. (Abs.) - and centralized accounting. J. W. Cullen and G. F. Doherty. (Abs.).....	147
- in Cuban sugar factories. E. Pedrosa P. and G. Benazet.....	287
dextrose and levulose mixture analysis. K. Lauer <i>et al.</i> (Pat.).....	324
dryer dimensions calculation. W. Poersch and P. Thelen. (Abs.).....	218
factory heat scheme conversion. N. M. Spinul <i>et al.</i> (Abs.).....	354
- materials balance calculation. A. M. Guthrie. (Abs.).....	394
laboratory report calculations. J. R. Fitzgerald. (Abs.).....	153
optimum pH calculation in evaporation and boiling. A. Y. Zagorul'ko <i>et al.</i> (Abs.).....	320
project work at Wissington sugar factory. I. S. Higgins <i>et al.</i> (Abs.).....	254
Control, Automatic: J. Browkin.....	149
S. G. G. (Abs.).....	87
L. Oledzki. (Abs.).....	353
F. Zama and G. Cerolini. (Abs.).....	149
beet diffuser and slicer speeds. K. E. Reznik and Z. L. Ziman. (Abs.).....	119
- diffusion. B. A. Eremenko <i>et al.</i> - and juice liming. A. B. Gussakov and S. P. Gotskii. (Abs.).....	88, 254
- temperature. W. Lau. (Abs.).....	255
- juice flow. B. A. Eremenko <i>et al.</i> - slicer throughput and tower diffusion loading. N. F. Shurbovanyi <i>et al.</i> (Abs.).....	181
- sugar factory processes. B. A. Eremenko <i>et al.</i> (Abs.).....	119
boiling. (T.N.).....	94
- N. Barkow and G. Witte. (Abs.).....	23
- R. J. Batterham <i>et al.</i> (Abs.).....	180
- M. Garabet. (Abs.).....	389
- H. L. Oliveros. (Abs.).....	53
- V. P. Zubchenko <i>et al.</i> (Abs.).....	55
cane carrier drives. Anon. (Abs.).....	119
- juice flow. D. J. Hale and E. Whayman. (Abs.).....	175
- and milk-of-lime proportioning. P. V. L. Narasimham. (Abs.).....	180
- sulphitation pH. C. M. Kwang and K. H. Shen. (Abs.).....	352
- temperature. P. V. L. Narasimham. (Abs.).....	180
- - - M. Pearse. (Abs.).....	116
- mill disinfection. J. Raffray. (Abs.).....	86
- milling in Taiwan. H. I. H. Chen and L. F. Huang. (Abs.).....	55
- reception and sampling. M. Pearse - sugar factory processes. M. C. Forest. (Abs.).....	116, 86
carbonatation. B. G. Susorov and B. A. Eremenko. (Abs.).....	354

	PAGE
Control, Automatic: carbonatation mud filtration parameters calculation. R. Osvald and E. Havlova. (Abs.).....	353, 218
clarification. A. M. Bunyak <i>et al.</i> in Czechoslovakia. J. Oledzki. (Abs.).....	87
electronic vs. pneumatic techniques. R. C. Sharma. (Abs.).....	20
evaporator calculation. L. A. Popovich and A. M. Kozak. (Abs.).....	23
- juice feed. G. K. Chetty. (Abs.).....	319, 388
- vapour balance. B. A. Eremenko <i>et al.</i> (Abs.).....	288
filter mud feed level. V. I. Abramchuk. (Abs.).....	117
- - - G. V. Pershouse. (Abs.).....	180
refined sugar drying. V. A. Demchenko. (Abs.).....	221
refinery liquor resin decolorization. H. Hashimoto. (Abs.).....	355
syrup Brix. A. M. Bunyak <i>et al.</i> in Taiwan sugar factories. Y. P. Yu. see also Computers and Instruments	288, 21
Control, Chemical: absolute vs. normal juice. H. Lopez V. (Abs.).....	323
beet leaf preparation. A. Y. Zagorul'ko <i>et al.</i> (Abs.).....	122
- dirt tare. A. E. Popov and S. K. Mezentsev. (Abs.).....	59
- flume water sugar determination. J. P. T. Oldfield <i>et al.</i> (Abs.).....	289, 393
- - - W. Ulenbroek. (Abs.).....	395
- molasses target purity determination. E. Y. Golsman. (Abs.).....	59
- - - M. I. Pererivn <i>et al.</i> (Abs.).....	323
- processing quality calculation. J. Schmidt and J. Zahradnick. - and pulp sugar determination. A. Y. Zagorul'ko <i>et al.</i> (Abs.).....	121, 59
- sampling. M. Burba and W. Hause - M. Z. Kheleskii <i>et al.</i> (Abs.).....	122, 90
- K. Metelski. (Abs.).....	289
- and analysis. K. Kaniewski and T. Hrycak. (Abs.).....	122
- - - equipment. (Abs.).....	32
- in Poland. B. Swiatkowski.....	22
- tarehouse. G. Dosedla. (Abs.).....	152
boiling house performance assessment. A. C. Chatterjee. (Abs.).....	253
- - - B. S. Gurumurthy. (Abs.).....	217
- E. Oommen. (Abs.).....	253
- - - J. M. Tamargo T. and J. Rodriguez L. (Abs.).....	185
cane analysis. P. G. Atherton. (Abs.) - M. Demaux. (Abs.).....	20, 395
- disintegrator. (T.N.).....	262
- maintenance. R. Dadant.....	289
- and sugar recovery calculation. E. J. Buchanan. (Abs.).....	299, 337
- molasses purity prediction. J. P. Gupta <i>et al.</i> .....	275
- sugar factory materials balance calculation. A. M. Guthrie.....	394
- sampler. P. E. Beaudoux. (Pat.).....	397
- sampling. Anon. (Abs.).....	116
- S. C. Grimley. (Abs.).....	222
- and analysis. A. C. Barnes.....	90, 141
- automatic control. M. Pearse.....	116
laboratory report calculation by computer. J. R. Fitzgerald. (Abs.).....	153
loss reduction. C. Bayma. (Abs.).....	223
purity determination by conductivity. V. Valtor. (Abs.).....	322
raw sugar analysis. J. Bures and M. Friml. (Abs.).....	121
reducing sugars determination. D. Bourdon. (Abs.).....	322
- - - B. N. Ershov. (Abs.).....	89
refined sugar analysis. N. K. Kva-cheva and G. A. Chikin. (Abs.).....	185
refinery products purity determination. L. P. Beva and L. A. Leneva sugar analysis. A. F. Radford. (Abs.).....	289, 394
- yield prediction in South Africa. A. M. Guthrie. (Abs.).....	153
- in US. W. W. Binkley. (Abs.).....	122
white sugar remend calculation. J. Dobrzycki. (Abs.).....	118
see also Ash; Brix; Colour; Filtrability; Invert sugar; Losses; Polarization; Reducing sugars; Suore; Sugar; Water and Weighing Conveyors. (T.N.).....	95, 158
bagged sugar. E. P. Shkolenko and M. M. Kichigin. (Abs.).....	150
beet unloaders. H. Brunke. (Abs.).....	391
chains. (T.N.).....	30, 358
in Philippines sugar factory. (Brev.).....	356
tramp metal detector. (T.N.).....	126, 261

# INDEX

<b>Conveyors:</b>		<b>Density clarifier mud calculation.</b> K. J. Nix. (Abs.)	222
<i>see also</i> Bulk handling and Mills, Cane		<i>see also</i> Brix	
Coolers: white sugar fluidized bed. J. Mlynář. (Abs.)	117	Dextran: content in cane, effect of billet size. L. G. Vallance. (Abs.)	111
Corrosion: aluminum tubes. Anon.	352	destruction in stale cane. G. H. Richards. (Abs.)	386
distillery waste pH. N. A. da Gloria <i>et al.</i> (Abs.)	290	effect of pol. measurement in frost-damaged beet. R. Bergkvist	118
evaporator tubes. H. Hirschmüller	393	raw sugar filtrability. G. P. James	148
-- A. Lemaître. (Abs.)	389	polysaccharides determination in cane juice. L. E. Leal G. and S. G. Kara-Murza. (Abs.)	395
-- H. Shimbar <i>et al.</i> (Abs.)	287	Dextrose: in bagasse extract. S. E. Pathak and V. R. Srinivasan	289
-- effect of sulphitation. B. I. Kats	392	determination. K. Lauer <i>et al.</i> (Pat.)	324
inhibition with molasses. F. Pérez and S. Müller. (Abs.)	357	enzymatic conversion to levulose. Anon. (Abs.)	27
iron ions and colorant formation. I. F. Bugaenko and M. Mukhamed prevention in boilers. (T.N.)	358	irradiation and browning reaction. W. W. Binkey <i>et al.</i> (Abs.)	223
steel in beet juice. V. V. Suprunchuk <i>et al.</i> (Abs.)	182	manufacture in UK (Brev.)	358
sugar factory equipment. M. le Blanc	288	moisture determination. (T.N.)	157
Costa Rica sugar production 1971/72	32	physical properties. R. S. Burdukova <i>et al.</i> (Abs.)	322
Crystallization, Masecuite. I. N. Akindinov. (Abs.)	150	separation from levulose. T. Kubo	260
W. C. Black. (Pat.)	28	-- A. J. Melaja. (Pat.)	293
M. Nimi <i>et al.</i> (Pat.)	155	-- R. Tatuki. (Pat.)	291
F. Schneider. (Abs.)	152	-- K. Tatuki and T. Kubo. (Pat.)	187
batch <i>vs.</i> continuous. K. F. Hsieh	352	<i>see also</i> Invert sugar; Reducing sugars and Sugars	
cane burning effect. J. M. Tamargo T.	85	Diffusers, Beet. M. J. C. Barre. (Pat.)	228
deterioration effects. E. B. Butle	147	G. P. Duchateau and F. J. Vanherwegen. (Pat.)	258
-- C. S. Henderson. (Abs.)	179	Raffinerie Tirllemontoise S.A. (Pat.)	187
and C-sugar quality. S. C. Gupta and S. K. D. Agarwal. (Abs.)	351	automatic control of cossette:water ratio. A. B. Gusakov and S. P. Gotskil. (Abs.)	254
masecuite purity and Brix estimation. I. N. Akindinov. (Abs.)	218	-- loading. N. F. Shuribovany <i>et al.</i>	181
rate determination. S. Zagrodzki and Z. Sudomir. (Abs.)	395	-- speed. K. E. Reznik and Z. L. Ziman. (Abs.)	119
<i>see also</i> Boiling and Masecuite		-- temperature. W. Lau. (Abs.)	255
Crystallization, Sucrose: effect of calcium chloride and potassium nitrate. S. E. Kharin <i>et al.</i> (Abs.)	322	BMA. (T.N.)	126
-- salts. V. M. Kharin and V. F. Dobromirova. (Abs.)	356	-- in Holland. (T.N.)	358
-- glyeine and lysine. W. M. Nicol and C. L. Farmer. (Abs.)	152	cossette scalding. E. Langen and H. Weddecke. (Pat.)	91
-- potassium and sodium chlorides. V. M. Kharin and V. F. Dobromirova. (Abs.)	289	-- juice circulation. N. S. Karpovich. (Abs.)	390
-- sodium chloride. V. F. Dobromirova <i>et al.</i> (Abs.)	394	-- skimmer. Braunschweigische Maschinenbauanstalt. (Pat.)	227
-- solution viscosity. G. Pidoux	152	-- weighing. A. B. Gusakov and S. P. Gotskil. (Abs.)	117
grain size distribution. S. Orlovski and D. Schilphake. (Abs.)	393	DDS. H. Brüniche-Olsen. (Abs.)	181
heat of crystallization and activity coefficient calculation. J. Fernández B. and L. Ballester. (Abs.)	90	-- controls and measuring instruments. A. V. Ternovoi. (Abs.)	119
Crystallizers: continuous. D. H. Foster design influence on molasses purity. M. Otalora B. (Abs.)	54	-- drive shafts and pinions alignment. S. V. Dudnikov and V. A. Lupashko. (Abs.)	182
drivers. J. W. Khanna. (Abs.)	180	-- in East Germany. (T.N.)	262
Cuba: aid for Sierra Leone sugar project automatic centrifugal orders. (Brev.)	95	-- W. Jaszcyński. (Abs.)	320
bulk sugar shipment. G. González cane cleaning. G. González. (Abs.)	347	-- scroll pressure on cossettes. I. M. Fedotkin <i>et al.</i> (Abs.)	118
-- and mechanization. J. Vázquez	248	-- shaft mounting. A. Y. Volokhov	22
-- mechanical harvesting. A. F. Betancourt. (Abs.)	53, 319	disinfectant. J. A. Casey. (Pat.)	324
De Smet cane diffusion. A. Valdés <i>et al.</i> (Abs.)	287	-- B. Guerin <i>et al.</i> (Abs.)	149
factory data processing by computer. R. Pedrosa P. and G. Benazet	287	gears and path rings. (Brev.)	95
"Pablo Noriega" experimental sugar factory. G. González. (Abs.)	319	<i>see also</i> Diffusion, Beet	
steam turbine orders. (Brev.)	398	Diffusers, Cane. M. J. C. Barre. (Pat.)	228
sugar industry. Anon. (N.B.)	57	W. R. Crawford. (Pat.)	61
-- statistics. (Stat.)	264	F. Daubrine. (Pat.)	293
-- trade agreement with USSR	64	291	
Cuba: sugar: crystal crushing. S. A. Brennan and N. K. Kudryavtseva	292	W. Kaether and H. D. Backofen	188
factory closure in Nigeria. (Brev.)	221	W. Kaether <i>et al.</i> (Pat.)	188
press. J. Shpak and D. M. Humm	221	B. L. Mittal. (Abs.)	216
Czechoslovakia: automatic control. J. Oledzki. (Abs.)	87	A. van Hengel. (Pat.)	92
beet production 1972. (Brev.)	160	BMA licence in Brazil. (Brev.)	30
Hrochuv Týn. (Brev.)	291	DDS use for beet cane. D. P. Kulkarni <i>et al.</i> (Abs.)	391
Hrušovany sugar factories. Z. Nitschke. (Abs.)	320	De Smet operation in Cuba. A. Valdés <i>et al.</i> (Abs.)	287
new sugar factory. (Brev.)	32	disinfectant. J. A. Casey. (Pat.)	324
sugar exports 1972. (Brev.)	328	-- in Taiwan. Y. P. Yu. (Abs.)	21
		<i>see also</i> Diffusion, Cane	
<b>Dahomey:</b> new sugar factory. (Brev.)	64	Diffusion, Beet. G. V. Genie, 67, 99, 117, 354	391
M. Dedini S.A. Metalúrgica: BMA cane diffuser licence. (Brev.)	30	-- automatic control. J. Browkin. (Abs.)	149
		-- B. A. Eremenko <i>et al.</i> (Abs.)	88, 182
<b>Demerara</b> sugar sulphated ash-conductivity relationship. I. E. de Castro and F. de O. Barbosa. (Abs.)	90	-- S. Ginal. (Abs.)	87
		beet physical properties. K. Yukov	288
<b>Denmark:</b> sugar factory steam consumption. P. V. L. Narasimham	122	-- tissue permeability calculation. B. M. Lysyanski <i>et al.</i> (Abs.)	353
-- industry. Anon. (Abs.)	182	condenser water electro dialysis. K. Číž. (Abs.)	389
-- H. B. Ostenfeld. (Abs.)	119, 149	-- treatment and utilization. S. Zagrodzki. (Abs.)	321
		cossette layer permeability maintenance. V. G. Drynov and V. G. Dmyshko. (Abs.)	354
		-- quality. V. N. Shehegolev and G. M. Korbut. (Abs.)	354
		<b>Diffusion, Beet: cossette retention time calculation.</b> N. Margnietti and G. Mantovani	35
		effect on boiling house performance. K. Wagnerski. (Abs.)	118
		flow measurement. B. Lepenne and J. P. Merlet. (Abs.)	389
		imido-disulphonate formation. A. Carruthers. (Abs.)	182
		loss calculation. G. d'Orazi. (Abs.)	23
		micro-organisms determination. I. Vokounová and J. Smolik. (Abs.)	223
		-- identification. F. Hollaus and H. Klaushofer	237, 271
		-- and losses. H. Klaushofer and G. Pollach. (Abs.)	117, 321
		non-sugars effect. S. Zagrodzki and J. Kubiak. (Abs.)	59
		optimum juice draft determination. B. A. Eremenko and B. N. Valovoi	392
		pH and pectin extraction in juice. A. Carruthers. (Abs.)	182
		plasmolysis, effect of temperature and time. S. Zagrodzki and J. Kubiak. (Abs.)	353
		sugar decomposition. H. Klaushofer and G. Pollach. (Abs.)	223
		-- factory water economy. J. Herótk dryer diffuser performance. V. G. Drynov and V. G. Dmyshko. (Abs.)	391
		-- A. P. Parkhod'ko. (Abs.)	22
		water spray heating. V. M. Rosinski <i>et al.</i> (Abs.)	391
		-- treatment with aluminium sulphate. A. A. Lipets and I. A. Oleinik. (Abs.)	391
		<i>see also</i> Beet; Control, Automatic; Diffusers, Beet; Factory and Losses	
		Diffusion, Cane. J. C. P. Chen. (Abs.)	116
		BMA diffuser performance. C. B. van der Riet and R. H. Renton	86
		comparison with cane milling. U. C. Upadhiaya. (Abs.)	21
		DDS diffuser performance. S. K. D. Agarwal <i>et al.</i> (Abs.)	387
		-- in Tanzania. G. van der Wolf. (Abs.)	319
		De Smet performance. B. Narayanarao <i>et al.</i> (Abs.)	216
		"Hi-Extractor" performance. L. J. Rhodes and J. W. Bersch. (Abs.)	116
		-- G. B. Ross and B. W. Barnes	351
		impurities extraction. D. P. Kulkarni and J. R. Unde. (Abs.)	216
		juice retention time calculation. N. Margnietti and G. Mantovani	35
		Satureni diffuser performance. J. Palaez	267
		Silver diffuser performance. A. M. Hirose and R. D. Mounts. (Abs.)	351
		-- Y. C. Yen. (Abs.)	21
		-- in South Africa. J. P. Lamusse	86
		sugar recovery calculation. S. K. Goel. (Abs.)	217
		<b>Diseases, Beet: <i>Alternaria tenuis</i> control.</b> A. N. Mukhopadhyay and R. P. Thakur. (Abs.)	385
		black root zoospore production. L. J. Herr. (Abs.)	284
		<i>Cercospora</i> leaf spot. E. P. van Arsdal <i>et al.</i> (Abs.)	145
		crown rot causal agent determination in soil. L. J. Herr. (Abs.)	251
		curly top isolates virulence. C. L. Schneider. (Abs.)	114
		fungal disease control. W. J. Byford	215
		-- in Spain. J. Isart. (Abs.)	84
		in India. K. Singh <i>et al.</i> (Abs.)	84
		leaf spot. F. B. Russell. (Abs.)	285
		-- control. M. Göbelze. (Abs.)	214
		-- lesion development, effect of pollen. R. C. Warren. (Abs.)	251
		-- mycoflora effect of pollen. R. C. Warra. (Abs.)	251
		-- resistance, effect of enzymes. G. S. Rauteala and M. G. Payne	284
		-- varietal resistance testing. E. G. Ruppel and J. O. Gaskill	213
		rhizomania control. C. A. Ghillini	178
		root disease control. V. R. Schüfelle and C. Winner. (Abs.)	214
		virus disease transmission from volunteer beet. W. E. Howell and G. Mink. (Abs.)	252
		-- yellowed beet yield effect of spraying for aphid control. G. D. Heathcote and R. L. Cattrall. (Abs.)	286

# INDEX

PAGE		PAGE
<p>Diseases, Beet: virus yellows isolates and plant infection, A. Aapola and G. I. Mink. (Abs.)..... 215</p> <p>--- varietal tolerance. G. I. Mink 214</p> <p>Diseases, Cane. A. G. Hayes. (Abs.) 345</p> <p><i>Alternaria tenuis</i> leaf spot. S. Singh alternative hosts. P. B. Hutchinson in Australia. Anon. (Abs.)..... 109</p> <p>--- C. G. Hughes and D. R. L. Steindl 141</p> <p>Burma. M. M. Thauang. (Abs.)..... 143</p> <p>cane varieties exchange. C. G. Hughes. (Abs.)..... 47</p> <p>--- and quarantine. G. M. Thompson and J. Wilson 47</p> <p><i>Cephalosporium sacchari</i>. N. N. Sarma. (Abs.)..... 208</p> <p>chlorotic streak control. C. Ricaud. 49, 81</p> <p>control chemicals calculation. E. G. Spry. (Abs.)..... 278</p> <p>--- by hot water treatment. A. W. Ford. (Abs.)..... 380</p> <p>--- separate seed cane growing. R. S. Kanwar. (Abs.)..... 174</p> <p>downy mildew and Fiji disease control. J. Daniels <i>et al.</i> (Abs.)..... 49</p> <p>--- resistance testing. N. D. Stevenson. (Abs.)..... 313</p> <p>eye spot control. Anon. (Abs.)..... 113</p> <p>--- resistance determination. R. S. Byther and G. W. Steiner. 245</p> <p>--- G. W. Steiner and R. S. Byther. (Abs.)..... 80</p> <p>--- toxin and leaf cell structure. G. A. Strobel <i>et al.</i> (Abs.)..... 209</p> <p>Fiji disease. B. T. Egan. (Abs.)..... 384</p> <p>--- C. G. Hughes. (Abs.)..... 280</p> <p>--- C. L. Toohy and P. J. Nielsen 280</p> <p>--- alternative hosts and transmission. P. B. Hutchinson <i>et al.</i> (Abs.)..... 384</p> <p>--- control. Anon. (Abs.)..... 141, 249</p> <p>--- C. L. Toohy. (Abs.)..... 380</p> <p>--- transmission. Anon. (Abs.)..... 109</p> <p>--- A. G. Hayes. (Abs.)..... 280</p> <p>--- hazard. Anon. (Abs.)..... 249</p> <p>--- varietal resistance testing. A. Husain and P. B. Hutchinson 49</p> <p>--- virus particles in insect vector. R. I. B. Francki and C. J. Grivell. (Abs.)..... 315</p> <p>fungus diseases. F. Holliday. (Abs.) 143</p> <p><i>Fusarium</i> stem rot and germination. L. J. Liu and J. Migonci. (Abs.) 246</p> <p>grassy shoot. G. K. Zende and N. B. Shaikh. (Abs.)..... 49</p> <p>--- and cane yield. J. A. Gumaste control. S. S. Sandhu <i>et al.</i>..... 200</p> <p>gummosis. M. B. Pinto and M. de Mendonca. (Abs.)..... 315</p> <p>--- C. Ricaud. (Abs.)..... 81</p> <p>--- causal agent. B. Rat. (Abs.)..... 318</p> <p>--- varietal susceptibility. J. A. Lalouette and L. C. Y. L. S. Chong. (Abs.)..... 80</p> <p>in Hawaii. R. S. Byther <i>et al.</i> (Abs.) 143</p> <p>--- C. A. Wismer. (Abs.)..... 349</p> <p>hot air vs. hot water treatment and cane sett germination. A. Harding-Goodman and G. M. Thomson --- treatment. R. G. Menon <i>et al.</i> 48</p> <p>in India. Anon. (N.B.)..... 151</p> <p>international slide collection. Anon. 144</p> <p>leaf blight resistance by tissue culture. L. S. Leu <i>et al.</i> (Abs.)..... 144</p> <p>--- varietal resistance. L. S. Leu and W. H. Hsieh. (Abs.)..... 142</p> <p>--- scald. B. T. Egan. (Abs.)..... 19</p> <p>--- C. G. Hughes. (Abs.)..... 384</p> <p>--- C. Ricaud and M. E. Paulo. 81</p> <p>--- causal agent isolation. G. J. Persley. (Abs.)..... 313</p> <p>--- control in sets. D. R. L. Steindl. (Abs.)..... 47</p> <p>--- transmission. Anon. (Abs.)..... 282, 316</p> <p>--- varietal resistance. B. T. Egan 19</p> <p>--- M. S. Khan. (Abs.)..... 142</p> <p>--- testing. H. Koike. (Abs.)..... 47</p> <p>in Mauritius. C. Ricaud. (Abs.)..... 81</p> <p>Mexico. S. Flores C. (Abs.)..... 174</p> <p>mosaic. K. S. Bhargava <i>et al.</i> (Abs.) 47, 313</p> <p>--- S. M. P. Khurana and S. Singh. 383</p> <p>--- aphid vectors and ants. S. M. A. Rizvi <i>et al.</i> (Abs.)..... 384</p> <p>--- control. Anon. (Abs.)..... 209</p> <p>--- by "roguing" with herbicides. H. Koike and B. L. Fipgett 249, 312</p> <p>--- and raatoon stunting effects on cane yield. R. J. Steib. (Abs.) 311</p> <p>--- response testing. J. Dick. (Abs.) 384</p>	<p>Diseases, Cane: mosaic, smut and streak --- reactions. G. M. Thomson. (Abs.) 144</p> <p>--- susceptibility of heat-treated cane. G. T. Benda. (Abs.)..... 143</p> <p>--- varietal resistance. L. Lauden. 249</p> <p>--- virus control. G. T. A. Benda. 48</p> <p>--- extract purification. A. G. Gillaspie. (Abs.)..... 48</p> <p>--- H. Handjlo and D. Noordam 48</p> <p>--- transmission. I. L. Forbes <i>et al.</i> 48</p> <p>--- by aphids. H. David <i>et al.</i> 384</p> <p>--- K. M. Lal and K. S. Bhargava 383</p> <p>--- J. L. Saladini and F. W. Zettler. (Abs.)..... 384</p> <p><i>Phytoplasma tuscananensis</i> leaf spot. P. Prakasham and P. Appalarasiah 143</p> <p>pineapple disease control. H. W. Hilton. (Abs.)..... 349</p> <p>--- H. W. Hilton <i>et al.</i> (Abs.)..... 245</p> <p>--- L. J. Liu <i>et al.</i> (Abs.)..... 50</p> <p>--- C. Ricaud. (Abs.)..... 81, 312</p> <p>--- G. M. Thomson. (Abs.)..... 143</p> <p>--- C. A. Wismer. (Abs.)..... 349</p> <p>in Portuguese East Africa. A. P. da S. Cardoso. (Abs.)..... 246</p> <p>--- A. do R. Noronha. (Abs.)..... 50, 247</p> <p><i>Pythium</i> root rot. H. Koike. (Abs.) 109, 144</p> <p>raatoon stunting. Anon. (Abs.)..... 311</p> <p>--- S. Sandhu <i>et al.</i> (Abs.)..... 247</p> <p>--- M. Santos. (Abs.)..... 312</p> <p>--- R. J. Steib. (Abs.)..... 48</p> <p>--- G. M. Thomson. (Abs.)..... 143</p> <p>--- causal organisms. Anon. (Abs.) 312</p> <p>--- control. Anon. (Abs.)..... 378</p> <p>--- S. M. Babu <i>et al.</i> (Abs.)..... 379</p> <p>--- B. J. Steib and S. J. P. Chilton. (Abs.)..... 476</p> <p>--- D. M. Tantera and R. J. Steib 377</p> <p>--- by harvester sterilization. Anon. (Abs.)..... 377</p> <p>--- hot air treatment, effect on sett germination and cane yield. S. S. Sandhu and K. S. Ram. (Abs.)..... 378</p> <p>--- water treatment tanks. B. F. King and G. M. Thomson 382</p> <p>--- diagnosis with elephant grass. S. Matsuoaka. (Abs.)..... 312, 314</p> <p>--- and mosaic control. G. T. A. Benda. (Abs.)..... 211</p> <p>--- by plant nurseries. Anon. 208</p> <p>--- and smut control. G. L. James 246</p> <p>--- virus isolation. A. G. Gillaspie red rot. C. Ricaud. (Abs.)..... 313</p> <p>--- control in seed pieces. L. Anzalone. (Abs.)..... 50, 281</p> <p>--- varietal resistance. K. Kar <i>et al.</i> 318</p> <p>--- determination. A. K. Verma <i>et al.</i> (Abs.)..... 173</p> <p>--- stripe. J. Delgado and M. Abarca --- causal agent and alternative host. S. R. S. Dange and M. M. Payak. (Abs.)..... 383</p> <p>research in Réunion. Anon. (Abs.) 344</p> <p>rust varietal susceptibility. N. B. Shaikh and V. V. Shingte. (Abs.) 318</p> <p>sett blight fungus. S. M. P. Khurana and S. Singh. (Abs.)..... 313</p> <p>--- fungicide treatment and yield. K. Singh <i>et al.</i> (Abs.)..... 315</p> <p>--- O. Singh <i>et al.</i> (Abs.)..... 314</p> <p>--- rooting inhibition by <i>Ceratocystis parvula</i>. R. S. Byther and G. W. Steiner. (Abs.)..... 210</p> <p>smut. L. L. Landen. (Abs.)..... 114</p> <p>--- J. P. S. L. Netto. (Abs.)..... 377</p> <p>--- C. Ricaud. (Abs.)..... 81</p> <p>--- causal fungus teliospore germination. L. S. Leu. (Abs.)..... 384</p> <p>--- incidence and cane yield. K. T. S. Raja <i>et al.</i> (Abs.)..... 383</p> <p>--- effect of roguing. G. L. James 311, 382</p> <p>--- varietal resistance. V. Durairaj <i>et al.</i> (Abs.)..... 313</p> <p>--- G. L. James. (Abs.)..... 312, 382</p> <p>--- L. S. Leu and W. S. Teng. 312</p> <p>--- and wild cane. L. S. Leu. (Abs.) 143</p> <p>striate mosaic. M. V. Nayudu <i>et al.</i> 249</p> <p>symptoms. M. E. Lopez. (Abs.)..... 249</p> <p>in Taiwan. H. T. Chu. (Abs.)..... 177, 314</p> <p>--- L. S. Leu and W. H. Hsieh. (Abs.) 79</p> <p>US. B. A. Bourne. (Abs.)..... 287</p> <p>varietal resistance in Australia. Anon. (Abs.)..... 242</p> <p>--- susceptibility in Réunion. F. Léoville. (Abs.)..... 207</p> <p>West Africa. H. Barat. (Abs.)..... 313</p> <p>white leaf. S. C. Lin and C. H. Li 177</p>	<p>Diseases, Cane: white leaf control, effect of antibiotics on sets. S. C. Lin and W. S. Teng. (Abs.)..... 79</p> <p>--- vector. L. S. Leu. (Abs.)..... 143</p> <p>--- H. L. Yang and J. S. Pan. 317</p> <p>wilt. K. T. S. Raja and S. Natarajan 313</p> <p>--- control. D. S. Bhatti and J. S. Chohan. (Abs.)..... 247</p> <p>--- incidence. Effect of infected seed cane. K. Kar <i>et al.</i> (Abs.)..... 376</p> <p>--- incitement. K. K. P. Rao <i>et al.</i> 312</p> <p>--- and red rot fungi relationships. P. Prakasham. (Abs.)..... 144</p> <p>world cane collection and varieties exchange. R. E. Coleman. (Abs.) 47</p> <p>yellow spot. B. T. Egan. (Abs.) 143, 175, 280</p> <p>--- C. Ricaud. (Abs.)..... 313</p> <p>--- control. C. Ricaud and S. Sullivan. (Abs.)..... 81</p> <p>--- effect of air temperature and humidity. T. Sreeramulu <i>et al.</i> 315</p> <p>see also Cane deterioration</p> <p>Distillery by-products. K. A. Prabhu carbon dioxide, carbonate production. D. L. N. Rao and A. Gani. (Abs.) 290</p> <p>closures in Taiwan. J. F. Williams 21</p> <p>scale reduction. (T.N.)..... 262</p> <p>waste as fertilizer. P. D. Bajpal and S. P. Dua. (Abs.)..... 210</p> <p>--- A. C. Chatterjee <i>et al.</i> (Abs.)..... 290</p> <p>--- fodder yeast production. S. F. Lin 27</p> <p>--- treatment by fermentation. D. S. Dahiya and K. A. Prabhu. (Abs.) 290</p> <p>--- with lime. N. A. da Gloria <i>et al.</i> 290</p> <p>see also Alcohol and Fermentation</p> <p>Dominican Republic: land reform.. 64</p> <p>sugar industry. Anon. (N.B.)..... 57</p> <p>--- statistics..... 162, 192, 327</p> <p>--- supply and International Sugar Agreement quota. (N.C.)..... 162</p> <p>Drives. (T.N.)..... 95</p> <p>cane carriers. Anon. (Abs.)..... 115</p> <p>--- mill and shredder steam turbines centrifugal. M. Tondos and H. Widlok. (Abs.)..... 392</p> <p>--- modernization in refinery. (Brev.) 62</p> <p>--- steam turbine. (T.N.)..... 189</p> <p>chains. (T.N.)..... 30, 358</p> <p>selection. J. W. Khanna. (Abs.)..... 180</p> <p>thyristor electric automatic control. N. F. Shurbuvanyi <i>et al.</i> (Abs.)..... 181</p> <p>see also Gears</p> <p>Dryers: beet pulp. B. Görgényi and Z. Asztalos. (Abs.)..... 357</p> <p>--- dimensional calculation. W. Pörsch and P. Thelen. (Abs.) 218</p> <p>sugar. R. S. Burdukova <i>et al.</i> (Abs.) 322</p> <p>--- air filters. Anon. (Abs.)..... 287</p> <p>white sugar fluidized bed. J. Mlynář 117</p> <p>Drying: bagasse. F. Grobart and Y. Brestevic. (Abs.)..... 116</p> <p>beet pulp. F. Loss. (Abs.)..... 123</p> <p>--- P. Thelen. (Abs.)..... 154</p> <p>--- A. Vigh. (Abs.)..... 357</p> <p>--- and pulp-molasses mixtures. M. G. Parfenopulo and N. B. Karalov. (Abs.)..... 396</p> <p>--- sulphite content, effect of gas. H. Schieweck <i>et al.</i> (Abs.)..... 396</p> <p>molasses. A. P. Pellegrini. (Pat.) 325</p> <p>refined sugar automatic control. V. A. Demchenko. (Abs.)..... 291</p> <p>refinery liquor. R. H. Gray. (Pat.) 291</p> <p>sugar solution. E. T. Woodruff and V. S. Anderson. (Pat.)..... 397</p> <p>Dust: bagasse and electrical equipment. J. W. Khanna. (Abs.)..... 180</p> <p>explosion in India. K. Shanker <i>et al.</i> 84</p> <p>formation from sugar crystals. G. N. Allan and J. R. Fitzgerald. (Abs.) 86</p> <p>--- S. A. Farag <i>et al.</i> (Abs.)..... 119</p> <p>separation. (T.N.)..... 126</p> <p>--- J. Mlynář. (Abs.)..... 117</p> <p>Egypt: cane borers. A. L. Isa and W. H. Awadallah. (Abs.)..... 315</p> <p>--- damage. M. T. Kira and H. el-Sherif. (Abs.)..... 16</p> <p>--- infestation, effect of cane planting date. M. T. Kira and H. el-Sherif. (Abs.)..... 16</p> <p>--- expansion. (Brev.)..... 292</p> <p>--- flowering. J. T. Rao <i>et al.</i>..... 241</p> <p>--- spacing and seed rate trials. A. H. Nour <i>et al.</i> (Abs.)..... 177</p> <p>new sugar factory. (Brev.)..... 326</p> <p>sugar production 1972/73. (Brev.) 263</p>

INDEX

	PAGE
Electrodialysis. K. Číž. (Abs.).....	389
dextrose-levulose separation. R. Tatuki and T. Kubo. (Pat.).....	187
membrane analysis for juice treatment. F. Persechak. (Abs.).....	90
sulphuric acid recovery from ion exchanger regeneration effluent. F. Persechak. (Abs.).....	255
Electrophoresis: albumins analysis and separation. S. S. Miroshnichenko <i>et al.</i> (Abs.).....	356
ribonucleic acid extraction from cane buds. C. G. Lo. (Abs.).....	347
Entrainment: in evaporators. R. E. Bickle. (Abs.).....	148
- K. K. Rao. (Abs.).....	217
- D. A. Stolyar and N. Y. Tobilevich - and vacuum pans. G. G. Ashe. . .	219
Ethiopia sugar production 1972/73. . .	86
Europe: beet area 1973.....162, 191,	266
- sugar prospects. (N.C.).....	297
EEC and British Commonwealth sugar imports. (N.C.).....97, 161, 265	256
- S. N. Girwar. (N.B.).....	256
- fines on sugar companies. (Brev.)	96
- and International Sugar Agreement. (N.C.).....	161
- sugar import quotas for African associates. (Brev.).....	96
- and UK sugar industry structure	96, 297, 362
- - - refining price margin. (N.C.)	66
Evans, H. - to joint Panel of Referees. . .	116
Evaporators. E. B. Elliot. (Abs.).....	116
automatic control. G. K. Chetty. . .319, 388	387
- S. Ginal. (Abs.).....	87
- L. A. Popovich and A. M. Kozak. (Abs.).....	23
cane burning effect. J. M. Tamargo T. (Abs.).....	85
capacity increase. A. van Hengel. . .	388
circulation and heat transfer. H. Banskil. (Abs.).....	353
condenser tests. P. N. Stewart. . .	20
experimental design. N. Y. Tobilevich and Y. G. Porzhezniskil. (Abs.)	55
explosions in Taiwan. Y. C. Yen and K. W. Pi. (Abs.).....	21
forced circulation. M. A. Geishovt and V. V. Gonchar. (Abs.).....	23
- - - and hydraulic resistance. M. A. Geishovt <i>et al.</i> (Abs.).....	181
heat and steam losses. G. Kimeney - transfer. I. I. Sagan' and V. A. Karas'. (Abs.).....	320
- S. Zagrodzki. (Abs.).....	321
juice colour formation. M. A. Geishovt <i>et al.</i> (Abs.).....	218, 288
- level and heat transfer. B. A. Eremenko <i>et al.</i> (Abs.).....	150
- pH. M. A. Geishovt <i>et al.</i> (Abs.)	23, 118
Optimum conditions calculation. . .	118
- N. Y. Tobilevich. (Abs.).....	118
- heating surface. V. A. Kolesnyov	115
steam jet ejectors. F. Caballero. . .	223
sugar loss determination. C. Bayma - A. Y. Zagorul'ko <i>et al.</i> (Abs.)	320
tube corrosion. H. Hirschmüller. . .	393
- A. Lemaitre. (Abs.).....	389
- H. Shimbar <i>et al.</i> (Abs.).....	287
- effect of sulphitation. B. I. Kats	392
- cross-section area calculation. B. A. Matvienko. (Abs.).....	219
vacuum breakers. R. Velázquez R. vapour balance maintenance by steam compressors. B. A. Eremenko <i>et al.</i> (Abs.).....	288
- bleeding and factors of steam consumption. S. Y. Chiu. (Abs.)	351
see also Control, Automatic; Corrosion; Entrainment and Scale	
Explosion: ion exchange column. F. Juračka <i>et al.</i> (Abs.).....	355
properties of sugar. J. Mather. (Abs.)	54
sugar dust in India. K. Shanker <i>et al.</i> in Taiwan evaporators. Y. C. Yen and K. W. Pi. (Abs.).....	21

	PAGE
<b>Factory:</b>	
capacity effect of juice quality. S. K. Kulkarni. (Abs.).....	253
computer applications. H. L. Olliveros. (Abs.).....	53
- data processing. E. Svoboda. . .	353
- - - in Cuba. R. Pedrosa P. and G. Benazet. (Abs.).....	287
electrical equipment. J. W. Khanna	180
equipment capacities. R. Quesada G. (Abs.).....	287
- cleaning. (T.N.).....	94
- manufacture in India. A. C. Chatterjee. (Abs.).....	387
- plastics application. B. S. Petrovskil <i>et al.</i> (Abs.).....	117
- selection. J. Dobrzycki. (Abs.).....	321
heat economy. D. B. Batstone and K. J. Nix. (Abs.).....	20
- N. M. Spinul <i>et al.</i> (Abs.).....	354
labour efficiency. J. Ferrán O. (Abs.)	54
location. S. Ozel. (Abs.).....	117
modernization in Taiwan. Y. P. Yu	21
performance comparison in South Africa. A. M. Guthrie. (Abs.).....	153
polyamide sleeve bearings. Y. I. Krasnov <i>et al.</i> (Abs.).....	119
processing beet and cane. G. P. Lodi	319
products pesticide residues. L. van Steyvoort <i>et al.</i> (Abs.).....	26
radio-isotope applications. H. Hirschmüller. (Abs.).....	393
rotary equipment axes alignment. B. Ardanz. (Abs.).....	54
size and efficiency in India. S. W. Sinha and M. Prasad. (Abs.).....	351
steam consumption in Denmark. P. V. L. Narasimham. (Abs.).....	22
- - - reduction. K. E. Nagpuray and A. C. Chatterjee. (Abs.).....	54
- and power generation plant. W. Pachinetti. (Abs.).....	321
steel applications. M. le Blanc. (Abs.)	320
technology in India. M. Anand . . .	53
waste reduction. S. Chandra. (Abs.)	180
- treatment and reduction. B. S. Rao. (Abs.).....	253
<b>Fermentation: animal fodder manufacture from bagasse. S. Matsuka</b>	124
- - - molasses. P. N. Boyta and T. G. Cleasby. (Pat.).....	60
cane molasses alcohol manufacture. D. O. Fernández and J. A. Sicard - K. N. Paul. (Abs.).....	225, 396
- K. A. Prabhu. (Abs.).....	290
- R. Samanlego and R. L. Srivastav. (Abs.).....	27
- in Nigeria. (Brev.).....	128
- - - citric acid manufacture. J. H. Fried. (Pat.).....	188, 260
dextranucrase production. O. Aizán and R. Kabele. (Abs.).....	225
distillery waste treatment. D. S. Dahiya and K. A. Prabhu. (Abs.)	290
enzyme production for dextrose conversion to levulose. Anon. (Abs.)	27
fertilizer and gas from bagasse and cane trash, etc. S. C. Gupta and A. P. Gupta. (Abs.).....	224
glutamic acid manufacture from molasses. H. Fukuda <i>et al.</i> (Pat.)	188
- Z. Said. (Abs.).....	224
levulose preparation. M. Kulhánek and M. Tadra. (Abs.).....	224
mannitol and sorbose preparation. M. Kulhánek and M. Tadra. (Abs.)	224
methane gas manufacture from bagasse. D. B. Batstone. (Abs.)	123
raffinose reduction in beet juice and molasses. H. Suzuki <i>et al.</i> (Pat.)	229
yeast factory in Peru. (Brev.).....	263
- Zaire. (Brev.).....	360
- production. K. A. Aroj and K. A. Prabhu. (Abs.).....	290
- D. O. Fernández. (Abs.).....	186
- - - on bagasse substrate. D. B. Batstone. (Abs.).....	123
- - - from vinasse. S. F. Lin. (Abs.)	27
see also Micro-organisms and individual fermentation products	
<b>Fertilizers: application. L. E. Golden</b>	208
- and beet cistic acid. M. Burba and U. Nitzschke. (Abs.).....	350
- yield. A. P. Draycott and D. C. Thomson. (Abs.).....	286
- effect of soil type. C. C. Wei. (Abs.)	51
- to sandy soil. D. S. Chong. (Abs.)	51
bagasse compost and green manure. J. Friedrichsen and C. C. Wei. . .	50

	PAGE
<b>Fertilizers:</b>	
boron application and deficiency in soil. H. H. Mayr and W. Frohner - beet status determination. J. Vlamis and A. Ulrich. (Abs.).....	286
- deficiency and beet leaf morphology. S. Troeme. (Abs.).....	84
calcium silicate. Y. W. Y. Cheong - and cane sugar yield. H. H. Hagihara. (Abs.).....	80
cane nutrients in filter cake. K. E. F. Alexander. (Abs.).....	383
- uptake determination. Y. W. Y. Cheong. (Abs.).....	80
- - - effect of soil type. C. L. Mehrotra <i>et al.</i> (Abs.).....	209
- - - water table depth and soil bulk density. T. C. Juang - in Réunion. J. Fritz. (Abs.)	345
- - - ratooning improvement. T. P. Pao - sulphur status determination. Anon. (Abs.).....	209
- - - varietal trials in Ghana. Y. Tweneboah. (Abs.).....	283
- - - Taiwan. C. C. Tse <i>et al.</i> (Abs.)	110
controlled-release. M. Isobe. (Abs.)	376
- W. G. Purdy. (Abs.).....	376
distillery waste. P. D. Bajpai and S. P. Dua. (Abs.).....	210
distribution. J. Wright. (Abs.).....	381
- accuracy determination. E. F. Copley. (Abs.).....	380
- in subsurface irrigation water. E. Okazaki. (Abs.).....	349
economics in Australia. Anon. (Abs.)	141
filter cake. Anon. (Abs.).....	112
- - - medium for cane seedling growing. M. A. Ehlari and N. N. Sarkar. (Abs.).....	209
green manure and cane trash. B. S. Yang. (Abs.).....	79
liquid application. S. Pontallier. . .	250
lithium effect on beet. A. M. el-Sheikh <i>et al.</i> (Abs.).....	215
magnesium sulphate and beet sugar yield. M. J. Durrant and A. P. Draycott. (Abs.).....	84
manufacture from bagasse, cane trash, etc. S. C. Gupta and A. P. Gupta. (Abs.).....	224
- distillery waste. A. C. Chatterjee <i>et al.</i> (Abs.).....	290
nitrogen. J. R. Kadde. (Abs.).....	347
- ammonia and cane yield. L. S. Chapman. (Abs.).....	348
- loss prevention. L. G. W. Tilley - and beet growth. D. W. James <i>et al.</i> (Abs.).....	380
- - - petiole nitrate-N concentration. J. N. Carter <i>et al.</i> (Abs.).....	146
- - - M. C. Saxena <i>et al.</i> (Abs.).....	215
- plant density effects on yield. K. H. Barocka <i>et al.</i> (Abs.).....	250
- potassium, sodium and amino-nitrogen. K. H. Barocka <i>et al.</i>	385
- processing quality. A. Graf. . .	218
- L. Wildicky. (Abs.).....	58
- requirements determination. G. E. Nichol. (Abs.).....	385
- J. O. Reuss and P. S. C. Rao - seed germination failure. L. E. Schweitzer and E. E. Hardin	252
- uptake, effects of irrigation and plant population. A. P. Draycott and M. J. Durrant. (Abs.)	84
- - - soil fumigation. D. A. Cooke and A. P. Draycott. (Abs.)	114
- cane burning effects on yield. Anon. (Abs.).....	113
- intercropping with onions. K. Kar <i>et al.</i> (Abs.).....	879
- juice colour formation. A. P. Gupta <i>et al.</i> (Abs.).....	89
- non-sugars content. A. P. Gupta and B. Prasad. (Abs.)	342
- requirements. P. Halais and P. Nababings. (Abs.).....	80
- R. A. Kale <i>et al.</i> (Abs.).....	342
- N. S. Parihar. (Abs.).....	176
- uptake, effect of age and harvest time. P. K. Moberly. (Abs.)	206
- yield. N. Y. Chiu. (Abs.).....	247
- - - F. A. Fogliata and R. A. Dip - P. D. Jhamb. (Abs.).....	208
- - - K. N. S. Kaurava and R. K. Rajput. (Abs.).....	176
- - - O. Singh and B. P. Singh. . .	210
- - - increase when intercropping. R. L. Bhoj and P. C. Kapoor. (Abs.).....	314





# INDEX

	PAGE		PAGE		PAGE
Hawaii:		India: cane planting. R. B. Prasad	208	International Sugar Organization:	
- sugar factory closure postponed..	264	- smut. V. Durairaj <i>et al.</i> (Abs.)..	313	- Sugar year book 1971. (N.B.)....	24
- industry. Anon. (N.B.).....	57	- striate mosaic. M. V. Nayudu		International sugar yearbook and	
- contraction. (Brev.).....	31, 264	- varieties. Anon. (N.B.).....	144	- directory. H. Ahlfeld. (N.B.)....	56
- investment. (Brev.).....	96	- S. K. Ojha <i>et al.</i> (Abs.).....	351	International, <i>see also</i> World	
- manual. A. G. Bloomquist. (N.B.)	24	- M. R. Pataskar <i>et al.</i> (Abs.)....	342	- invert sugar: colour formation in white	
- trickle-irrigation. J. M. Langa. (Abs.)	349	- G. K. Zende. (Abs.).....	342	- sugar manufacture. W. Chen....	26
- <i>see also</i> United States of America		- effect of weather. T. R. Sriniva-		- decomposition and beet molasses	
Heat: economy improvement by bag-		- van <i>et al.</i> (Abs.).....	208	- colour. A. Y. Gadzhiev <i>et al.</i> (Abs.)	80
- asse drying. F. Grobart and Y.		- root development differences.		- and R. G. Zhizhina. (Abs.)....	390
- Terentiev. (Abs.).....	116	- O. P. Negi <i>et al.</i> (Abs.).....	15	- product structure. V. F. Seimenev	
- exergy. P. Wertan. (Abs.).....	255	- trials. C. N. Babu and P.		- determination. E. Kraus <i>et al.</i>	153
- losses in evaporator. G. Kimenov.	149	- Sankaranarayanan. (Abs.)....	316	- dextrose and levulose separation.	323
- pulp drying. A. Vigh. (Abs.)....	357	- P. P. Singh and K. Singh....	343	- A. J. Melaja. (Pat.).....	293
- sugar factory balance. S. Zagrodzki	321	- wilt disease. K. T. S. Raja and S.		- formation inhibition by sodium meta-	
- mathematical simulation.		- Natarajan. (Abs.).....	313	- silicate. A. G. Alexander. (Pat.)	397
- N. M. Spitul <i>et al.</i> (Abs.)....	354	- yield. J. A. Gumaste. (Abs.)....	83	- ion exchange resin catalysis. (T.N.)	62
- economy. D. B. Balstone and		- V. G. Vaidya. (Abs.).....	347	- mannilol and sorbose production. M.	
- K. J. Nix. (Abs.).....	20	- DDS diffuser performances. S. K. D.		- Kulhánek and M. Tadra. (Abs.)	224
- W. Fachtinell. (Abs.).....	390	- Agarwal <i>et al.</i> (Abs.).....	387	- manufacture. R. N. Prince and A. O.	
- transfer in bottling. V. T. Garyazha		- fertilizer trials. O. Singh <i>et al.</i> (Abs.)	315	- Mayolitt. (Pat.).....	188
- and V. I. Pavelko. (Abs.).....	391	- Kerala new sugar factories. (Brev.)	159	- melanoidin formation. J. F. Baga-	
- Y. D. Petroenko and I. I. Sagan	389	- khandsari manufacture. V. M.		- aenko and M. Mukhamad. (Abs.)	90
- L. I. Sagan <i>et al.</i> (N.B.).....	353	- Bhalotar. (Abs.).....	287	<i>see also</i> Dextrose; Levulose; Reducing	
- evaporators. H. Banu. (Abs.)....	321	- Madhya Pradesh sugar industry.		- sugars and Sugars	
- S. Zagrodzki. (Abs.).....	321	- H. K. Shrivastava. (Abs.).....	316	- Ion exchange. (T.N.).....	62
- effect of juice level. B. A.		- Maharashtra sugar production. R. K.		- K. J. Parker. (Abs.).....	355
- Eremenko <i>et al.</i> (Abs.).....	150	- Kulkarni and P. B. Londhe. (Abs.)	387	- beet juice and syrup treatment,	
<i>see also</i> Steam		- D. M. Popat. (Abs.).....	208	- costs. P. Dupon. (Abs.).....	354
Hiro Zoki Co. Ltd. name change. (Brev.)	358	- nematodes. K. Singh and S. R.		- treatment. G. Assalini and G.	
Holland: beet diffuser. (Brev.)....	264	- Misra. (Abs.).....	350	- Brandoli. (Abs.).....	119
- sugar factory closure. (Stat.)....	160	- new sugar factories. ....	32, 263, 295, 328	- K. Číž and V. Čejková. (Abs.)	393
- imports and exports. (Stat.)....	160	- nitrogen and cane yield. P. D. Jhamb	208	- E. H. Felber. (Abs.).....	87
Honduras sugar imports. (Brev.)....	323	- fertilizer usage. J. R. Kakkde.	347	- Z. Zhuravleva and K. P.	
Hong Kong sugar imports and exports	191	- ratoon stunting disease. S. S. Sandhu	247	- Gonchoura. (Abs.).....	354
Hungary: beet production 1972. (Brev.)	192	- seal insect. S. Kumar <i>et al.</i> (Abs.)	211	- and resin deterioration.	103
- icing sugar manufacture. T. Dávid	288	- soil analysis. B. Singh <i>et al.</i> (Abs.)	343	- J. F. T. Oldfield <i>et al.</i> .....	70, 154
- sugar industry. Anon. (N.B.)....	151	- sugar dust explosion. K. Shanker	54	- molasses sugar extraction. A.	390
Hydrocyclones. H. J. Delavier. (Abs.)	149	- factory equipment manufacture.		- Kacimi. (Abs.).....	390
- beet juice steam treatment. F. N.		- A. C. Chatterjee. (Abs.).....	387	- S. J. Landi and G. Mantovani.	395
- Dobronravov and Z. D. Zhurav-	88	- size and efficiency. S. N. Sinha		- boiler feedwater treatment. V. S.	
- leva. (Abs.).....	88	- and M. Prasad. (Abs.).....	351	- Sud. (Abs.).....	57
- milk-of-lime treatment. E. T. Aksen-		- technology. M. Anand. (Abs.)	53	- green syrup treatment. K. W. R.	
- ov and V. P. Kharitonenko. (Abs.)	182	- industry. H. Hirschmüller and		- Schoenrock. (Abs.).....	84
		- H. J. Delavier. (Abs.).....	115	- levulose-dextrose separation. A. J.	293
		- production 1972. (Brev.).....	128	- liquid sugar manufacture. P. Bald-	
		- incentives. (Brev.).....	128	- assari. (Abs.).....	88
		- project in Malaysia. (Brev.)....	191	- phosphoric acid and organic acids	
		- research institute plans. (Brev.)	128	- determination. J. F. T. Oldfield	
		- situation. (N.C.).....	268	- <i>et al.</i> .....	3, 44
		- termite and grub control. S. Kumar	206	- reconstituted non-sugars use as	
		- Mathur. (Abs.).....	318	- animal fodder. J. A. Levad <i>et al.</i>	154
		- yeast production plant. (Brev.)....	328	- resin compared with adsorbent resin.	120
		Indonesia: steam turbine orders. (Brev.)	398	- fouling prevention. (T.N.)....	95
		- sugar factory rehabilitation. ....	234, 360	- regeneration. V. N. Belous and	
		- imports, 1972. (Brev.).....	328	- K. P. Zakharov. (Abs.).....	219
		- 1973/74. (Brev.).....	400	- J. F. Zievers and C. J. Novotny	61
		- Tjot Girek sugar factory. S. Giel-		- effluent electrodiagnosis. K. Číž	389
		- zyński. (Abs.).....	319	- sulphuric acid recovery. F.	
		Instruments: boiling controls. (T.N.)..	94	- Perschak. (Abs.).....	255
		- cane mill stoppage recorders. R. C.		- sucrose inversion. (T.N.).....	62
		- Sharma. (Abs.).....	115	- J. Szejtli. (Abs.).....	89
		- contents gauge. (T.N.).....	119	- sugar solution treatment. N. V.	
		- DDS beet diffuser. A. V. Ternovoi	94	- Octrooien Mij. Activit. (Pat.)..	228
		- <i>see also</i> Brisk; Colour; Control; Auto-		<i>see also</i> Colour	
		- matic; Flow; Level; pH; Polariza-		Ion exclusion. R. E. Anderson. (Abs.)	85
		- tion; Refractometer; Viscosity;		- cane molasses treatment. J. F.	85, 355
		- Water; <i>etc.</i>		- Zievers <i>et al.</i> (Abs.).....	
		International environmental chemistry		- colorant separation from resin column	
		- symposium. (Brev.).....	231	- eluates. K. Číž <i>et al.</i> (Abs.)....	121
		International Society for Sugar Cane		- resin comparison. K. Číž <i>et al.</i> (Abs.)	395
		- Technologists: 14th Congress Pro-		- Iran: beet molasses sugar extraction.	185, 230, 321
		- ceedings. M. T. Henderson. (N.B.)	151	- A. Kremky. (Abs.).....	321
		- 15th Congress. ....	64, 295, 399	- plant, lime kiln and centri-	
		International Sugar Agreement: Chile		- fugals order. (Brev.)....	189
		- accession. (Brev.).....	160	- project. (Brev.).....	128
		- Council meetings. (N.C.).....	1, 161	- new sugar factories. (Brev.)....	264, 399
		- Dominican Republic sugar quota and		- rat control. H. Azizi and K. A. Sund	19
		- supply. (N.C.).....	162	- steam turbine orders. (Brev.)....	398
		EEC membership application pro-		- Iraq: cane harvesters. (Brev.)....	263
		- posal. (N.C.).....	265	- Mosul sugar factory. Z. Nitschke..	320
		- new draft agreement. (N.C.)....	166	- sugar expansion study. (Brev.)....	328
		- sugar supply commitment price. ....	98, 129	Ireland: beet yield, effect of weather	
		- and membership. (N.C.).....	2, 161	- and soil. J. Lee and C. K. Comer-	
		- world sugar prospects 1973. (N.C.)	34	- ford. (Abs.).....	385
		<i>see also</i> International Sugar Organiza-		- sugar industry development loan.	264
		- tion		- Irrigation. M. Robelin. (Abs.)....	214
		International Sugar Conference. (N.C.)	193, 297, 329, 361	- in Australia. Anon. (Abs.)....	278
		International sugar development sym-		- and beet yield. A. Boukhald <i>et al.</i>	251
		- posium. (N.C.).....	2	- and cane intercropping with onions.	
		International Sugar Journal: death of		- K. Kar <i>et al.</i> (Abs.).....	379
		- Agricultural Editor. (N.C.)....	97	- leaf hopper population. R. M. Bull	280
		- Panel of Referees.....	231	- ratooning. T. P. Pao. (Abs.)....	209
				- varietal choice. L. K. Izatt. (Abs.)	249

# INDEX

PAGE		PAGE
Irrigation: cane varietal response differences. Y. T. Chang. (Abs.)..	51	
- yield. L. S. Chapman and W. J. Nicholson. (Abs.)..	279	
- G. Kingston. (Abs.)..	279	
control, gypsum block depth. Y. T. Chang. (Abs.)..	51	
ditch bank Johnson grass control. Anon. (Abs.)..	317	
furrow irrigation water control by siphon. Y. Chu <i>et al.</i> (Abs.)..	51	
and herbicide activity. E. P. Sullivan in India. J. R. Kakde. (Abs.)..	254	
intervals and cane yield. K. N. S. Kaurava and R. K. Rajput..	176	
nitrogen application and cane sugar yield. T. R. Srinivasan and A. Mariakulandai. (Abs.)..	376	
- plant population effects on beet yield. A. P. Draycott and D. J. Webb. (Abs.)..	84	
- uptake by beet. A. P. Draycott and M. J. Durrant. (Abs.)..	114	
overhead. C. Bayma. (Abs.)..	204	
- compared with surface. C. Bayma in Portuguese East Africa. H. W. Zadrazil. (Abs.)..	246	
- sprinkler trials. M. Hardy. (Abs.)..	82	
- sugar factory waste water. L. L. Rennie. (Abs.)..	388	
requirements, effect of ground water accessibility. Y. T. Chang. (Abs.)..	51	
- in India. V. O. Mahajan and D. G. Dakshindas. (Abs.)..	343	
- Y. S. Rao. (Abs.)..	316	
- H. K. Shrivastava. (Abs.)..	343	
research in Australia. K. C. Leverington. (Abs.)..	83	
restriction for cane flowering control. M. A. Sant and S. V. Chinchorkar..	343	
- sugar increase. A. Maretzki <i>et al.</i> scheduling from meteorological data. L. M. Arco. (Abs.)..	82	
and sodium and magnesium effects on beet. A. P. Draycott and R. F. Farley. (Abs.)..	178	
soil salinity reduction. K. P. Humbert. (Abs.)..	381	
- water consumption by beet. A. P. Draycott and M. J. Durrant..	114	
sub-surface and cane yield. G. J. Durbin. (Abs.)..	377	
- effect of soil. E. Okazaki. (Abs.)..	349	
sugar factory waste water. E. Mariani. (Abs.)..	320	
- L. L. Rennie. (Abs.)..	388	
surface vs. sub-surface and cane growth. J. C. Mongelard <i>et al.</i> ..	344	
- in Taiwan. H. Chang. (Abs.)..	79	
- C. J. Hu and S. M. Lee. (Abs.)..	79	
- J. F. Williams. (Abs.)..	112	
trials in Jamaica. Anon. (Abs.)..	349	
trickle. J. M. Langa. (Abs.)..	204	
in Venezuela. Anon. (Abs.)..	204	
water salinity and cane growth. M. M. Syed and S. A. el-Swaify..	247, 384	
see also Water		
Italy sugar industry concentration..	160	
Ivory Coast cane sugar project. (Brev.)..	128	
<b>Jamaica: animal fodder from cane by-products. (Brev.)..</b>	327	
bagasse board manufacture. K. Ruckstuhl. (Abs.)..	225	
cane agriculture and sugar manufacture research institute. (Brev.)..	296	
- borer damage. Anon. (Abs.)..	113	
- fly. Anon. (Abs.)..	113	
- infection by <i>Leucostoc mesenteroides</i> . R. Tilbury. (Abs.)..	116	
- land forming. Anon. (Abs.)..	112	
- mechanization. Anon. (Abs.)..	305	
- harvesting. J. C. van Groenigen..	6	
- trials. Anon. (Abs.)..	112	
- planting. I. S. Ralston. (Abs.)..	211	
- varietal trials. Anon. (Abs.)..	112	
- yield, effect of temperature and rainfall. Anon. (Abs.)..	112	
chemical weed control. Anon. (Abs.)..	112	
fertilizer experiments. Anon. (Abs.)..	112	
irrigation trials. Anon. (Abs.)..	112	
rat control. Anon. (Abs.)..	113	
soil micro-organisms. Anon. (Abs.)..	113	
- trace elements. Anon. (Abs.)..	112	
<b>Jamaica:</b>		
sugar exports suspension. (Brev.)..	360	
- factory acquisition by government..	159	
- closure. (Brev.)..	296	
- production 1972. (Brev.)..	31, 234	
- 1973. (Brev.)..	400	
West Indies Sugar Co. Ltd. (N.C.)..	130	
Japan: beet sugar production 1972/73..	191	
- sugar imports. (Stat.)..	190	
Jordan sugar imports 1972. (Brev.)..	327	
<b>Juice, Beet: active carbon treatment.</b>		
H. Zaorska. (Abs.)..	149	
albumin separation by electrophoresis. S. S. Miroshnichenko <i>et al.</i> ..	356	
alkalinity and purity, effect of beet growth factors. A. Graf. (Abs.)..	218	
amino-acids. H. Gruszecka. (Abs.)..	395	
amino-nitrogen determination. N. Kubadinow and J. Wenzinger..	90	
- non-sugars effect. R. Bretschneider <i>et al.</i> (Abs.)..	394	
anion analysis. F. Neulrunn. (Abs.)..	393	
Brix measurement. V. Valter <i>et al.</i> ..	121	
- and steam consumption. S. Zagrodzki. (Abs.)..	321	
calcium and magnesium salts reduction. M. S. Zhigalov and N. D. Tantsyura. (Abs.)..	88	
colour formation in evaporation, effect of residence time. M. A. Geishtovt <i>et al.</i> (Abs.)..	218	
- removal with active carbon. H. Zaorska. (Abs.)..	254	
- and bone char. M. I. Daishev and V. M. Shcherbak. (Abs.)..	391	
composition, effect of beet storage composition. R. E. Wyse and S. T. Dexter. (Abs.)..	213	
electrodialysis. K. Ciz. (Abs.)..	389	
- membrane analysis. F. Perschke..	90	
filter and dispersion system particle size. R. Osvald and E. Havlova..	322	
flow measurement. B. Lepenne and J. P. Merlet. (Abs.)..	389	
hydrocycloane treatment. H. J. Delavier. (Abs.)..	389	
ion exchange treatment. G. Assalini and G. Brandoli. (Abs.)..	119	
- E. H. Felber. (Abs.)..	87	
- Z. D. Zhuravleva and K. P. Goncharova. (Abs.)..	354	
- costs. P. Dupont. (Abs.)..	354	
- and resin deterioration. J. P. T. Oldfield <i>et al.</i> ..	70, 103	
iron determination. K. Ciz and V. Cejlova. (Abs.)..	393	
lactic acid determination. H. Schiweck and L. Busingh. (Abs.)..	90	
level and heat transfer in evaporator. B. A. Eremenko <i>et al.</i> (Abs.)..	150	
lime salts determination with ion-selective electrodes. T. Henschel <i>et al.</i> (Abs.)..	119	
- reduction with ammonia and soda. S. Zagrodzki and H. Zaorska. (Abs.)..	254	
- H. Zaorska and S. Zagrodzki micro-organisms. V. Z. Nakhodkina milk-of-lime proportioning automatic control. A. B. Gusakov and S. P. Kotelski. (Abs.)..	254	
organic acids determination. F. Schneider <i>et al.</i> (Abs.)..	322	
pH. V. A. Pronina and S. Z. Ivanov in evaporation. M. A. Geishtovt <i>et al.</i> (Abs.)..	152	
phosphoric acid and organic acids determination. J. P. T. Oldfield <i>et al.</i> (Abs.)..	118	
polysaccharide hydrolysis sugars. R. Bretschneider <i>et al.</i> (Abs.)..	3, 44	
purity, effect of diffusion water treatment with aluminium sulphate. A. A. Lipets and I. A. Oleinik..	223	
- fertilizer application. A. P. Draycott and D. C. Thomson..	286	
- K. G. Mazepin <i>et al.</i> (Abs.)..	286	
- M. Slaeem and T. M. Choudhury raffinose content reduction. H. Suzuki <i>et al.</i> (Pat.)..	212	
- determination. M. Sugawara and Y. Senba. (Abs.)..	356	
raw cane sugar melting and carbonatation. G. Garcia. (Abs.)..	321	
reverse osmosis. R. F. Madsen. (Abs.)..	55	
steam treatment in hydrocyclones. F. N. Dobronaravov and Z. D. Zhuravleva. (Abs.)..	88	
<b>Juice, Beet:</b>		
steel corrosion. V. V. Suprunchuk <i>et al.</i> (Abs.)..	182, 288	
- and iron content. A. Lemaitre sugars analysis. H. Gruszecka. (Abs.)..	389	
supersaturation determination. G. Vavrinez. (Abs.)..	323	
thick juice amino-acids, effect of beet storage. A. Y. Gadzhiev <i>et al.</i> ..	153	
- calcium determination. E. A. Grivtseva <i>et al.</i> (Abs.)..	89	
- decolorization with adsorbent resin. N. M. Kodens and D. M. Leibovich. (Abs.)..	122	
- bone char and active carbon. M. I. Daishev and V. M. Shcherbak. (Abs.)..	118	
- ion exchange treatment costs. P. Dupont. (Abs.)..	391	
- molecular diffusion. L. P. Zhmyryta <i>et al.</i> (Abs.)..	354	
- non-sugars and boiling house performance. K. Wagnerowski..	323	
- post-campaign processing. M. Beauvais. (Abs.)..	118	
- P. Dupont. (Abs.)..	389	
- S. Zagrodzki. (Abs.)..	354	
- road tanker charging, flow measurement. B. Lepenne and J. P. Merlet. (Abs.)..	87, 354	
- storage. F. Domsa <i>et al.</i> (Abs.)..	389	
turbidity determination. J. Odenakova and R. Osvald. (Abs.)..	119	
ultra-filtration. R. F. Madsen. (Abs.)..	59	
see also Carbonatation		
<b>Juice, Cane: automatic flow control.</b>		
D. J. Hale and E. Whayman..	179	
- evaporator level control. G. K. Chetty. (Abs.)..	319, 388	
chloride content and moisture purity prediction. J. P. Gupta <i>et al.</i> ..	275	
colorants, phenolics and amino-nitrogen determination. P. Smith and P. E. Gregory. (Abs.)..	25	
colour formation, effect of nitrogen fertilizer. A. Gupta <i>et al.</i> (Abs.)..	89	
composition, effect of nitrogen fertilizer. A. P. Gupta and B. Prasad..	342	
- potassium fertilizer. A. P. Gupta and S. P. Shukla. (Abs.)..	82	
heater. J. P. Mukherji <i>et al.</i> (Abs.)..	216	
- aluminium tubes. Anon. (Abs.)..	352	
- automatic temperature control. P. V. L. Narasimham. (Abs.)..	180	
- M. Pearse. (Abs.)..	116	
- operation, effect of lime quality and juice pH. Anon. (Abs.)..	351	
- steel tubes. K. P. Mittal and A. Prakash. (Abs.)..	216	
- vacuum breakers. R. Velazquez R. inversion control. A. G. Alexander <i>et al.</i> (Abs.)..	352	
- reduction. A. G. Alexander. (Pat.)..	26	
liming automatic control. P. V. L. Narasimham. (Abs.)..	397	
lime sludge. T. Henschel <i>et al.</i> ..	180	
mud and sand removal.. C. C. Chow organic acids content and reducing sugar decomposition. K. K. Sharma and P. K. Aren. (Abs.)..	352	
pH determination as guide to stale cane. G. S. Henderson. (Abs.)..	59	
- effect of soil structure. J. C. P. Chen and R. W. Picou. (Abs.)..	179	
phosphate content. M. A. A. Cesar <i>et al.</i> (Abs.)..	116	
- and clarification. S. S. Garrucho and J. L. T. Raminantany..	346, 356	
- determination. J. Studnický <i>et al.</i> polysaccharides determination. I. E. Leal G. and S. G. Kara-Murza..	86	
purity, effect of water hardness. I. Talib and Z. Said. (Abs.)..	58	
- reduction and sugar recovery. S. K. Kulkarni. (Abs.)..	395	
reverse osmosis. R. F. Madsen..	54	
rocks and bagacillo removal. K. E. Steppe and A. L. Webr. (Pat.)..	253	
starch distribution and removal. S. L. Sang. (Abs.)..	163	
- reduction. P. Hidi <i>et al.</i> (Pat.)..	21	
sugar determination, effect of dextrose:levulose ratio differences. J. E. Irvine. (Abs.)..	124	
see also Clarification and Syrup		
<b>Juice, Sorghum, see Sorghum</b>		
<b>Kenya: cane loader trials. (Brev.)..</b>	95	
Mumias sugar project. (Brev.)..	96	



# INDEX

	PAGE		PAGE
Mechanization, Beet: advisers in U.K.		Mechanization, Cane: tractor economies. N. G. Hyatt (Abs.)	211
- N. V. Turner (Abs.)	252	- D. M. Morin (Abs.)	174
"chisel" harrow. E. Dalleimné (Abs.)	84	- for inter-row cultivation. Anon.	282
harvesters. Anon. (Abs.)	146	- safety. Anon. (Abs.)	248
- A. F. Barnes (Pat.)	258	in Venezuela. Anon. (Abs.)	204
- R. G. Duquenne (Pat.)	156	West Indies. Anon. (Abs.)	304
- R. W. Hook and R. D. Zaun (Pat.)	324	Mexico: bagasse paper and pulp manufacture. L. Galeazzi (Abs.)	306
- A. I. Partyanko <i>et al.</i> (Pat.)	258	bulk handling terminal. I. Gurza I. cane area 1972/73. (Brev.)	287
- S. L. Sjovald (Pat.)	292	- diseases and pests. S. Flores C.	192
- W. J. Whitted (Pat.)	124	- mechanical harvesters. (Brev.)	174
harvesting group operations. W. K. Hall (Abs.)	251	--- harvesting, loading and transport. C. Ruiz C. (Abs.)	263
- losses in UK. G. L. Maughan	385	--- and payment. A. L. Fors.	278
- in Spain. R. J. Alvarez (Abs.)	214	- pests. S. Flores C. (Abs.)	378
- seed drill. I. O. Skoyen and J. S. McFarland (Pat.)	213	- red stripe. J. Delgado and M. Abarca (Abs.)	145, 378
- drilling. H. H. Norris (Abs.)	252	gophers. C. M. Riess and S. Flores C. (Abs.)	317
- speeds. J. J. Crow (Abs.)	178	--- C. M. Riess and S. Flores C. (Brev.)	18, 347
spring work. J. Pichenez and D. Guiraud (Abs.)	178	new sugar factories. 130, 158	
- demonstration in UK. Anon.	286	sorghum agriculture and processing. A. González G. (Abs.)	21
thinner. A. E. Ernst (Pat.)	258	sugar industry. D. Smith (Abs.)	352
- Eversman Manufacturing Co.	187	Micro-organisms: bagasse sterilization. Y. W. Han <i>et al.</i> (Abs.)	136
- B. E. Shader (Pat.)	258	- C. D. Wright (Pat.)	280
topping. Anon. (Abs.)	178	in bagged sugar. M. B. Yarmolinskii beet cassettes, juice, masecuite and water. V. Z. Nakhodkina (Abs.)	220
Mechanization, Cane. E. L. Claparols cleaning. G. J. Durbin (Abs.)	378	- diffusion. F. Hollaus and H. Klaushofer	237, 271
- R. T. Symes (Abs.)	251	--- H. Klaushofer and G. Pollichi (Abs.)	227, 321
in Cuba. J. V. Andrews	248	--- L. Vokounová and J. Smolík	223
equipment manufacturers' merger. harvesters. (T.N.)	62, 93, 358	--- formaldehyde reactions. A. Carruthers (Abs.)	182
- Anon. (Abs.)	109, 145, 173, 204, 209, 345, 383	--- reduction. B. Guerin <i>et al.</i> (Abs.)	149
- V. P. Broussard (Pat.)	29	cane mill dissection. (T.N.)	262
- C. M. Cruz F. <i>et al.</i> (Pat.)	92	- R. G. Camurungan (Abs.)	352
- E. A. Duncan (Pat.)	124, 260	- S. C. Gupta and S. K. D. Agarwal (Abs.)	388
- P. P. Gomez and D. Andrews	379	--- P. P. Maña (Abs.)	352
- R. Henderson K. (Pat.)	258	--- J. Raffray (Abs.)	86
- H. R. Hill (Pat.)	125	--- milling inversion losses. T. K. Mukherjee (Abs.)	89
- L. L. Lauden (Abs.)	281	control in alcohol preparation from cane molasses. D. O. Fernández and J. A. Sicard (Abs.)	225
- A. G. Minet (Pat.)	260	disinfectant. J. A. Casey (Pat.)	324
- J. M. Mizzi (Pat.)	291	in filter cake and soil aggregate stability. G. Roth (Abs.)	205
- B. F. Sparge (Abs.)	341	inversion reduction in clarifier juice. A. P. Lapin (Abs.)	218
- L. G. Vallance	50, 145, 207, 345, 379	liquid sugar mixtures. C. Krüger and W. Steinmetzer (Abs.)	218
- H. A. Willett and J. A. Giardina	61	microbiology courses in UK. (Brev.)	127, 231
- attachment. V. P. Broussard	28	osmophilic yeasts in raw sugar. US refiners' standards. A. H. Hifiola (Abs.)	225, 393
- company report. (Brev.)	263	preservation. L. Vokounová (Abs.)	59
- sterilization for disease control. Anon. (Abs.)	377	soil organisms, effect of solar radiation. T. T. Yang and C. H. Chang	109
- trials in Jamaica. Anon. (Abs.)	112	- in Jamaica. Anon. (Abs.)	113
harvesting in Australia. E. H. Churchward and R. M. Belcher	278	- population and cane roots. Anon.	113
- L. G. Vallance (Abs.)	249	- and nitrogen fixation. M. K. Srivastava and K. Singh	83
- G. A. Willis (N.B.)	256	--- varietal yield decline. S. M. Yang (Abs.)	49
- billet length and deterioration. Anon. (Abs.)	282	in treated flume water. L. Vokounová	320
- C. S. Henderson and L. R. Kirby (Abs.)	279	<i>see also</i> Diseases; Fermentation; Losses and individual fermentation products	
- P. C. Ivin (Abs.)	179	Milling, Cane. M. Anand (Abs.)	216
- N. J. King (Abs.)	377	automatic control in Taiwan. H. I. H. Chen and L. F. Huang (Abs.)	21
- L. K. Kirby (Abs.)	380	burnt cane. J. M. Tamargo T. (Abs.)	85
- L. G. Vallance (Abs.)	111	cane preparation. M. Anand (Abs.)	54
- burnt <i>vs.</i> unburnt cane. G. E. Sloane and L. J. Rhodes (Abs.)	386	- in Mauritius. E. C. Vignes and M. Randabel (Abs.)	26
- and cane cleaning. R. P. Humbert	311	comparison with silvering diffusion. U. C. Upadhyaya (Abs.)	21
- extraneous matter. A. L. Fors	378	effect of cane and juice quality reduction. S. K. Kulkarni (Abs.)	253
- processing. E. Batule D. (Abs.)	147	extraction, burnt <i>vs.</i> unburnt cane. G. E. Sloane and L. J. Rhodes	386
- varietal choice. L. K. Izatt	209	frequencies and time delays. W. McWhimney	331, 363
- requirements. R. P. Humbert	149	inhibition recycling. T. M. Hamill	324
in Cuba. A. F. Betancourt (Abs.)	53, 319	- and sugar recovery. L. C. Banerji	217
- Jamaica. J. C. van Groeningen	6	inversion losses. T. Mukherjee (Abs.)	89
- and loading in Mexico. C. Ruiz C.	278	--- reduction. (T.N.)	262
- Philippines. T. R. Escobar	144	--- R. G. Camurungan (Abs.)	352
- Taiwan. Anon. (Abs.)	209	--- J. A. Casey (Pat.)	324
loaders	95, 158	--- S. C. Gupta and S. K. D. Agarwal (Abs.)	388
- Anon. (Abs.)	221	--- P. P. Maña (Abs.)	352
- grab. H. A. Willett (Pat.)	221	--- J. Raffray (Abs.)	86
- for lodged cane. Anon. (Abs.)	142	juice extraction, effect of roller velocity. A. T. de Boer	306
loading. (T.N.)	398		
- L. Mares S. (Abs.)	144		
- in Réunion. M. Hoarau (Abs.)	207		
planters. Anon. (Abs.)	204, 278, 317, 378		
- L. L. Lauden (Abs.)	348		
- O. W. D. Myatt (Abs.)	344		
- H. Robichaux (Abs.)	381		
- L. G. Vallance (Abs.)	381		
- sterilization for disease control. A. G. Hayes (Abs.)	345		
- trials in Taiwan. E. P. King (Abs.)	210		
sett cutting for planting. I. P. Freshwater (Abs.)	175		
suitable cane characteristics. Anon. topper. S. R. Makeham and K. L. Ruback (Pat.)	92		
- H. Willett (Pat.)	397		
tractors. (T.N.)	230		
- D. M. Morin (Abs.)	173		
- P. Pete (Abs.)	345		
- accidents. G. R. Cullen (Abs.)	278		
- G. L. McDonald (Abs.)	279		

# INDEX

	PAGE
Molasses, Beet: sugar extraction.	
A. Kacimi. (Abs.).....	390
-- R. Vandewijer et al. (Abs.).....	181
-- R. G. E. Vandeweyer. (Pat.).....	292
-- costs. P. Dupont. (Abs.).....	354
-- in Iran. (Brev.).....158, 189, 230, 262	
-- A. Kreny. (Abs.).....	321
viscosity, effect of sulphate and sulphate ions. L. D. Bobrovnik et al.	394
-- norm establishment. N. P. Silina and E. L. Lyakhtsik. (Abs.).....	354
-- reduction by surface-active agent. yield, effect of ash and non-sugar contents. M. Kimeš. (Abs.).....	153
Molasses, Cane: acid corrosion inhibition. F. Pérez and S. Müller. (Abs.).....	357
addition to raw sugar. A. J. Radford and B. C. E. Gordon. (Abs.).....	388
alcohol distillery in Nigeria. (Brev.)	128
-- fermentation. K. A. Frablin. (Abs.)	290
-- manufacture. D. O. Fernández and J. A. Sicard. (Abs.).....	225
-- K. N. Paul. (Abs.).....	396
-- R. Samaniego and R. L. Srivastava. (Abs.).....	27
analysis in Brazil. J. P. Stupliello et al. (Abs.).....	85
animal fodder. M. H. Butterworth	154
-- O. Carrillo and M. C. Benavides	224
-- J. Clark et al. (Abs.).....	357
-- F. Dixon. (Abs.).....	224
-- J. Guzmán. (Abs.).....	224
-- H. Losada et al. (Abs.).....	224
-- J. Ly. (Abs.).....	224
-- N. Perón. (Abs.).....	224
-- N. Perón et al. (Abs.).....	357
-- T. R. Preston et al. (Abs.).....	186
-- A. Ramirez. (Abs.).....	357
-- V. Rodriguez. (Abs.).....	290
-- S. Valarezo and R. Pérez. (Abs.)	357
-- M. Velázquez et al. (Abs.).....	396
-- factory in Jamaica. (Brev.).....	327
-- U.S. (Brev.).....	232
ash determination. S. N. Fleites et al. (Abs.).....	58
browning polymers. W. W. Binkley	58
bulk handling terminal in Brazil.	57
Anon. (N.B.).....	57
cane sett and foliage treatment.	174
U.S. Singh et al. (Abs.).....	174
citric acid manufacture. J. H. Fried 188,	260
dehydration and use as animal fodder. A. P. Pellegrini. (Abs.).....	123
destruction in storage. H. Ahmed. 20,	53
drying. A. P. Pellegrini. (Pat.).....	325
exhaustion. J. Brujin et al. (Abs.).....	393
-- V. A. Custodio. (Abs.).....	53
-- R. M. Morris and L. W. Roberts. 386	
-- T. T. Oommen and B. S. Gurnurthy. (Abs.).....	59, 217
-- effect of masticity viscosity. M. Otalora B. (Abs.).....	54
-- water hardness. I. Talib and Z. Said. (Abs.).....	54
-- purity prediction. J. P. Gupta et al. ....	275
ion exclusion treatment. J. F. Zievers et al. (Abs.).....	85, 355
lactic acid production. S. Mukherjee and M. U. Ovasisi. (Abs.).....	154
magnesium determination. V. A. Soffantini. (Abs.).....	153
monosodium glutamate manufacture. Z. Said. (Abs.).....	224
oligosaccharides determination. K. J. Schäffer and A. H. Juckes. (Abs.)	153
oxalic acid production. S. Bose et al.	290
pesticide residues. A. J. M. Carnegie and R. A. Wood. (Abs.).....	382
rheological properties. S. Bhattacharyya et al. (Abs.).....	148
-- D. H. Smuk and H. J. Delavier. (Abs.).....	394
saturation temperature determination. J. F. R. Rivalland. (Abs.).....	58
sodium, potassium and calcium determination. S. N. Fleites et al. 185,	222
soil application and cane chlorotic streak. G. Ricard. (Abs.).....	49
-- yield. Anon. (Abs.).....	113
spontaneous destruction. D. J. Mehta and D. C. Karhadkar. (Abs.)	287
sugar determination. C. Bayma.....	223
-- W. F. Beans and A. W. Macdonald. (Abs.).....	184
-- loss. S. Srinivasan and M. Muthujothi. (Abs.).....	351
-- calculation. E. J. Buchanan 299,	337
-- effect of cane burning. Anon. 319	

	PAGE
Molasses, Cane: sugar loss effect of syrup non-sugars. D. L. N. Rao et al. (Abs.).....	89
-- reduction. B. N. Kankarej.....	253
use as fertilizer. K. C. Leverington	83
virtual purity. V. R. Rao. (Abs.).....	185
viscosity, effect of calcium magnesium acetate. A. W. MacGillivray.....	184
volatile acids. J. Brujin and M. Vanis	393
Molasses, Refinery: drying. R. H. Gray	397
-- E. T. Woodruff and V. S. Andersen	397
fluorescence measurement. J. H. Wall and F. G. Carpenter. (Abs.)	122
potassium removal, ion exchange resin regeneration. J. P. Zievers and C. J. Novotny. (Pat.).....	61
standard. E. Y. Goisman. (Abs.).....	120
viscosity determination. R. Wilkes and R. P. Jennings. (Abs.).....	184
Mozambique, see Portuguese East Africa	
New Guinea: cane varietal origins. R. P. Humbert. (Abs.).....	109
Nigeria: cube sugar factory closure.	232
Ilorin sugar factory. (N.C.).....	130
molasses alcohol distillery. (Brev.)	128
new sugar factory. (Brev.).....	64
sugar development. (Brev.).....	360
Nitrogen: amino-nitrogen in beet. F. W. Snyder. (Abs.).....	284
-- effect of growth factors. A. Graf. (Abs.).....	218
-- determination in beet. M. Burba and E. Lurz. (Abs.).....	322
-- and juice. R. Bretschneider et al. (Abs.).....	394
-- N. Kubadinov and L. Wieninger. (Abs.).....	90
-- cane juice. P. Smith and P. E. Gregory. (Abs.).....	25
-- in predefecation mud. K. D. Zhura et al. (Abs.).....	218
cane juice, effect of potassium fertilizer. A. P. Gupta and S. P. Shukla. (Abs.).....	82
colorant separation by ion exclusion. K. Číž et al. (Abs.).....	121
noxious nitrogen formation in beet, effect of cavity formation. S. G. Enikeev and L. Z. Meshkova. (Abs.)	223
-- trace elements. K. G. Mazepin et al. (Abs.).....	286
-- and syrup and molasses colour. A. Y. Gadzhiev et al. (Abs.).....	89
see also Amino-acids; Betaine; Fertilizers and Glutamic acid	
Norway sugar imports. (Brev.).....	191
Obituary: H. Ahfeld.....	295
N. B. Bach.....	282
P. G. Berdeshevsky.....	96
F. M. Chapman.....	296
H. H. Dodds.....	194
F. N. Howes.....	97
Oil fuel additive. (T.N.).....	358
see also Lubrication	
Oxalic acid manufacture from cane molasses. S. Bose et al. (Abs.).....	290
Packaging: refined sugar crystal crushing. S. A. Brennan and N. K. Kudryavtseva. (Abs.).....	221
Pakistan: Bahawalnagar sugar factory. S. Gielzyński. (Abs.).....	54, 319
-- cane damage by borers and frost. O. d'Hotman. (Abs.).....	145
-- intercropping with beet and wheat. S. Fasih et al. (Abs.).....	145
-- varieties. S. Fasih. (Abs.).....	145
fertilizer trials. A. A. Khan et al. 212	
-- M. Slescen and T. M. Choudhry	232
new sugar factories. (Brev.).....	293
steam turbines. (T.N.).....	358
sugar shortage. (Brev.).....	296
Panama: new sugar factory. (Brev.)	328

	PAGE
Pans, Vacuum. (T.N.).....	94
A. R. Grandadam. (Pat.).....	125
E. Kaczmarek. (Abs.).....	118
I. I. Prilutskii. (Abs.).....	88
continuous. P. Dambriene et al. (Pat.)	156
-- G. C. de Bruyn et al. (Abs.).....	23
-- Pives Lille-Cail. N. Barkow and G. Witte. (Abs.).....	23
design influence on molasses purity. M. Otalora B. (Abs.).....	54
entrainment reduction. G. Ashme gum formation, effect of cane deterioration. C. S. Henderson. (Abs.)	179
steam jet ejectors. F. Caballero.....	115
sugar incrustation. I. S. Gulyi et al.	88
syrup feeding. R. Lobato L. (Abs.)	352
-- automatic control. J. Browkin	149
VAMTS-600. L. G. Bolotoukii and Y. D. Kot. (Abs.).....	219
see also Boiling; Crystallization; Entrainment; Heat; Masticite and Scale	
Paper, Bagasse: experimental cane fibre separation in Barbados. (Brev.).....	160
manufacture. B. Paul. (Abs.).....	123
-- and bagasse availability. J. E. Atchison. (Abs.).....	27
-- cane variety effect. E. Batlle and J. A. Espinosa. (Abs.).....	174, 224
-- in Mexico. L. Galeazzi. (Abs.).....	396
-- Taiwan. P. K. Kwan and C. S. Lu. (Abs.).....	154
newsprint company formed. (Brev.)	159
see also Pulp, Bagasse	
Payment, Beet: in U.S. T. G. Meyer.....	150
Payment, Cane: in Australia. Anon. cane analysis, disintegrator. (T.N.)	262
computerized system. J. W. Cullen and G. F. Doherty. (Abs.).....	147
in India. A. P. Gupta. (Abs.).....	343
Mexico. A. L. Fors. (Abs.).....	378
stale cane in India. D. P. Sharma.....	343
Pectin, Beet: extraction in diffusion juice, effect of H. A. Carruthers	182
Peru: bagasse board factory. (Brev.).....	192
cane harvesters. (Brev.).....	263
Casa Grande sugar factory. G. Husz et al. (Abs.).....	85
Hacienda Cayalti expansion. (N.C.)	234
soli salinity reduction. R. P. Humbert. (Abs.).....	381
sugar industry. P. E. Sequera. (Abs.)	204
-- P. E. Sequera T. and G. Sandiga	86
-- production 1972. (Brev.).....	160
yeast factory. (Brev.).....	263
Pests, Beet: aphid control. G. D. Heathcote and R. L. Catrall.....	286
-- virus disease transmission from volunteer beet. W. E. Howell and G. I. Mink. (Abs.).....	252
beet seed treatment with insecticides. W. R. Schäufele and C. Winner.....	52
chemical control. (T.N.).....	398
-- F. Löcher. (Abs.).....	215
mangold beetle and beet fly control. K. Kütke. (Abs.).....	385
nematodes. A. Aziz. (Abs.).....	350
-- K. Singh and S. R. Misra. (Abs.)	350
-- control. K. F. Ruppel and C. W. Laughlin. (Abs.).....	285
-- in cabbages. J. D. Bodevold et al. (Abs.).....	52
-- by fumigation and nitrogen uptake. D. A. Cooke and A. P. Draycott. (Abs.).....	114
-- damage in UK. E. B. Brown and G. B. Sykes. (Abs.).....	114
-- infestation of non-host plants. A. E. Steele. (Abs.).....	252
-- and root amino-acids. D. L. Doney et al. (Abs.).....	146
in Spain. J. Isart. (Abs.).....	84
U.S. F. G. Jones and R. A. Dunning. (N.B.).....	256
Pests, Cane: aphids as mosaic vectors. H. David et al. (Abs.).....	384
-- I. L. Forbes et al. (Abs.).....	48
-- K. M. Lal and K. S. Bhargava	383
-- S. M. A. Rizvi et al. (Abs.).....	384
-- J. L. Saladin and F. W. Zettler. (Abs.).....	384
in Australia. B. E. Hitchcock. (Abs.)	83
biological control. D. K. Butani.....	317
-- S. Nagarkatti. (Abs.).....	379
-- in US. L. J. Charpentier et al. 17	
borers. A. L. Isa and W. H. Awadallah. (Abs.).....	315
-- Y. P. Madan. (Abs.).....	210
-- activity, effect of weather. G. Varadarajan et al. (Abs.).....	317



# INDEX

	PAGE
<b>Pests, Cane: borers control.</b> C. N. Babu <i>et al.</i> (Abs.).....	314, 379
- M. N. Begg and F. D. Bennett.....	16
- A. K. Ota, (Abs.).....	349
- A. K. Ota and W. C. Mitchell.....	211
- S. Sithanandham and S. C. Daniel. (Abs.).....	379
- T. H. Su and C. J. Liang. (Abs.).....	177
- G. Varadharajan <i>et al.</i> (Abs.).....	110
- by cane planting date adjustment. M. T. Kira and H. el-Sherif. (Abs.).....	16
- in U.S. S. D. Hensley. (Abs.).....	17
- damage in Egypt. M. T. Kira and H. el-Sherif. (Abs.).....	16
- Jamaica. Anon. (Abs.).....	113
- Pakistan. O. d'Hotman. (Abs.).....	145
- U.S. L. J. Charpentier <i>et al.</i> .....	245
- in East Africa. D. J. Girling. (Abs.).....	16
- hosts in India. K. R. Nair <i>et al.</i> .....	17
- incidence, effect of rainfall, cane lodging, planting date, etc. V. G. Rajani and P. Nath. (Abs.).....	377
- parasites. J. Etienne. (Abs.).....	17, 317
- K. L. Kamat <i>et al.</i> (Abs.).....	316
- A. A. Negm and S. D. Hensley.....	16
- A. P. Saxena. (Abs.).....	145
- T. H. Su. (Abs.).....	177
- G. Varadharajan <i>et al.</i> (Abs.).....	145
- rearing. W. Y. Cheng. (Abs.).....	177
- A. L. Isa. (Abs.).....	315
- J. W. Sanford. (Abs.).....	17
- and scale insect incidence, effect of cane planting date. G. V. Phadke <i>et al.</i> (Abs.).....	318
- sex attractant. A. N. Kaira and H. David. (Abs.).....	209
- varietal resistance. V. C. S. Chang.....	349
- G. E. Coburn and S. D. Hensley. (Abs.).....	16
- in Brazil. H. D. de Souza. (Abs.).....	346
- P. Guagliumi and E. J. Marques cane damage in Hawaii. A. H. Teshima. (Abs.).....	376
- India. D. M. Popat. (Abs.).....	208
- fly generation segregation and parasitism. J. H. Frank.....	17
- in Jamaica. Anon. (Abs.).....	113
- chemical control. (T.N.).....	398
- cecidid. K. J. Chandler. (Abs.).....	280
- control. Z. N. Wang and L. S. Lou.....	177
- damage in Philippines. L. M. Arceo. (Abs.).....	110
- fungal parasites. L. S. Lou and Z. N. Wang. (Abs.).....	18
- effect of herbicide and insecticide. Z. N. Wang and L. S. Lou. (Abs.).....	347
- in Malagasy Republic. M. Bèbeder-Matibet. (Abs.).....	18
- coccothax damage in Australia. K. G. W. Tilley. (Abs.).....	348
- control. Y. P. Yu. (Abs.).....	177
- in Brazil. Anon. (Abs.).....	174
- chemicals calculation. E. G. Spry.....	278
- by phytosanitary measures. J. A. Ribemboim. (Abs.).....	82
- in U.S. Anon. (Abs.).....	245
- root control. W. A. C. Webb. (Abs.).....	349
- frog hopper control. Anon. (Abs.).....	346
- A. K. Dodson. (Abs.).....	346
- D. E. Evans and D. A. Buxo.....	18
- P. Guagliumi. (Abs.).....	246, 380
- gopher control. C. M. Riess and S. Flores C. (Abs.).....	18, 347
- grub. R. M. Bull. (Abs.).....	380
- and borer control. S. Nagarkatti and V. P. Rao. (Abs.).....	348
- in India. Anon. (N.B.).....	151
- insecticide residues in water. Anon.....	281
- and soil fertility. N. J. King. (Abs.).....	141
- insects in South Africa. A. J. M. Carnegie. (Abs.).....	174
- introduction with exchange cane varieties. G. M. Thompson and J. Wilson. (Abs.).....	47
- leaf hopper. R. M. Bull. (Abs.).....	280
- control. J. S. Sandhu and Y. P. Madan. (Abs.).....	176
- and Fiji disease transmission. Anon. (Abs.).....	109
- R. I. B. Francki and C. J. Grivell. (Abs.).....	315
- A. G. Hayes. (Abs.).....	280
- A. A. Usami and P. B. Hutchinson. (Abs.).....	49
- P. B. Hutchinson <i>et al.</i> (Abs.).....	384
- fungus parasite. K. Kar and S. C. Gupta. (Abs.).....	383
- in India. R. L. Gupta <i>et al.</i> .....	113

	PAGE
<b>Pests, Cane: leaf hopper population and migration.</b> K. M. Gupta <i>et al.</i> .....	318
- sucker control in Swaziland. A. J. M. Carnegie. (Abs.).....	18
- locust control. Anon. (Abs.).....	249
- in Mexico. S. Flores C. (Abs.).....	145, 174
- mite control. S. K. Gupta <i>et al.</i> (Abs.).....	379
- nematode control. Anon. (Abs.).....	208, 283
- J. J. Dick and R. H. G. Harris.....	206
- R. H. G. Harris. (Abs.).....	143
- K. Singh and S. R. Misra.....	335, 389
- and cane yield. R. H. G. Harris.....	383
- fumigant applicator. Anon.....	282
- in U.S. W. Birchfield. (Abs.).....	49
- population, effect of soil treatment. Anon. (Abs.).....	311
- and root damage. Anon. (Abs.).....	311
- seedling blight fungus. S. M. P. Khurana and S. Singh. (Abs.).....	313
- survival, effect of soil temperature. C. H. Hu <i>et al.</i> (Abs.).....	347
- nomenclature incidence. A. J. M. Carnegie.....	381
- life cycle and development. Anon.....	283
- pesticide application and cane yield. R. S. Kanwar. (Abs.).....	383
- loss in soil. K. C. Leverington.....	83
- residues in cane and molasses. A. J. M. Carnegie and R. A. Wood. (Abs.).....	382
- pig damage in Australia. P. J. Amiet.....	348
- C. M. McAleese. (Abs.).....	176
- rats. Anon. (Abs.).....	248
- bait aerial application. Anon.....	377
- B. E. Hitchcock. (Abs.).....	383
- R. H. Robinson and A. E. Oliver. (Abs.).....	50
- control. H. W. Hilton. (Abs.).....	349
- in Hawaii. H. W. Hilton <i>et al.</i> .....	19
- Iran. H. Azizi and K. A. Sund.....	19
- Jamaica. Anon. (Abs.).....	113
- H. H. Samuel. (Abs.).....	18
- damage in Australia. T. D. Redhead. (Abs.).....	19
- and bait preference. M. A. Rajabalee. (Abs.).....	81
- and control in Australia. R. E. Kerkwyk. (Abs.).....	348
- in U.S. H. H. Samuel. (Abs.).....	18
- in Taiwan. B. Y. Wang. (Abs.).....	79
- scale insect. S. Kumar <i>et al.</i> (Abs.).....	211
- J. R. Williams. (Abs.).....	17, 81
- and cane bacteria. N. N. Sarma.....	208
- parasites. J. R. Williams. (Abs.).....	378
- in Tanzania. D. W. Fewkes.....	18
- soldier fly. Anon. (Abs.).....	173
- B. E. Hitchcock. (Abs.).....	278
- control. Anon. (Abs.).....	282
- B. E. Hitchcock. (Abs.).....	278
- B. D. A. Stickley and B. E. Hitchcock. (Abs.).....	280
- mating and dispersion. A. W. Osborn and E. J. Halbert.....	17
- in Taiwan. Y. S. Pan <i>et al.</i> (Abs.).....	79
- termite damage in India. K. M. Gupta and R. A. Singh. (Abs.).....	318
- and grub control. S. Kumar. (Abs.).....	208
- trash caterpillar. Anon. (Abs.).....	283
- A. J. M. Carnegie and J. Dick.....	381
- wattle beetles. Anon. (Abs.).....	311
- weevils. O. P. Singh and R. B. Mathur. (Abs.).....	318
- white leaf disease vector. H. L. Yang and J. S. Pan. (Abs.).....	317
- automatic control. C. M. Riess and K. H. Shen. (Abs.).....	352
- in resin deodorization column. H. Hashimoto. (Abs.).....	355
- beet diffusion, effect on pectin extraction in juice. A. Carruthers. (Abs.).....	182
- water, adjustment by electro-dialysis. K. Číž. (Abs.).....	389
- effect of aluminium sulphate addition. A. A. Lipets and I. A. Oleinik. (Abs.).....	391
- juice colorant and lime salts transfer from carbonation mud. S. P. Olyanskaya <i>et al.</i> (Abs.).....	354
- in evaporation. M. A. Gelshtovt <i>et al.</i> (Abs.).....	23, 118
- and syrup. V. A. Pronina and S. Z. Ivanov. (Abs.).....	152
- cane diffusion. D. P. Kulkarni and J. R. Under. (Abs.).....	216
- juice as guide to stale cane. C. S. Henderson. (Abs.).....	171
- and heater operation. Anon.....	359
- colour formation. S. E. Kharin and V. V. Maslova. (Abs.).....	223
- in carbonatation. W. Chen.....	26

	PAGE
<b>pH: colour formation evaporators.</b> M. A. Gelshtovt <i>et al.</i> (Abs.).....	288
- electrode. S. P. Gotskik. (Abs.).....	150
- readings, effect of sucrose solution structure. M. A. Clarke. (Abs.).....	152
- refinery liquor during bone char treatment. K. Amako. (Abs.).....	355
- steel corrosion in beet juice. V. V. Suprunchuk <i>et al.</i> (Abs.).....	182
- undetermined losses in carbonatation, evaporation and boiling. A. Y. Zagorul'ko <i>et al.</i> (Abs.).....	320
- see also Carbonatation; Clarification and Sulphitation	
<b>Philippines: bagasse furfural plant.</b> .....	328
- bulk sugar terminal. (Brev.).....	32
- cane damage by cecidias. L. M. Arceo. (Abs.).....	110
- mechanical harvesting and loading. T. R. Escobar. (Abs.).....	144
- transport. L. M. Arceo. (Abs.).....	248
- varietal performance. A. M. Galvez <i>et al.</i> (Abs.).....	79
- M. A. Tetangco <i>et al.</i> (Abs.).....	144
- conveyors. (Brev.).....	358
- raw sugar quality standards for exports to U.S. A. H. Hifola. (Brev.).....	222, 393
- steam turbine. (T.N.).....	358
- sugar production 1972. (Brev.).....	128
- Tolong sugar factory. A. Gelly. (Abs.).....	386
- Physik und Chemie der Zuckerrübe. K. Vukov. (N.B.).....	56
<b>Poland: beet agriculture.</b> H. W. Byzowski. (Abs.).....	214
- production 1972. (Brev.).....	192
- sampling. B. Swiatkowski. (Abs.).....	22
- filtration. K. Kocjan and T. Drozdowski. (Abs.).....	353
- sugar chemistry and technology advances. S. Zagrodzki. (Abs.).....	181
- International conference.....	203
- factory in Pakistan. S. Gielzyński.....	54
- process automation. S. Ginal.....	87
- water consumption and effluent load. K. Skalski. (Abs.).....	181
<b>Polarization; measurement.</b> L. P. Reva and L. A. Leneva. (Abs.).....	289
- H. Gruszocka. (Abs.).....	323
- effect of clarification with aluminium salts. A. A. Lipets and I. A. Oleinik. (Abs.).....	323
- dextran in frost-damaged beet. R. Bergkvist. (Abs.).....	118
- dextrose: levulose ratio. J. E. Irvine. (Abs.).....	184
- polarimeter effective wavelength. R. Bünning <i>et al.</i> (Abs.).....	356
- raw sugar, effect of time. E. G. Que and A. A. Guerrero. (Abs.).....	222
- U.S. refiners' standards. A. H. Hifola. (Abs.).....	222, 393
- tables. I. N. Akindinov. (Abs.).....	153
- see also Control, Chemical	
<b>Polarography: iron determination in beet juice and refined sugar.</b> K. Číž and V. Čejková. (Abs.).....	393
<b>Polysaccharides: determination in cane juice.</b> L. E. Leal G. and S. G. Kara-Murza. (Abs.).....	395
- hydrolysis in beet juice. R. Bretschneider <i>et al.</i> (Abs.).....	223
- see also Dextran; Gum and Starch	
<b>Portugal: Azores sugar factory.</b> R. J. Leffingwell. (Abs.).....	150
- cane sugar industries' development. A. McMartin. (Abs.).....	246
- Madeira sugar industry. R. J. Leffingwell. (Abs.).....	85
- sugar imports 1972. (Brev.).....	190
- Portuguese East Africa: bulk sugar silo order. (Brev.).....	192
- cane diseases. A. do R. Noronha.....	50, 247
- varieties and soils. A. P. da S. Cardoso. (Abs.).....	246
- gummosis. M. E. Pinto and M. de Mendonça. (Abs.).....	315
- planting date and yield. F. M. Ramos and J. S. Melo. (Abs.).....	315
- ratoon stunting. M. Santos. (Abs.).....	15
- fertilizer trials. F. M. Ramos and J. de S. Melo. (Abs.).....	246
- new sugar factory. (Brev.).....	31
- overhead irrigation. H. W. Zadrazil.....	246
- soils. P. E. Lapperte. (Abs.).....	246
- Portuguese West Africa: sugar production 1972. (Brev.).....	328
- Powdered sugar, see Acing sugar	
<b>Power: factor.</b> O. E. Aguirre. (Abs.).....	352
- increase. R. J. McIntyre. (Abs.).....	147

# INDEX

	PAGE		PAGE
<b>Power:</b>		<b>Raw sugar:</b>	
generation plant. W. Fachinetti . . . . .	321	quality improvement in South Africa.	
- at Winstington sugar factory. I. S. Higgins <i>et al.</i> (Abs.) . . . . .	254	- M. Matic. (Abs.) . . . . .	86
steam vs. electricity for equipment operation. R. C. Sharma. (Abs.) . . . . .	116	- standards for US refiners. A. H. Hifiola. (Abs.) . . . . .	222, 393
Pressure switches. (T.N.) . . . . .	30	solution as sugar crystal coating.	
Price: International Sugar Agreement supply commitment price. (N.C.) 98, 120	98, 120	- P. L. Veltman <i>et al.</i> (Pat.) . . . . .	124
sugar refining margin in EEC and UK. (N.C.) . . . . .	66, 362	- starch content and filtrability. S. L. Sang. (Abs.) . . . . .	21
UK refined sugar and Sugar Board payments. (Brev.) . . . . .	64	- determination. M. Matic. (Abs.) . . . . .	25
world raw sugar. (N.C.) . . . . .	34, 97	- S. L. Sang <i>et al.</i> (Abs.) . . . . .	25
- -- prospects. (N.C.) . . . . .	34, 97	- storage. J. P. Stuppiello and S. Joly <i>et al.</i> (Abs.) . . . . .	184
- and US raw sugar. Anon. (N.B.) . . . . .	57	- and irradiation. W. W. Binkley <i>et al.</i> (Abs.) . . . . .	223
see also Payment		- relative humidity control. S. C. Gupta <i>et al.</i> (Abs.) . . . . .	20
Puerto Rico: bagasse board plant . . . . .	327	- world price. (N.C.) . . . . .	1, 33, 34, 65, 97, 233, 297, 362
cane agriculture. R. S. Kanwar . . . . .	379	- and US price. Anon. (N.B.) . . . . .	57
pineapple disease control. L. J. Liu <i>et al.</i> (Abs.) . . . . .	50	see also Affination; Boiling; Bulk handling; Bulk storage; Bulk transport; Colour; Control; Chemical; Crystallization; Dryers; Factory; Masecuite; Polarization; Refining and Sugar	
<i>Pythium tharcescens</i> . H. Koike . . . . .	144	Reducing sugars: ash ratio and molasses purity production. J. P. Gupta <i>et al.</i> . . . . .	275
sugar industry. Anon. (N.B.) . . . . .	57	- in beet juice, effect of mud removal.	
- production 1971/72. (Brev.) . . . . .	31	- A. R. Sapronov and R. G. Zhizhina <i>et al.</i> . . . . .	390
<b>Pulp, Bagasse; characteristics from cane varieties. E. Batlle and J. A. Espinosa. (Abs.) . . . . .</b>	<b>174, 214</b>	- cane juice in Brazil. G. B. Serra <i>et al.</i> . . . . .	<b>281</b>
- manufacture. D. B. Batstone. (Abs.) . . . . .	123	- decomposition by micro-organisms in diffusion. Klaushofer and G. Pollach. (Abs.) . . . . .	223
- E. C. Mills. (Pat.) . . . . .	228	- and organic acids in cane juice.	
- B. A. Paul. (Abs.) . . . . .	123	- K. K. Sharma and P. K. Aren . . . . .	59
- H. D. Wilder. (Pat.) . . . . .	91	- determination. D. Bourdon. (Abs.) . . . . .	322
- and bagasse availability. J. E. Atchison. (Abs.) . . . . .	27	- B. N. Ershov. (Abs.) . . . . .	89
- in Mexico. L. Galeazzi. (Abs.) . . . . .	396	- extraction in cane diffusion, effect of pH. D. P. Kulkarni and J. R. Unde. (Abs.) . . . . .	216
- Taiwan. P. C. Kwan and C. S. Lu . . . . .	154	- in stored beet, effect of temperature.	
- Y. P. Yu. (Abs.) . . . . .	21	- R. E. Wyse and S. T. Dexter. (Abs.) . . . . .	213
see also Paper, Bagasse		- syrup manufacture. Tate & Lyle Ltd. <i>et al.</i> . . . . .	213
Pulp, Beet: animal fodder. Anon. (Abs.) . . . . .	225	see also Dextrose; Invert sugar; Levulose and Sugars	
- R. J. Burt. (Abs.) . . . . .	186, 225	Refined sugar: ash content and colour correlation. M. Marounek. (Abs.) . . . . .	59
- R. G. Hemingway and J. J. Parkins. (Abs.) . . . . .	396	- colorants. L. Farber and F. G. Carpenter. (Abs.) . . . . .	26, 152
- S. V. Novikov. (Abs.) . . . . .	123	- crystal crushing. S. A. Brenman and N. K. Kuzryavtseva. (Abs.) . . . . .	221
- V. Sevčik <i>et al.</i> (Abs.) . . . . .	290	- determination of iron. K. Číž and V. Čejková. (Abs.) . . . . .	393
- effect of ion exchange waste addition. V. A. Levai <i>et al.</i> . . . . .	154	- moisture. L. I. Kon <i>et al.</i> (Abs.) . . . . .	59
briquetting. V. P. Borodyanskii <i>et al.</i> (Abs.) . . . . .	225	- non-sugars. N. K. Kvacheva and G. A. Chikin. (Abs.) . . . . .	185
- press. G. S. Stepanov <i>et al.</i> (Abs.) . . . . .	123	- drying automatic control. V. A. Demchenko. (Abs.) . . . . .	221
cellulose for icing sugar manufacture. J. M. Micevici. (Pat.) . . . . .	258	- price margin in EEC and UK. (N.C.) 66, 362	66, 362
dryer. E. Görényi and Z. Asztalos . . . . .	357	- UK price and Sugar Board payments . . . . .	64
- dimensions calculation. W. Poersch and P. Thelen. (Abs.) . . . . .	218	see also Cube sugar; Icing sugar; Liquid sugar; Tablet sugar and White sugar	
drying. F. Loss. (Abs.) . . . . .	123	Refinery: automatic centrifugals. E. M. Karnasevich and I. A. Deonoga . . . . .	120
- M. G. Parfenopulo and N. E. Karaulov. (Abs.) . . . . .	396	- boiling schemes in USSR. E. Y. Goisman. (Abs.) . . . . .	120
- P. Thelen. (Abs.) . . . . .	154	- in Cameroun. A. Bernard. (Abs.) . . . . .	386
- A. Vigh. (Abs.) . . . . .	262	- carbonation station. R. Valkers <i>et al.</i> (Abs.) . . . . .	221
- and pelleting. (Brev.) . . . . .	262	- closure in Finland. (Brev.) . . . . .	341
presses. (T.N.) . . . . .	158	- equipment maintenance. E. Vergara <i>et al.</i> . . . . .	221
pressing. A. Carruthers. (Abs.) . . . . .	182	- ion exchange column explosion. F. Juračka <i>et al.</i> (Abs.) . . . . .	355
sugar determination. A. Y. Zagornik <i>et al.</i> (Abs.) . . . . .	59	- laboratory boiling test. M. Sugiyama <i>et al.</i> (Abs.) . . . . .	356
sulphite control. H. Schiwiek <i>et al.</i> . . . . .	396	- liquor drying. H. Greer. (Pat.) . . . . .	291
Pumps: steam turbine drives. (Brev.) . . . . .	398	- E. P. Woodruff and V. S. Andersen. (Pat.) . . . . .	397
		- fluorescence measurement. J. H. Wall and F. G. Carpenter. . . . .	122
		- materials balance. F. Garcia L. . . . .	355
		- project in Mauritania. (Brev.) . . . . .	328
		- tramp iron separation. Anon. (Abs.) . . . . .	319
		- in US. (Brev.) . . . . .	159, 296
		- waste water and atmospheric emission. P. F. Meads <i>et al.</i> (Abs.) . . . . .	355
		Refining: liquor carbonatation evaluation. D. S. Wilkes. (Abs.) . . . . .	184
		- -- es. sulphitation for colour removal. F. H. C. Kelly <i>et al.</i> . . . . .	308
		- decolorization. D. Cookson <i>et al.</i> . . . . .	122
		- with active carbon. S. A. Brenman and I. L. Zdanovich. . . . .	120
		- -- Y. O. Kravets <i>et al.</i> (Abs.) . . . . .	120
		- -- S. B. Smith <i>et al.</i> (Abs.) . . . . .	183
		- -- A. Vera Z. (Abs.) . . . . .	221
		- adsorbent resin. Anon. (Abs.) . . . . .	120
		Refining: liquor decolorization with adsorbent resin. D. F. Bagster. . . . .	120
		- -- H. Hashimoto. (Abs.) . . . . .	355
		- -- S. Landi and G. Mantovani. . . . .	392
		- -- K. J. Parker. (Abs.) . . . . .	355
		- -- Rohm & Haas Co. (Pat.) . . . . .	257
		- -- W. R. Tison <i>et al.</i> (Abs.) . . . . .	221
		- -- J. F. Zievers and C. J. Novotny. (Pat.) . . . . .	61
		- -- bone char. C. C. Chou and K. R. Hanson. (Abs.) . . . . .	231, 355
		- -- bulk density and performance. J. C. Abram and P. S. Warren. . . . .	235
		- -- efficiency. J. C. Abram <i>et al.</i> . . . . .	201
		- -- inorganic ions effect. K. Amako. (Abs.) . . . . .	355
		- -- sweetening-off. F. M. Chapman. (Abs.) . . . . .	221
		- -- kinetics. M. Frimi <i>et al.</i> (Abs.) . . . . .	221
		- -- with polyamide. Colonial Sugar Refining Co. Ltd. (Pat.) . . . . .	257
		- -- surface-active agent. M. C. Bennett. . . . .	189, 221, 325
		- -- W. B. Hill. (Abs.) . . . . .	220
		- research. M. G. Bennett <i>et al.</i> (Abs.) . . . . .	355
		- Technical Session 1972. . . . .	31
		- Southdown Sugars Inc. Anon. (Abs.) . . . . .	183
		see also Affination; Bone char; Carbon, Active; Ion exchange; Raw sugar and Syrup	
		Refractometers. (T.N.) . . . . .	261
		- cane maturity determination. P. J. Nielsen. (Abs.) . . . . .	380
		see also Brix	
		Réunion: cane areas and varieties. F. Léoville. (Abs.) . . . . .	207
		- borer parasites. J. Etienne. (Abs.) . . . . .	317
		- breeding and disease research. Anon. (Abs.) . . . . .	344
		- gummosis. B. Rat. (Abs.) . . . . .	318
		- varieties. J. Fritz. (Abs.) . . . . .	317
		- fertilizer trials. J. Fritz. (Abs.) . . . . .	246
		- -- J. Fritz <i>et al.</i> (Abs.) . . . . .	317
		- uptake by cane. J. Fritz. (Abs.) . . . . .	317
		- mechanical cane loading. M. Hoarar <i>et al.</i> . . . . .	207
		- sugar production 1972. (Brev.) . . . . .	263
		Rhodesia: cane leaf analysis. A. C. Long. (Abs.) . . . . .	206
		- optimum harvest dates. J. M. Gosnell and M. J. P. Koenig. . . . .	382
		- smut varietal susceptibility. G. L. James. (Abs.) . . . . .	312
		- refineries operation. (N.C.) . . . . .	130
		Salvador new sugar factory. (Brev.) 32, 159	32, 159
		Saponin removal from waste water. S. Zagrodzki and A. Kurkowska. . . . .	255
		Seale: boiler, reduction. (T.N.) . . . . .	358
		- removal. A. Aziz. (Abs.) . . . . .	53
		- -- A. K. Basu. (Abs.) . . . . .	217
		- -- S. Bose <i>et al.</i> (Abs.) . . . . .	115
		- evaporator, formation. D. B. Batstone and K. J. Nix. (Abs.) . . . . .	20
		- -- effect of cane deterioration. E. Batule D. (Abs.) . . . . .	147
		- -- reduction. (T.N.) . . . . .	157, 262
		- -- A. C. Chatterjee. (Abs.) . . . . .	388
		- -- I. M. Fedotkin <i>et al.</i> (Abs.) . . . . .	391
		- -- A. J. Margabandhu. (Abs.) . . . . .	180
		- -- N. Y. Toblichvich and Y. G. Porzhezinskii. (Abs.) . . . . .	55
		- -- M. S. Zhigalov and N. D. Tantsyura. (Abs.) . . . . .	88
		- -- Z. D. Zhuravleva and K. P. Goncharova. (Abs.) . . . . .	354
		- -- and removal. C. K. Cloninger . . . . .	387
		- -- removal. A. F. Lapin. (Abs.) . . . . .	218
		- -- R. C. Smith. (Abs.) . . . . .	217
		- -- R. R. Trott and B. Maloney. . . . .	386, 387
		- -- molasses as corrosion inhibitor. F. Pérez and S. Müller. (Abs.) . . . . .	357
		- juice heaters, effect of lime quality and juice pH. Anon. (Abs.) . . . . .	351
		- reduction. (T.N.) . . . . .	157
		- renouaf. (T.N.) . . . . .	80, 95
		- -- P. K. Chheda. (Abs.) . . . . .	217
		- Senegal sugar expansion. (Brev.) . . . . .	32
		- Shinippon Machinery Co. Ltd. (Brev.) . . . . .	358
		Sierra Leone: Cuban aid for sugar industry. (Brev.) . . . . .	327
		- sugar imports 1972. (Brev.) . . . . .	192
		- industry investigation. (Brev.) . . . . .	328
		Singapore sugar imports 1972. (Brev.) . . . . .	191

# INDEX

	PAGE		PAGE		PAGE
Soil: aggregate stability, effect of filter cake micro-organisms. G. Roth	205	Soil:	382	Starch: and ash content in cane.	377
aluminum toxicity in South Africa.		- C. N. Macvicar and G. A. Perfect. (Abs.)	206	M. A. A. Cesar and M. R. Mazzari in cane juice, effect of potassium fertilizer. A. P. Gupta and S. P. Shukla. (Abs.)	82
- M. E. Sumner and J. H. Meyer analysis in India. B. Singh <i>et al.</i>	343	structure and ploughing time effects on beet yield. A. Vez and P. Villouin. (Abs.)	215	- and raw sugar. S. L. Sang. (Abs.)	21
bagasse mulching. M. T. Chen and C. T. Huang. (Abs.)	347	sulphur status determination. Anon. temperature, effect on cane growth. J. C. Mongelard and L. Mfiru. (Abs.)	283	determination in raw sugar. M. Matic. (Abs.)	25
- and cane quality. J. C. P. Chen and R. W. Picou. (Abs.)	116, 319	- intercropping. H. Chang. (Abs.)	51	- S. L. Sang <i>et al.</i> (Abs.)	25
bulk density and cane nutrient uptake. T. C. Huang. (Abs.)	345	- nematode survival. C. H. Hu <i>et al.</i> (Abs.)	347	raw sugar filtrability. J. P. Murray reduction by enzymatic hydrolysis. F. Hidi <i>et al.</i> (Pat.)	394
cane land classification in Australia. H. S. Pink. (Abs.)	279	- phosphate uptake by beet seedlings. K. M. Siptanos and A. Ulrich. (Abs.)	213	Dominican Republic sugar	192, 327
- conservation. M. C. Liao. (Abs.)	347	- testing. L. S. Robertson and E. C. Doll. (Abs.)	385	Dutch sugar imports and exports	160
- deep tillage. P. K. Moberly	382, 383	- type and cane agriculture in India. J. B. Kakde. (Abs.)	112	East Africa sugar	191, 266
- drainage. A. I. Linedale. (Abs.)	380	- response to potassium. J. Fritz	210	Europe beet area 1973	191, 266
- I. J. V. Stewart. (Abs.)	348	- fertilizer application. C. C. Wei	246	International Sugar Organization Year Book 1971. (N.B.)	24
- L. G. Vallance. (Abs.)	144	- phosphorus response. J. R. Kakde water availability determination. P. Y. Chan and B. Z. Arledge	51	Japan sugar imports	190
- and erosion avoidance. D. E. Menard. (Abs.)	378	- consumption by beet, effects of plant population and irrigation. A. P. Draycott and M. J. Durrant	80	South Africa sugar exports	326
- drains. G. A. Christie. (Abs.)	175	- content and cane growth. D. R. Ridge. (Abs.)	114	Taiwan sugar exports	328
- weed control. Anon. (Abs.)	173	- loss prevention with asphalt barriers. M. E. Sumner and E. C. Gillilan. (Abs.)	249	Thailand sugar exports	324
- effects of legume crops. Anon.	173	- stress and cane stalk growth. J. C. Mongelard. (Abs.)	209	UK sugar imports and exports 1972	127
- forming in Jamaica. Anon.	112	- table level and cane growth. J. M. Gonnell.	209	USSR sugar imports and exports	232
- in US. Anon. (Abs.)	183	- see also Fertilizers; Irrigation and Pests	135	world sugar production 1972/73	63, 294
- levelling. M. A. Heister. (Abs.)	176	Sorghum: agriculture and processing in US and Mexico. A. González G. gur manufacture. A. K. Ghosh.	21	1973/74.	359
- preparation for cane mechanization in the West Indies. Anon.	304	- ripening with chemicals. B. Quebedeaux. (Pat.)	385	Zuckerwirtschaftliches Taschenbuch 1972/73. G. Janeba <i>et al.</i>	56
- slope and cane yield. B. T. White. (Abs.)	279	- trials in US. W. E. Cowley and B. A. Smith. (Abs.)	125	Steam: beet juice treatment in hydro-cyclones. F. N. Dobronravov and Z. D. Zhuravleva. (Abs.)	88
characteristics and beet processing quality. A. Graf. (Abs.)	218	- South Africa: bagasse board manufacture. J. T. Baird. (Abs.)	177	comparison with electricity for equipment operation. R. C. Sharma. (Abs.)	116
- seed germination. E. Dallielme	214	- furural plant. (Brev.)	154	compressors for vapour balance maintenance in evaporators. B. A. Eremenko <i>et al.</i> (Abs.)	288
- yield in Ireland. J. Lee and C. K. Comerford. (Abs.)	385	- bulk storage silo at Durban. (Brev.)	400	consumption in boiling. V. Sáazavský	118
compaction and cane growth. L. G. Vallance. (Abs.)	378	- cane agronomy research. G. D. Thompson. (Abs.)	400	- in Denmark. P. L. Narasimham	22
- yield. M. A. Johnston and R. A. Wood. (Abs.)	207	- area expansion. (Brev.)	111	- evaporation. S. Z. Zagrodzki <i>et al.</i>	321
- prevention. J. Pichenez and D. Guiraud. (Abs.)	178	- damage by nematodes. Anon.	160	- reduction with bagasse fuel. C. H. Nagpuray and A. C. Chatterjee	54
crusting reduction and beet emergence. D. M. VanDoren and J. E. Henry. (Abs.)	251	- diffusion. J. P. Lamusee. (Abs.)	208	- vapour bleeding. S. Y. Chiu	351
cultivation with "chisel". E. Dallielme. (Abs.)	84	- J. Palaci. (Abs.)	86	flow and tube diameter calculation. P. M. Fabregat. (Abs.)	352
erosion prevention. C. M. McAleese	380	- C. B. van der Riet and R. H. Renton. (Abs.)	207	generation plant. W. Faschinetti	321
- by strip planting on hillsides. C. T. Wise. (Abs.)	382	- insect pests. A. J. M. Carnegie	174	- at Wissington sugar factory. I. S. Higgins <i>et al.</i> (Abs.)	254
fertility, effect of insecticides. N. J. King. (Abs.)	141	- molasses exhaustion. J. Bruijn <i>et al.</i> (Abs.)	393	jet ejectors. F. Caballero. (Abs.)	115
filter cake and cane molasses addition, effect on chlorotic streak. C. Ricard. (Abs.)	378	- mosaic, smut and break reactions. G. M. Thomson. (Abs.)	144	losses in evaporator. G. Kimenov	159
lime application. Anon. (Abs.)	49	- potential. J. P. Glover. (Abs.)	144	turbines. (T.N.)	358
- A. P. Hurney. (Abs.)	278	- filter cake fertilizer contents. K. E. F. Alexander. (Abs.)	381	- as centrifugal drive. (T.N.)	189
- in UK. J. Topper. (Abs.)	178	- Iloilo Sugar Estates. (N.C.)	383	- manufacturer name change. (Brev.)	216
magnesium clay structural stability. P. Y. Chan. (Abs.)	81	- molasses addition to export raw sugar. A. J. Radford and B. C. E. Gordon. (Abs.)	130	- operation. R. K. Sirdeshmukh	398
maturity and cane fertilizer response. C. L. Mehrotra <i>et al.</i> (Abs.)	209	- raw sugar quality improvement. M. Matic. (Abs.)	86	- orders. (Brev.)	398
micro-organisms and cane varietal yield decline. S. M. Yang. (Abs.)	49	- sandy soil and cane yield. Anon.	311	see also Boilers; Heat and Power	
- in Jamaica. Anon. (Abs.)	113	- seed cane production and approval. G. M. Thomson. (Abs.)	312	Storage: bagasse. J. E. Atchison. (Abs.)	27
- nitrogen fixation. M. K. Srivastava and K. Singh. (Abs.)	83	- soils. J. le Roux. (Abs.)	382	beet molasses spontaneous destruction. M. Friml. (Abs.)	87, 389
nitrate and beet growth. D. W. James <i>et al.</i> (Abs.)	146	- aluminum toxicity. J. H. Meyer <i>et al.</i> (Abs.)	206	- thick juice. M. Beauvissage. (Abs.)	389
- nitrogen requirements determination. J. O. Reuss and P. S. C. Rao. (Abs.)	252	- M. E. Sumner and J. H. Meyer	206	- F. Domsa <i>et al.</i> (Abs.)	119
nutrients in South Africa and Swaziland. J. H. Meyer <i>et al.</i> (Abs.)	206	- nutrients. J. H. Meyer <i>et al.</i> (Abs.)	206	- P. Dupont. (Abs.)	354
pesticide loss. K. C. Leverington	83	- steam turbine order. (Brev.)	398	cane molasses spontaneous destruction. H. Ahmed. (Abs.)	20, 53
residue and soldier fly control. B. D. A. Stickley and B. E. Hitchcock. (Abs.)	280	- sugar exports. (Stat.)	326	- D. J. Mehta and D. C. Karhadkar. (Abs.)	287
In Portuguese East Africa. P. E. Lapperre. (Abs.)	246	- A. M. Guthrie. (Abs.)	153	- sett germination. D. M. Broadhead	110
recommendations for cane varieties in US. Anon. (Abs.)	378	- effect of cane quality. E. J. Buchanan	299, 337	- syrup. E. M. Hine. (Abs.)	116
research in Australia. K. C. Leverington. (Abs.)	83	- Milling Research Institute computer calculations. J. R. Fitzgerald. (Abs.)	153	- contents gauge. (T.N.)	94
- needs in Taiwan. Anon.	345	- production 1972/73. (N.C.)	162	- liquid fertilizers. S. Pontallier. (Abs.)	250
salinity and seed germination. L. E. Francois and J. R. Goodin	286	- Tongaat Group Ltd. 1972/73 report	295	- sugars, colour formation. C. Krüger and W. Steinmetzer	218
- and cane nitrogen response. Anon.	112	- waste water treatment. G. G. Ashe	86	- Krüger and W. Steinmetzer	218
- photosynthate translocation. A. Maretzki <i>et al.</i> (Abs.)	344	- Spain: beet agriculture. R. J. Alvarez	214	- raw sugar. J. P. Stupiello and S. Joly. (Abs.)	184
- Portuguese East Africa. A. P. da Cardoso. (Abs.)	246	- diseases and pests. J. Isart. (Abs.)	84	- irradiation protection. W. W. Binkley <i>et al.</i> (Abs.)	223
- reduction. R. W. Fitzpatrick <i>et al.</i>	205	- new sugar factories. (Brev.)	321	- and white sugar humidity maintenance. S. C. Gupta <i>et al.</i>	220
- by irrigation. R. P. Humbert	381	- Sri Lanka sugar industry project	232	- refined sugar crystal crushing. S. A. Brennan and N. K. Kudryavtseva	221
sampling. J. C. Schickluna. (Abs.)	385			- sugar bags. M. B. Yarmolinskii	320
sand and cane yield in South Africa. Anon. (Abs.)	311			- strength. S. A. Brennan <i>et al.</i>	292
solar radiation and cane growth. T. T. Yang and C. H. Chang. (Abs.)	109			- N. M. Kishigin and I. I. Novogorski. (Abs.)	182
				white sugar colour and ash. P. Devillers and J. Roger. (Abs.)	253
				- and SO <sub>2</sub> loss. D. R. Parashar	224
				see also Bulk storage	
				Storage: Beet. Anon. (N.B.)	24
				H. J. Delavier. (Abs.)	320
				M. Martens and J. P. T. Gueze <i>et al.</i>	146
				beet cleanliness. Anon. (Abs.)	52
				- P. Royle. (Abs.)	286
				- phenols and rotting prevention. J. Trzebinski. (Abs.)	395

# INDEX

	PAGE		PAGE
<b>Storage: Beet:</b>			
effect on flume water sugar content.		Sugar: crystal crushing, E. A. Niediek	183
W. Uhlenbrock. (Abs.).....	395	-dust formation. G. N. Allan and	
-marc content. R. E. Wyse and		J. R. Fitzgerald. (Abs.).....	116
S. T. Dexter. (Abs.).....	90	S. A. Farag <i>et al.</i> (Abs.).....	89
-syrup amino-acids. A. Y. Gadzhiev		-sieve analysis. G. Pidoux. (Abs.)	185
<i>et al.</i> (Abs.).....	89	-- conversion to number size	
-undetermined losses. A. Y. Zagoruk		distribution. E. T. White	
<i>ko et al.</i> (Abs.).....	320	and P. G. Wright. (Abs.)	222
-Josses, J. C. Chartier <i>et al.</i> (Abs.)	87	-size determination. A. I. Grom-	
-effect of frost. R. Bergkvist. (Abs.)	118	kovski and N. A. Romizova.....	289
-nitrogen application. R. E.		-- distribution. S. Orlovski and	
Wyse and S. T. Dexter. (Abs.)	213	D. Schliephake. (Abs.).....	393
pile dimensions calculation. S. M.		-- P. G. Wright and E. T. White	
Kirchigin and N. A. Emel'yanov..	181	determination in beet. A. A. Lipeta	
-forch ventilation. J. Browkin..	149	and I. A. Oleinik. (Abs.).....	323
-- I. I. Dik and A. I. Solov'ev..	22	-- cossoltes and pulp. A. Y.	
-- M. Z. Khelemskii. (Abs.).....	22	Zagoruk <i>et al.</i> (Abs.).....	59
-- A. Kostenko and A. Gonchar		-- flume and wash water. J. F. T.	
<i>et al.</i> .....	88	Oldfield <i>et al.</i> (Abs.).....	289, 393
-- L. Litvinenko and D. Potanenko.		-- water. W. Uhlenbrock. (Abs.)	395
(Abs.).....	22	-- cane. G. Husz. (Abs.).....	185
-- A. A. Vasil'ev <i>et al.</i> (Abs.)..	88	-- Juice: effect of dextronecellulose	
-temperature automatic measurement		and differences. J. E. Irving.....	184
and indication. U. A.		-dust explosion in India. K. Shanker	
Kovzashvili. (Abs.).....	150	<i>et al.</i> (Abs.).....	54
-- and beet juice composition.		-economic pocket book 1972/73.	
R. E. Wyse and S. T. Dexter.....	213	Janeba <i>et al.</i> (N.B.).....	56
-- and time. K. Vukov. (Abs.)..	214	-fertilization with nutrients. J. F.	
in Poland. H. W. Byzewski. (Abs.)		Carter. (Pat.).....	124
volatile substances formation. G.		-incrustation in vacuum pans. I. S.	
Steinle. (Abs.).....	121	Gulyi <i>et al.</i> (Abs.).....	88
<b>Sucrose:</b> cane leaf secretion. J. Edel-		-international development sympos-	
man and A. I. Schoolar. (Abs.)..	175	ium. (N.C.).....	56
-- A. I. Schoolar and J. Edelman		-- economy yearbook and directory.	
decomposition in carbonation.	247	H. Ahlfeld. (N.B.).....	2
A. R. Saponov and R. G. Zhizhina		-inversion by electroanalysis. K. Ciz	
-by micro-organisms in diffusion.	390	-ion exchange. (T.N.).....	389
- H. Klaushofer and G. Pollach.		-moisture determination. (T.N.)..	157
determination. I. P. Reva and L. A.	223	-pesticide residues. L. van Steyvoort	
Leneva. (Abs.).....	289	<i>et al.</i> (Abs.).....	24
-in beet. H. Gruszecka. (Abs.)..	323	-props. (N.B.).....	24
-cane molasses. W. F. Beams and		-soft sugar production from white	
A. W. MacGillivray. (Abs.).....	184	sugar. S. Staichenko <i>et al.</i> (Pat.)..	391
-effect on bone char and active carbon		-solubility in liquid sugar mixtures. C.	
adsorptive properties. M. I.		Kriger and W. Steinmetz. (Abs.)	610
Daishev and V. M. Sheherbak....	391	-solution conductimetric purity deter-	
-- carbonation. J. Vašátko <i>et al.</i>		mination. V. Valter. (Abs.).....	322
Dandár. (Abs.).....	353	-- cooling and electrical resistance.	
-- colour adsorption by CaCO <sub>3</sub> . S. E.		I. N. Krasnov and V. I. Tuzh-	
Kharin and V. V. Maslova. (Abs.)	181	likin. (Abs.).....	153
-- reduction by Al(OH) <sub>3</sub> . S. E.		-drying. E. T. Woodruff and V. S.	
Kharin and V. V. Maslova.....	223	Andersen. (Pat.).....	397
-- reducing sugars determination. D.		-- preparation. K. Lauer and P.	
Bourdon. (Abs.).....	322	Stephan. (Pat.).....	292
-heat of crystallization and activity		-- starch reduction. Anon. (Abs.)..	180
coefficient calculation. J. Fernán-	90	-- P. Hidi <i>et al.</i> (Pat.).....	124
dez B. and L. Ballester. (Abs.)..		-- treatment with ion exchange resin.	
-- solution. Y. V. Zeltser and B. M.		world balance 1971/72. (N.C.)....	1
Malyarov. (Abs.).....	394	-- 1972/73. (N.C.).....	65, 233, 266
-hydrolysis. J. Szejtli. (Abs.).....	89	-- production 1972/73. 33, 63, 98, 265, 294	
-interaction with non-sugars and		-- 1973/74.....	330, 359
molasses formation. N. P. Silina		-year book 1971. (N.B.).....	34, 97
and K. Ciz. (Abs.).....	131	-see also Bulk handling; Bulk storage;	
-- salts. N. P. Silina <i>et al.</i> .....	322	Bulk transport; Crystallization;	
-irradiation and browning reaction.		Liquid sugar; Polarization; Raw	
W. W. Binkley <i>et al.</i> (Abs.).....	223	sugar; Refined sugar; Sucrose and	
-monosaccharides production. M.		White sugar	
Kulhánek and M. Tadra. (Abs.)..	224	Sugars: accumulation in cane. P. D.	
-physical properties. R. S. Burdukova		-Bajpai and R. C. Tripathi. (Abs.)	342
<i>et al.</i> (Abs.).....	322	-in beet. H. Gruszecka. (Abs.)....	323
-separation from potassium chloride		-by polysaccharide hydrolysates.	
by ion exclusion. K. Ciz <i>et al.</i> ...	395	R. Bretschneider <i>et al.</i> (Abs.)..	223
-solubility. S. E. Kharin. (Abs.)..	395	-detergent manufacture. W. I. Lyness	
-- J. Vašátko <i>et al.</i> (Abs.).....	121	and J. E. Thompson. (Pat.).....	292
-solution, aragonite precipitation.		-determination. H. Gruszecka and	
M. C. Bennett and S. D. Gardiner	260	S. Kubacki. (Abs.).....	323
-- molecular diffusion. L. P. Zhmyrya		-- by gas-liquid chromatography.	
<i>et al.</i> (Abs.).....	223, 323	V. S. Velasco <i>et al.</i> (Abs.).....	122
-- structure and pH and calcium		-esters preparation. P. Jacques.....	258
electrode readings. M. A. Clarke	152	-melibiose hydrolysis. J. Szejtli....	89
-- thermodynamics. S. E. Kharin..	395	-oligosaccharides determination in	
-see also Crystallization; Fermentation;		cane molasses. E. J. Schäffler and	
Polarization; Sugar and Sugars		A. H. Jukes. (Abs.).....	153
<b>Sudan: new sugar factory</b> .....	192, 234	-- and reducing sugars determination.	
<b>Sugar: accumulation in cane. P. D.</b>		D. Bourdon. (Abs.).....	322
-Bajpai and R. C. Tripathi. (Abs.)	342	-polyurethane foam production. J. S.	
-y Azcar yearbook 1972. Anon.....	57	Heckles and E. J. Quinn. (Pat.)..	324
-beet content in U.S. F. W. Snyder.		-separation. M. Roche. (Abs.).....	394
-brown sugar manufacture. J. M.		-see also Dextrose; Fermentation;	
Mickeycz. (Pat.).....	125	Invert sugar; Levulose; Raffinose;	
-caking prevention. K. Suzuki. (Pat.)	188	Reducing sugars and Sucrose	
-chemistry and technology advances		Sulphitation: beet juice. K. Vukov..	288, 390
in Poland. S. Zagrodzki. (Abs.)..	181	-- and evaporator corrosion. B. I.	
-- conference in Poland.....	263	Kats. (Abs.).....	392
-colour removal with polyamide.		-continuous. Walchandnagar Indus-	
Colonial Sugar Refining Co. (Ltd.)	257	tries Ltd. (Pat.).....	257
-- resin. Rohm & Haas Co. (Pat.)	257		
-crystal adhesion to materials. I. S.			
Gulyi <i>et al.</i> (Abs.).....	88		
-- coating. W. R. Grace & Co....	291		
-- P. L. Veltman <i>et al.</i> (Pat.).....	124		
		<b>Sulphitation:</b>	
		pH automatic control. C. M. Hwang	
		and K. H. Shen. (Abs.).....	352
		-phosphate and lime addition. B. R.	
		Math. (Abs.).....	180
		-refinery syrup colour removal.	
		F. H. C. Kelly <i>et al.</i> .....	308
		-sulphur dioxide spraying. V. M.	
		Rosinskii <i>et al.</i> (Abs.).....	391
		-Surface-active agent: addition to	
		herbicide and cane damage. F. E.	
		Richardson. (Abs.).....	381
		-- yield. Anon. (Abs.).....	282
		-in boiling. (T.N.).....	262, 358
		-- O. Krieger. (Abs.).....	389
		-- O. Krieger and I. Csilek. (Abs.)..	288
		-- T. P. Saxena <i>et al.</i> (Abs.).....	85
		-- S. Srinivasan and T. S. Thiya-	
		garajan. (Abs.).....	217
		-- N. R. Twaite. (Abs.).....	254
		-- and scale removal. (T.N.).....	30
		-refinery liquor treatment. M. C.	
		Bennett <i>et al.</i> .....	183, 221, 325
		-- W. B. Hill. (Abs.).....	230
		-syrup and massecuite treatment.	
		Swaziland: cane leaf sucker control.	
		A. J. M. Carnegie. (Abs.).....	18
		-soil nutrients. J. H. Meyer <i>et al.</i> ...	206
		-sugar exports 1972. (Brev.).....	327
		-- industry. Anon. (Abs.).....	115
		-- labour shortage. (Brev.).....	64
		-Sweden sugar imports and exports 1972	326
		-Switzerland sugar imports 1972. (Brev.)	191
		-Syria sugar imports 1972. (Brev.)..	399
		-Syrup: blending. V. D. Smith. (Pat.)	29
		-Brix automatic control. A. M.	
		Bunyak <i>et al.</i> (Abs.).....	288
		-- measurement. V. Valter <i>et al.</i> ...	121
		-colour removal by hydrogenation. S.	
		Iwashina and T. Nagasaka. (Abs.)	356
		-manufacture. Tate & Lyle Ltd.....	228
		-non-sugars and cane molasses pol.	
		D. L. N. Rao <i>et al.</i> (Abs.).....	89
		-pan feeding. E. Lobato L. (Abs.)..	352
		-storage in Venezuela. E. M. Hine	116
		-sugar crystal coating. P. L. Veltman	
		<i>et al.</i> (Pat.).....	124
		-viscosity reduction. (T.N.).....	157
		-see also Juice, Beet; Liquid sugar and	
		Refining	
		<b>Tablet sugar manufacture. C. P.</b>	
		Graham <i>et al.</i> (Pat.).....	229
		<b>Taiwan: bagasse board, paper and</b>	
		pulp manufacture. P. C. Kwan	
		and C. S. Lu. (Abs.).....	154
		-cane borer control. T. H. Su and	
		C. J. Liang. (Abs.).....	177
		-- cleaning. C. C. Chow. (Abs.)..	352
		-- diseases. H. T. Chu. (Abs.).....	177, 314
		-- L. S. Liu and W. H. Hsieh.....	79
		-- flowering control. P. C. Yang <i>et al.</i>	210
		-- handling at Taichung. L. S. Kuo	53
		-- insect pest control. Y. P. Yu....	177
		-- irrigation. C. J. Hu and S. M.	
		Lee. (Abs.).....	80
		-- J. F. Williams. (Abs.).....	79
		-- leaf blight resistance. L. S. Liu	
		and W. H. Hsieh. (Abs.).....	142
		-- mechanical harvesting. Anon..	209
		-- pests. Y. S. Pan <i>et al.</i> (Abs.)..	79
		-- planter trials. S. T. King. (Abs.)	210
		-- smut. L. S. Liu. (Abs.).....	384
		-- L. S. Liu and W. S. Teng. (Abs.)	312
		-- varietal and fertilizer experiments.	
		C. C. Tse <i>et al.</i> (Abs.).....	51
		-diseases resistance testing of Hawaiian	
		cane varieties. C. A. Wismer....	349
		- evaporator explosions. Y. C. Yen	
		and K. W. Pi. (Abs.).....	21
		-fertilizers. Anon. (Abs.).....	345
		-- W. H. Lee. (Abs.).....	346
		-- C. C. Wang. (Abs.).....	345
		- <i>Mogannia hebes</i> fungal parasites.	
		L. S. Liu and Z. N. Wang. (Abs.)	18
		-- "no-plough" cane farming. Anon..	210
		-pig breeding. C. C. Catanooan. (Abs.)	211
		-rainfall distribution and cane irriga-	
		tion. H. Chang. (Abs.).....	79
		-rats. B. Y. Wang. (Abs.).....	79
		-raw sugar filtrability. S. L. Sang..	21
		-- improvement. J. H. Chen.....	115
		-sugar exports. (Stat.).....	264
		-- factory modernization. Y. P. Yu	21
		-- industry changes. J. F. Williams	21
		-weather and cane growth. W. H.	
		Tung. (Abs.).....	50

# INDEX

	PAGE
Tanzania: cane white scale insect.	18
D. W. Fewkes. (Abs.).....	319
DDS cane diffuser performance. G. van der Wolf. (Abs.).....	358
new sugar factory. (Brev.).....	160
sugar expansion plans. (Brev.).....	400
- production 1972. (N.C.).....	234
Tate & Lyle Ltd.: centrifugal drives modernization. (Brev.).....	62
cube sugar factory closure in Nigeria dextrose factory. (Brev.).....	232
report 1972. (N.C.).....	130
Thailand: gear orders. (Brev.).....	158
International Sugar Agreement.....	2, 161
new sugar factories. (Brev.).....	360
sugar exports 1972.....	96, 191, 328
Toft Bros Industries Ltd. report 1971/72. (Brev.).....	263
Tongaat Group Ltd. report 1972/73.....	295
Trade Notices: Actuated Controls Ltd. Allied Colloids Manufacturing Co. Ltd.....	30
Amalgamated Power Engineering Ltd.....	157
Anacon Inc.....	358
ASEA (Great Britain) Ltd.....	157
W. & T. Avery Ltd.....	126
T. T. Boughton & Sons Ltd.....	261
Braunschweigische Maschinenbauanstalt.....	398
Gehr. Claas Maschinenfabrik GmbH Conveyancer Ltd.....	126
Ditmar Zonen N.V.....	62
Electromagnets Ltd.....	262
Euronikan AB.....	94
Ewart Chainbelt Co. Ltd.....	398
Fabcon International Inc.....	94
Hindle Valves Ltd.....	262, 358
Hiro Zoki Co. Ltd.....	158
Hodag Chemical Corp.....	189
F. A. Hughes & Co. Ltd.....	30, 157
KDG Instruments Ltd.....	230
Kina Engineering Ltd.....	94
Masey-Ferguson (Export) Ltd.....	30
Mirreles Watson Co. Ltd.....	358
Muir-Hill.....	30, 95, 358, 398
Fermuth Co. Ltd.....	230
Folmex Cokoy.....	62
Portosilo Research Ltd.....	262
Renold Ltd.....	62
Rohm and Haas Co.....	95, 358, 398
Rotatools (U.K.) Ltd.....	62, 95
Shell International Chemical Co. Ltd. A. & W. Smith & Co. Ltd.....	398
Speed-O-Klene Equipment Co. Ltd. Stord Bartz Industri A/S.....	30, 95
Soc. Sucrière d'Etudes et de Conseils S.A.....	158
Sugar Manufacturers' Supply Co. Ltd.....	230
Televa.....	262
Toft Bros Industries Ltd.....	261
Volvo BM AB.....	93, 157
Weylode Engineering Ltd.....	158
VEB Carl Zeiss Jena.....	189
Tramp: iron separation. Anon. (Abs.) - metal detector. (T.N.).....	261
Transport, Beet: cart. H. D. Harris. load weighing. (T.N.).....	188
in Poland. H. W. Byszewski. (Abs.) - S. Zagrodzki. (Abs.).....	189
US. F. B. Russell. (Abs.).....	214
Transport, Cane. (T.N.).....	87, 354
J. C. van Groenigen. (Abs.).....	385
in Australia. G. A. Willis. (N.B.) cart unloading. (T.N.).....	157, 158
infield. E. H. Churchward and R. M. Belcher. (Abs.).....	211
in Mexico. C. Ruiz G. (Abs.).....	278
Philippines. L. M. Arceo. (Abs.).....	248
railway in Australia. A. K. Roseler and R. N. Mazlin. (Abs.).....	281
- scheduling. E. E. Shepherd and R. A. James. (Abs.).....	281
self-loading trailer. (T.N.).....	398
in West Indies. Anon. (Abs.).....	304
Transport, Sugar: crystal damage. S. A. Brennan and N. K. Kudrayatseva. (Abs.).....	221
load weighing. (T.N.).....	189
road tanker pneumatic discharge. V. I. Bereznyak. (Abs.).....	117
see also Bulk transport	
Trinidad: bagasse board manufacture. R. Hoesli. (Abs.).....	154
cane loader trials. (Brev.).....	95
- mechanization. Anon.....	305
Caroni Ltd. (N.C.).....	2, 130
centrifugals. (T.N.).....	30, 95
new cane varieties. (Brev.).....	399

	PAGE
Trinidad: sugar exports 1972. (Brev.).....	190
- production 1972.....	32, 234
Tubes: steam flow and diameter calculation. P. M. Fabregat. (Abs.).....	350
water jet cleaning equipment. (T.N.) see also Scott.....	232
Turkey sugar exports 1972. (Brev.).....	296
Union of Soviet Socialist Republics: beet production 1972/73. (Brev.).....	191
- 1973/74. (Brev.).....	380
new sugar factory. (Brev.).....	231
sugar factory losses. F. N. Dobronravov and M. Barko. (Abs.).....	232
- imports and exports.....	194, 232
- production prospects. (N.C.).....	298
- trade agreement with Cuba. (Brev.) United Kingdom: beet agriculture. G. H. Battle. (Abs.).....	64
- and fertilizer usage. A. P. Draycot and D. C. Thomson.....	350
- area expansion.....	286
- damage by nematodes. E. B. Brown and G. B. Sykes. (Abs.).....	31, 286
- harvesters. Anon. (Abs.).....	114
- harvesting losses. G. L. Maughan - pests. F. G. W. Jones and R. A. Dunning. (N.B.).....	146
- pulp animal fodder consumption. R. J. Burt. (Abs.).....	385
- spring work demonstration. Anon. - varietal trials. L. A. Willey. (Abs.).....	186
bulk handling company. (Brev.).....	232
- name change. (Brev.).....	126
dextrose manufacture. (Brev.).....	126
EEC membership and British Commonwealth sugar. (N.C.).....	358
- S. N. Girwar. (N.B.).....	97, 161, 255
Fives Lille-Cail associate company. microbiology courses. (Brev.).....	95
soil treatment with lime. J. Tupper steam turbines. (T.N.).....	127, 281
Sugar Board distribution payments. 1, 64, 66, 190, 264	358
- imports and exports 1972.....	100, 227
- industry future structure.....	96, 297, 362
- production 1972/73.....	100, 298
- refining price margin. (N.C.).....	66
see also British Sugar Corporation Ltd.; Fletcher and Stewart Ltd. and Tate & Lyle Ltd.	
United States of America: beet area reduction. (Brev.).....	160
- leaf spot. F. B. Russell. (Abs.).....	285
- processing quality. F. W. Snyder California, Crockett refinery cube sugar press. J. Shpak and D. M. Hunn. (Abs.).....	284
cane pest biological control. L. J. Charpentier et al. (Abs.).....	221
- sugar production 1972/73. (Brev.) - varietal decline and soil micro-organisms. S. M. Yang. (Abs.).....	326
- performances. M. J. Giamalva Colorado, American Beet Sugar Institute. (Brev.).....	149
Florida, bagasse press operation. F. Cordovez. (Abs.).....	42
- Canal Point Cane Field Station. L. P. Hebert. (Abs.).....	31
- cane crossing. N. I. James and J. D. Miller. (Abs.).....	141
- diseases. B. A. Bourne. (Abs.) - and Louisiana sugar industries. Anon. (N.B.).....	377
- rat control. H. H. Samol. (Abs.) - damage. H. H. Samol. (Abs.).....	19
- sugar industry. J. N. Fairbanks Great Western Sugar Co. sold. (Brev.) Illinois new refinery. (Brev.).....	216
Iowa sugar factory closure. (Brev.) Louisiana Agricultural Experiment Station. S. J. P. Chilton. (Abs.).....	296
- animal fodder factory. (Brev.) - cane agriculture. R. S. Kanwar - borer control. S. D. Hensley.....	141
- damage. L. J. Charpentier et al. (Abs.).....	232
- predators. A. A. Negm and S. D. Hensley. (Abs.).....	17
- cleaning. Anon. (Abs.).....	245
- cultivation numbers and yield. R. Ricaud. (Abs.).....	16
- handling by Supple system. Anon. (Abs.).....	113
- insect control. Anon. (Abs.).....	15
- mosaic control. Anon. (Abs.).....	176
245	209

	PAGE
United States of America: Louisiana cane ratoon stunting. R. J. Steib - control. Anon. (Abs.).....	48
- D. M. Tantera and R. J. Steib - red rot control. L. Anzalone.....	378
- varieties. Anon. (Abs.).....	49
R. J. Steib et al. (Abs.).....	142, 383
- Florida-Hawaii sugar manual. A. C. Bloomquist. (N.B.).....	254
- Gramercy refinery liquor decolorization. W. R. Tison et al.....	221
- Houma Cane Field Station. E. V. Abbott. (Abs.).....	141
- nematode control. Anon. (Abs.).....	49
- rain and cane harvesting difficulties. L. L. Lauden. (Abs.).....	204
- Southdown Inc. operations. Anon. - sugar factory closures. (Brev.).....	183
- performance. F. A. Graubnard. (Abs.).....	327, 399
- industry. G. J. Durbin. (Abs.) Michigan beet transport. F. B. Russell. (Abs.).....	116
- soil sampling. J. C. Schickluna.....	216
- testing. L. S. Robertson and E. G. Doll. (Abs.).....	385
new beet sugar factories. (Brev.).....	385
New Mexico beet leaf spot. E. P. van Arsdel et al. (Abs.).....	192
New York new refinery. (Brev.).....	145
- Sugar Trade Laboratory. W. W. Binkley. (Abs.).....	159
North Dakota new sugar factory. raw sugar imports quality standards. A. H. Hinfola. (Abs.).....	122
Sugar Act. Anon. (N.B.).....	158
- supply quotas 1972.....	222, 393
- 1973.....	2, 93, 64
298, 330, 360, 362, 400	31
Technical Session on Cane Sugar Refining Research 1972.....	145
Texas beet leaf spot. E. P. van Arsdel et al. (Abs.).....	21
- sorghum agriculture and processing. A. Gonzalez G. (Abs.).....	177
- trials. W. R. Cowley and B. A. Smith. (Abs.).....	150
Utah beet payment. T. G. Meyer.....	47
world cane variety collection. R. E. Coleman. (Abs.).....	57
- raw sugar control. Anon. (S.B.) see also Anstuar Corp. and Hawaii Upper Volta cane smut. H. Barat.....	313
Uruguay Calnu sugar factory. G. F. Lodi. (Abs.).....	319
Valves. (T.N.).....	158
Varieties, Beet: bolting. L. A. Willey leaf spot resistance testing. E. G. Ruppel and J. O. Gaskill. (Abs.) monogram. J. Christmann. (Abs.) physical property differences and diffusion. K. Ukov. (Abs.).....	213
processing quality. A. Graf. (Abs.) in Spain. R. J. Alvarez. (Abs.).....	218
storage losses, effect of nitrogen fertilizer. R. E. Wyse and S. T. Dexter. (Abs.).....	214
- marc content changes. R. E. Wyse and S. T. Dexter. (Abs.).....	213
- temperature and chemical composition. R. E. Wyse and S. T. Dexter. (Abs.).....	90
trials in Belgium. N. Rousset et al. - U.K. L. A. Willey. (Abs.).....	213
virus yellows tolerance. G. I. Mink see also Beet breeding Varieties, Cane: in Australia. Anon. (Abs.) 50, 316, 344	176
- N. J. Kling. (Abs.).....	176
bagasse and pulp composition. E. Battle and J. A. Espinosa. (Abs.) B.O.14 optimum crushing period. S. C. Sharma and N. S. Gupta.....	174, 224
borer resistance. V. C. S. Chang.....	83
- G. R. Coburn and S. D. Hensley in Brazil. G. M. Azzi. (Abs.).....	349
- W. Carneiro. (Abs.).....	16
chemical ripening tests. H. R. Julien and G. McIntyre. (Abs.).....	82, 346
chlorotic streak resistance. C. Ricaud. (Abs.).....	82
Co 312 yield correlations. B. V. Singh and A. S. Sangha. (Abs.).....	49
Co 419 grassy shoot susceptibility. J. A. Gumaste. (Abs.).....	110
Co 1053. K. C. Mishra and K. C. Panda. (Abs.).....	83
- K. G. Panda et al. (Abs.).....	211
379	379



# INDEX

Varieties, Cane:	PAGE	Varieties, Cane:	PAGE	Water:	PAGE
Co 1148 and borer attack. Y. P. Madan. (Abs.).....	210	in Réunion. J. Fritz. (Abs.).....	317	centrifugal wash water requirements calculation. E. Benz. (Abs.)....	288
Co 1336. R. L. Bhoj and P. C. Kapoor	141	root development in India. O. P. Negi <i>et al.</i> (Abs.).....	15	consumption by Polish sugar factories. K. Skalski. (Abs.).....	181
Co 6304. K. V. Daniel <i>et al.</i> (Abs.)	248	smut susceptibility. N. B. Shaikh and V. V. Shingte. (Abs.).....	318	determination. (T.N.).....	121
Co 6808. S. N. G. Rao and S. C. Sharma. (Abs.).....	83	selection for seed production. M. Pineda L. (Abs.).....	83	- in molasses. V. Falter <i>et al.</i> .....	121
Co 6811. S. S. Khanna <i>et al.</i> (Abs.)	145	sett storage and germination. D. M. Broadhead. (Abs.).....	110	- raw sugar. N. R. Piper.....	74
Co L9. C. N. Babu <i>et al.</i> (Abs.).....	379	smut resistance. V. Dattaraj <i>et al.</i>	313	- refined sugar. L. I. Kon <i>et al.</i> ...	59
dextrose:levulose ratio differences.	184	- G. L. James. (Abs.).....	312, 382	effect on cane growth. Anon. (Abs.)	281
J. E. Irvine. (Abs.).....	207	- L. S. Leu and W. S. Teng. (Abs.)	312	- coated beet seed germination.	250
disease susceptibility in Réunion. F. Léoville. (Abs.).....	207	- J. P. S. L. Netto. (Abs.).....	377	factory air moisture reduction. B. Bissinger. (Abs.).....	150
drought resistance. M. Lakshmikantham <i>et al.</i> (Abs.).....	344	sugar accumulation. P. D. Bajpai and R. C. Tripathi. (Abs.).....	342	- economy, effect of continuous beet diffusion. J. Hercik. (Abs.).....	321
end-of-row vs. in-row cane growth.	51	- L. A. Rossler and P. K. Moberly	173	hardness effect on cane juice and molasses. I. Talib and Z. Said. . . . .	54
exchange and disease protection.	47	- content in Australia. Anon. (Abs.)	316	jetting equipment. (T.N.).....	230
C. G. Hughes. (Abs.).....	47	trials in India. C. N. Babu and P. Sankaranarayanan. (Abs.).....	343	in raw sugar. US refiners' standards.	222, 393
- and quarantine. G. M. Thompson	47	- P. P. Singh and K. Singh. (Abs.)	112	A. H. Hihola. (Abs.).....	381
- and J. Wilson. (Abs.).....	110	- Jamaica. Anon. (Abs.).....	80	in sugar, effect on bulk storage. J. Mather. (Abs.).....	219
fertilizer trials in Ghana. Y. Tweneboah. (Abs.).....	51	- Mauritius. P. Halais and G. Rouillard. (Abs.).....	80	treatment. (T.N.).....	149
Fiji disease resistance testing. A. A. Husain and P. B. Hutchinson. . . . .	176	- J. A. Lalouette and L. C. Y. L. S. Chong. (Abs.).....	80	- by hydrocyclohex. H. J. Delavier	62
fodder cane in Australia. N. J. King	176	- Philippines. A. M. Galvez <i>et al.</i> ...	399	- reverse osmosis. (T.N.).....	285
frost resistance. J. E. Irvine. (Abs.)	174	- Trinidad. (Brev.).....	378	vapour transfer from beet leaf. P. V. Biscoe. (Abs.).....	284
tolerance. O. Singh <i>et al.</i> (Abs.)	49	US. Anon. (Abs.).....	142, 383	see also Brix; Drying; Irrigation; Milling; Cane; Soil and Weather	119
grassy shoot susceptibility. G. K. Zende and N. B. Shaikh. (Abs.)	81	wilt resistance. D. S. Bhatti and J. S. Chohan. (Abs.).....	247	Water, Waste: ammonia, COD and oil determination. K. P. Goncharova <i>et al.</i> (Abs.).....	289, 393
gummosis susceptibility in Mauritius.	349	world collection. R. E. Coleman. . . . .	175, 280	beet flume and wash water sugar determination. J. E. T. Oldfield <i>et al.</i> (Abs.).....	289, 393
C. Ricard. (Abs.).....	112	yellow spot resistance. B. T. Egan	213	- water sugar determination. W. Uhlenbrock. (Abs.).....	395
Hawaiian varieties disease resistance testing in Fiji and Taiwan. C. A. Wismer. (Abs.).....	112, 213	yield decline, effect of soil micro-organisms. S. M. Yang. (Abs.)	49	- - - treatment. L. Vokounová. . . . .	320
herbicide effects. Anon. (Abs.).....	248	- reduction by raton stunting disease. R. J. Steib and S. J. P. Chilton. (Abs.).....	376	- pulp removal. (T.N.).....	126
- tolerance. S. Y. Peng. (Abs.).....	316	see also Cane breeding	204	BOD. G. Coutoux and J. N. Morlaux	121
- S. Y. Peng and H. J. Yeh. (Abs.)	174	Venezuela: cane mechanization. Anon.	204	- K. Skalski. (Abs.).....	181
high-yielding, fertilizer requirements.	151	- syrup storage. E. M. Hine. (Abs.)	314	cane sugar factory. D. R. Parashar	116
K. Kar and P. D. Bajpai. (Abs.)	348	fertilizer trials. L. G. Segura. (Abs.)	204	condenser and press water proportioning with beet cossettes. A. B. Gusakov and S. P. Gotskii. (Abs.)	254
- K. Kar. (Abs.).....	342	irrigation. Anon. (Abs.).....	95, 130, 159	- - - treatment with aluminium sulphate for diffusion.	391
- S. K. Ojha <i>et al.</i> (Abs.).....	342	new sugar factory.....	30	Liptets and I. A. Oleinik. . . . .	389
- M. R. Pataskar <i>et al.</i> (Abs.).....	51	Rio Turbio sugar factory. (T.N.).....	234	- micro-organisms. V. Z. Nakhodkina. (Abs.).....	122
- G. K. Zende. (Abs.).....	377	sugar industry. P. E. Sequera. (Abs.)	234	- treatment for beet diffusion. S. Zagrodzki. (Abs.).....	321
irrigation response differences. Y. T. Chang. (Abs.).....	249	Venertide HVA Mij. N.V. report 1972	319	H. Schiweck <i>et al.</i> (Abs.).....	396
L 65-69. Anon. (Abs.).....	142	Vietnam, North. Van Diem sugar factory. S. Gielzycki. (Abs.).....	394	disposal by irrigation. L. L. Rennie	388
- L. Lauden. (Abs.).....	245	Vinasse, see Distillery waste	354	- at refineries. P. F. Meads <i>et al.</i> ...	355
leaf blight resistance. L. S. Leu and W. H. Hsieh. (Abs.).....	111	Viscosity: beet molasses, effect of sulphate and sulphite ions. L. D. Bobrovnik <i>et al.</i> (Abs.).....	394	drain water jetting equipment. (T.N.)	230
- - - H. Kolke. (Abs.).....	245	- norm establishment. N. P. Silin and E. L. Lyakhtsik. . . . .	394	French pollution curb undertaking. mineral oil determination. M. Marounek. (Abs.).....	222
losses after scheduled maturity.	111	- - - rheological properties. D. H. Smolnick and H. J. Delavier	394	pollution in Taiwan. Y. P. Yu. (Abs.)	21
R. S. Chowdappan and A. Mariakulandai. (Abs.).....	245	cane molasses rheological properties. S. Bhattacharyya <i>et al.</i> (Abs.).....	148	press water spray heating for diffusion. V. M. Rosinski <i>et al.</i> (Abs.)	391
maturity times. F. O. Brieger. . . . .	249	liquid sugar mixtures. C. Krüger and W. Stimmmeizer. (Abs.).....	218	reduction. R. E. Bickle. (Abs.).....	148
mechanical harvesting and irrigation effects. L. K. Izatt. (Abs.).....	384	massecuite. M. Otalora B. (Abs.)	54	- G. G. Ashe. (Abs.).....	86
- requirements. H. P. Hunnort	144	- measurement in boiling. H. Thiele <i>et al.</i> (Pat.).....	229	- R. Beeltz. (Abs.).....	87
mosaic resistance testing. J. Dick	348	- and molasses, effect of calcium magnesium aconitate. A. W. MacGillivray. (Abs.).....	184	- A. Canuti and P. V. Baldacci. . . . .	149
- smut and streak disease reaction.	109	- reduction with surface-active agent. (T.N.).....	157, 355	- L. A. Chernyi. (Abs.).....	150
G. M. Thomson. (Abs.).....	210	- - - T. P. Saxena <i>et al.</i> (Abs.).....	385	- J. Hercik. (Abs.).....	321
N-Co 310 and Fiji disease in Australia.	80	- - - N. R. Twaite. (Abs.).....	254	- F. Kastner. (Abs.).....	321
B. T. Egan. (Abs.).....	381	- - - in boiling. O. Krieger and I. Ostlek. (Abs.).....	288	- A. P. Lepin and I. H. Favard	392
- irradiation. Anon. (Abs.).....	382	refinery molasses. R. Wilkes and R. P. Jennings. (Abs.).....	184	adze. (Abs.).....	320
nitrogen application and yields. O. Singh and B. P. Singh. (Abs.).....	152	sucrose solution. G. Pidoux. (Abs.)	322	- E. Mariani. (Abs.).....	392
- requirements in Mauritius. P. Halais and P. Nababsing. (Abs.)	208	sugars solutions. R. S. Burdukovs <i>et al.</i> (Abs.).....	217	- D. R. Parashar. (Abs.).....	20, 253
non-flowering varieties. R. Julien	144		115	- F. Schlanitz. (Abs.).....	255
numicia incidence. A. J. M. Carnegie	142		255	- J. P. Thomas and W. A. Sackett	182
optimum harvest dates. J. M. Gosnell and M. J. P. Koenig. (Abs.)	208		51	- with algae. V. N. Yuzvova. (Abs.)	23
in Pakistan. S. Fashi. (Abs.).....	111		51	- Z. D. Zhuravleva and K. P. Goncharova. (Abs.).....	390
performance in India, effect of weather. T. R. Srinivasan <i>et al.</i>	204		349	- and re-pollution. N. F. Ermolov and V. G. Zamanaev. (Abs.)	392
- Philippines. M. A. Tetaneco <i>et al.</i>	143		205	- by hydrocyclohex. H. J. Delavier	149
- U.S. M. J. Gianava. (Abs.).....	48		376	- microbiology course. (Brev.).....	127, 231
phosphate application and clarification.	318		376	- and reduction. B. S. Rao. (Abs.)	253
S. S. Garrucho and J. L. T. Raminantant. (Abs.).....	317		312	- for saponin removal. S. Zagrodzki and A. Kurkowska. (Abs.).....	255
- contents. M. A. A. Cesar <i>et al.</i>	246		312	Wax, Cane: ash removal. K. K. Nigam and A. C. Raha. (Abs.).....	123
in Portuguese East Africa. A. P. de S. Cardoso. (Abs.).....	281		312		
processing quality in Brazil. G. E. Serra <i>et al.</i> (Abs.).....	278		312		
Q 86. C. D. Jones. (Abs.).....	248		312		
Q 94. Anon. (Abs.).....	111		312		
- and Q 95. Anon. (Abs.).....	204		312		
rain and harvesting difficulties. L. L. Lauden. (Abs.).....	144		312		
ratonon stunting disease effects. Anon.	143		312		
- G. M. Thomson. (Abs.).....	48		312		
- tolerance. R. J. Steib. (Abs.)	318		312		
red rot resistance. K. Kar <i>et al.</i> (Abs.)	173		312		
- determination. A. K. Verma <i>et al.</i> (Abs.).....	317		312		
- stripe resistance. J. Delgado and M. Abarea. (Abs.).....					

# INDEX

	PAGE		PAGE
Wax, Cane: extraction from filter cake and properties. E. O. de la Cuesta and R. Samanigo. (Abs.)	27	Weeds: chemical control. K. Kar.	379
Weather: air humidity and cane red rot. C. Ricard. (Abs.)	313	-- G. McIntyre. (Abs.)	82
-- and temperature and cane yellow spot. T. Sreeramulu <i>et al.</i>	315	-- J. F. Niederer. (Abs.)	285
cane damage by drought and flood in India. D. M. Papat. (Abs.)	208	-- G. K. Patro <i>et al.</i> (Abs.)	314
-- frost in Pakistan. O. d'Hotman	145	-- S. Y. Peng. (Abs.)	209
-- lightning. Anon. (Abs.)	173	-- J. Pichenez and D. Guiraud.	178
-- field micro-climate. W. H. Tung	79	-- M. V. Sant and V. S. Mane.	342
cyclone and drought insurance in Mauritius. Anon. (Abs.)	204	-- R. R. Schmidt and L. Bue.	173
data application to irrigation scheduling. L. M. Arceo. (Abs.)	82	-- E. E. Schweizer. (Abs.)	212
drought in Australia. B. Gordon.	279	-- E. F. Sullivan. (Abs.)	284
-- Brazil. (Brev.)	192	-- J. G. Swallow. (Abs.)	178
-- Canada and beet seed germination. Anon. (Abs.)	52	-- O. S. Ugaz and P. J. Espinoza	315
-- effect on cane. A. Maretzki <i>et al.</i>	344	-- P. H. Vahlsing. (Pat.)	61
-- leaf abscisic acid. B. H. Mosi.	315	-- advisers in UK. N. W. Turner	252
-- processing. E. Batule D.	147	-- and beet injury. J. H. Dawson	284
-- M. N. Gokhale. (Abs.)	253	-- seed germination. A. E. Depeyre and P. A. Sement	88
-- and growth. H. A. Naqvi and R. ul-Qayyum	168	-- yield. W. R. Schäufele and C. Winner. (Abs.)	350
-- and cold effects on cane sugar content. Glover. (Abs.)	205	-- and cane leaf chlorosis. F. S. de Almeida. (Abs.)	247
-- and rain effects on cane in India. T. R. Srinivasan <i>et al.</i> (Abs.)	208	-- alquidity. P. Agrawal and N. K. Jain. (Abs.)	110
-- resistance mechanism. M. Lakshmilantham <i>et al.</i> (Abs.)	344	-- shoot growth. M. Ikeda and N. Inoue. (Abs.)	247
effect on beet processing quality. A. Graf. (Abs.)	218	-- in drains. Anon. (Abs.)	173
-- yield in Ireland. J. Lee and C. K. Comerford. (Abs.)	385	-- economics. A. Velasco P. (Abs.)	83
-- cane agriculture in India. J. R. Kakde. (Abs.)	210	-- effect of drought. Anon. (Abs.)	52
-- borer activity. G. Varadharajan <i>et al.</i> (Abs.)	317	-- moisture. L. L. Herweyer.	251
-- flowering. J. P. Rao <i>et al.</i>	241	-- herbicide. (T.N.)	398
-- nitrogen response. Anon. (Abs.)	112	-- CIBA-Geigy AG. (Pat.)	61
-- rust incidence. N. B. Shaikh and V. V. Shingte. (Abs.)	318	-- R. V. Osgood. (Abs.)	376
-- yellow spot incidence. B. T. Egan. (Abs.)	280	-- application with beet seed. J. Christmann. (Abs.)	52
-- yield in India. J. Lee and C. K. Comerford. (Abs.)	176	-- calculation. E. G. Spry. (Abs.)	278
-- sugar production in West Indies flooding and cane burning. J. Wright	348	-- cane response. Anon. 112, 113, 283	248
-- frost cane varietal tolerance. O. Singh <i>et al.</i> (Abs.)	174	-- S. Y. Peng. (Abs.)	248
-- effect on beet losses. R. Bergkvist	118	-- S. Y. Peng and H. J. Yeh	316
-- rain effect on cane borer incidence. V. G. Rajani and P. Nath. (Abs.)	377	-- effect of surface-active agent. Anon. (Abs.)	282, 383
-- harvesting. L. L. Laudon.	204	-- F. E. Richardson. (Abs.)	381
-- yield. B. J. White. (Abs.)	279	-- and cicada parasitic fungi. P. Y. Wang and L. S. Leu	347
-- sugar production in Tanzania.	234	-- doses. J. Fernandes. (Abs.)	378
-- and herbicide effect. L. L. Herweyer. (Abs.)	251	-- effect on urea nitrification. J. Leidenman <i>et al.</i> (Abs.)	246
-- nitrogen effects on cane yield. F. A. Fogliata and R. A. Dip.	32, 246	-- mixture water content. E. Löcher. (Abs.)	215
-- stimulation by cloud seeding. E. Hughes. (Abs.)	382	-- phytotoxicity. B. M. Savory	195
-- in Taiwan. H. Chang. (Abs.)	79	-- spraying. R. A. Fogg. (Abs.)	251
-- and temperature effects on cane growth. W. H. Tung. (Abs.)	50	-- H. T. Hearn. (Abs.)	252
-- smut. V. Durairaj <i>et al.</i> (Abs.)	313	-- in intercrops. W. B. Sze. (Abs.)	79
-- yield in Jamaica. Anon. (Abs.)	112	-- ss. manual control costs. G. M. Azzl. (Abs.)	377
-- in Réunion. Anon. (Abs.)	344	couch grass control. J. H. Armstrong	252
temperature effect on beet seed germination. L. E. Francois and J. R. Goodin. (Abs.)	286	<i>Eupatorium odoratum</i> control. Anon.	282
-- cane growth. J. C. Mongelard	349	grasses and cane yellow spot survival. T. Sreeramulu <i>et al.</i> (Abs.)	315
-- J. C. Mongelard and L. Mimura. (Abs.)	245	-- chemical control. Anon.	204, 283, 317
wind protection and beet yield. K. W. Brown and N. J. Rosenberg. (Abs.)	251, 285	-- F. E. Richardson. (Abs.)	207
Weeds: cane mosaic vector infestation. K. M. Lal and K. S. Bhargava.	383	-- effect of biennial harvesting. F. A. J. Leonardi <i>et al.</i>	248
chemical control. Anon.	112, 214, 378	-- and leaf scald transmission. Anon. (Abs.)	282, 316
-- J. L. Ahle. (Pat.)	346	growth, effect of "no-plough" farming. Anon. (Abs.)	210
-- R. A. Arevalo. (Abs.)	346	Johnson grass control, effect of cane cultivation number. R. Ricard.	15
-- M. Botbeter-Matibet <i>et al.</i>	346	-- mosaic virus transmission to cane. I. L. Forbes <i>et al.</i> (Abs.)	48
-- R. A. Fogg. (Abs.)	385	<i>Kochia scoparia</i> density and shading effect on beet yield. A. D. Dzozenko and A. L. Arp. (Abs.)	252
-- J. Garrido and A. J. Cortes.	251	Mexican clover and calopo in Australia. J. P. Usher. (Abs.)	175
-- H. W. Hilton. (Abs.)	349	pigeweed chemical control. W. C. Doyle and J. L. Ahle. (Pat.)	229
		Raoul grass control. Anon. (Abs.)	112
		St. Augustine grass and cane mosaic transmission. J. L. Saladini and F. W. Zettler. (Abs.)	384
		<i>Striga</i> in Portuguese East Africa. A. do R. Noronha. (Abs.)	247
		Weighers. (T.N.)	261
		beet and sugar loads. (T.N.)	189
		silol load cells. (T.N.)	262
		Weighing: beet cassettes. A. B. Gusakov and S. P. Gotskii. (Abs.)	117
		-- sugar and bagasse. H. Hirschmüller	393
		West Indies: Antigua sugar industry closure. (N.C.)	129
		-- St. Kitts cane mechanization. Anon.	305
		-- (London) Sugar Factory Ltd. report 1972. (Brev.)	191
		-- sugar production 1973. (Brev.)	400
		-- Sugar Association report 1972. (N.C.)	234
		-- technologists meeting. (Brev.)	190
		-- see also Barbados, Jamaica and Trinidad	
		White sugar: ash conductivity factor. I. E. de Castro and J. de O. Barbosa. (Abs.)	90
		bleaching additive. T. P. Sakseena <i>et al.</i> (Abs.)	54
		bulk storage. A. A. Ivanova <i>et al.</i>	354
		colorants separation. I. F. Bugaenko <i>et al.</i> (Abs.)	89
		colour and ash changes in storage. P. Devillers and J. Roger. (Abs.)	223
		-- Chatterjee. (Abs.)	26
		-- and SO <sub>2</sub> loss in storage. D. R. Parashar. (Abs.)	54
		-- measurement. S. K. D. Agarwal and R. C. Gupta. (Abs.)	323
		-- deteco-melt-phosphotation. A. C. Chatterjee. (Abs.)	388
		-- fluidized bed dryer/cooler. J. Mlynář	117
		-- humidity maintenance in storage. S. C. Gupta <i>et al.</i> (Abs.)	20
		-- invert sugar manufacture. R. N. Prince and A. O. Maylott. (Pat.)	188
		-- pneumatic conveying. V. I. Berznyak. (Abs.)	117
		-- quality, effect of double curing. P. Devillers <i>et al.</i> (Abs.)	222
		-- sulphur dioxide determination. S. L. Sang and W. C. Cheng. (Abs.)	26
		-- yield calculation. J. Dobrzycki.	118
		-- effect of boiling with surface-active additives. O. Krieger and I. Csilek. (Abs.)	288
		-- see also icing sugar; Refined sugar and Sugar	
		World: raw sugar price. (N.C.)	33, 65, 97, 104, 233, 297, 362
		-- sugar balance 1971/72. (N.C.)	1
		-- 1972/73. (N.C.)	65, 233, 266
		-- production 1972/73	33, 63, 98, 265, 294
		-- 1973/74	330, 359
		-- and price prospects. (N.C.)	97
		-- prospects 1973. (N.C.)	34
		-- and US raw sugar price. Anon.	57
		-- see also International	
		Yeast: animal fodder. O. Carrillo and M. C. Benavides. (Abs.)	224
		-- J. Guzmán. (Abs.)	224
		cultivation in bagasse fermentation gas. K. A. Aroj and K. A. Prabhu	290
		-- production. D. O. Fernández. (Abs.)	186
		-- on bagasse substrate. D. B. Batstone. (Abs.)	123
		-- from distillery waste. S. F. Lin.	27
		-- plant in India. (Brev.)	323
		-- Peru. (Brev.)	263
		-- Zaire. (Brev.)	360
		-- see also Alcohol and Micro-organisms	
		Yugoslavia: Boco centrifugal performance. (Brev.)	30
		-- sugar imports 1972. (Brev.)	82
		-- production 1972/73. (Brev.)	190
		Zaire yeast factory. (Brev.)	360
		Zambia: automatic centrifugal order.	30
		-- sugar production 1972. (Brev.)	128
		-- Zambia Sugar Co. Ltd. (N.C.)	130
		Zuckerwirtschaftliches Taschenbuch 1972/73. G. Janocha <i>et al.</i> (N.B.)	56

# INDEX

## NAMES

	PAGE		PAGE		PAGE
<b>A</b> APOLA, A. and MINK, G. I. Infection by virus yellows isolates. (Abs.)	215	ARCO, L. M. Cane damage by cicadas in Philippines. (Abs.)	110	BARNES, A. C. Cane analysis and sampling. (Abs.)	90, 141
ABARCA, M. see DELGADO, J.		Cane transport in Philippines. (Abs.)	248	BARNES, A. F. Beet harvester. (Pat.)	258
ABBOTT, E. V. Cane breeding in U.S.	141	Irrigation scheduling from meteorological data. (Abs.)	82	BAROCKA, K. H. <i>et al.</i> Nitrogen and plant density effects on beet. 250,	385
ABB, K. see SUGIYAMA, M.		ARDANA, B. Aligning rotary equipment axes. (Abs.)	54	BARRE, M. J. C. Beet or cane diffuser	228
ABOUKHALID, A. <i>et al.</i> Irrigation and beet yield. (Abs.)	251	AREN, P. K., see SHARMA, K. K.		BARRON, A. V. Bagasse furnace fly ash collection. (Abs.)	351
ABRAM, J. C. and WARREN, P. S. Bone char bulk density and performance index	235	AREVALO, R. A. Chemical weed control in Argentina. (Abs.)	346	BASHIR-UD-DIN, M., see FASHI, S.	
<i>et al.</i> Bone char decolorization and ash removal efficiency	201	ARLIDGE, E. Z., see CHAN, P. Y.		BASS, R. J. <i>et al.</i> Masecuite electrical resistance heating	10, 40
- Ion exchange resin adsorptive capacities. (Abs.)	90	ARMSTRONG, J. H. Couch grass control	252	see also HIGGINS, I. S.	
ABRAMCHUK, V. I. Filter suspension level regulation. (Abs.)	117	ARMSTRONG CORK CO., see HECKLES, J. S.		BASU, A. K. Boiler feedwater treatment and scale removal. (Abs.)	217
ACCOSSI, C. A., see MANTOVANI, G.		ARNOULD, R., see DEVUYST, A.		BATTELLE DEVELOPMENT CORP., see RANDOLPH, A. D.	
ACIN-DIAZ, N., see ALEXANDER, A. G.		AROI, K. A. and PRABHU, K. A. Yeast cultivation in bagasse fermentation gas. (Abs.)	290	BATLLE, E. and ESPINOSA, J. A. Bagasse and pulp composition from cane varieties. (Abs.)	174, 224
ACTIVIT N.V. Osmocon MII. Ion exchange treatment of sugar solution. (Pat.)	228	ARORA, S. C., see JHUNG, T. C.		BATSTONE, D. B. Bagasse utilization and Nix, K. J. Factory heat economy and evaporator sealing. (Abs.)	20
ADRIANSEN, O. Continuous vs. batch centrifugals. (Abs.)	389	ARP, A. L., see DOTZENKO, A. D.		see also LEDUNG, L. S.	
AGARWAL, S. K. D. and GUPTA, R. C. White sugar colour measurement	323	ARVIER, A. C. Gibberellic acid and cane stalk elongation. (Abs.)	281	BATTERHAM, R. J. <i>et al.</i> Automatic boiling control. (Abs.)	180
aid. Clarification with flocculation aid. (Abs.)	115	ASGHAR, K. A., see FASHI, S.		BATTLE, G. H. Beet agriculture in UK	350
- DDS diffuser performances. (Abs.)	387	ASH, D. E. Enviro-Clear clarifier performance. Oil-fired lime kiln. (Abs.)	170, 219	BATTLE, D. E. Cane deterioration after burning, mechanical harvesting and drought. (Abs.)	147
see also GUPTA, S. C.		ASHE, G. G. Entrainment reduction in evaporators and vacuum pans	86	BAYMA, C. Losses determination. (Abs.)	223
AGENCY OF INDUSTRIAL SCIENCE & TECHNOLOGY, see SUZUKI, H.		Waste water treatment. (Abs.)	86	Overhead irrigation. (Abs.)	204
AGRAWAL, J. P. and JAIN, N. K. Cane seeded and post-planting cultivation. (Abs.)	110	ASSALINI, G. and BRANDOLI, G. Beet juice ion exchange treatment. (Abs.)	119	Overhead vs. surface irrigation. (Abs.)	245
AGUIRRE, O. E. Power factor. (Abs.)	352	ASZTALOS, Z., see GJORGJEVI, E.		BELM, W. F. and MACGILLIVRAY, A. W. Sucrose determination in cane molasses. (Abs.)	184
AHL, J. L. Chemical weed control.	292	ATCHISON, J. E. Bagasse storage and paper and pulp production. (Abs.)	27	BEAUDOUX, P. E. Cane sampler. (Pat.)	397
see also DOYLE, W. C.		ATHAR, M., see KHAN, A. A.		BEAUVISAGE, M. Beet thick juice storage and post-campaign processing. (Abs.)	389
AHLFELD, H. P. O. Licht's Internationalen Zuckerwirtschaftliches Jahrbuch and Adressbuch 1972. (N.B.)	56	ATHERTON, P. G. Cane analysis. (Abs.)	20	BEHLITZ, R. Waste water treatment	387
AHLRICH, L. E., see PORTER, C. A.		Cane sugar factory equipment and performance in Queensland. (Abs.)	20	BEG, M. N. and BENNETT, F. D. Cane borer control in Bahamas. (Abs.)	16
AHMAD, N., see OJHA, S. K.		AWADALLAH, W. H., see ISA, A. L.		BEHL, K. L., see BABU, C. N.	
AHMED, H. Cane molasses destruction in storage. (Abs.)	20, 53	AZIZ, A. Boiler scale removal. (Abs.)	53	BEICHER, R. M., see CHURCHWARD, E. H.	
AHMED, N. J., see DURAIRAJ, V. and RAJA, K. T. S.		Clarification efficiency determination	185	BELK, V. G. <i>et al.</i> Level indicator for viscous materials. (Abs.)	181
AHINDINOV, I. N. Brax determination	153	Nematodes. (Abs.)	350	BELL, T. O. Molasses spraying on pasturage. (Abs.)	396
Low-grade masecuite crystallization and curing. (Abs.)	150	AZIZ, H. and SUND, K. A. Rat control in Iran. (Abs.)	19	BELOSOTSKI, L. G. and KOT, Y. D. VAMTS-600 vacuum pan. (Abs.)	219
Permissible masecuite purity and Brax calculation. (Abs.)	218	AZRIEVICH, M. Y., see EREMENKO, B. A.		and SHERSTOKYKI, V. A. Masecuite stirring and crystal growth in boiling. (Abs.)	22
AKSENOV, E. T. and KHARTOMENKO, V. F. Milk-of-lime treatment.	182	AZZI, G. M. Cane varieties in Brazil. Chemical vs. manual weed control costs. (Abs.)	32, 377	BELOUS, V. N. and ZAKHAROV, K. P. Ion exchange resin regeneration.	219
ALEXANDER, A. G. Cane juice inversion control. (Pat.)	397			BENAVIDES, M. C., see CARRELLO, O.	
<i>et al.</i> Cane juice inversion control.	26			BENAZET, G., see PERRO, P. R.	
ALEXANDER, K. C., see DAVID, H. and SINGH, K.				BENGA, G. T. C. Cane mosaic virus control. (Abs.)	48
ALEXANDER, K. E. F. Filter cake fertilizer contents. (Abs.)	383			Cane ratoon stunting and mosaic control. (Abs.)	211
ALLAN, G. N. and FITZGERALD, J. R. Sugar dust formation. (Abs.)	86			Mosaic susceptibility of heat-treated cane. (Abs.)	143
ALLEN, J. R. Sugar factory research in Australia. (Abs.)	387			BENNETT, F. D., see BRO, M. N.	
ALMAZAN, O. and RABELO, R. Dextran-sucrose production. (Abs.)	225			BENNETT, M. C. Colour removal with surface-active agent	183, 221, 325
ALSCOPE LTD., see MILLS, E. C.				and GARDINER, S. D. Aragonite precipitation in sucrose solution	260
ALTENBURG, M. E., see BINKLEY, W. W.				<i>et al.</i> Reining research. (Abs.)	355
ALVAREZ, R. J. Beet agriculture in Spain. (Abs.)	214			BENT, E. Masecuite analysis and run-off quantity calculations. (Abs.)	288
AMARO, K. Inorganic ions and liquor decolorization by bone char. (Abs.)	355			BEREZYAK, V. I. White sugar pneumatic conveying. (Abs.)	117
AMERICAN SUGAR CO. Clarifier. (Pat.)	226			BERGER, P., see HENSCHIED, T.	
see also GRAHAM, C. P.				BERGKVIST, R. Frost effect on beet losses. (Abs.)	118
AMPT, P. J. Cane damage by pigs in Australia. (Abs.)	348			BERNARD, A. M'Bandjock sugar factory/refinery. (Abs.)	386
ANAND, M. Cane milling. (Abs.)	216			BERSCH, J. W., see RHODES, L. J.	
Cane preparation for milling. (Abs.)	54			BERTI, M., see FASULO, M. P.	
Cane shredders. (Abs.)	115			BESSANT, D. V., see SHANN, J.	
Cane sugar factory technology in India. (Abs.)	53			BETANCOURT, A. F. Mechanical cane harvesting in Cuba. (Abs.)	53, 319
ANANTHANARAYANA, K., see DAVID, H.				BETBEDER-MATTHEB, M. <i>Yanga outfall-ata</i> cane pest in Malagasy Republic	18
ANDERSON, V. S., see WOODRUFF, E. T.				<i>et al.</i> Chemical weed control. (Abs.)	346
ANDERSON, R. E. Ion exclusion. (Abs.)	85			BHAGWAT, B. A., see MUKHERJI, J. P.	
see also RADER, J. E.				BHALAHOBI, V. M. Khandasari sugar yield. (Abs.)	287
ANDREEV, V. G., see GREBENYUK, S. M.				BHARGAVA, K. S. <i>et al.</i> Cane mosaic in India. (Abs.)	47, 313
ANDREWS, D. K., see GOMES, F. P.				see also LALI, K. M. and RIZVI, S. M. A.	
ANIKREV, Y. V. and ZAMBROVSKII, V. A. Die filter operation. (Abs.)	182			BHAT, N. S. Cane mill roller bearings for top roller free floating. (Abs.)	217
see also BOBROVNIK, L. D.					
ANTOINE, R. Cane intercropping. (Abs.)	207				
ANTOV, K., see VALTER, V.					
ANZALONE, L. Red rot control in cane seed pieces. (Abs.)	50, 281				
APPALARASIAH, P., see PRAKASAM, P.					

# INDEX

	PAGE		PAGE
BHATTI, I. S., see VERMA, A. K.		BROWN, J. Automatic control. (Abs.)	149
BHATTACHARYA, S. <i>et al.</i> Cane molasses rheological properties . . .	148	BROWN, A. H. D. <i>et al.</i> Mass cane selection. (Abs.) . . . . .	209
BHATTI, D. S. and CHOHAN, J. S. Cane with control. (Abs.) . . . . .	247	BROWN, C. R., see MEADS, P. F.	
see also SANDHU, S. S.		BROWN, E. B. and SYKES, G. B. Nematode damage in UK (Abs.) . . .	114
BHOJ, R. L. and KAPOOR, P. C. Cane intercropping with maize. (Abs.) . . .	314	BROWN, K. W. and ROSENBERG, N. J. Windbreaks and beet yield. (Abs.)	251, 285
— Co 1336 cane variety. (Abs.) . . .	141	see also KAR, K.	
see also KAR, K.		BRUYER, T. C., see EL-SHEIKH, A. M.	
BICHSEL, S. E., see LEVAD, J. A.		BRUHNS, G., see JANEBA, G.	
BICKLE, R. E. Evaporator entrainment reduction. (Abs.) . . . . .	148	BRULIN, J. and VANIS, M. Cane molasses organic acids. (Abs.) . . . . .	393
Waste water reduction. (Abs.) . . .	148	et al. Cane molasses exhaustion in South Africa. (Abs.) . . . . .	393
et al. ATV clarifier performance. . . .	179	BRUNICH-OISEN, H. DDS beet diffuser. (Abs.) . . . . .	181
BIEBER, H. Boiler selection. (Abs.) . . .	388	BRUNKE, H. Beet unloaders. (Abs.) . . .	391
BIESER, G. C. Split nitrogen applications and cane yield. (Abs.) . . . . .	270	BUCHANAN, E. J. Cane sugar recovery prediction . . . . .	299, 337
BINKLEY, W. W. Cane molasses brown-ing polymers structure. (Abs.) . . . . .	58	MASCHENFABRIK BUCKAU R. WOLF AG, see HEINRICH, K., LANGEN, E. and PATSKE, K.	
New York Sugar Trade Laboratory et al. Irradiation and browning reaction. (Abs.) . . . . .	122	BUCHANAN, E. K., see IVANOVA, A. A. BUDRAJA, T. R., see SINGH, K.	
223		BUGANJO, I. F. and MUHAMMAD, M. Iron ions in colorant formation. . . . .	322
BIRCHFIELD, W. Nematode control in Louisiana. (Abs.) . . . . .	49	— Melanolin formation from invert sugar. (Abs.) . . . . .	90
BIRD MACHINE CO. Mассuccite treatment by centrifugal. (Pat.) . . . . .	227	— Molasses colorants separation . . . . .	289
see also FERNEY, F. X.		— Temperature and alkalinity effects on colour formation in liming. . . . .	182
BISCO, P. V. Beet leaf water vapour transfer resistance. (Abs.) . . . . .	285	et al. White sugar colorants separation. (Abs.) . . . . .	89
BISHOP, R. W. Cane as animal fodder	61	BUKTOVA, L. P., see VOVK, G. A.	
BISSINGER, B. Factory air moisture reduction. (Abs.) . . . . .	150	BULL, R. M. Cane grub. (Abs.) . . . . .	380
BITNER, J. L., see DEITZ, V. R.		Cane leafhopper. (Abs.) . . . . .	280
BLACK, W. C. Massuccite crystallization. (Pat.) . . . . .	28	BUNNAGE, R. <i>et al.</i> Polarimeter effective wavelength. (Abs.) . . . . .	356
BLOOMQUIST, A. G. Gilmore Louisiana-Florida-Hawaii sugar manual 1971	24	BUNYAK, A. M. <i>et al.</i> Automatic Brix syrup control. (Abs.) . . . . .	288
BOBROVNIK, L. D. <i>et al.</i> Adsorption mechanism of calcium carbonate — Sulphite and sulphate ions effect on molasses viscosity. (Abs.) . . . . .	353	— Automatic clarification control. . . . .	218
394		BURBA, M. and HAUSE, E. Beet sampling. (Abs.) . . . . .	122
C. F. BOEHRINGER & SOEHNE GMBH., see LAUER, K.		and LURZ, E. Beet amino-nitrogen determination. (Abs.) . . . . .	352
BOGDANOV, S. A., see ZAGORUKO, A. Y.		and NITZSCHER, U. Beet citric, malic and ketoglutaric acid contents . . . . .	320
BOGER, D. V., see BHATTACHARYA, S. BOHAČENKO, I., see BRETSCHNEIDER, R.		BURDUKOV, R. S. <i>et al.</i> Sugars physical properties and dryers. (Abs.) . . . . .	322
BORODIN, L. A., see IVANOVA, A. A. BOROBYANSKI, V. P. <i>et al.</i> Beet pulp briquetting. (Abs.) . . . . .	225	BUREN, L. L. Cane response to gibberellic acid. (Abs.) . . . . .	376
BORODYANSKI, V. P. <i>et al.</i> Beet pulp briquetting. (Abs.) . . . . .	225	BURKS, J. and FRYDL, M. Raw sugar and molasses analysis. (Abs.) . . . . .	121
BOSB, S. <i>et al.</i> Boiler feed water treatment. (Abs.) . . . . .	115	BURGESS, I. G. R., see HIDI, P.	
— Oxalic acid manufacture from cane molasses. (Abs.) . . . . .	290	BURT, R. J. Beet pulp as animal fodder. (Abs.) . . . . .	186, 225
— Preventing cane deterioration after harvest. (Abs.) . . . . .	82	BUTSCHING, L., see SCHWIECK, H.	
BOSMA, S. E., see CARTER, J. N.		BUSH, H. L., see MILLIKEN, G. A.	
BÖTTGER, S. Molasses sugar extraction	87, 88	BUTANI, D. K. Cane pest biological control. (Abs.) . . . . .	317
BÖTZ, R. Bagasse fibre separation and classification. (Pat.) . . . . .	324	BUTTERWORTH, M. H. Cane molasses and bagasse pith as animal fodder	154
BOURDON, D. Reducing sugars determination. (Abs.) . . . . .	322	BUXO, D. A., see EVANS, D. E.	
BOURNE, B. A. Cane diseases in US . . .	247	BYFORD, W. J. Beet fungal diseases control. (Abs.) . . . . .	215
BOYCE, J. P., see THOMPSON, G. D.		BYSEWICK, H. W. Beet agriculture in Poland. (Abs.) . . . . .	214
BOYD, D. A., see DRAYCOTT, A. P.		BYTNER, R. S. and STEINER, G. W. Cane sett eye spot resistance testing. (Abs.) . . . . .	245
BOYES, P. N. and CLEASBY, T. G. Molasses animal fodder production	60	— Cane sett rooting inhibition by <i>Ceratocytis paradoxa</i> . (Abs.) . . . . .	110
BRAHMANANDAM, K., see NARAYANARAO, B.		et al. Cane diseases in Hawaii. (Abs.)	143
BRANCH, M. F., see HIGGINS, I. S.		see also STEINER, G. W.	
BRANDOLI, G., see ASSALINI, G.		CABALLERO, F. Steam jet ejectors . . .	115
BRAMMILLER, E., see MONGELARD, J. C. BRAUNSCHWEIGISCHE MASCHINENBAU-ANSTALT. Centrifugal basket deflection prevention. (Pat.) . . . . .	291	CABRERA, G., see SHIMBAR, H.	
Continuous centrifugal. (Pat.) . . . . .	227, 257	CALIFORNIA & HAWAIIAN SUGAR REFINING CO., see PRINCE, R. N. and SCHWEF, F. W.	
Cossette pre-scalded juice skimmer. . . .	227	CALLIHAN, D., see HAN, Y. W.	
see also KÄSTNER, W., PETERS, W. and STEFFATH, W.		CAMERON, J. M., see JAMES, G. P.	
BRENMAN, S. A. and KUDRYAVTSEVA, N. K. Refined sugar crystal crushing. (Abs.) . . . . .	221	CAMURUNGAN, R. G. Inversion reduction in cane milling. (Abs.) . . . . .	352
and ZDANOVICH, I. L. Syrup decolorization with active carbon. (Abs.)	120	CANADA and DOMINION SUGAR CO. LTD., see STACHENKO, S.	
et al. Sugar bag strength. (Abs.) . . . .	392	CANADIAN CANE EQUIPMENT LTD., see TILBY, S. E.	
BRETSCHNEIDER, R. <i>et al.</i> Beet juice polysaccharide hydrolysatc sugars — Non-sugars and amino-nitrogen determination in beet juice. . . . .	394	CANE MACHINERY & ENGINEERING CO. INC., see WILLETT, H. A.	
245		CANEVORO, A. L. Cane press juice clarification. (Abs.) . . . . .	147
BRIEGER, F. O. Cane maturity. (Abs.)	245	CANUTI, A. and BALDACCIO, P. V. Waste water treatment. (Abs.) . . . . .	149
BROADFOOT, R. and WRIGHT, P. G. Threshold supersaturation limit and nucleation rate calculations. . . . .	222	CARDOSA, A. P. DA S. Cane diseases, varieties and soils in Portuguese East Africa. (Abs.) . . . . .	246
BROADHEAD, D. M. Storage and cane cutting germination. (Abs.) . . . . .	110	CARNIGHE, A. J. M. Cane insect pests in South Africa. (Abs.) . . . . .	174
BROUGHTON, N. W., see BASS, R. J.		Cane leaf sucker control. (Abs.) . . . .	18
BROUSSARD, V. P. Cane harvester . . . .	29	Nuclicia incidence on cane. (Abs.) . . .	381
Cane harvester attachment. (Pat.) . . .	28	and DICK, J. Trash caterpillars . . . .	381
		and WOOD, R. A. Pesticide residues in cane and molasses. (Abs.) . . . . .	382
		CARNEIRO, W. Cane varieties in Brazil	109
		CARPENTER, F. G., see FARBER, L. and WALL, J. H.	
		CARPENTER, T. D., see LEVAD, J. A.	
		CARRILLO, O. and BENAVIDES, M. C. Cane molasses and yeast as animal fodder. (Abs.) . . . . .	224
		CARRUTHERS, A. Chemical problems in factory processes. (Abs.) . . . . .	182
		CARTER, J. F. Fortified sugar production. (Pat.) . . . . .	124
		CARTER, J. N. <i>et al.</i> Nitrogen application and beet petticle nitrate-N . . . .	215
		CASEY, J. A. Distillation. (Pat.) . . . .	324
		CASS, A., see FITZPATRICK, R. W.	
		CASTANEDO B., L. Cane harvesting date determination. (Abs.) . . . . .	347
		Cane ripeness determination. (Abs.) . . .	319
		CATANAOGAN, C. C. Pig breeding in Taiwan. (Abs.) . . . . .	211
		CATROUX, G. and MOPFAUX, J. N. Waste water BOD determination	121
		CATRALI, R. L., see HEATHCOTE, G. D. ČEJKOVÁ, V., see ČÍŽ, K.	
		CEKROLINI, G., see ZAMA, F.	
		CENAR, M. A. A. Cane standover and sugar yield. (Abs.) . . . . .	346
		and MAZZARI, M. R. Cane ash and starch content. (Abs.) . . . . .	377
		et al. Cane phosphate uptake. (Abs.)	346, 356
		see also SEERA, G. E.	
		CENNIK, R. O. Bunch method of cane breeding. (Abs.) . . . . .	111
		C F & E ENGINEERS INC. Bagasse press	187
		see also STEELE, C. R.	
		CHABLAY, R., see CHARTER, J. C.	
		CHAN, P. Y. Magnesium clay soil structural stability. (Abs.) . . . . .	81
		and ARLINGER, B. Z. Soil water availability determination. (Abs.) . . . . .	80
		CHANDLER, K. J. Cicada in Australia	280
		CHANDRA, S. Cane sugar factory waste and losses reduction. (Abs.) . . . . .	180
		CHANG, C. H., see YANG, T. T.	
		CHANG, D. S. Fertilizer application to sandy soil. (Abs.) . . . . .	51
		CHANG, H. Cane intercropping and net radiation, soil temperature and growth. (Abs.) . . . . .	51
		Rainfall distribution in Taiwan . . . . .	79
		et al. Water consumption of inter-planted soil. (Abs.) . . . . .	51
		CHANG, V. C. S. Cane bore varietal resistance. (Abs.) . . . . .	349
		CHANG, Y. S., see CHU, Y.	
		CHANG, Y. T. Cane irrigation. (Abs.) . . .	51
		Water consumption of ratoon cane	51
		CHAPMAN, F. M. Bone char sweetening-off and decolorization costs. (Abs.) . . . .	221
		CHAPMAN, L. S. Ammonium hydroxide fertilization. (Abs.) . . . . .	348
		Phosphate accumulation and loss in soil. (Abs.) . . . . .	278
		and NICHOLSON, W. J. Irrigation and cane yield. (Abs.) . . . . .	279
		CHAPMAN, M. W. Cane cleaner. (Pat.) . . .	229
		CHAPMENTER, L. J. <i>et al.</i> Cane borer damage in US. (Abs.) . . . . .	245
		— Cane pest biological control in US . . .	17
		CHARTER, J. C. <i>et al.</i> Losses in stored beet. (Abs.) . . . . .	87
		CHATTERJEE, A. G. Boiling house performance assessment. (Abs.) . . . .	253
		Defeco-melt-phosfolotation process . . . .	388
		Sugar factory equipment manufacture in India. (Abs.) . . . . .	387
		et al. Fertilizer manufacture from distillery waste. (Abs.) . . . . .	290
		see also MUKHERJI, J. P. and NAGPURAY, K. R.	
		CHATTOPADHYAY, S. K. and PERUMAL, R. L. Crystall content determination. (Abs.) . . . . .	289
		CHAWD, R. P., see B. C. N.	
		CHEN, H. I. H. and HUANG, L. F. Automatic cane milling control. . . . .	21
		CHEN, J. C. P. Cane diffusion. (Abs.) . . .	116
		and PICOU, R. W. Bagasse application to soil and cane quality . . . . .	116, 319
		see also MEADS, P. F.	
		CHEN, J. H. Clarifier mud filtration. . . .	115

INDEX

	PAGE		PAGE
CHEN, M. T. and HUANG, C. T. Bagasse mulching and cane yield. (Abs.)	347	COOKSON, D. <i>et al.</i> Raw sugar colorants removal by ion exchange. (Abs.)	122
CHEN, W. Colour formation in white sugar manufacture. (Abs.)	26	<i>see also</i> ABRAM, J. C.	
CHENG, D. S., <i>see</i> TSE, C. C.		ČOPIKOVÁ, J., <i>see</i> BRETSCHNEIDER, R.	
CHENG, J. S., <i>see</i> TSE, C. C.		COPLEY, E. F. Determining fertilizer distribution accuracy. (Abs.)	380
CHENG, W. C., <i>see</i> SANG, S. L.		CORDOVEZ, F. Bagasse press performance. (Abs.)	147
CHENG, W. Y. Medium for borerearing <i>see also</i> PAN, Y. S.	177	COHONA, E., <i>see</i> MILOVANOV, A.	
CHONG, Y. W. Y. Calcium silicate application and cane growth. (Abs.)	80	CORTES, A. J., <i>see</i> GARRIDO, J.	
Cane nutrient uptake determination <i>at leaf</i>	80	CORTES, M. A., <i>see</i> LIU, L. J.	
Silicon deficiency and cane leaf freckling. (Abs.)	15	COWLEY, W. R. and SMITH, B. A. Sorghum trials in U.S. (Abs.)	177
- Silicon effect on cane enzymes and photosynthesis. (Abs.)	15	CRABEL, R. and VICAGNE, J. M. Centrifugal washing devices. (Abs.)	389
CHEPURNOI, M. N., <i>see</i> FEDOTKIN, I. M.		CRAWFORD, R. W., <i>see</i> RANDOLPH, A. D.	
CHEWNYI, L. A. Waste water treatment	150	CRAWFORD, W. R. Cane diffuser. (Pat.)	61
Chetty, G. K. Evaporator automatic juice level control. (Abs.)	319	Shredder hammer failures. (Abs.)	147
Furnace forced-draft application <i>see also</i> MUKHERJEE, J. P.	85	CRISPO, V., <i>see</i> VALDÉS, A.	
CHHEDA, P. K. Chemical vs. mechanical descaling. (Abs.)	217	CROWT, J. Beet seed drilling speeds	178
CHIKIN, G. A., <i>see</i> KYACHEVA, N. K.		CRUZ F. C. M. <i>et al.</i> Cane harvester	92
CHILTON, S. J. P. Cane research in US <i>see also</i> STEIB, R. J.	141	OSLEK, I., <i>see</i> KRIEGER, O.	
CHIN, N. Y. Nitrogen and cane yield	247	CULLEN, G. R. Tractor overturning	278
CHINCHORAKAR, S. V., <i>see</i> SANT, M. A.		CULLEN, J. W. and DEWY, G. P. Computerized accounting and data processing. (Abs.)	147
CHIU, M. S., <i>see</i> CHU, Y.		CURTIS, O. D., <i>see</i> GOLDEN, L. E.	
CHIU, S. Y. Vapour bleeding and steam consumption reduction. (Abs.)	351	CUSTODIO, V. A. Molasses purity reduction. (Abs.)	53
CHOHAN, J. S., <i>see</i> BHATTI, D. S.		DADANT, R. Cane disintegrator maintenance. (Abs.)	289
CHONG, L. C. Y. L. S., <i>see</i> LALOUETTE, J. A.		DADENKOVA, M. N., <i>see</i> ZHMYRYA, L. P.	
CHOU, C. C. Pore structure of carbonaceous adsorbents. (Abs.)	220	DA GLORIA, N. A. <i>et al.</i> Distillery waste water treatment with lime	290
and HANSON, K. R. Refinery liquor decolorization with bone char.	221	DAHIVA, D. S. and PRABHU, K. A. Distillery waste treatment by fermentation. (Abs.)	290
CHOUHRY, T. M., <i>see</i> SLAMM, M.		DAISREY, M. I., <i>see</i> GOLBOV, I. P.	
CHOW, G. G. Cane cleaning and juice mud and sand removal. (Abs.)	352	Three-masscutte boiling scheme, and LYUSYI, N. A. Mассcutte cutting in boiling. (Abs.)	219
CHOWDAPPAN, R. S. and MARAKULANDAI, A. Losses in cane after scheduled maturity. (Abs.)	111	and SCHERBAK, V. M. Irreversibility of colour adsorption by bone char and active carbon. (Abs.)	391
CHOWDAPPAN, S. R. and MORACHAN, Y. B. Cane weight loss after harvest. (Abs.)	111	DARSHIDAS, D. G., <i>see</i> MAHAJAN, V. O.	
CHRISTIE, G. A. Cane land drainage	175	DALLBRINNE, E. "Chisel" harrow. (Abs.)	84
CHRISTMANN, J. Beet breeding and seed rubbing and grading. (Abs.)	52	Soil condition and beet seed germination. (Abs.)	214
Beet seed germination and emergence	178	DALL'OLIO, G., <i>see</i> FASULO, M. P. and MANTOVANI, G.	
CHRISTODOULOU, P. Carbonatation at Planty factory. (Abs.)	117	D'AMICO, V., <i>see</i> GHILLINI, C. A.	
CHU, C. C. Cane field carbon dioxide concentration. (Abs.)	79	DAMBRINE, F. Cane diffuser. (Pat.)	293
and KONG, L. Cane photosynthesis <i>see also</i> KONG, L.	50	D. <i>et al.</i> Continuous vacuum pan. (Pat.)	156
CHU, H. T. Cane diseases in Taiwan	177, 314	DANDAR, A., <i>see</i> VAŠÁTKO, J.	
CHU, Y. <i>et al.</i> Water control in furrow irrigation by siphon. (Abs.)	51	DANOE, S. R. S. and PATAK, M. M. Cane red stripe causal agent and alternative hosts. (Abs.)	383
CHUA, M. G. S., <i>see</i> KELLY, F. H. C.		DANIEL, K. V. <i>et al.</i> CO304 cane variety. (Abs.)	248
CHURCHWARD, E. H. and BELCHER, R. M. Mechanical cane harvesting	278	DANIEL, S. C., <i>see</i> SITHANANTHAM, S.	
CIBA-GEIGY A.G. Herbicide. (Pat.)	61	DANIELS, J. <i>et al.</i> Cane downy mildew and Fiji disease control. (Abs.)	49
Čiz, K. Electrodialysis. (Abs.)	389	<i>see also</i> BROWN, A. H. D.	
and ČEKROVÁ, V. Iron determination by polarography. (Abs.)	393	DAVID, H. <i>et al.</i> Cane mosaic vectors <i>see also</i> KALRA, A. N.	384
<i>et al.</i> Ion exchange column eluate colorant separation. (Abs.)	121	DÁVID, J. Iceing sugar manufacture in Hungary. (Abs.)	288
- Ion excretion. (Abs.)	395	and ZELMAN, A. East German sugar industry. (Abs.)	22
<i>see also</i> JURÁČKA, F. and SILINA, N. P.		DAWSON, J. H. Chemical weed control	284
CLAPAROLS, E. L. Cane mechanization	378	DAYAL, R., <i>see</i> GUPTA, R. L.	
CLARK, J. <i>et al.</i> Cane molasses as animal fodder. (Abs.)	357	DAYAN, S., <i>see</i> BAINS, S. S.	
CLARKE, M. A. Sucrose solution structure and pH and calcium electrode readings. (Abs.)	152	DE ALMEIDA, F. S. Chemical weed control and cane leaf chlorosis	247
<i>see also</i> HARTLEY, E. D.		DE BOER, A. T. Cane mill roller velocity and juice extraction	306
CLASBY, T. G., <i>see</i> BOYES, P. N.		Feeding two-roller compared with three-roller mills	106
CLONINGER, C. K. Evaporator scale reduction and removal. (Abs.)	387	DE BRUYN, G. C. <i>et al.</i> Continuous vacuum pan. (Abs.)	23
COBURN, G. E. and HENSLEY, S. D. Cane varietal resistance to borer. <i>see also</i> FORBES, J. L.	16	DE CASTRO, J. E. and BARBOSA, J. DE O. Sulphated ash-conductivity relationship in sugar. (Abs.)	90
COLEMAN, R. E. World cane variety collection. (Abs.)	47	DE CRÉMOUX, J. Liming tank. (Abs.)	386
COLONIAL SUGAR REFINING CO. LTD. Colour removal with polyamide. <i>see also</i> CHAPMAN, M. W. and HIDI, P.	257	Massecutte seedling. (Pat.)	229
<i>see also</i> CHAPMAN, M. W. and HIDI, P.		<i>see also</i> DAMBRINE, F.	
COMBERFORD, C. K., <i>see</i> LEE, J.		DERBE & CO. INC., <i>see</i> HOOK, R. W.	
COMMONWEALTH OF PUERTO RICO, <i>see</i> ALEXANDER, A. G. and RAMOS R., E.		DEITZ, V. R. and BITNER, J. L. Oxygen and carbon adsorbent performance	183
COOKE, D. A. and DRAYCOTT, A. P. Effect of soil fumigation for nematode control on beet nitrogen uptake. (Abs.)	114	DE LA CUESTA, E. O. and SAMANIEGO, E. Filter cake wax extraction and properties. (Abs.)	27
		DE LAVIER, H. J. Beet storage. (Abs.)	320
		Hydrocyclones. (Abs.)	149
		<i>see also</i> HIRSCHMÜLLER, H. and SMOLNIE, D. H.	
		DELGADO, A. A., <i>see</i> DA GLORIA, N. A. and STUPIELLO, J. P.	
		DELGADO, J. and ABARCA, M. Cane red stripe. (Abs.)	317
		DEL MONTE N., <i>see</i> FERRARI <i>et al.</i> Three-roller cane crushers. (Abs.)	116
		DEMAUX, M. Cane analysis. (Abs.)	395
		DEMCHENKO, V. A. Automatic refined sugar drying control. (Abs.)	221
		<i>see also</i> KON, L. I.	
		DE MENDONÇA, M., <i>see</i> PINTO, M. E.	
		DE MORAES, E. S., <i>see</i> STUPIELLO, J. P.	
		DENEUCHE, J. Beet breeding. (Abs.)	52
		DE NIE, L. H., <i>see</i> DE BRUYN, G. C.	
		DENIS, G. Beet washer. (Abs.)	255
		DE OLIVEIRA, A. J., <i>see</i> SERRA, G. E.	
		DE OLIVEIRA, E. R., <i>see</i> CESAR, M. A. A. and STUPIELLO, J. P.	
		DEONEGA, I. A., <i>see</i> KARNASVICH, E. M.	
		DEPEYRE, A. E. and SEMENT, P. A. Herbicides application and beet seed germination. (Abs.)	284
		DEREY, M. Volume of beet. (Abs.)	284
		DEZRYAVKO, A. F. Lime kiln reconstruction. (Abs.)	88
		DE SOUZA, H. D. Cane pests in Brazil	346
		DEVILLE, J., <i>see</i> CHONG, Y. W. Y.	
		DEVILLERS, P. and ROGER, J. Colour and ash content of stored white sugar. (Abs.)	223
		<i>et al.</i> Double curing and white sugar quality. (Abs.)	222
		<i>see also</i> CHARTER, J. C.	
		DEVUYST, A. <i>et al.</i> Beet leaves as animal fodder. (Abs.)	123
		DE WILDE, C., <i>see</i> CHARTER, J. C.	
		DEXTER, S. T., <i>see</i> WYSE, R. E.	
		DHOORIA, M. S., <i>see</i> GUPTA, S. K.	
		D'HOTMAN, O. Cane damage by borers and frost. (Abs.)	145
		DIAGO, R. E. Three-masscutte boiling scheme. (Abs.)	85
		DICK, J. Cane mosaic response testing and HARRIS, R. H. G. Nematode control. (Abs.)	206
		<i>see also</i> GARNEGIE, A. J. M.	
		DIETZEL, W., <i>see</i> KAETHER, W.	
		DIE, I. I. and SLOVYAN, A. I. Beet pile forced ventilation. (Abs.)	22
		DIESHT, R. K., <i>see</i> SARSENA, T. P. and SAXENA, T. P.	
		DION, H. G. Cane pith as animal fodder. <i>see also</i> ROSA, F. A.	244
		DIXIT, H. K., <i>see</i> AGARWAL, S. K. D.	
		DIXON, F. Cane molasses as animal fodder. (Abs.)	224
		<i>see also</i> LOSADA, H.	
		DMITRASH, V. V., <i>see</i> GRABOVETSNIK, B. E.	
		DMYSHYAN, V. G., <i>see</i> DRYNOV, V. G.	
		DOBROMIROVA, V. F. <i>et al.</i> Sodium chloride and sucrose crystallization <i>see also</i> KHARIN, S. E. and KHARIN, V. M.	394
		DOBROBRAGOV, F. N. and BARRO, M. Losses in USSR sugar factories, and ZHURAVLEVA, Z. D. Beet juice treatment with steam in hydrocyclones. (Abs.)	88
		DOBZYCKI, J. Sugar factory equipment selection. (Abs.)	321
		White sugar remendement calculation	118
		DODSON, A. K. Froghopper control.	346
		DOHERTY, G. F., <i>see</i> CULLEN, J. W.	
		DOI, M., <i>see</i> FUKUDA, H.	
		DOLL, E. C., <i>see</i> ROBERTSON, L. S.	
		DOMSA, F. <i>et al.</i> Beet thick juice storage	119
		DONBY, D. L. <i>et al.</i> Nematodes and beet amino-acid concentrations	146
		D'ORAZI, G. Beet diffusion loss calculation. (Abs.)	23
		DOSEDLA, G. Beet tarehouse. (Abs.)	152
		DOTZENKO, A. D. and ARP, A. L. Light reduction by <i>Kochia scoparia</i> and beet yield. (Abs.)	252
		DOYGAL', N. N., <i>see</i> BORODYANSKI, V. P.	
		DOWNING, J. F., <i>see</i> VELASCO, V. S.	
		DOYLE, W. C. and AHEE, J. L. Chemical pigweed control. (Pat.)	229
		DRAYCOTT, A. P. and DURANT, M. J. Beet population and irrigation effects on nitrogen uptake. (Abs.)	114
		- Beet plant population and irrigation effects on soil water consumption. (Abs.)	114
		and FARLEY, R. F. Sodium, magnesium and irrigation effects on beet. (Abs.)	178



# INDEX

PAGE		PAGE
<p>DRAYCOTT, A. P. and THOMSON, D. C. Beet agriculture and fertilizer usage in UK. (Abs.)..... 286</p> <p>and WEBB, D. J. Nitrogen, irrigation and plant population effects on beet yield. (Abs.)..... 84</p> <p><i>et al.</i> Phosphorus fertilizer trials .. see also COOKE, D. A. and DURRANT, M. J.</p> <p>DROZDOWSKI, V. G. see KOJIAN, K.</p> <p>DRYNOV, V. T. and DUMYSHKO, V. G. Beet cossette layer permeability maintenance in tower diffuser .. - KDA-25-59 beet diffuser perform- ance. (Abs.)..... 391</p> <p>DUA, S. P. see BAJPAL, P. D. Co. see DUDHATEAU, G. F. and VANHERWEGEN, F. J. Beet diffuser. (Pat.)..... 258</p> <p>DUKDA, V. V. see PARTYANKO, A. I.</p> <p>DUMNINOV, S. V. and LUPASHKO, V. A. DDS beet diffuser drive shafts and pinions alignment. (Abs.)..... 182</p> <p>DUNCAN, R. A. Cane harvester. (Pat.) 124, 260</p> <p>DUNNING, R. A. and WINDER, G. H. Beet defoliation and yield. (Abs.) see also JONES, F. G. W.</p> <p>DUPAL, R. see ŠEVČÍK, V.</p> <p>DUPONT, P. Ion exchange and molasses sugar extraction costs. (Abs.).... 354</p> <p>E. I. DU PONT DE NEMOURS &amp; CO. see ELLIS, L. M. and QUEBEDAUX, B.</p> <p>DU PÉREZ, P. see MEYER, J. H.</p> <p>DUQUENNE, R. G. Beet harvester. (Pat.) 156</p> <p>DURABAJ, V. <i>et al.</i> Cane smut. (Abs.) 313</p> <p>DUREIN, G. J. Cane cleaning. (Abs.) 209</p> <p>Louisiana sugar industry. (Abs.) .. Sub-surface irrigation and cane yield. (Abs.)..... 377</p> <p>DURRANT, M. J. and DRAYCOTT, A. P. Beet magnesium sulphate uptake and sugar yield. (Abs.)..... 84</p> <p>see also DRAYCOTT, A. P.</p> <p>DUŠEK, S. Beet flume stone catcher.. 149</p> <p>DU TOIT, J. L. see WOOD, R. A.</p> <p>DUTTON, J. V. see OLDFIELD, J. F. T.</p> <p>DYAL, R. see GUPTA, K. M.</p>	<p>ERNST, A. E. Beet thinner. (Pat.) .. 258</p> <p>EROSHENKO, I. A. see KHELEMSKI, J.</p> <p>ERSHOV, B. N. Reducing sugars deter- mination. (Abs.)..... 89</p> <p>ESCHER WYSS LTD. see RÜEGG, E.</p> <p>ESCOBER, T. R. Mechanical cane harvesting and loading in Philip- pines. (Abs.)..... 144</p> <p>ESPIROSA, J. A. see BALLE, E.</p> <p>ESPIROZA, P. J. see UGAZ, O. S.</p> <p>ESSO RESEARCH &amp; ENGINEERING CO., see RIONDA, J. A.</p> <p>ETHYL CORPORATION, see WILDER, H. D.</p> <p>ETIENNE, J. Cane borer parasites. 17, 317</p> <p>EYE, L. see SCHMIDT, R. E.</p> <p>EVANS, D. E. and BUXO, D. A. Frog- hopper control. (Abs.)..... 18</p> <p>EYERMAN MANUFACTURING CO. Beet thinner. (Pat.)..... 187</p> <p>see also SHADER, B. E.</p> <p>EYMERENKO, V. F. see BRENNAN, S. A.</p>	<p>FORBES, I. L. <i>et al.</i> Cane mosaic virus transmission. (Abs.)..... 48</p> <p>FORD, W. Cane hot water treatment for disease control. (Abs.)..... 380</p> <p>FOREST, M. C. Automatic control in cane sugar factory. (Abs.)..... 86</p> <p>FORMECK, C. G. see SMITH, S. B.</p> <p>FORS, A. L. Mechanical cane harvest- ing and excessive trash. (Abs.) .. 378</p> <p>FORTEADE, G. N. R. see HUTCHINSON, P. B.</p> <p>FOSTER, D. H. Continuous crystallizers FRANCKI, R. I. B. and GRIVELL, C. J. Insect vector and Fiji disease particles. (Abs.)..... 315</p> <p>FRANCOIS, L. E. and GOODIN, J. E. Soil salinity and temperature effects on beet seed germination.. 286</p> <p>FRANK, J. H. Cane fly generation segregation and parasitism. (Abs.) 17</p> <p>FRENCH, A. W. Bagasse press. (Pat.) 91</p> <p>and STARRETT, F. J. Cane diffuser.. 258</p> <p>FRENCH OIL MILL MACHINERY CO. Bagasse press. (Pat.)..... 226</p> <p>see also FRENCH, A. W.</p> <p>FRESHWATER, I. T. Cane planting in Australia. (Abs.)..... 175</p> <p>Cane yield in Australia. (Abs.) .. 380</p> <p>FREW, J. A. see BATTERHAM, R. J.</p> <p>FRIED, J. H. Citric acid manufacture from cane molasses. (Pat.)..... 188, 260</p> <p>FRIEDRICHSEN, J. and WEI, C. C. Bagasse compost and green manure effects. (Abs.)..... 50</p> <p>FRIEDL, M. Beet molasses destruction in storage. (Abs.)..... 87, 389</p> <p><i>et al.</i> Refinery liquor decolorization kinetics. (Abs.)..... 221</p> <p>see also BURBS, J.</p> <p>FRIEZE, J. Cane nutrient uptake. (Abs.) 317</p> <p>Cane varieties in Réunion. (Abs.).. 317</p> <p>Fertilizer trials in Réunion. (Abs.).. 246</p> <p><i>et al.</i> Fertilizer trials in Réunion.. 317</p> <p>FROHNER, W. see MAYR, H. H.</p> <p>FUKUDA, H. <i>et al.</i> Glutamic acid manu- facture from molasses. (Pat.)..... 188</p> <p>FURUKAWA, T. see NIMI, M.</p>
<p>EAGLES, J. T. H. see PHIPPS, O. H.</p> <p>EASTAUGHFFE, G. P. Continuous centrifugal performance analysis 148</p> <p>EAVES, B. W. see ROSS, B. G.</p> <p>EDELMAN, J. and SCHOOLAR, A. I. Iodoacetate and cane leaf sucrose secretion. (Abs.)..... 175</p> <p>see also SCHOOLAR, A. I. M.</p> <p>EGAN, B. T. Cane breeding for leaf scald resistance. (Abs.)..... 19</p> <p>Cane leaf scald. (Abs.)..... 19</p> <p>Cane yellow spot. (Abs.)..... 143, 175, 280</p> <p>Fiji disease in Australia. (Abs.) 348, 384</p> <p>ELMI, M. A. and SARKAR, N. N. Filter cake as cane set growing medium 209</p> <p>ELIAS, J. F. see LEONARDI, F. A. J.</p> <p>ELLIOT, E. B. Multiple-effect evapora- tors. (Abs.)..... 116</p> <p>ELLIS, L. M. Chemical cane ripening 260</p> <p>ELLISON, J. V. Bagasse and cane trash disposal. (Abs.)..... 351</p> <p>EL-MANHALI, M. A. see RAO, J. T. T.</p> <p>EL-SHEIKH, A. M. and ULRICH, A. Sodium uptake by beet. (Abs.) 250</p> <p><i>et al.</i> Lithium effect on beet. (Abs.) 215</p> <p>EL-SHERIF, H. see KIRA, M. T.</p> <p>EL-SWAIFY, S. A. see SYED, M. M.</p> <p>EMEL'YANOV, N. A. see KICHIGIN, N. M.</p> <p>EMMERICH, A. see SCHNEIDER, F.</p> <p>ENIKIEV, S. G. and MESHKOVA, L. Z. Beet crown cavity formation and processing quality. (Abs.)..... 223</p> <p>EREMENKO, B. A. and VALOV, B. N. Optimum diffusion juice draft determination. (Abs.)..... 392</p> <p><i>et al.</i> Automatic beet diffusion control. (Abs.)..... 88</p> <p>- Automatic flow control. (Abs.).. 182</p> <p>- Evaporator juice level and heat transfer. (Abs.)..... 150</p> <p>- Evaporator vapour balance main- tenance by steam compressors 288</p> <p>- Factory central control. (Abs.).. 119</p> <p>see also SHUBOVANYI, N. F. and SUSCROV, B. G.</p> <p>ERIKSEN, A. G. see MILLIKEN, G. A.</p> <p>ERLIKH, V. M. see EREMANOV, B. G.</p> <p>ERMOLOV, N. F. and ZAMANKO, V. A. Waste water treatment with algae and re-pollution. (Abs.)..... 392</p>	<p>FABREGAT, P. M. Steam tube diameter calculation. (Abs.)..... 352</p> <p>FACHINETTI, W. Boilers and heating schemes. (Abs.)..... 390</p> <p>Steam and power generation plant FAI, K. K. and YVANG, S. Z. Losses on evaporation in boiling. (Abs.) .. 321</p> <p>FAIRBANKS, J. N. Florida sugar industry. (Abs.)..... 216</p> <p>FAN, Y. T. see CHU, Y.</p> <p>FARAG, S. A. <i>et al.</i> Sugar crystal dust formation. (Abs.)..... 119</p> <p>FARBER, L. and GARFINKEL, F. G. Cane and sugar colorants. (Abs.) 26, 152</p> <p>FARLEY, R. F. see DRAYCOTT, A. P.</p> <p>FARMEC, C. L. see NICOL, W. M.</p> <p>FARQUHAR, R. H. Cane agriculture computer simulation. (Abs.)..... 279</p> <p>FASIH, S. Cane varieties in Pakistan <i>et al.</i> Cane intercropping with beet and wheat. (Abs.)..... 145</p> <p>FASULO, M. P. <i>et al.</i> Beet seed irradi- ation effects. (Abs.)..... 214</p> <p>see also MANTOVANI, G.</p> <p>FEDOTCHIN, I. M. <i>et al.</i> Evaporator scale reduction by ultrasonics .. 391</p> <p>- Juice residence time and gas mixing in carbonation. (Abs.)..... 390</p> <p>- Pressure on cosettes in DDS diffuser. (Abs.)..... 118</p> <p>see also GULYI, I. S. and ROSINSKI, V. M.</p> <p>FELBER, E. H. Beet juice ion exchange treatment. (Abs.)..... 87</p> <p>FERNANDES, J. Herbicide doses. (Abs.) 378</p> <p>FERNÁNDEZ, D. O. Bio-mass manu- facture. (Abs.)..... 186</p> <p>and SIGARD, J. A. Alcohol manu- facture from cane molasses. (Abs.) 226</p> <p>FERNÁNDEZ B. J. and BALLESTER, L. Sucrose heat of crystallization and activity coefficient calculation .. 90</p> <p>FERNÉY, F. X. Centrifugal. (Pat.).. 28</p> <p>FERRÁN, O. J. Cane sugar factory labour efficiency. (Abs.)..... 54</p> <p>FEWCKES, D. W. Cane white scale insect. (Abs.)..... 18</p> <p>FIALOVA, E. see BRETSCHEIDNER, R.</p> <p>FIBRELTZ CORP. see RUCKSTUHL, K.</p> <p>FIFE, J. M. see DONEY, D. L.</p> <p>FINGER, L. J. see MITCHELL, G. E.</p> <p>FITZGERALD, J. R. Laboratory report calculations by computer. (Abs.) 153</p> <p>see also ALLAN, G. N. and BRUJN, J.</p> <p>FITZPATRICK, R. W. <i>et al.</i> Soil salinity reduction. (Abs.)..... 205</p> <p>Soc. IEDICES LILLE-CAIL. Continuous centrifugal molasses discharge .. 291</p> <p>see also DAMBRINE, F., DE CRÉMOUX, J. and MERCIER, A.</p> <p>FLETCHER, S. N. <i>et al.</i> Sodium, potassium and calcium determination in cane molasses. (Abs.)..... 58, 185, 222</p> <p>FLORES C., S. Cane pests and diseases in Mexico. (Abs.)..... 145, 174, 378</p> <p>see also RIESS, C. M.</p> <p>FOGG, R. A. Chemical weed control.. 251, 385</p> <p>FOGLIATA, F. A. and DIP, R. A. Cane follar analysis and fertilizer re- quirements. (Abs.)..... 246</p> <p>- Rainfall and nitrogen effects on cane yield. (Abs.)..... 82</p> <p>see also LEIDERMAN, J.</p> <p>FONTI, L. see GRAHAM, C. P.</p>	<p>GADZHEV, A. Y. <i>et al.</i> Beet storage and syrup amino-acids. (Abs.)..... 89</p> <p>GALAZZI, L. Bagasse paper and pulp manufacture in Mexico. (Abs.)..... 396</p> <p>GALVEZ, A. M. <i>et al.</i> Cane varietal trials in Philipinos. (Abs.)..... 79</p> <p>see also TETANAGO, M. A.</p> <p>GANGAVATI, S. S. see MUKHERJI, J. P.</p> <p>GANGULY, P. N. see BOSE, S.</p> <p>GANI, A. see RAO, D. L. N.</p> <p>GARBETT, M. Automatic boiling con- trol. (Abs.)..... 389</p> <p>GARCIA, G. Raw sugar liquor car- bonation. (Abs.)..... 321</p> <p>GARCÍA H., O. L. see GONZÁLEZ P., L.</p> <p>GARCÍA L., F. Refinery materials balance. (Abs.)..... 355</p> <p>GARDINER, S. D. see BENNETT, M. C.</p> <p>GARIOCH, D. Cane varietal performance evaluation in Australia. (Abs.).. 249</p> <p>GARRIDO, J. and CORTES, A. J. Chemi- cal weed control. (Abs.)..... 251</p> <p>GARRUCHO, S. S. Cane flowering con- trol. (Abs.)..... 207</p> <p>and RAMINANTAN, J. L. T. Phosphate fertilizer and cane juice clarifica- tion. (Abs.)..... 86</p> <p>GARSIDE, D. see HIGGINS, I. S.</p> <p>GARYAZHA, V. T. and PAVELKO, V. I. Calculation of heat transfer in boiling. (Abs.)..... 391</p> <p>see also PAVELKO, V. I.</p> <p>GASKILL, J. O. see RUPPEL, E. G.</p> <p>GEIDEL, H. see BAROCKA, K. H.</p> <p>GEISHTOVY, M. A. and GONCHAR, V. V. Forced circulation in evaporators <i>et al.</i> Evaporator juice colour forma- tion. (Abs.)..... 218, 288</p> <p>- Evaporator juice pH. (Abs.) .. 23, 118</p> <p>- Forced circulation and hydraulic resistance in evaporators. (Abs.) 181</p> <p>GELLY, A. Tolong sugar factory. (Abs.) 386</p> <p>GENE, G. V. Beet diffusion. 79, 117, 354</p> <p>GENOTHELLE, J. Boiling variables deter- mination. (Abs.)..... 389</p> <p>GERBUT, K. F. see EREMANOV, B. A.</p> <p>GHAFFAGA, E. E. see NOUR, A. H.</p> <p>GHILLINI, C. A. and D'AMBRA, V. Beet rhizomania control. (Abs.)..... 178</p>

# INDEX

	PAGE		PAGE		PAGE
GHOSE, A. K. Gur manufacture from sorghum. (Abs.)	386	GREBNYUK, S. M. <i>et al.</i> Continuous centrifugal acceleration cup height and separation rate. (Abs.)	228	GUTHRIE, A. M. Factory materials balance calculation. (Abs.)	394
GIAMALVA, M. J. Cane varietal performances in U.S. (Abs.)	142	GREGORY, P. E., see SMITH, P.		Factory performances in South Africa. (Abs.)	153
see also FORBES, I. L.		GRIMLEY, S. C. Cane sampling. (Abs.)	222	GUYOT, J. Y., see CHARTRIER, J. C.	
HARDINA, J. A., see WILLETT, H. A.	54	GRITSSENKO, I. I., see BUNYAK, A. M.		GUZMAN, J. Cane molasses and yeast as animal fodder. (Abs.)	224
GIELZYŃSKI, S. Pakistan sugar factory. Polish cane sugar factory exports.	319	GRIVELL, C. J., see FRANCKI, R. I. B.			
GIFFORD, J. R., see CHARPENTIER, L. J.		GRIVYVA, E. A. <i>et al.</i> Calcium determination in beet sugar products. (Abs.)	122		
GILLMAN, E. C., see SUMNER, M. E.		GROBAT, F. and TERENTIEV, Y. Bagasse drying. (Abs.)	116	HAESSELER, H. Offenau sugar factory HAGHARA, H. H. Calcium silicate application and cane sugar yield	376
GILLM, L. C., see DE BRUYN, G. C.		GROMKOVSKII, A. I. and REMIZOVA, N. A. Average sugar crystal size determination. (Abs.)	289	HAI, V. H., see BETBEDER-MATHIEF, M.	
GILL, H. S., see SINGH, O.		GRUSZEKA, H. Beet amino-acids content. (Abs.)	395	HAJARINS, B. M. Cane agriculture improvement and increased sugar production. (Abs.)	342
GILL, P. S., see FANJE, R. R.		Beet sugars content. (Abs.)	323	HALL, B. J., see RADEWALD, J. D.	
GILLASPIE, A. G. Cane mosaic virus extract purification. (Abs.)	48	Sucrose determination in beet. (Abs.)	323	HALL, W. K. Group beet harvesting operations. (Abs.)	251
Ratoon stunting disease virus isolation. (Abs.)	143	and KURACKI, S. Sugars determination. (Abs.)	323	HALBBERG, E. J., see OSBORN, A. W.	
GIMENEZ L. O., see MARIOTTI, J. A.		GRUHLING, P. Froghopper control. 246, 380 and MARQUES, E. J. Cane pests in Brazil. (Abs.)	109	HALE, D. J. and WHAYMAN, E. Automatic cane juice flow control. (Abs.)	179
GINAT, S. Automatic control. (Abs.)	87	GURBIN, B. <i>et al.</i> Beet diffuser disinfectant. (Abs.)	149	- Clarifier. (Abs.)	148
GINTY, R. F., see VAN ARSDEL, E. P.		GURBIN, M. S., see GURDY, B. W. C.		see also BICKLE, R. E.	
GIORGI, J. C. Beet diffusion. (Abs.)	391	GUERRERO, A. P., see QUE, E. G.		HALL, B. J., see RADEWALD, J. D.	
see also DAMBRINE, E.		GUILLERMO L., F. Cane breeding in Argentina. (Abs.)	207	HALL, W. K. Group beet harvesting operations. (Abs.)	251
GIRLING, D. J. Cane borer in East Africa. (Abs.)	16	GUIRAUD, D., see PICHEREZ, J.		HALMOS, A. L., see BHATTACHARYYA, S.	
GRIVAR, S. N. EEC and British Commonwealth sugar. (N.B.)	256	GURNEY, M. S., see GURDY, B. W. C.		HAMBLYCK, M., see DEUTYNE, A.	
GLOYER, J. Cane yield potential in South Africa. (Abs.)	381	GURRERO, A. P., see QUE, E. G.		HAMILL, T. M. Cane milling. (Pat.)	324
Drought and cold effects on cane and cane ripening. (Abs.)	205	GUDDY, E. J., see TUSON, W. R.		HAMPSON, R. J., see STUBBS, O. W.	
GÖBLEZ, M. Beet leaf spot control.	214	GUILLERMO L., F. Cane breeding in Argentina. (Abs.)	207	HAN, Y. W. <i>et al.</i> Bagasse sterilization	186
GODOY, D., see SERA, G. B.		GUIRAUD, D., see PICHEREZ, J.		HANDJO, H. and NOORDAM, D. Cane mosaic virus extract purification	48
GOEL, S. K. Cane diffusion sugar recovery calculation. (Abs.)	217	GURNEY, M. S., see GURDY, B. W. C.		HANSON, K. E., see BENNETT, M. C.	
GOHAR, M. A., see NOUR, A. H.		GULYI, I. S. and FEDOTKIN, I. M. Masseculite residence time calculation in continuous boiling. (Abs.)	391	and CHOU, C. H.	
GOISMAN, E. Y. Molasses target purity determination. (Abs.)	59	- Recirculation number and masseculite Brix in continuous boiling	218	HARDIN, E. E., see SCHWEITZER, L. R.	
Rehery boiling schemes in USSR.	120	<i>et al.</i> Boiling temperature fluctuations and crystallization rate. (Abs.)	390	HARDING-GOODMAN, A. and THOMSON, G. M. Hot air vs. hot water treatment and cane sett germination	812
GOKHALE, M. N. Shale cane processing	253	- Sugar incrustation in vacuum pans	88	HARDY, M. Overhead sprinkler trials	32
GOLDEN, L. E. <i>et al.</i> Fertilizer application to cane. (Abs.)	208	GUMASTE, J. A. Cane yield reduction in India. (Abs.)	83	HARPHAM, D., see HIGGINS, I. S.	
GOLOVNYAK, Y. D. Carbonatation	22	GUNKE, K. M. Bagasse depithing	156	HARRIS, H. Beet cut. (Pat.)	188
GOLUBOV, I. F., see DAIŠEV, M. I.		GUNN, J. R., see GRAHAM, W. S.		HARRIS, R. H. G. Nematode control in cane. (Abs.)	143, 383
GOMES, F. P. and ANDREWS, D. K. Cane harvester. (Pat.)	229	GUNN, J. R., see GRAHAM, W. S.		see also DICK, J.	
GÓMI, I. F., see KOSTROY, Y.		GUNN, J. R., see GRAHAM, W. S.		HARRIS & TROUSE MANUFACTURING Co., see HARRIS, H. D.	
GONCHAR, A., see KOSTENKO, A.		GUNN, J. R., see GRAHAM, W. S.		HARTLEY, E. D. and CLARKE, S. G. Cane shredder. (Abs.)	147
GONCHAR, V. V., see GEISHOTOV, M. A.		GUNN, J. R., see GRAHAM, W. S.		HARTMANN, H., see PETERS, V.	
GONCHAROVA, K. P. <i>et al.</i> Ammonia, oil and COD determination in waste water. (Abs.)	119	GUNN, J. R., see GRAHAM, W. S.		HARTT, C. E. Phosphorus application and cane radio-carbon translocation. (Abs.)	316
see also ZHRUVAYEV, Z. D.		GUNN, J. R., see GRAHAM, W. S.		HARVEY, C. W., see ODFIELD, J. F. T.	
GONZÁLEZ, G. Bulk sugar shipment from Cuba. (Abs.)	287	GUNN, J. R., see GRAHAM, W. S.		HASHIMOTO, H. Automatic ion exchange control. (Abs.)	355
Cane cleaning in Cuba. (Abs.)	347	GUNN, J. R., see GRAHAM, W. S.		HAUSE, W., see BURBA, M.	
"Pablo Noriega" experimental sugar factory. (Abs.)	319	GUNN, J. R., see GRAHAM, W. S.		HAVLIN, A., see VALTER, V.	
GONZÁLEZ, M. C. and LEONARDI, P. A. J.		GUNN, J. R., see GRAHAM, W. S.		HAVLOVÁ, E., see OSWALD, R.	
GONZÁLEZ, G. A. Sorghum agriculture and processing in US and Mexico	21	GUNN, J. R., see GRAHAM, W. S.		HAWAIIAN SUGAR PLANTERS ASSOCIATION, see NICKELL, L. G.	
GONZÁLEZ P., L. and GAROJA H., O. L. Continuous centrifugals. (Abs.)	319	GUNN, J. R., see GRAHAM, W. S.		HAUSE, W., see BURBA, M.	
GOODIN, J. R., see FRANCOIS, L. E.		GUNN, J. R., see GRAHAM, W. S.		HAVLIN, A., see VALTER, V.	
GOPALAM, B., see LAKSHMIKANTHAM, M.		GUNN, J. R., see GRAHAM, W. S.		HAVLOVÁ, E., see OSWALD, R.	
GORDON, B. Drought in Australia	279	GUNN, J. R., see GRAHAM, W. S.		HAWAIIAN SUGAR PLANTERS ASSOCIATION, see NICKELL, L. G.	
GORDON, B. C. E., see RADFORD, A. J.		GUNN, J. R., see GRAHAM, W. S.		HAYASHI, M., see IXADOME, T.	
GORGÉNYI, E. and ASZTALOS, Z. Beet pulp dryer. (Abs.)	357	GUNN, J. R., see GRAHAM, W. S.		HAYES, A. G. Cane diseases. (Abs.)	345
GORSKII, V. F. <i>et al.</i> Lime particle dispersion. (Abs.)	150	GUNN, J. R., see GRAHAM, W. S.		Fiji disease transmission. (Abs.)	280
GORYANOV, N. A., see VASIL'EV, A. A.		GUNN, J. R., see GRAHAM, W. S.		HEALY, R. W. Cane burning in Australia. (Abs.)	348
GOSNELL, J. M. Water table level and cane growth	135	GUNN, J. R., see GRAHAM, W. S.		and HEATHCOTE, G. D. and CATTRALL, K. L. Effect of virus yellows and spraying for aphid control on beet yield.	286
and KOENIG, M. J. P. Optimum cane harvest dates. (Abs.)	382	GUNN, J. R., see GRAHAM, W. S.		HEBERT, L. P. Cane breeding at Canal Point, Florida. (Abs.)	141
and LONG, A. C. Cane leaf analysis for fertilizer requirements determination. (Abs.)	206	GUNN, J. R., see GRAHAM, W. S.		HECKER, R. J. Beet breeding and root yield. (Abs.)	285
GOTSCH, S. P. pH electrode. (Abs.)	150	GUNN, J. R., see GRAHAM, W. S.		see also SMITH, G. S.	
see also GUSAKOV, A. B.		GUNN, J. R., see GRAHAM, W. S.		HECKLES, J. S. and QUINN, E. J. Polyurethane foam production from sugars. (Pat.)	324
GOVINDASWAMY, K. N., see SRINIVASAN, T. R.		GUNN, J. R., see GRAHAM, W. S.		HEINRICH, K. Cane screw press. (Pat.)	61, 91
GRABOVYSHKI, B. E. <i>et al.</i> Beet sugar factory losses calculation. (Abs.)	390	GUNN, J. R., see GRAHAM, W. S.		HEINZ, D. J. and MEE, G. W. P. Hybrid cane clone variations. (Abs.)	111
W. R. GRACE & CO. Sugar crystal coating. (Pat.)	291	GUNN, J. R., see GRAHAM, W. S.		see also MOORE, P. H.	
see also GRAY, R. H., VETTMAN, P. L. and WOODRUFF, E. T.		GUNN, J. R., see GRAHAM, W. S.		HEISLER, M., see VELASCO, V. S.	
GRAF, A. Growth factors and beet processing. (Abs.)	218	GUNN, J. R., see GRAHAM, W. S.		HEITZ, A., see CHEONG, Y. W. Y.	
GRAHAM, C. P. <i>et al.</i> Tablet sugar manufacture. (Pat.)	229	GUNN, J. R., see GRAHAM, W. S.		HEINZWAY, R. G. and PARKINS, J. J. Animal fodder from beet pulp and molasses. (Abs.)	396
GRAHAM, W. S. and GUNN, J. R. Cane cure and processing. (Abs.)	86	GUNN, J. R., see GRAHAM, W. S.		HENDERSON, C. S. Cane deterioration after harvest. (Abs.)	179
GRANBADAM, A. R. Vacuum pan.	125	GUNN, J. R., see GRAHAM, W. S.		and KIRBY, L. K. Cane billet length and deterioration. (Abs.)	271
GRAIGNARD, P. A. Factory performance in U.S. (Abs.)	116	GUNN, J. R., see GRAHAM, W. S.		HENDERSON, M. T. ISSCO 14th Congress Proceedings. (P.B.)	159
GRAY, R. H. Rehery liquor drying	291	GUNN, J. R., see GRAHAM, W. S.		HENDERSON K., see R. Cane harvester.	258
GREBENYUK, A. M. Carbonatation lime consumption reduction. (Abs.)	117	GUNN, J. R., see GRAHAM, W. S.		HENRY, J. E., see VANDOREN, D. M.	
		GUNN, J. R., see GRAHAM, W. S.		HENSCHOLD, T. <i>et al.</i> Ion-selective electrode applications. (Abs.)	119

# INDEX

PAGE		PAGE		PAGE	
<p>HENSLEY, S. D. Cane borer control in Louisiana. (Abs.)..... 17  <i>see also</i> COBURN, G. E. <i>and</i> NEGRI, A. A.</p> <p>HERGIC, P. Continuous diffusion and beet sugar factory water economy</p> <p>HERMELIN, P. R. Cane breeding in Mauritius. (Abs.)..... 80</p> <p>HERNÁNDEZ C. L. Bagasse pentosans hydrolysis. (Abs.)..... 225</p> <p>and SUÁREZ R., R. Bagasse delignification and pentosan removal for cellulose production. (Abs.)..... 396</p> <p>HERR, L. J. Beet black root zoospore production. (Abs.)..... 284</p> <p>Determination of beet crown rot causal agent in soil. (Abs.)..... 251</p> <p>HERWEYER, L. L. Moisture and herbicide effect. (Abs.)..... 251</p> <p>HESCH, R. Bagasse board manufacture in Trinidad. (Abs.)..... 154</p> <p>HESSE, W. M., <i>see</i> STROBEL, G. A.</p> <p>HETHERINGTON, M. A. Cane land levelling. (Abs.)..... 176</p> <p>HICKS, E. J. Double drill planting and cane stalk population. (Abs.)..... 377</p> <p>HIDI, P. <i>et al.</i> Starch reduction by enzymatic hydrolysis. (Pat.)..... 124</p> <p>HIGGINS, I. S. <i>et al.</i> Wisington sugar factory. (Abs.)..... 254</p> <p>HILL, H. B. Cane harvester. (Pat.)..... 125</p> <p>HILL, W. B. "Tallofoc" decolorization system. (Abs.)..... 220</p> <p>HILDT, H. W. Weeds, rats and pineapple disease control. (Abs.)..... 349</p> <p><i>et al.</i> Cane sett pineapple disease control. (Abs.)..... 245</p> <p>- Rat control in Hawaii. (Abs.)..... 19</p> <p>HINE, E. M. Cane syrup storage in Venezuela. (Abs.)..... 116</p> <p>HINOJO, J. M., <i>see</i> LEIDERMAN, J.</p> <p>HINOLA, A. H. Raw sugar quality standard in Philippines. (Abs.)..... 222, 393</p> <p>HIROSE, A. M. and MOUNTS, R. D. Silver cane diffuser performance</p> <p>HIRSCHMULLER, H. Radio-isotope applications. (Abs.)..... 393</p> <p>and DELAVIER, H. J. Indian sugar industry. (Abs.)..... 115</p> <p>HITCHCOCK, B. E. Cane pests in Australia. (Abs.)..... 83</p> <p>Soldier fly. (Abs.)..... 278</p> <p><i>see also</i> STICKLEY, B. D. A.</p> <p>Ho, F. W., <i>see</i> CHANG, H. <i>and</i> YANG, P. C.</p> <p>HOARAU, M. Mechanical cane loading in Réunion. (Abs.)..... 207</p> <p>HODKOVÁ, V., <i>see</i> ČÍŽ, K.</p> <p>HOGARTH, D. M. Cane field in Australia</p> <p>HOGG, J. S., <i>see</i> BASS, R. C.</p> <p>HOKAYEM, A., <i>see</i> ABOKHAILA, A.</p> <p>HOKKADO SUGAR CO., <i>see</i> SHIMIZU, J.</p> <p>HOLDGATE, R. H., <i>see</i> HIDI, P.</p> <p>HOLLAUS, F. and KLAUSHOFFER, H. Beet diffusion juice micro-organisms. 237, 271</p> <p>HOLLIDAY, P. Cane fungus diseases. 143</p> <p>HOOK, E. W. and ZAUS, R. D. Beet harvester. (Pat.)..... 324</p> <p>HORNKOVA, J., <i>see</i> VALTER, V.</p> <p>HORSLEY, D. F. A. Boiler feedwater condensate treatment. (Abs.)..... 255</p> <p>HOSUR, M. C. Cane trash twisting to prevent lodging. (Abs.)..... 248</p> <p>HOWELL, W. E. and MINK, G. L. Virus disease transmission from volunteer beet. (Abs.)..... 252</p> <p>HRDLÍČKA, V. and VALTER, V. Carbonatation juice alkalinity indication. (Abs.)..... 320</p> <p>HRZYAK, T., <i>see</i> KANTIEWSKI, K.</p> <p>HSEIH, K. F. Batch <i>vs.</i> continuous crystallization. (Abs.)..... 352</p> <p>HSEIH, W. H., <i>see</i> LEU, L. S.</p> <p>HU, C. H. <i>et al.</i> Soil temperature and nematode survival. (Abs.)..... 347</p> <p>HU, C. J. and LEE, S. M. Irrigation in Taiwan. (Abs.)..... 80</p> <p>HUANG, C. T., <i>see</i> CHEN, M. T.</p> <p>HUANG, L. F., <i>see</i> CHEN, H. I. H.</p> <p>HUANG, T. J., <i>see</i> CHU, Y.</p> <p>HUCKEYBER, W. C., <i>see</i> HIGGINS, I. S.</p> <p>HUGHES, C. G. Cane diseases in Australia. (Abs.)..... 109</p> <p>Cane diseases and intravarietal varieties exchange. (Abs.)..... 47</p> <p>Fiji disease. (Abs.)..... 280</p> <p>Leaf scald. (Abs.)..... 384</p> <p>and STEINDL, D. R. L. Cane diseases in Australia. (Abs.)..... 141</p>	<p>HUGHES, E. Cloud seeding for rainfall stimulation. (Abs.)..... 382</p> <p>HULITT'S SUGAR CORPORATION LTD. Cane diffuser. (Pat.)..... 291</p> <p><i>see also</i> VAN HENGEL, A.</p> <p>HUMBERT, R. P. Mechanical cane harvesting and cleaning. (Abs.)..... 311</p> <p>New Guinea and cane varieties. (Abs.)..... 381</p> <p>Soil salinity reduction by irrigation</p> <p>HUMM, D. M., <i>see</i> SHPAK, J.</p> <p>HUMMEL, R. Molasses fodder delivery</p> <p>HURNEY, A. P. Acid soil liming. (Abs.)..... 278</p> <p>HUSAIN, A. A. and HUTCHINSON, P. B. Cane Fiji disease resistance testing <i>see also</i> DANIELS, J.</p> <p>HUSZ, G. Cane sugar determination <i>et al.</i> Casa Grande sugar factory .. 85</p> <p>HUTCHINSON, B., <i>see</i> HIGGINS, I. S.</p> <p>HUTCHINSON, P. B. Cane disease alternative hosts. (Abs.)..... 313</p> <p><i>et al.</i> Fiji disease alternative hosts and transmission. (Abs.)..... 384</p> <p><i>see also</i> DANIELS, J. and HUSAIN, A. A.</p> <p>HWAUNG, C. M. and SHEN, K. H. Automatic pH control. (Abs.)..... 352</p> <p>HYLTON, N. C. Tractor economics..... 211</p> <p>ILEVLEV, D. M., <i>see</i> MAZEPIN, K. G.</p> <p>IKEDA, M. and INOUE, N. Chemical weed control and cane shoot growth. (Abs.)..... 247</p> <p>IL'IN, M. I. <i>et al.</i> Continuous centrifugal indapone. T. and H. YASUDA. Cane bud baxins and sprouting. (Abs.)..... 219</p> <p>INDUSTRIAL FILTER &amp; PUMP MFG. CO., <i>see</i> ZIEVERS, J. F.</p> <p>INOUE, N., <i>see</i> IKEDA, M.</p> <p>INTERNATIONAL HARVESTER CO., <i>see</i> HILL, H. B.</p> <p>INTERNATIONALE ERFINDER- UND PATENTANSTALT, <i>see</i> VELOSO, A. E.</p> <p>IRVINE, J. E. Dextrose:levulose ratio and cane juice sugar determination</p> <p>Frost effect on cane. (Abs.)..... 184</p> <p>ISA, A. L. Cane borer rearing. (Abs.)..... 315</p> <p>and AWADALLAH, W. H. Cane borers</p> <p>ISART, J. Beet pests in Spain. (Abs.)..... 84</p> <p>ISCHENKO, P. I., <i>see</i> PRILUTSKII, I. I.</p> <p>ISOBE, M. Controlled-release fertilizers</p> <p>IVANOV, S. Z., <i>see</i> FAI, K. K. <i>and</i> PRONINA, V. A.</p> <p>IVANOVA, A. A. <i>et al.</i> White sugar bulk storage. (Abs.)..... 354</p> <p>P. C. Cane hit, smag and deterioration after harvest. (Abs.)..... 179</p> <p>IWASHINA, S. and NAGASAKA, T. Colour removal by hydrogenation. (Abs.)..... 356</p> <p>IZATT, L. K. Mechanical harvesting and irrigation effects on cane varietal choice. (Abs.)..... 249</p> <p>JACKLIN, D. G. Shredder hammer tip electro-casting. (Abs.)..... 147</p> <p>JACKSON, R. D., <i>see</i> CHARPENTIER, L. J.</p> <p>JACQUES, J., <i>see</i> VANDEWIJER, R.</p> <p>JACQUES, P. Sugars ester preparation</p> <p>JAIN, N. C. and KUMAR, V. Large grain sugar manufacture. (Abs.)..... 253</p> <p>JAIN, N. C., <i>see</i> AGRWAL, J. P.</p> <p>JAIN, V. K., <i>see</i> SHANKER, K.</p> <p>JAINISWAL, S. P., <i>see</i> BABU, C. N. <i>and</i> VERMA, A. K.</p> <p>JAMES, D. W. <i>et al.</i> Soil nitrate and beet growth. (Abs.)..... 146</p> <p>JAMES, G. L. Cane roging and smut 311, 382</p> <p>Cane smut varietal resistance... 312, 382</p> <p>Hot water treatment and cane sett germination. (Abs.)..... 206</p> <p>JAMES, G. P. Cane deterioration and raw sugar filtrability. (Abs.)..... 148</p> <p>and CAMERON, J. M. Cane deterioration and raw sugar filtrability .. 53</p> <p>JAMES, N. I. and MILLER, J. D. Cane breeding criteria. (Abs.)..... 111, 314</p> <p>- Cane crossing in US. (Abs.)..... 377</p> <p>JAMES, R. A., <i>see</i> SHEPHERD, E. E.</p> <p>JANEBA, G. <i>et al.</i> Zuckerwirtschafts-Hoches Taschenbuch 1972/73. (N.B.)</p> <p>JARIS, T. W., <i>see</i> VAN ARSDEL, E. P.</p> <p>JASZYCZYNSKI, W. DDS beet diffusers in East Germany. (Abs.)..... 320</p> <p>JENNINGS, R. P., <i>see</i> WILKES, R.</p> <p>JENSEN, M. B., <i>see</i> CARTER, J. N.</p> <p>JHAMB, P. D. Nitrogen application and cane yield. (Abs.)..... 208</p>	<p>JHINGAN, T. C. and AROBA, S. G. Seed slurry preparation. (Abs.)..... 216, 253</p> <p>JIMENEZ, I. L., <i>see</i> GALVEZ, A. M.</p> <p>J &amp; L ENGINEERING CO. INC., <i>see</i> STEEB, A. C.</p> <p>JOBLING, M. J., <i>see</i> HIGGINS, I. S.</p> <p>JOHNSTON, M. A. and WOOD, R. A. Soil compaction and cane yield. (Abs.)..... 207</p> <p>JOLY, S., <i>see</i> STUPELLO, J. P.</p> <p>JONES, C. D. 80 cane variety. (Abs.)..... 278</p> <p>JONES, F. W. and DUNNING, R. A. Beet pests in U.K. (N.B.)..... 256</p> <p>JOSEPH, A., <i>see</i> SAXENA, M. C.</p> <p>JOSHI, B. D., <i>see</i> BHARGAVA, K. S. <i>and</i> RIZVI, S. M. A.</p> <p>JUANG, P. Y. Cane characteristics and yield. (Abs.)..... 51</p> <p>End-of-row vs. in-row cane differences</p> <p>JUANG, T. C. Water table depth and soil bulk density effects on cane nutrient uptake. (Abs.)..... 345</p> <p>JUCKES, A. H., <i>see</i> SCHÄFFLER, K. J.</p> <p>JULIEN, H. R. Photoperiod effects on cane flowering. (Abs.)..... 80</p> <p>and McINTYRE, G. Cane chemical ripening. (Abs.)..... 82</p> <p>JURACK, E. <i>et al.</i> On exchange column explosion. (Abs.)..... 355</p> <p>KACIMI, A. Beet molasses sugar extraction. (Abs.)..... 390</p> <p>KACZMARESKI, E. Vacuum pan. (Abs.)..... 118</p> <p>KADYBEI, A. K., <i>see</i> DANIEL, K. V.</p> <p>KADLEC, P., <i>see</i> BREITENBEIDER, R.</p> <p>KÄETHER, W. and BÄCKOPEN, H. D. Cane diffuser. (Pat.)..... 188</p> <p><i>et al.</i> Cane diffuser. (Pat.)..... 188</p> <p>KAGA, T., <i>see</i> SHIMIZU, J.</p> <p>KAGANOV, I. N. and FUZHILKIN, V. I. Sugar solution cooling and electrical resistance. (Abs.)..... 153</p> <p>KAJKE, J. R. Cane agriculture in India. (Abs.)..... 210</p> <p>Nitrogen fertilization. (Abs.)..... 347</p> <p>Soil and potassium effects on cane phosphorus response. (Abs.)..... 174</p> <p>KALB, R. A. <i>et al.</i> Cane nitrogen requirements determination by crop logging. (Abs.)..... 342</p> <p>KALINICHENKO, A. K. <i>et al.</i> Three-massette boiling scheme. (Abs.)..... 202</p> <p>KALRA, A. N. and DAVID, H. Cane borer sex attractant. (Abs.)..... 316</p> <p>KAMAT, K. L. <i>et al.</i> Cane borer parasites</p> <p>KANTIEWSKI, K. and IRVING, T. Beet sugar ash determination. (Abs.)..... 122</p> <p>KANKAREJ, B. N. Boiling for molasses loss reduction. (Abs.)..... 253</p> <p>KANWAR, R. S. Autumn planting and cane intercropping. (Abs.)..... 383</p> <p>Cane agriculture in US and Puerto Rico. (Abs.)..... 379</p> <p>Pesticide application and cane yield</p> <p>Separate seed cane growing for disease control. (Abs.)..... 174</p> <p><i>see also</i> BABU, C. N. <i>and</i> SANDHU, S.</p> <p>KANZAKI, T., <i>see</i> FUKUDA, H.</p> <p>KAPATI, A. V., <i>see</i> EREMEENKO, B. A.</p> <p>KAPOOR, P. C., <i>see</i> BHOS, R. L. <i>and</i> KAR, K.</p> <p>KAR, K. Cane yield improvement needs in India. (Abs.)..... 82</p> <p>Chemical weed control. (Abs.)..... 379</p> <p>and BAJPAI, P. D. Fertilizer requirements of high-yielding cane varieties. (Abs.)..... 174</p> <p>and GUPTA, S. C. Leafhopper fungus parasite. (Abs.)..... 383</p> <p><i>et al.</i> Seed cane infection and wilt disease incidence. (Abs.)..... 376</p> <p>- Cane intercropping with onions. 379</p> <p>- Cane red rot varietal resistance... 318</p> <p>KARA-MURZA, S. G., <i>see</i> LEAL, G. L. E.</p> <p>KARAS, V. A., <i>see</i> SAGAN, I. I.</p> <p>KARAFLOV, N. B., <i>see</i> PARENPOULO, M. G.</p> <p>KARHADKAR, D. C., <i>see</i> MEHTA, D. J.</p> <p>KARNASVICH, E. M. and DEONEGA, I. A. Automatic centrifugals in refinery. (Abs.)..... 120</p> <p>KARPOVICH, N. S. Pesticide juice circulation and diffuse performance. (Abs.)..... 390</p> <p>KASTNER, F. Waste water treatment</p> <p>KATARIA, R. C., <i>see</i> BABU, C. N.</p> <p>KATS, B. I. Beet thick juice sulphitation and evaporator tube corrosion 392</p>			

INDEX

PAGE		PAGE		PAGE
	KATURAVA, K. N. S. and RAJPUT, R. K. Irrigation intervals and nitrogen effects on cane yield. (Abs.)	176		
	KEAN, C. E., see SCHWEY, F. W.			
	KELLY, F. H. C. et al. Calcium carbonate particle size and shape in carbonation	131		
	- Syrup decolorization by carbonation	308		
	- S. sulphitation			
	KELSEY, R. L., see MEADS, P. F.			
	KERKWEY, R. E. Cane damage by rats. (Abs.)	348		
	KETKAR, V. A., see KULKARNI, D. P.			
	KHAN, A. A. et al. Fertilizer trials in Pakistan. (Abs.)	212		
	KHAN, M. S. Cane leaf scald resistance trials in Guyana. (Abs.)	142		
	KHANNA, J. W. Factory electrical equipment. (Abs.)	180		
	KHANNA, S. S. et al. Co 6811 cane variety. (Abs.)	145		
	KHARIN, S. B. Sucrose solution thermodynamics and sucrose solubility	395		
	and MASLOVA, V. V. Colour reduction with aluminum hydroxide. (Abs.)	223		
	- Sucrose effect on colorant adsorption by CaCO <sub>3</sub> . (Abs.)	181		
	et al. Calcium chloride and potassium nitrate effects on sucrose crystallization. (Abs.)	322		
	see also DOBROMIROVA, V. F.			
	KHARIN, V. M. and DOBROMIROVA, V. F. Calcium salt and sucrose crystallization. (Abs.)	356		
	- KCl and NaCl effects on sucrose crystallization. (Abs.)	289		
	see also DOBROMIROVA, V. F. and KHARIN, S. E.			
	KHAMITONENKO, V. F., see AKSENOV, E. Y.			
	KHELEMSKII, M. Z. Beet pile forced ventilation. (Abs.)	22		
	et al. Beet sampling for dirt content determination. (Abs.)	90		
	KHURANA, S. M. P. and SINGH, S. Cane mosaic. (Abs.)	383		
	- Nematoide and cane seedling blight fungus. (Abs.)	313		
	KHVALKOVSKI, T. P., see ZAGORULKO, A. Y.			
	KICHIGIN, N. M. and EMELEYANOV, N. A. Beet pile dimensions calculation. (Abs.)	181		
	and NOVOKURSKI, I. I. Sugar bag fibre resistance in storage. (Abs.)	182		
	see also SKHOLENKO, B. P.			
	KIMENOV, G. Evaporator heat and steam losses. (Abs.)	149		
	KING, A. R., see BENNETT, M. C.			
	KING, N. J. Cane billet length and deterioration. (Abs.)	377		
	Cane varieties in Australia. (Abs.)	176		
	Fodder cane varieties in Australia.	176		
	Insecticides and soil fertility. (Abs.)	141		
	KING, R. F. and THOMSON, G. M. Tanks for ratoon stunting disease control by hot water treatment.	382		
	KING, S. T. Cane planter trials in Taiwan. (Abs.)	210		
	KINSTON, G. Irrigation and cane yield	279		
	KIRA, M. T. and EL-SHERIF, H. Cane borer damage. (Abs.)	16		
	- Cane planting date and borer infestation. (Abs.)	16		
	KIRBY, L. K. Cane billet length and deterioration after harvesting.	380		
	and STEWART, E. J. BMA continuous centrifugals. (Abs.)	148		
	see also HENDERSON, C. S.			
	KISILEV, A. V. Beet washer impurities removal. (Abs.)	150		
	KLAUSHOEFER, H. and POLLACH, G. Micro-organisms and losses in beet diffusion. (Abs.)	117, 223, 321		
	see also HOLLAUS, F.			
	KLIMENKO, M. I., see FEDOTKIN, I. M.			
	KLIMB, M. Ash and non-sugars effects on beet molasses yield. (Abs.)	153		
	KLYAVIN, I. Y., see KHELEMSKII, M. Z.			
	KNAPP, E. Beet hybridization. (Abs.)	350		
	KNOFLIČKOVÁ, H., see ŠEVČÍK, V.			
	KOCHUBI, N. S., see ZAGORULKO, A. Y.			
	KOCHUN, K. and DROZDOWSKI, T. P. Fertilization at Racibórz. (Abs.)	353		
	KODENKO, N. M. and LEBOVICH, D. M. Beet syrup ion exchange treatment	118		
	KOENIG, M. J. P., see GOSNELL, J. M.			
	KOENIG, S., see BRUIJN, J.			
	KOHAJA SUGAR CO., see GOMES, F. P.			
	KOIKE, H. <i>Pythium</i> root rot of cane 109, 144			
	Testing for cane varietal resistance to leaf scald. (Abs.)	47		
	and TIPPETT, R. L. Mosaic-diseased cane "roguing" with herbicides 249, 312			
	KOLESNIKOV, V. A. Optimum evaporator heating surface. (Abs.)	181		
	KOLOMIETS, V. F., see GREBENYUK, S. M.			
	KON, L. I. et al. Refined sugar moisture determination. (Abs.)	59		
	KONG, L. and CHU, C. C. Cane leaf dark respiration. (Abs.)	347		
	see also CHU, C. C.			
	KOPRYVA, B., see BRETSCHNEIDER, R.			
	KORUT, G. M., see SHOHGOLEV, V. N.			
	KOROL'KOV, A. S., see MAZEPIN, K. G.			
	KOSTENKO, A. and GONCHAR, A. Beet pile forced ventilation. (Abs.)	88		
	KOSTROV, Y. A. et al. Bagasse cellulose reactivity. (Abs.)	225		
	KOT, Y. D., see BELOSOTSKI, G.			
	KOVAL'CHUK, E. A., see PREREVIN, M. I.			
	KOVALECHUK, V. P., see BUNYAK, A. M.			
	KOZIASHVILI, U. A. Beet pile temperature measurement and indication. (Abs.)	150		
	KOWALCZYK, T. Filters. (Abs.)	255		
	KOZAK, A. M., see POPOVICH, L. A.			
	KRAJČOVIČ, Z. ARO automatic centrifugals. (Abs.)	149		
	KRAMER, F. A. et al. Bagasse furnace ash removal. (Abs.)	85		
	KRASKI, T. Xanthi sugar factory	320		
	KRASKINOVA, V. N., see GONCHAROVA, K. P.			
	KRASNOV, Y. I. et al. Polyamide sleeve bearings. (Abs.)	119		
	KRAUSE, E. et al. Invert sugar determination. (Abs.)	323		
	KRAVETS, Y. O. et al. Syrup decolorization with active carbon. (Abs.)	320		
	KREMKY, A. Beet molasses sugar extraction. (Abs.)	321		
	KRENZ, E., see JANBA, G.			
	KRIBGER, O. D. Boiling with surface-active additive. (Abs.)	389		
	and CSLEK, I. Boiling with surface-active additive. (Abs.)	288		
	KRISHNAMOORTHY, T. N., see PICHUMANI, A. V.			
	KRÜGER, C. and STEINMEYER, W. Liquid sugar mixtures. (Abs.)	218		
	KUBACKI, S., see GRUSZEKA, H.			
	KUBADINOV, N. and WIENINGER, L. Amino-nitrogen determination in beet and juice. (Abs.)	90		
	KUBIAR, J., see ZAGRODZKI, S.			
	KUBO, T. and TATUKI, R. Dextrose and levulose separation. (Pat.)	260		
	see also TATUKI, R.			
	KUDRYAVTSEVA, N. K., see BRENNMAN, S. A.			
	KULHANEK, M. and TADRA, M. Levulose, sorbose and mannitol preparation. (Abs.)	224		
	KULKARNI, D. P. and UNDE, J. R. Cane diffusion and impurities extraction. (Abs.)	216		
	et al. Beet es. cane processing. (Abs.)	391		
	KULKARNI, R. K. and LONDRE, P. B. Sugar recovery in India. (Abs.)	387		
	KULKARNI, S. K. Effect of cane and juice quality reduction on sugar recovery. (Abs.)	253		
	KUMAR, S. Termite and grub control et al. Scale insect. (Abs.)	208, 211		
	KUMAR, V., see JAIN, N. C.			
	KUO, S. S. Cane handling at Taitung	53		
	KURKOWSKA, A., see ZAGRODZKI, S.			
	KÜTKE, K. Mangold beetle and beet fly control. (Abs.)	385		
	KVACHEVA, N. K. and CHIRIK, G. A. Refined sugar non-sugars determination. (Abs.)	185		
	KWAN, P. C. and LU, C. S. Bagasse board, paper and pulp manufacture in Taiwan. (Abs.)	164		
	KWO, C. Y. and MOK, B. C. Cane sett dense es. single planting. (Abs.)	51		
	LAARSHMIKANTHAM, M. et al. Cane character inheritance. (Abs.)	176		
	- Cane drought resistance. (Abs.)	344		
	- Cane intercropping. (Abs.)	344		
	- Lodging effect on cane. (Abs.)	210		
	LAL, A. B., see SARSENA, T. P. and SAXENA, T. P.			
	LAL, K. M. and BHARGAVA, K. S. Cane mosaic transmission. (Abs.)	383		
	see also BHARGAVA, L. S.			
	LAL, P., see SINGH, B.			
	LALOUETTE, J. A. Cane breeding in Mauritius. (Abs.)	80		
	and CHONG, L. C. Y. L. S. Cane varietal trials in Mauritius. (Abs.)	80		
	LAMUSSE, J. P. Cane diffusion in South Africa. (Abs.)	86		
	LANDI, S. and MANTOVANI, G. Decolorization by ion exchange. (Abs.)	392		
	- Dilution and ion exchange resin capacity. (Abs.)	395		
	LANGE, J. M. Trickle irrigation. (Abs.)	349		
	LANGEN, E. and WEDDECKE, H. Beet cossette scald. (Pat.)	91		
	LANYON, W. M. and TORY, P. Maintenance planning. (Abs.)	254		
	see also HIGGINS, I. S.			
	LATY, A. P. Clarifier juice preservation. (Abs.)	218		
	and TAVARTKILADZE, I. M. Waste water treatment. (Abs.)	392		
	LAPKIN, A. I., see BUGAENKO, I. F.			
	LAPPERRE, P. E. Soils in Portuguese East Africa. (Abs.)	246		
	LA SERNA, G., see LODOS, J.			
	LASTOVENKO, V. A., see PARYANKO, A. I.			
	LAU, W. Automatic beet diffusion temperature control. (Abs.)	255		
	LAUDEN, L. L. Cane harvester. (Abs.)	281		
	Cane planting. (Abs.)	204		
	Cane smut in Hawaii. (Abs.)	249		
	L 65-69 cane variety. (Abs.)	204		
	Rain and cane harvesting difficulties "Serapping" lodged cane. (Abs.)	142		
	LAUER, K. and STEPHAN, P. Sugar solution preparation. (Pat.)	292		
	et al. Dextrose and levulose determination. (Pat.)	324		
	LAUGHLIN, C. W., see RUPPEL, R. F.			
	LAUGHLIN, H. F., see SMITH, S. B.			
	LYARHITSK, E. L., see SILINA, N. P.			
	LEAI G., J. E. and KARA-MURZA, S. G. Polysaccharides determination in cane juice. (Abs.)	395		
	LE BLANC, M. Sugar factory steel applications. (Abs.)	320		
	LEE, J. and COMERFORD, C. K. Weather and soil effects on beet. (Abs.)	385		
	LEE, S. M., see HU, C. J.			
	LEE, W. H. Fertilizers in Taiwan	346		
	LEFEVRE, G. Beet nitrogen fertilization	52		
	LEFFINGWELL, R. J. Azores sugar factory. (Abs.)	150		
	Madeira sugar industry. (Abs.)	85		
	LEIBOVICH, D. M., see KODENKO, N. M.			
	LEIMBERMAN, J. C. Herbicides and urea nitrification. (Abs.)	246		
	LEMAITRE, A. Evaporator corrosion. Vierz juice station. (Abs.)	389, 118		
	LENEVA, L. A., see REVA, L. P.			
	LEONARDI, F. A. J. et al. Biennial cane harvesting. (Abs.)	248		
	LÉOVILLE, P. Cane areas and varieties in Réunion. (Abs.)	207		
	LEPENNE, B. and MERLET, J. P. Flow measurement. (Abs.)	389		
	LE ROUX, J. South Africa cane soils.	382		
	LEU, L. S. Cane white leaf vector. (Abs.)	143		
	Smut fungus teliospore germination	884		
	Wild cane and smut disease. (Abs.)	143		
	and HSIEH, W. H. Cane diseases in Taiwan. (Abs.)	79		
	- Cane leaf blight resistance. (Abs.)	312		
	and TENG, W. S. Cane smut varietal susceptibility. (Abs.)	142		
	and WANG, Z. N. <i>Mogannia hebes</i> parasites. (Abs.)	18		
	et al. Cane leaf blight resistance by tissue culture. (Abs.)	144		
	see also WANG, P. Y. and WANG, Z. N.			
	LEUNG, L. S. et al. Bagasse furnace fly ash removal. (Abs.)	148		
	LEVAD, J. A. et al. Reconstituted non-sugars and beet pulp as animal fodder	154		
	LEVERINGTON, K. C. Soil and cane research in Australia. (Abs.)	83		
	LI, C. H., see LIU, S. C.			
	LIANG, C. J., see PAN, Y. S. and SU, T. H.			
	LIAO, M. C. Cane land soil conservation	347		
	LIBERMAN, I. G., see SPINUL, N. M.			
	LIN, S. C. and LI, C. H. Cane white leaf disease. (Abs.)	177		
	and TENG, W. S. Cane white leaf control. (Abs.)	79		

# INDEX

	PAGE		PAGE		PAGE
LIN, S. F. Podder yeast production from vinasse. (Abs.)	27	MANA, P. P. Inversion reduction in cane milling. (Abs.)	352	MEZENTSEV, S. K., see POPOV, A. E.	
LINEDALE, A. I. Tile drainage. (Abs.)	380	MANCILLAS, M. A. Mассеcude seedling	54, 147	MICKEVICZ, J. M. Brown sugar manufacture. (Pat.)	125
LINK, K. C. H., see HIGGINS, I. S.		MANCINI, F., see MANZONI, G.		icing sugar manufacture. (Pat.)	258
LIPPERT, A. A. and OLEINIK, I. A. Beet sugar determination. (Abs.)	323	MANN, W. S., see SANT, M. V.		MIGNUCCI, J., see LIU, L. J.	
- Diffusion water treatment with aluminium sulphate. (Abs.)	391	MANTOVANI, G. et al. Seed irradiation and beet processing quality. (Abs.)	250	MILLER, J. D., see JAMES, N. I.	
LITVINENKO, L. and POTABENKO, D. Beet pile forced ventilation. (Abs.)	22	see also FASULO, M. P., LANDI, S. and MARIGNETTI, N.		MILLIKEN, G. A. et al. Beet parents combining ability. (Abs.)	52
LIU, L. J. et al. Pineapple disease control. (Abs.)	50	MARESS, S. L. Mechanical cane loading	144	MILLNER, J. H. Tower Hill factory	116
and MIGNUCCI, J. Cane <i>Fusarium</i> stem rot. (Abs.)	246	MARETTI, A. et al. Drought and salinity effects on cane. (Abs.)	344	MILLS, E. C. Cellulose pulp manufacture. (Pat.)	228
LIU, T. C. et al. Flyash arrestors. (Abs.)	352	MARGABHANDHU, A. J. Clarification with magnesium oxide. (Abs.)	180	MILOVANOV, A. and CORONA, E. Purfural production from bagasse	225
LIU, Y. T., see LEU, L. S.		MARIAKULANDAI, A., see CHOWDAPPAN, R. S. and SRINIVASAN, T. R.		MIMURA, L., see MONGELARD, J. C.	
LLANOS L., R. Optimum fertilizer rate. (Abs.)	142	MARIANI, E. Waste water treatment	320	MINET, A. G. Cane harvester. (Pat.)	260
LO, C. C. Cane bud ribonucleic acid extraction. (Abs.)	347	MARIGNETTI, N. and MANTOVANI, G. Diffusion residence time	35	MINK, G. I. Beet varietal yellows tolerance. (Abs.)	214
LO, M. P., see LIU, T. C.		MARIOTTI, J. A. Cane character correlations. (Abs.)	142	see also AAFOLA, A. and HOWELL, W. E.	
LOBATO L., R. Vacuum pan syrup feeding. (Abs.)	352	Cane hybrid genetics. (Abs.)	142	MIRONOVA, L. P., see SILINA, N. P.	
LOEHRER, F. Agricultural spray mixtures	215	and GIMENEZ L., O. Cane ratooning ability. (Abs.)	182	MIROSHNICHENKO, S. S. et al. Beet albumin analysis. (Abs.)	356
LOH, G. P. Calbu sugar factory. (Abs.)	319	MAROUNER, M. Refined sugar ash and colour. (Abs.)	59	see also ZHURA, K. D.	
LOMBOS, J. and LA SERNA, G. Icingsugar particle size. (Abs.)	59	Waste water oil determination. (Abs.)	222	MISHRA, K. C. and PANDA, K. C. Co1053 cane variety. (Abs.)	211
LOGAN, J. T., see SESTERO, J. R.		MARQUES, E. J., see GUAGLIUMI, P.		MISRA, A., see PATRO, G. K.	
LOJLER, M., see CHARTIER, J. C., DEVILLERS, P. and GUERIN, B.		MARSHALL, J. M., see STEELE, C. R.		MISRA, S. R., see MENON, R. G. and SINGH, K.	
LONDHE, P. B., see KULKARNI, R. K.		MARTENS, M. Beet agriculture in Belgium. (Abs.)	350	MISRA, S. S., see KUMAR, S.	
LONG, A. G. Cane leaf analysis. (Abs.)	206	Beet research. (Abs.)	350, 385	MITCHELL, G. E. and FINGER, L. J. Salty waste water treatment. (Abs.)	148
see also GOSNELL, J. M.		and OLDFIELD, J. F. T. Beet storage	146	MITCHELL, W. C., see OZA, A. K.	
LOO, K. C., see KELLY, F. H. C.		see also DEVUYST, A.		MITTAL, B. L. Continuous cane diffuser juice heater tubes. (Abs.)	216
LOPEZ, M. E. Cane disease symptoms	249	MARTENS, P. H., see VAN STEYVOORT, L.		MITZI, J. M. Cane harvester. (Pat.)	291
LOPEZ D., A. A., see TRIANA F., C. J.		MARTINEZ, A. M., see GRAHAM, C. P.		MILYNAZ, J. Sugar fluidized bed dryer, cooler. (Abs.)	117
LOPEZ H., J. A. and PAZ, H. A. Bagasse board manufacture. (Abs.)	186	MASADA, H., see NIMI, M.		MOBERLY, P. K. Cane age, harvest time and nitrogen uptake. (Abs.)	206
LOPEZ V., H. Chemical control systems	323	MASHATA, V. V., see KHARIN, S. E.		Deep tillage. (Abs.)	382, 383
LOSDA, H. et al. Cane molasses as animal fodder. (Abs.)	224	MATKOVA, J., see VASATKO, J.		and STEVENSON, D. W. A. Poultry manure as fertilizer. (Abs.)	205
LOSS, F. Beet pulp drying. (Abs.)	123	MATH, B. R. Phosphate and lime in sulphitation. (Abs.)	180	see also ROESLER, L. A.	
LOUPE, D. T., see GOLDEN, L. E.		MATHER, J. Sugar bulk handling and storage properties. (Abs.)	219	MOK, B. C., see KWO, C. Y.	
LOUW, C. W. and RICHARDS, J. F. Cane fluorine determination. (Abs.)	185	MATHERN, R. J. Cane varieties in US. (Abs.)	142, 383	MOLLER, P. B. Cane cultivation, planting and harvesting time	348
LOYNER, G., see FRITZ, J.		Spacing and planting rate effects on cane. (Abs.)	15	MONGELARD, J. C. Cane root temperature and water consumption. (Abs.)	349
LU, C. S., see KWAN, P. C.		MATHUR, B. K. Fertilizer trials in India and Singh. A. Cane planting rate and yield. (Abs.)	314	and MIMURA, L. Root temperature and cane growth. (Abs.)	245
LUPASHKO, V. A., see DUDNIKOV, S. V.		see also KHANNA, S. S.		et al. Surface vs. sub-surface irrigation. (Abs.)	344
LURZ, E., see BURBA, M.		MATHUR, K. K., see AGARWAL, S. K. D.		MONT'ALBRE, O. Australian sugar industry. (Abs.)	85
LYAKHCHIK, E. L., see SILINA, N. P.		MATHUR, R. B., see SINGH, O. P.		MONTALVO-ZAPATA, R., see ALEXANDER, A. G.	
LYNESS, W. I. and THOMPSON, J. E. Detergent manufacture from sugars	292	MATIC, M. Raw sugar quality in South Africa. (Abs.)	86	MONTHERJE, J., see FLEITES, S. N.	
LYSTANSKII, B. M. et al. Beet tissue permeability calculation. (Abs.)	353	see also KHANNA, S. S.		MOOR, B. S. C. Bagasse furnace gas scrubber. (Abs.)	388
see also ZHMYRYA, L. P.		MATSUOKA, S. Bagasse animal fodder	312	MOORE, P. H. Cane flowering. (Abs.)	175
LYUSYI, N. A., see DAISHEV, M. I.		Ratoon stunting diagnosis. (Abs.)	312, 314	and HEINZ, D. J. Cane flowering control. (Abs.)	111, 344
		MATVIENKO, B. A. Evaporator tube cross-section area calculation	219	MORACHAN, Y. B., see CHOWDAPPAN, S. R.	
		MAUGHAN, G. L. Beet harvesting losses in UK. (Abs.)	385	MOREJÓN, M., see PRESTON, T. R.	
		MAURANDI, V. Beet juice filtration	117	MORELAND MOLASSES CO. LTD., see BOYES, P. N.	
		MAYLOTT, A. O., see PRINCE, B. N.		MORFAUX, J. N., see CATROUX, G.	
		MAYR, H. H. and FROHNER, W. Soil boron deficiency. (Abs.)	286	MORGAN, N. D., see OLDFIELD, J. F. T.	
		MAZEPIN, K. G. et al. Trace elements and beet processing quality. (Abs.)	286	MORIN, D. M. Tractor side and cane agriculture costs. (Abs.)	174
		MAZLIN, R. N., see ROESLER, A. K.		Tractors in cane agriculture. (Abs.)	173
		MAZUR, A. A., see GORSKI, V. A.		MORITSUGU, T. Laboratory boiling	356
		MAZARI, M. E., see CESAR, M. A. N.		MORRIS, R. M. and ROBERTS, L. W. Cane molasses exhaustion. (Abs.)	386
		MEADS, P. F. et al. Refinery air and water discharge requirements	355	MORTON, J. C., see PHIPPS, O. H.	
		MEE, G. W. P., see HEINZ, D. J.		MORTON, R. M. Cane leaf abscisic acid	315
		MEHROTRA, S. K., see SINGH, A. S.		MOUNTS, R. D., see HROSE, A. M.	
		MEHTA, D. J. and KARHADKAR, D. C. Cane molasses spontaneous destruction. (Abs.)	287	MUKERJI, N. Beet agriculture in India	214
		MEHTA, J. S., see GUPTA, S. C.		MUKHAMED, M., see BUGAENKO, I. F.	
		MELAJA, A. J. Dextrose and levulose separation. (Pat.)	293	MUKHERJEE, J. P. and CHETTY, G. K. Continuous centrifugal screen reclamation. (Abs.)	115, 216
		MELO, J. D. S., see RAMOS, F. M.		MUKHERJEE, S. and OVASISI, M. U. Lactic acid production from cane molasses. (Abs.)	154
		MENARD, D. E. Cane land drainage and soil erosion prevention. (Abs.)	378	see also BOSE, S.	
		MENON, R. G. et al. Cane hot air treatment. (Abs.)	48	MUKHERJEE, T. K. Inversion loss calculation in cane milling. (Abs.)	89
		MERCIER, A. Continuous centrifugal molasses discharge. (Pat.)	292	MUKHERJI, J. P. et al. Juice heater "Wal-Kontl" continuous centrifugal. (Abs.)	54, 216
		Continuous centrifugal tilting prevention. (Pat.)	292	MUKHOPADHYAY, A. N. and THAKUR, R. P. <i>Alternaria tenuis</i> control	385
		MERLET, J. P., see LEPENE, S. B.		MULLER, E. G., see ABBAM, J. C.	
		MESHKOVA, L. Z., see ENIKIEV, S. G.			
		MESNARD, G., see CHARTIER, J. C.			
		METSBERG, K. Beet sampling. (Abs.)	289		
		MEYER, J. H. et al. Soil nutrients in South Africa. (Abs.)	206		
		see also SUMNER, M. E.			
		MEYER, T. G. Beet payment in US.	150		



# INDEX

	PAGE		PAGE		PAGE
MÜLLER, S., <i>see</i> PÉREZ, F. and SHIMBAR, H.		NOVKOV, S. V. "Amido" pulp production. (Abs.)	123	PARKHOD'KO, A. P. Tower diffuser performance. (Abs.)	22
MÜLLER, W., <i>see</i> BAROCKA, K. H.		NOVOGUSHEV, I. I., <i>see</i> KICHIGIN, N. M.		PARKINS, J. J., <i>see</i> HEMINGWAY, R. G.	
MURO, M., <i>see</i> FLEITES, S. N.		NOVOTNY, C. J., <i>see</i> ZIEVVERS, J. F.		PARMESWARAN, K. V., <i>see</i> SAXENA, M. C.	
MURRAY, J. P. Starch and raw sugar filtrability. (Abs.)	394	<b>Ö</b> ČENÁŠKOVÁ, J. and OSVALD, R. Beet juice turbidity determination. (Abs.)	59	PARSLOW, R., <i>see</i> OLDFIELD, J. F. T.	258
MUTHUJOTHI, M., <i>see</i> SRINIVASAN, S.		OLJA, S. K., <i>et al.</i> Cane varieties in India. (Abs.)	348	PARTYANKO, A. I., <i>et al.</i> Beet harvester	342
MYATT, O. W. D. Cane planter. (Abs.)	348	OKAZAKI, E. Soil and sub-surface irrigation. (Abs.)	349	PATSKAR, M. R., <i>et al.</i> Cane varieties in India. (Abs.)	342
<b>N</b> ABABING, P., <i>see</i> HALAIS, P. NAGARKATTI, S. Cane pest control and RAO, V. P. Cane grub and borer control. (Abs.)	379 348	OKAZAKI, H., <i>see</i> FUKUDA, H.		PATCHAPPALAM, K., <i>see</i> NARAYANARAO, B.	
<i>see also</i> NAIR, K. R.		OLDFIELD, J. F. T. <i>et al.</i> Beet flume and wash water sugar determination. (Abs.)	289, 393	PATHAK, S. R. and SRINIVASAN, V. R. Bagasse extract composition. (Abs.)	289
NAGASAKA, T., <i>see</i> IWASHINA, S.		OLDFIELD, J. F. T., <i>et al.</i> Beet flume and wash water sugar determination. (Abs.)	70, 103	PATIL, S. T., <i>see</i> PHADKE, G. V.	
NAGURAY, K. R. and CHATTERJEE, A. C. Factory steam consumption reduction. (Abs.)	54	— Beet juice ion exchange treatment and resin deterioration. (Abs.)	3, 44	PATRO, G. K., <i>et al.</i> Chemical weed control. (Abs.)	314
NAIR, K. R., <i>et al.</i> Cane borer hosts. (Abs.)	17	— Phosphoric and organic acids determination in beet juice and molasses. (Abs.)	3, 44	PAUL, B. B. Bagasse paper, pulp and board manufacture. (Abs.)	123
<i>see also</i> KAMAT, K. L.		OLEZNIK, J. Automatic control. (Abs.)	87, 353	PAUL, K. N. Ethyl alcohol production from cane molasses. (Abs.)	396
NAITHANI, S. P., <i>see</i> NEGI, O. P.		OLEZNIK, I. A., <i>see</i> LIPETS, A. A.		PAULO, M. E., <i>see</i> RICAUD, C.	
NAKAMURA, A., <i>see</i> SUGIYAMA, M.		OLIVER, A. E., <i>see</i> ROBINSON, R. H.		PAUSE, K. Centrifugal basket. (Abs.)	259, 390
NAKHOPIKA, V. Z. Bacteria in beet sugar factory products. (Abs.)	122	OLYANOS, H. L. Computer applications in cane sugar factory. (Abs.)	53	Centrifugal spindle. (Pat.)	260
NAQVI, H. A. and UL-QAYYUM, R. Drought effect on cane growth and processing. (Abs.)	168	OLYANSKAYA, S. P., <i>et al.</i> Carbonation mud colorants and lime salts transfer to juice. (Abs.)	354	PAVELKO, V. I. and GARYAZHA, V. T. Mассасuite temperature in boiling. (Abs.)	320
<i>see also</i> NAIR, K. R.		<i>see also</i> ZHURA, K. D.		<i>see also</i> GARYAZHA, V. T.	
NARASIMHAM, P. V. L. Juice temperature and juice-milk-of-lime proportioning control. (Abs.)	180	O'NEILL, B. K., <i>see</i> LEUNG, L. S.		PAWAR, B. B. Continuous centrifugal screens. (Abs.)	53
Sugar factory steam consumption.	22	ONISCHENKO, G. I., <i>see</i> PARTYANKO, A. I.		PAYAK, M. M., <i>see</i> DANGE, S. R. S.	
NARASIMHAN, R. and NARAJAN, B. V. Pistilloidly in P 1036/1 cane. (Abs.)	111	OOMMEN, T. T. Cane molasses virtual purity and boiling house performance. (Abs.)	253	PAYNE, M. G., <i>see</i> RAUTELA, G. S.	
NARAYANA, R. and SRINIVASAN, H. Cane stem tissue bud formation.	248	ORLOWSKI, S. and SCHLIEPHAKE, D. Grain size distribution in boiling. (Abs.)	393	PAZ, H. A., <i>see</i> LÓPEZ H., J. A.	
NARAYANARAO, B., <i>et al.</i> De Smet cane diffuser performance. (Abs.)	216	ORLÓGA, S., <i>see</i> VALDÉS, A.		PEARSE, M. Cane reception and snuffing and juice heater automatic control. (Abs.)	116
NATARAJAN, B. V., <i>see</i> NARASIMHAN, R.		ORSON, A. W. and HALBERT, E. J. Pasture soldier fly. (Abs.)	17	PEDROSA P. R. and BENAZET, G. Factory data processing. (Abs.)	287
NATARAJAN, S., <i>see</i> DURAIRAJ, V. and RAJA, K. T. S.		<i>see also</i> HUTCHINSON, P. B.		PEGANIA, M. R., <i>see</i> TRANGCO, M. A.	
NATH, H., <i>see</i> GUPTA, R. L.		OSGOD, R. V. Cane seed piece coating and germination. (Abs.)	376	PEIXOTO, A. A. Fertilizer trials in Brazil. (Abs.)	377
NATH, P., <i>see</i> RAJANI, V. G.		New herbicide. (Abs.)	376	PELLEGRINI, A. P. Cane molasses as animal fodder. (Abs.)	123
NAYDU, M. V., <i>et al.</i> Cane striate mosaic. (Abs.)	144	OSTENFELD, H. B. Danish sugar industry. (Abs.)	119, 149	Molasses drying. (Pat.)	325
NEGI, O. P., <i>et al.</i> Cane root development. (Abs.)	15	OSVALD, R. and HAVLOVA, E. Carbonation mud filtration. (Abs.)	353	PENG, S. Y. Cane herbicide tolerance. Chemical weed control. (Abs.)	248, 209
NEGI, A. and HENSLEY, S. D. Cane borer control. (Abs.)	16	— Filter aid and juice dispersion system granulometry. (Abs.)	322	and YEH, H. J. Cane herbicide susceptibility. (Abs.)	316
NELSON, J., <i>see</i> RADEWALD, J. D.		OTA, A. K. Borer control. (Abs.)	349	PENICK & FORD LTD., <i>see</i> BLACK, W. C.	
NESTERENKO, V. I., <i>see</i> BEIK, V. G.		and MITCHELL, W. C. Cane borer control. (Abs.)	211	PÉREZ, F. and MÜLLER, S. Molasses as acid corrosion inhibitor. (Abs.)	357
NETTO, J. P. S. L. Cane smut. (Abs.)	377	OTALORA B. M. Mассасuite viscosity and molasses purity. (Abs.)	54	PÉREZ, R., <i>see</i> VALDREZO, S.	
NEUBRUNN, F. Beet sugar factory products anion analysis. (Abs.)	393	OVSASSI, M. U., <i>see</i> MURHERJEE, S. M.		PÉREZ, A. D., <i>see</i> CRUZ, F. C. M.	
NICHOL, G. E. Beet nitrogen requirements determination. (Abs.)	385	OWENS-ILLINOIS, <i>see</i> STEPPE, K. E.		PERFECT, G. A., <i>see</i> MACVICAR, C. N.	
Beet seed pelleting. (Abs.)	285	OZAWA, Y., <i>see</i> SUZUKI, H.		PERÓN, N. Cane molasses as animal fodder. (Abs.)	224
NICHOLSON, W. J., <i>see</i> CHAPMAN, L. S.		OZEL, S. Beet sugar factory location. (Abs.)	117	<i>et al.</i> Cane molasses as animal fodder	357
NICKELL, L. G. Cane ripening with chemicals. (Pat.)	250, 260	<b>P</b> ADMANABHAN, D., <i>see</i> DURAIRAJ, V. and RAJA, K. T. S.		PERSCHAK, F. Electrolysis membranes. (Abs.)	90
and TAKAHASHI, D. T. Cane ripening with chemicals. (Abs.)	349	PALACI, J. Saturated cane diffuser. (Abs.)	267	Sulphuric acid recovery from ion exchanger regeneration effluent.	255
<i>see also</i> MARETEKI, A.		PAN, J. S., <i>see</i> YANG, H. L.		PERSHOU, G. V. Automatic filter boot mud level control. (Abs.)	180
NICOL, W. M. and FARMER, C. L. Glycine and lysine effects on sucrose crystallization. (Abs.)	152	PAN, Y. S., <i>et al.</i> Cane pests in Taiwan	79	PERSLEY, G. J. Leaf scald causal agent isolation. (Abs.)	313
NIEDERER, J. J. Chemical weed control. (Abs.)	285	PANCALDI, G., <i>see</i> FASULO, M. P. and MANTOVANI, G.		PERUMAL, R. L., <i>see</i> CHATTOPADHYAY, S. K.	
NIEDERK, E. A. Sugar crystal crushing	183	PANDA, K. C., <i>et al.</i> Co 1053 cane variety. <i>see also</i> MISRA, K. C.	379	PETE, P. Miniature tractors in cane fields. (Abs.)	345
NIELSEN, P. J. Cane Brix determination. (Abs.)	380	PANDEY, B. N., <i>see</i> GUPTA, R. L.		PETERS, W., <i>et al.</i> Beet flume stone catcher. (Pat.)	29
<i>see also</i> TOORHY, C. L.		PANDIT, S. N., <i>see</i> SRIVASTAVA, S. G.		PETRENKO, Y. D. and SAGAN, I. I. Heat transfer in boiling. (Abs.)	380
NIEMANN, G., <i>see</i> HUSZ, G.		PANJE, R. R., <i>et al.</i> Cane bud number and position effects. (Abs.)	175, 314	PETRIK, G. A., <i>see</i> BOROBYANSKII, V. P.	
NINGAM, K. K. and RAHA, A. C. Cane wax ash removal. (Abs.)	123	PANOF, P. S., <i>see</i> MEHROTRA, C. L.		PETROVSKII, B. S., <i>et al.</i> Factory equipment plastics. (Abs.)	119
NIMI, M., <i>et al.</i> Mассасuite crystallization. (Pat.)	155	PAO, T. P. Soil water content and cane ratooning. (Abs.)	209	<i>see also</i> YANG, P. C.	
NITSCHKE, Z. Polish sugar factory exports. (Abs.)	320	PARAMESWARAN, P., <i>see</i> SRINIVASAN, T. R.		PEIFFER & LANGEN, <i>see</i> THIELE, H.	
NITSCHKE, U., <i>see</i> BURBA, M.		PARASHAR, D. R. Large grain sugar boiling. (Abs.)	217	CHAS. PRIZER & CO. INC., <i>see</i> FRIBB, J. H.	
NIX, K. J. Clarifier mud density calculation. (Abs.)	222	PARANPULO, M. G. and KARAUOV, N. E. Beet pulp and pulp-molasses drying. (Abs.)	396	PHADKE, G. V., <i>et al.</i> Cane planting date, pests and juice quality. (Abs.)	318
Model clarifier performance. (Abs.)	179	PARIHAR, N. S. Cane nitrogen requirements in India. (Abs.)	176	PHIPPS, G. H., <i>et al.</i> British Sugar Corporation budgetary control.	255
<i>et al.</i> Clarification with flocculation aid. (Abs.)	20	PARKER, K. J. Ion exchange. (Abs.)	355	Pi, K. W., <i>see</i> YEN, Y. C.	
<i>see also</i> BATSTONE, D. B.		<i>see also</i> ABRAH, J. C. and COOKSON, D.		PICHENEZ, J. and GUIRAUD, D. Beet spring work. (Abs.)	178
NOBLE, A. G. Clarifier mud filtration. (Abs.)	20, 179			PICHUMANI, A. V. and KRISHNAMOORTHY, T. N. Cane seed drying. (Abs.)	343
<i>see also</i> NIX, K. J.				PICOU, R. W., <i>see</i> CHEN, J. C. P.	
NOBURA, N. S., <i>see</i> HILTON, H. W.				PIDOUX, G. Sucrose solution viscosity and crystallization. (Abs.)	152
NOORDAM, D., <i>see</i> HANODOO, H.				Sugar sieve analysis. (Abs.)	185
NORMAN, L. W., <i>see</i> FARAG, S. A.				PIECK, R., <i>see</i> VANDERWEEJER, R.	
NORONHA, A. D. R. Cane diseases in Portuguese East Africa. (Abs.)	50, 247			PINEDA, L. M. Cane seed production	83
NORRIS, H. H. Beet seed drilling. (Abs.)	252			PINK, H. S. Land classification in Australia. (Abs.)	279
NOUR, A. H., <i>et al.</i> Cane spacing and seed rate. (Abs.)	177			PINTO, M. E. and DE MENDONÇA, M. Cane gummosis in Portuguese East Africa. (Abs.)	315
<i>see also</i> RAO, J. T.					
NOVAES, F. V. Cane trash removal, storage and losses. (Abs.)	53				

INDEX

PAGE		PAGE		PAGE
	PIPER, N. R. Raw sugar moisture determination.....	74		
	PLASTIFIER FORMULATIONS INC., see BOLTZ, R.			
	POLLAR, S., see NEGI, O. P.			
	PODOL'SKI, A. G., see BAKSHI, M. V.			
	POERSCH, W. and THELEN, P. Dryer dimensions calculation. (Abs.).....	218		
	POKRASS, N. N., see OLYANSKAYA, S. P.			
	POKUSA, A. A., see PARYANKO, A. I.			
	POLLACH, G., see KLAUSHOFFER, H.			
	POLLET, R. N., see TUSON, W. R.			
	POMMEZ, P. and STACHENKO, S. Chloride removal and affination efficiency. (Abs.).....	220		
	POKORAEVSKO, V. A., see PERRVIN, M. I.			
	PONTAILLER, S. Liquid fertilizers.....	250		
	POOSTCH, I. and SCHMEHL, W. R. Gibberellic acid and growth inhibitor effects on beet. (Abs.).....	146		
	POZAR, D. M. Sugar production fall in India. (Abs.).....	208		
	POPOV, A. E. and MEZENTSEV, S. K. Beet sampling for dirt content.....	59		
	POPOVICH, L. A. and KOZAK, A. M. Evaporator automatic control.....	23		
	POSTER, C. A. and AHLGREN, L. E. Cane ripening with chemicals.....	349		
	PORZHEVSKII, Y. G., see TOBLEVICH, N. Y.			
	POTABENKO, D., see LITVINENKO, L.			
	PRABHU, K. A. Distillery by-products Ethanol production from cane molasses. (Abs.).....	290		
	see also AROO, K. A. and DAHIYA, D. S.			
	PRADHAN, S. K., see KAMAT, K. L.			
	PRAKASAM, P. Cane wilt and red rot fungl. (Abs.).....	144		
	and APPALANATASIAH, P. Cane leaf spot. (Abs.).....	143		
	PRAKASH, A., see MITTAL, K. P.			
	PRAKASH, S., see NAIR, K. P.			
	PRASAD, B., see GUPTA, A. R.			
	PRASAD, M., see SINHA, S. N.			
	PRASAD, R. B. Adssil cane planting	208		
	PRASAD, S. K., see KUMAR, J.			
	PRESTON, G. C., see ABRAM, J. C.			
	PRESTON, T. R. <i>et al.</i> Cane molasses as animal fodder. (Abs.).....	186		
	see also CLARK, J., LOSADA, H., PERON, N. and VELAZQUEZ, M.			
	PRICE, F. B., see STEELE, C. R.			
	PRIMAK, V. M., see FIDOVKIN, I. M.			
	PRIKHOD'KO, I. A., see PERRVIN, M. I.			
	PRILUTSKI, I. I. <i>et al.</i> Vacuum pans.....	88		
	see also BRENNAN, S. A.			
	PRINCE, R. N. and MAYLOTT, A. O. Invert sugar manufacture. (Pat.).....	188		
	PROCESS EVALUATION AND DEVELOPMENT CORP., see VILLAVICENCIO, E. J.			
	PRO-COL CORP., see MICKEVICZ, J. M.			
	PROCTER & GAMBLE CO., see LYNESS, W. I.			
	PROFINA, V. A. and IVANOV, S. Z. Beet juice and syrup pH. (Abs.).....	152		
	PROVIDO, M. A., see GALVEZ, A. M.			
	PUNDIR, K. R. Bagasse heat economy and paper manufacture. (Abs.).....	217		
	PURDY, W. G. Controlled-release fertilizers. (Abs.).....	376		
	QUE, E. G. and GUERRERO, A. P. Transport time and raw sugar polarization differences. (Abs.).....	222		
	QUEBEDIATUX, B. Cane, beet and sorghum ripening with chemical.....	125		
	QUESADA G., R. Factory equipment capacities. (Abs.).....	287		
	QUINN, E. J., see HBOOKLES, J. S.			
	QUINONES, M., see PRESTON, T. R.			
	RAELO, R., see ALMAZAN, O.			
	RADALOVSKII, V. I., see BUNYAK, A. M.			
	RADNER, J. E. and ANDERSON, R. E. Decolorization with resins. (Abs.).....	220		
	RADWALD, J. D. <i>et al.</i> Nematode control on cabbages. (Abs.).....	52		
	RADFORD, A. J. Sugar analysis statistical control. (Abs.).....	394		
	and GORDON, E. C. E. Molasses addition to raw sugar. (Abs.).....	388		
	RAFFINERIE TIREMONTAISE S. A. Beet diffuser. (Pat.).....	187		
	see also DUCHATEAU, G. F., JACQUES, P. and VANDEWYBER, R. G. E.			
	RAFFRAY, J. Cane mill disinfectant.....	86		
	RAGHAVAN, S., see VARADHARAJAN, G.			
	RAHA, A. C., see NIGAM, K. K.			
	RAIKHINSTEIN, M. V., see GADZHIYEV, A. Y.			
	RAJA, K. T. S. and NATARAJAN, S. Cane wilt. (Abs.).....	313		
	<i>et al.</i> Cane smut. (Abs.).....	383		
	RAJABALEE, M. A. Rat damage and bait preference. (Abs.).....	81		
	RAJAN, S. D., see DANIEL, K. V.			
	RAJANI, V. G. and NATH, P. Cane borer. (Abs.).....	377		
	RAJPUT, R. K., see KATURAVI, R. N. S.			
	RALSTON, I. S. Cane planting in Jamaica. (Abs.).....	211		
	RAM, R. S., see SANDHU, S. S.			
	RAMAIAH, N. A., see GUPTA, S. C.			
	RAMAKRISHNA, V., see SREERAMULU, T.			
	RAMANTAN, J. L. T., see GARRUCHO, S. S.			
	RAMIREZ, A. Cane molasses as animal fodder. (Abs.).....	357		
	RAMOS, F. M. and MELO, J. S. Cane planting date and yield. (Abs.).....	15		
	- Fertilizer trials in Portuguese East Africa. (Abs.).....	246		
	RAMOS, R., E. Furfural and levulinic acid manufacture from bagasse.....	397		
	RANADIVE, S. J., see KALE, R. A.			
	RANDABEL, M., see VIGNES, E. C.			
	RANDOLPH, A. D. and CRAWFORD, R. W. Seed slurry preparation. (Pat.).....	325		
	RAO, B. and RAO, G. V. S. Dirt-Offler clarifiers comparison. (Abs.).....	180		
	RAO, B. S. Factory waste treatment and reduction. (Abs.).....	253		
	RAO, D. L. N. and GANI, A. Carbonate production from distillery CO <sub>2</sub> <i>et al.</i> Syrup non-sugars and cane molasses pol. (Abs.).....	290		
	see also LAKSHMIKANTHAM, M.	89		
	RAO, G. V. S., see RAO, B.			
	RAO, J. P., see LAKSHMIKANTHAM, M. and RAO, K. K. P.			
	RAO, J. T. <i>et al.</i> Cane flowering in Egypt.....	241		
	RAO, K. K. Evaporator entrainment.....	217		
	RAO, K. K. P. and RAO, J. P. Cane sett transplanting and survival.....	110		
	<i>et al.</i> Cane wilt. (Abs.).....	312		
	see also LAKSHMIKANTHAM, M.			
	RAO, K. L., see LAKSHMIKANTHAM, M.			
	RAO, N. N. V. P., see LAKSHMIKANTHAM, M.			
	RAO, P. N. R. and GUPTA, H. N. Cane mill roller lift and grooving. (Abs.).....	180		
	RAO, P. S. C., see REUSS, J. O.			
	RAO, S. G., see RAO, D. L. N.			
	RAO, S. N. G. and SHARMA, S. C. Co-6806 cane variety. (Abs.).....	83		
	RAO, V. P., see NAGARKATTI, S.			
	RAO, V. R. Average purity of total losses. (Abs.).....	185		
	RAO, Y. S. Irrigation requirements in India. (Abs.).....	343		
	RAT, B. Cane gummosis causal agent	318		
	RAITAN, B. K., see BABU, C. N.			
	RAUTELA, G. S. and PAYNE, M. G. Enzymes and beet leaf spot resistance. (Abs.).....	284		
	REDDY, V. S., see RAO, K. K. P.			
	REDHEAD, T. D. Cane damage by rats	19		
	REEDER, R. L., see JAMES, D. W.			
	REES, N. W., see BATTERHAM, R. J.			
	REIMAN, H., see KHAN, A. A.			
	REICHEL, C., see SCHNEIDER, F.			
	REIMOVA, N. A., see GROMKOVSII, A. I.			
	RENNE, L. L. Spray irrigation with calcium wetter. (Abs.).....	388		
	RENTON, R. H., see VAN DER RIET, C. B.			
	RESHETLOV, B. N., see PETROVSKII, B. S.			
	REUSS, J. O. and RAO, P. S. C. Soil nitrate and beet nitrogen requirements. (Abs.).....	252		
	REVA, L. P. and LUNEVA, L. A. Sucrose determination. (Abs.).....	289		
	REZNIK, K. E. and ZIMAN, Z. L. Automatic beet slicer and diffuser speed control. (Abs.).....	119		
	RHODES, L. J. and BERSOH, J. W. "HI-Extractor" performance.....	116		
	see also SLOAN, G. E.			
	RIBERMOID, J. A. Cane pest control.....	82		
	RICAUD, C. Cane chlorotic streak.....	49, 81		
	Cane diseases in Mauritius. (Abs.).....	81		
	Cane gummosis. (Abs.).....	81		
	Cane red rot. (Abs.).....	313		
	Cane smut. (Abs.).....	81		
	Cane yellow spot. (Abs.).....	313		
	Pineapple disease control. (Abs.).....	81, 312		
	and PAULO, M. E. Cane leaf scald.....	81		
	and SULLIVAN, S. Cane yellow spot control. (Abs.).....	15		
	RICAUD, R. Cane cultivation in Mauritius and yield. (Abs.).....	81		
	see also GOLDEN, L. E.			
	RICHARDS, A. W., see JAMES, D. W.			
	RICHARDS, G. H. Dextran destruction in stale cane. (Abs.).....	386		
	RICHARDS, J. F., see LOU, C. W.			
	RICHARDSON, P. E. Cane damage by herbicide. (Abs.).....	381		
	Chemical weed control. (Abs.).....	207		
	RIDGE, D. R. Waterlogging and cane growth. (Abs.).....	249		
	RIESS, C. M. and FLORES O., S. Gophers (Abs.).....	18, 347		
	RIMKUS, D., see BUNNAGEL, R.			
	RIONDA, J. A. Bagasse board manufacture. (Pat.).....	259		
	RISHI, N., see BHARGAVA, K. S.			
	RIVALANDI, J. P. R. Cane molasses saturation temperature. (Abs.).....	58		
	RIZVI, S. M. A. <i>et al.</i> Ants and mosaic aphid vectors. (Abs.).....	384		
	ROBELIN, M. Irrigation. (Abs.).....	214		
	ROBERTS, A. J., see STACHENKO, S.			
	ROBERTS, L. W., see MORRIS, R. M.			
	ROBERTSON, L. S. and DOLL, E. C. Soil testing. (Abs.).....	385		
	ROBICHAUX, H. Cane planter. (Abs.).....	344		
	ROBINSON, R. H. and OLIVER, A. E. Rat bait aerial application. (Abs.).....	50		
	ROBINSON, W. H., see HILTON, H. W.			
	ROOHE, M. Sugars separation by thin-layer chromatography. (Abs.).....	394		
	RODENKO, F. L., see PARYANKO, A. I.			
	RODRIGUES, H., see BETBEDER-MATIBET, M.			
	RODRIGUES, J. See STEDNICKY, J.			
	RODRIGUES, V. Cane molasses as animal fodder. (Abs.).....	290		
	RODRIGUEZ L., J., see TAMARGO T., J. M.			
	RODRIGUEZ V., R., see CRUZ F., C. M.			
	ROELANTS, W., see ROUSSEL, M.			
	ROGER, J., see DEVILLERS, P.			
	ROHM & HAAS CO. Sugar solution decolorization resin. (Pat.).....	257		
	ROLZ, C., see RUIZ, M.			
	ROOT HARVESTERS LTD., see WHITSED, W. J.			
	ROSE, DOWNS & THOMPSON LTD., see SHANN, J.			
	ROSELEY, A. K. and MAZLIN, R. N. Cane railway in Australia. (Abs.).....	281		
	ROSENBERG, N. J., see BROWN, K. W.			
	ROSENKIN, V. M. <i>et al.</i> Spray mixer applications. (Abs.).....	391		
	ROSS, B. G. and EAVES, B. W. "HI-Extractor" cane diffusion. (Abs.).....	351		
	ROSS, W. H., see BICKLE, R. E.			
	ROSSLER, L. A. and MOBERLY, P. K. Cane harvest date and sugar yield	382		
	ROSTRON, H. Cane age, harvest date and yield. (Abs.).....	381		
	Cane growth and yield. (Abs.).....	205		
	ROTH, G. Filter cake micro-organisms and soil aggregate stability. (Abs.).....	205		
	ROULLARD, G. Maize intercrop and cane yield. (Abs.).....	82		
	see also HALAIS, P.			
	ROUSSEL, N. <i>et al.</i> Beet varietal trials in Belgium. (Abs.).....	250		
	ROYLE, P. Beet dirt tare reduction	286		
	ROZHUK, S. G., see PETROVSKII, B. S.			
	RUBACK, K. L., see MAKHAM, S. B.			
	RUCKSTUHL, K. Bagasse board manufacture. (Abs.).....	225		
	Bagasse dehydrating hammer mill. (Pat.).....	228		
	RUDNEV, V. P., see BREMENKO, B. A.			
	RUEGG, E. Continuous centrifugal.....	28, 60		
	RUIZ, M. and ROLZ, C. Active carbon manufacture from bagasse. (Abs.).....	186		
	RUIZ, R., see PERON, N.			
	RUIZ, C. C. Cane harvesting, loading and transport. (Abs.).....	278		
	RUPPEL, E. G. and GASKILL, J. O. Beet leaf spot resistance. (Abs.).....	213		
	RUPPEL, R. F. and LAUGHLIN, C. W. Nematode control. (Abs.).....	285		
	RUSSELL, F. B. Beet leaf spot. (Abs.).....	285		
	Beet transport. (Abs.).....	385		
	RUZIN, I. M., see PARYANKO, A. I.			

INDEX

	PAGE		PAGE		PAGE
RYBALKIN, M. I. Beet slicer operation	219	SCHMIDT, R. R. and EUB, L. Chemical weed control. (Abs.)	178	S.I.C.E.R. SOCIÉTÉ INDUSTRIELLE & COMMERCIALE D'ÉTUDES ET DE RÉALISATIONS, see GRANDADAM, A. R.	
RYSEB, G. and THURBERG, J. C. Beet impurity index. (Abs.)	213	SCHNEIDER, C. L. Beet curly top virus isolates virulence. (Abs.)	114	SIDHU, A. S., see GUPTA, S. K.	
SACKETT, W. A., see THOMAS, J. P.		SCHNEIDER, F. Masseculé circulation in boiling and crystallization. (Abs.)	152	SIBGEL, E. P., see EBENAGEL, R.	
SAGAN, I. I. and KARAS, V. A. Heat transfer in boiling. (Abs.)	320	SCHNEIDER, F. Masseculé circulation in boiling and crystallization. (Abs.)	152	SILINA, N. P. and ČÍŽ, K. Sucrose interaction with non-sugars. (Abs.)	121
SAGAN, I. I. and PETRENYKO, D. D.		SCHROENROCK, K. W. R. Green syrup ion exchange treatment. (Abs.)	87	and LYAKHTSIK, E. L. Molasses purity determination. (Abs.)	184
SAID, Z. Monosodium glutamate manufacture from cane molasses. (Abs.)	224	see also HENSCHED, T.		- Molasses viscosity norm. (Abs.)	354
see also TALIB, I.		SCHOOLAR, A. I. and EDELMAN, J. Cane leaf sucrose secretion. (Abs.)	247	see also MATHUR, B. K.	322
SAINI, S. S., see SINGH, S.		SCHUYTTER, H. A., see HAN, Y. W.		SIMMONS, N. W. Optimum cane replanting time	107
SAIVARAJ, K., see VARADHARAJAN, G.		SCHWETZER, L. R. and HARDIN, E. E. Monogerm beet seed germination	84	SIMON, J. Chemical weed control and beet sugar content. (Abs.)	88
bleaching additive in boiling	54	SCHWEIZER, E. E. Chemical weed control. (Abs.)	212	SINGH, A. and MEHROTRA, S. K. Boiling	
see also GUPTA, J. P.		SCHWENKER, F. W. and KEAM, C. E. Icing sugar manufacture. (Pat.)	258	see also MATHUR, B. K.	
SALADINI, J. L. and ZETTLER, F. W. Cane mosaic transmission. (Abs.)	384	SEGURA, L. G. Fertilizer trials in Venezuela. (Abs.)	314	SINGH, B. et al. Soil analysis. (Abs.)	343
SALAM, M. A., see RAO, D. L. N.		SELEMEYEV, V. F. et al. Melanoidin and invert decomposition products.	153	see also PANJE, R. R. and SRIVASTAVA, S. C.	
SAMANTRGO, R. and SRIVASTAS, R. L. Ethanol production from cane molasses. (Abs.)	27	SELVICK, E. A., see ZIEVERS, J. F.		SINGH, B. P., see SINGH, A. S.	
see also DE LA CUESTA, E. O.		SEMENKO, V. Z., see BOBROVNIK, L. D.		SINGH, B. V. and SANGHA, A. S. Co 312 cane yield. (Abs.)	110
SAMIE, M. I. A., see NOUR, A. H.		SEMENOVSKII, V. A., see FEDOTKIN, I. M.		SINGH, G., see SINGH, O. P.	
SAMOI, H. H. Cane damage by rats. Rat control. (Abs.)	19	SEMENT, P. A., see DEPEYRE, A. E.		SINGH, G. P., see KAR, K. K.	
SÁNCHEZ, G., see STUDNICKÝ, J. P.		SENBA, Y., see SUGIWARA, M.		SINGH, I., see GUPTA, K. M.	
SANDHU, J. S. and MADAN, Y. (Abs.)	176	SENBA, Y., see SUGIWARA, M.		SINGH, J. P., see OJHA, S. K.	
<i>Pyrrula perpusilla</i> control. (Abs.)	176	SENBERA T., P. H. Peru and Venezuela sugar industries. (Abs.)	204	SINGH, K. and MISRA, S. R. Nematode control	335, 369
SANDHU, S. S. and RAM, R. S. Cane hot air treatment, germination and yield. (Abs.)	378	and SANDIGA, G. Peru sugar industry	86	- Nematodes in India. (Abs.)	350
et al. Grassy shoot control	200	SERRA, G. E. et al. Cane processing quality in Brazil. (Abs.)	281	- Beet diseases in India. (Abs.)	84
- Ratoon stunting disease. (Abs.)	247	SESTRO, J. R. and LOGAN, J. T. Waste water sugar content reduction. (Abs.)	148	- Cane sett fungicide treatment and yield. (Abs.)	315
see also BABU, C. N.		SEVČÍK, E. Beet pulp and molasses as animal fodder. (Abs.)	290	see also MENON, R. G., SINGH, P. P., SRIVASTAVA, M. K. and SRIVASTAVA, S. C.	
SANDIGA, G., see SEQUERA T., P. E.		SHADER, B. E. Beet thinner. (Pat.)	258	SINGH, K. N., see BAINS, S. S.	
SANFORD, J. W. Cane borer rearing diets. (Abs.)	17	SHAH, G. A., see KHAN, A. A.		SINGH, L., see BOSE, S.	
SANG, S. L. Clarification and raw sugar filtrability. (Abs.)	21	SHAIKH, N. B. and SHINGTE, V. V. Cane rust susceptibility. (Abs.)	318	SINGH, M., see SINGH, B.	
and CHENG, W. C. White sugar CO <sub>2</sub> determination. (Abs.)	26	see also ZENDE, G. K.		SINGH, M. P. and TIWARI, K. N. Fertilizer trials in India. (Abs.)	316
et al. Starch determination in raw sugar. (Abs.)	25	SHANKER, K. et al. Sugar dust explosion	54	SINGH, N. L., see GUPTA, K. M.	
SANGHA, A. S., see SINGH, B. V.		SHANN, J. and BESSANT, D. V. Cane press. (Pat.)	124	SINGH, N. P., see KHANNA, S. S.	
SANJEVI, P. S., see SRINIVASAN, T. R.		SHARMA, A. D., see GUPTA, A. P.		SINGH, O. Cane sett HCl treatment and germination. (Abs.)	209
SANKARANARAYANAN, P., see BABU, C. N.		SHARMA, D. P. Payment for stale cane. (Abs.)	343	and SINGH, B. P. Nitrogen application and cane yield. (Abs.)	210
SANKYO CO. LTD. Icing sugar caking prevention. (Pat.)	257	SHARMA, K. K. and ARN, P. K. Cane juice organic acids and reducing sugar decomposition. (Abs.)	59	et al. Cane frost tolerance. (Abs.)	174
SANT, M. A., see CHACKRABARTI, S. V.		SHARMA, K. P., see SINGH, O.		- Fertilizer trials in India. (Abs.)	315
Cane flowering control. (Abs.)	343	SHARMA, R. C. Cane mill stoppage records. (Abs.)	115	- Pre-planting treatment and cane sett germination. (Abs.)	314
SANT, M. V. and MANE, V. S. Chemical weed control. (Abs.)	342	Electronic vs. pneumatic controls	20	SINGH, O. P. and MATHUR, R. B. Weevils. (Abs.)	318
SANTA ANA, A. G., see DA GLORIA, N. A.		Steam vs. electricity for equipment operation. (Abs.)	116	SINGH, P. P. and SINGH, K. Cane varietal trials in India. (Abs.)	343
SANTOS, M. Ratoon stunting disease.	312	SHARMA, S. C. Middle juice carbonatation. (Abs.)	253	SINGH, R. A., see GUPTA, K. M.	
SAPRONOV, A. and ŽITNINA, B. G. Carbonatation and production mud removal. (Abs.)	390	and GUPTA, N. S. Optimum crushing period of B.O.14 cane. (Abs.)	83	SINGH, S. Cane leaf spot. (Abs.)	143
see also BOBROVNIK, L. D. and GADZHIEV, A. Y.		see also RAO, S. N. G.		and SAINI, S. Potassium application and cane yield. (Abs.)	377
SARBAR, N. N., see ILAHI, M. A.		SHCHERGOLEV, V. N. and KORBUS, G. M. Beet cossette quality. (Abs.)	354	see also KHURANA, S. M. P.	
SARMA, M. N., see RAO, K. K. P.		SHCHERBAK, V. M., see DAISHEV, M. I.		SINGH, U. P. and GUPTA, R. K. Clarification and filtration. (Abs.)	217
SARMA, N. N., see RAO, K. K. P.		SHEN, H. S., see LIU, T. C.		SINGH, U. S. et al. Cane treatment with molasses. (Abs.)	174
<i>Ophiostoma sacchari</i> . (Abs.)	208	SHEN, K. H., see HWANG, C. M.		SINHA, S. N. and PRASAD, M. Indian factory size and efficiency. (Abs.)	351
SARMA, Y. R., see NAYUDU, M. V.		SHEPHERD, E. E. and JAMES, R. A. Cane railway scheduling. (Abs.)	281	SIPPTANOS, K. M. and ULBRICH, A. Temperature, phosphorus and beet emergence. (Abs.)	213
SARRAF, S., see ABOUKHALED, A.		SHESTAKOVSKII, V. A., see BELOSTOTSKI, L. G.		SIRDESHMUKHI, R. K. Steam turbine operation. (Abs.)	216
SASTRY, K. S., see NAYUDU, M. V.		SHIBUYA, F., see RADEWALD, J. D.		SITHANTHAM, S. and DANIEL, S. C. Borer control. (Abs.)	379
SAVOTY, B. M. Herbicide phytotoxicity	195	SHIMBAR, H. et al. Evaporator tube corrosion. (Abs.)	287	SJOVALL, S. I. Beet harvester. (Pat.)	292
SAWHNEY, N. K. Grand Pont filters.	217	SHIMIZU, J. and KAGA, T. Raffinose hydrolysis in syrup. (Pat.)	260	SKALSKI, E. Water consumption and effluent load. (Abs.)	181
SAXENA, M. P. Cane borer parasite	145	SHINGTE, V. V., see SHAIKH, N. B.		SKINNER, J. C. Cane breeding in Australia. (Abs.)	83
SAXENA, M. A. C. Nitrogen application and beet petiole nitrate-N.	215	SHINLENKO, P. P. and KICHIGIN, N. M. Bagged sugar condensors. (Abs.)	150	SKOYEN, I. O. and MCFARLANE, J. S. Beet seed drill. (Abs.)	213
SAXENA, M. M. S., see SINGH, U. S.		SHKOL'NIKOVA, T. S., see GRABOVETSKII, B. E.		SLABEK, M. and CHOUHARY, T. M. Fertilizer trials in Pakistan. (Abs.)	212
SAXENA, T. P. et al. Masseculé surface-active additive. (Abs.)	85	SHNAIDER, V. E., see FEDOTKIN, I. M.		SLAVGORODSKAYA, I. P., see BUGAENKO, I. F.	
SÁZAVSKÝ, V. Steam consumption in boiling. (Abs.)	118	SHORE, M., see OLDFIELD, J. F. T.		SLOANE, G. E. and RHODES, L. J. Burnt vs. unburnt cane processing. (Abs.)	386
SCHÄPFER, K. J. and JUCKES, A. H. Oligosaccharides determination in cane molasses. (Abs.)	153	SHRAN, J. and HUMM, D. M. Cube sugar press. (Abs.)	221	SMART, S. G. Cane sere press performance	371
SCHÄPFER, W. B. and WINNER, C. Beet root diseases. (Abs.)	214	SHRINATH, -, see SINGH, U. S.		SMELK, A., see VAŠÁTO, J.	
- Beet seed treatment with insecticides. (Abs.)	52	SHRIVASTAVA, A. N., see BOSE, S.		SMITH, B. A., see COWLEY, W. R.	
- Chemical weed control. (Abs.)	350	SHRIVASTAVA, H. K. Madhya Pradesh sugar industry. (Abs.)	316	SMITH, D. Mexico sugar industry. (Abs.)	352
SCHOKLUNA, J. C. Soil sampling.	385	SHUKLA, R., see KAR, K.		Recife bulk handling terminal. (Abs.)	387
SCHWENKER, F. W. Lactic acid determination in beet juice and molasses. (Abs.)	90	SHUKLA, R. P., see AGARWAL, S. K. D.		SMITH, G. A. and HECKER, R. J. Beet double cross performance. (Abs.)	84
et al. Beet pulp sulphite content	396	SHUKLA, S. P., see GUPTA, A. P.		SMITH, P. and GREGORY, P. E. Cane juice colorants, phenolics and amino-nitrogen determination	25
SCHLANTZ, F. Waste water treatment	255	SHUROVANYI, N. F. et al. Automatic beet slicer and diffuser control.	181	SMITH, S. B. et al. Refinery liquor treatment with active carbon.	183
SCHLEPHAKE, D., see ORLOWSKI, S.		SHYAMSUNDER, C., see MUKHERJI, J. P.			
SCHMALZ, C. L., see RAO, S. A.		SICARD, J. A., see FERNANDEZ, D. O.			
SCHMIDL, W. R., see POOSTCHI, L.					
SCHMIDT, L. and ZHRADNÝČEK, J. Beet processing quality relationships. (Abs.)	121				
see also KRAUSE, E.					



# INDEX

	PAGE		PAGE
UGAZ, O. S. and ESPINOZA, P. J. Chemical weed control. (Abs.)...	315	VELSICO CHEMICAL CORP., see ZICK, W. H.	
UHLENBROCK, W. Flume water sugar determination. (Abs.)...	395	VELTMAN, P. L. et al. Sugar crystal coating. (Pat.)...	124
UL-QAYYUM, R., see NAQVI, H. A.		VERA Z., A. Colour removal with active carbon. (Abs.)...	221
ULRICH, A., see EL-SHEIKH, A. M., SPITANOS, K. M., TERRY, N. and VLAMIS, J.		VERDONK, J. C. J., see VELTMAN, P. L.	
UNDE, J. R., see KULKARNI, D. P.		VERDURA, T., see PERÓN, N.	
UPADHAYAYA, U. C. Silver ring diffusion vs. cane milling. (Abs.)...	21	VERGARA, E. Refinery equipment maintenance. (Abs.)...	221
USHER, G. F. Centrifugal. (Pat.)...	226	VERMA, A. K. et al. Cane red rot resistance. (Abs.)...	173
USON, W. R., see BENNETT, M. C.	175	VERNOIS, G. Gas-fired lime kiln and filter cake lime recovery. (Abs.)...	225
VAHLSING, F. H. Chemical weed control. (Pat.)...	61	VERSTRATE, P. H., see DEUYST, A., VEZ, A. and VULLIQUOUD, P. Ploughing lime, soil structure and beet yield. (Abs.)...	215
VAHSLING INC., see VAHLSING, F. H.		VICIGONE, J. M., see GRABEL, R.	
VAIDYA, V. G. Potassium fertilizer and cane yield. (Abs.)...	347	VIGH, A. Beet pulp drying. (Abs.)...	357
VAISMAN, M. L., see SPINUL, N. M.		VIGNES, E. C. and RANDABEL, M. Cane preparation in Mauritius. (Abs.)...	26
VALAREZO, S. and PEREZ, R. Cane molasses as turkey feed. (Abs.)...	357	VILLAVENCIO, E. J. Bagasse depithing. (Pat.)...	27, 292
VALDES, A. et al. De Smet cane diffusion. (Abs.)...	287	VILSHANSKI, A. A., see EREMENKO, B. A.	
VALKERS, R. et al. Refinery affination and carbonation. (Abs.)...	221	VISHWAKARMA, S. L., see GUPTA, R. L.	
VALLANCE, I. G. Cane billet size and deterioration. (Abs.)...	111	VISHARIONOV, M. M., see VASIL'EV, A. A.	
(Cane harvesters. (Abs.) 50, 145, 207, 345, 379)		VITTAI, B. P. R., see SREERAMULU, T.	
Cane land drainage. (Abs.)...	144	VLAMIS, J. and ULRICH, A. Beet borer deficiency. (Abs.)...	213
Cane planters. (Abs.)...	381	VOKOUNOVA, I. Flume water treatment. (Abs.)...	320
Mechanical harvesting in Australia. (Abs.)...	249	Preserving bacteriological specimens and SMOLIK, J. Beet diffusion infection determination. (Abs.)...	223
Soil compaction and cane growth. (Abs.)...	378	VOLOKHANENKO, G. P., see BOBROVNIK, L. D. and MIROSHNICHENKO, S. S.	
VALOVI, B. N., see EREMENKO, B. A.		VOLOSHIN, Z. S., see BELK, V. G.	
VALTER, V. Sugar solution conductimetric purity determination. (Abs.) and HORMIKOVA, J. Seed slurry quality determination. (Abs.)...	322	VON DORING, T., see THIELE, H.	
et al. Juice and syrup Brix measurement. (Abs.)...	121	VON PROSKOWITZ, W., see HUTZ, G.	
- Molasses moisture determination see also HRDLICKA, V.	121	VOVCHENKO, V. S., see SPINUL, N. M.	
VAN ARSDEL, E. P. et al. Beet leaf spot VAN DER RIET, C. B. and BRYSTON, R. H. Cane diffusion. (Abs.)...	145	VOVK, G. A. and BYKOV, L. P. Carbonation with predefecation mud removal. (Abs.)...	392
86		VUKOV, K. Beet physical and chemical properties. (N.B.)...	56
VAN DER WOLF, G. DDS diffusion in Tanzania. (Abs.)...	319	Beet physical properties and diffusion Beet storage time and temperature Carbonation. (Abs.)...	288 22 390
VANDEWIJER, R. et al. Molasses sugar recovery. (Abs.)...	181	Sulphitation. (Abs.)...	288
VANDEWYER, R. G. E. Beet molasses sugar extraction. (Pat.)...	292	VULLIQUOUD, P., see VEZ, A.	
VAN DONGEN, R. J., see KRAMER, F. A.		WAGH, R. G., see KALE, R. A.	
VANDOREN, D. M. and HENRY, J. E. Beet seed treatment and soil crusting prevention. (Abs.)...	251	WAGNEROWSKI, K. Boiling. (Abs.)...	149
VAN GROENINGEN, J. C. Cane transport and handling. (Abs.)...	211	Boiling house performance. (Abs.)...	118
Mechanical harvesting in Jamaica. (Abs.)...	6	WAKHARE, S. N., see PATAKAR, M. B.	
VAN HENGEL, A. Cane diffuser. (Pat.)...	92	WALCHANDANAGAR INDUSTRIES LTD. Continuous sulphitation and liming	257
Increasing evaporator capacity. (Abs.)...	388	WALDRON, L. J., see TERRY, N.	
VANHERWEGEN, F. J., see DUCHATEAU, G. F.		WALKERS LTD., see CRAWFORD, W. R.	
VANIS, M., see BRULIN, J.		WALL, J. H. and CARPENTER, F. G. Fluorescence vs. colour measurement. (Abs.)...	122
VANSTALLEEN, R. Beet seed coating and germination. (Abs.)...	250	see also WALKER, K. E., see LAUER, K. B.	
see also ROUSSEL, N.		WALLACHS, C. O., see SMITH, S. B.	
VAN STEYVOORT, L. et al. Pesticide residues in beet and sugar factory products. (Abs.)...	26	WAN, S. S., see TSE, C. C.	
VARADHARAJAN, G. et al. Cane borer control. (Abs.)...	110, 145	WANG, B. Y. Rats in Taiwan. (Abs.)...	79
- Weather and cane borer activity	317	WANG, C. C. Fertilizers in Taiwan. (Abs.)...	345
VASÁTKO, J. and DANDÁR, A. Milk-of-lime sucrose content and carbonation. (Abs.)...	353	WANG, J. S., see CHANG, H.	
et al. Colloid coagulation in carbonation. (Abs.)...	219	WANG, P. Y. and LEU, L. S. Herbicides, insecticides and cicada fungal parasites. (Abs.)...	347
- Sucrose solubility calculation. (Abs.)...	121	WANG, Z. N. and LEU, L. S. <i>Mogannia fabae</i> control. (Abs.)...	177
VASIL'EV, A. A. et al. Stored beet forced ventilation. (Abs.)...	88	see also LEU, L. S.	
VATKIN, A. S., see PARTYANKO, A. I.		WARRA, R. C. Pollen and beet leaf mycoflora. (Abs.)...	251
VAVRINECZ, G. B. P. E. and supersaturation determination. (Abs.) 153, 395	153, 395	WARREN, P. S., see ABRAM, J. C.	
VAZIRI, C. M., see MONGELARD, J. C.		WARREN, R. C. Pollen and lesion development by <i>Phoma betae</i> . (Abs.)...	251
VÁZQUEZ, J. Cane cleaning and mechanization in Cuba. (Abs.)...	248	WARNEY, W. R., see KRAMER, F. A.	
VELASCO, V. S. et al. Sugars determination by gas- and chromatography	122	WEAVER, W. H., see JAMES, D. W.	
VELASCO P. A. Chemical weed control economics. (Abs.)...	83	WEBB, D. J., see DRAYCOTT, A. P.	
VELÁZQUEZ, M. et al. Cane molasses as animal fodder. (Abs.)...	396	WEBB, W. A. C. Coot control. (Abs.)...	349
VELÁZQUEZ R., E. Bagasse applications Vacuum breakers. (Abs.)...	154	WEBBE, A. L., see STEPPE, K. E.	
352		WEDDECKE, H., see LANGEN, E.	
VELOSO, A. B. Bagasse charcoal briquette manufacture. (Pat.)...	292	WEDER, A., see SCHNEIDER, F.	
		WEGNER, G., see THIELE, H.	
		WEI, C. C. Soil type and fertilizer application. (Abs.)...	51
		see also FRIBDRICHSEN, J.	
		WERTAN, P. Exergy. (Abs.)...	255
		WEITMAN, E., see BICKLE, R. E. and HALE, D. J.	
		WHITE, B. J. Rainfall, land slope, soil type and cane yield. (Abs.)...	279
		WHITE, E. T. and WRIGHT, P. G. Sugar sieve analysis conversion. (Abs.)...	222
		see also WRIGHT, P. G.	
		WHITING CORPORATION. Continuous boiling. (Pat.)...	227
		WHITNEY, E. D., see DONKY, D. I.	
		WHITSED, W. J. Beet harvester. (Pat.)...	124
		WIDLOK, H., see TONDOS, M.	
		WIEWINGER, L., see KUBADINOW, N.	
		WIKILKY, L. Beet processing quality WILDER, H. D. Bagasse pulp manufacture. (Pat.)...	58
		91	
		WILKES, D. S. Raw sugar carbonation. (Abs.)...	184
		WILKES, R. and JENNINGS, R. P. Refinery molasses viscosity measurement. (Abs.)...	184
		WILETT, H. A. Cane loader grab. (Pat.)...	229
		WILLEY, L. A. Beet bolting. (Abs.)...	114
		WILLIAMS, J. C., see ABRAM, J. C. and COOKSON, D.	
		WILLIAMS, J. P. Irrigation in Taiwan Sugar factory and alcohol distillery changes in Taiwan. (Abs.)...	79
		21	
		Scale insect parasites. (Abs.)...	17, 81
		378	
		WILLIS, G. A. Mechanical harvesting and transport in Australia. (N.B.)	256
		WILLIS, M. B., see VELÁZQUEZ, M.	
		WILSON, J. C. THOMPSON, G. M.	
		WILSON, J. M., see KRAMER, F. A.	
		WINDAL, G., see DAMBRINE, F.	
		WINDER, G. H., see DUNNING, R. A.	
		WINSER, C., see SCHAUZELLE, W. R.	
		WISE, C. T. Cane strip planting. (Abs.)	382
		WISMER, C. A. Cane diseases in Hawaii see also BYTHER, R. S. and HILTON, H. W.	349
		WITTE, G., see BARKOW, N.	
		WOLF, S. Carbonation. (Abs.)...	55
		WOLFROD, M. L., see BINKLEY, W. W.	
		WOOD, R. A. Fluoride and cane leaf chlorosis. (Abs.)...	112
		et al. Cane burning and deterioration after harvesting. (Abs.)...	381
		see also ARNEBGE, A. J. M., JOHNSTON, M. A. and MEYER, J. H.	
		WOODRUFF, E. T. and ANDERSEN, V. S. Sugar solution drying. (Pat.)...	397
		WORDEN, W. W. Animal fodder from cane trash. (Pat.)...	124
		WRIGHT, C. L. Bagasse fungicide treatment. (Pat.)...	260
		WRIGHT, J. Cane flooding and burning Fertilizer distributor. (Abs.)...	348
		381	
		WRIGHT, P. G. and WHITE, E. T. Sugar crystal size distribution determination. (Abs.)...	25
		see also BROADFOOT, R. and WHITE, E. T.	
		WYSE, R. E. and DEXTER, S. T. Beet storage and beet marc content - Beet storage temperature and juice composition. (Abs.)...	90
		213	
		Nitrogen application and beet storage losses. (Abs.)...	213
		YADAVA, R. B. R. Cane sett growth inhibitor treatment. (Abs.)...	315
		YAMAUCHI, T., see SUGIYAMA, M.	
		YANG, H. L. and PAN, J. S. Cane white leaf vector. (Abs.)...	317
		YANG, P. C. et al. Cane flowering control. (Abs.)...	210, 347
		YANG, S. L., see PAN, Y. S.	
		YANG, S. M. Soil bacteria and cane yield decline. (Abs.)...	49
		YANG, S. S. Cane trash and green manure effects on cane yield. (Abs.)	79
		YANG, T. T. and CHANG, C. H. Soil heating by solar radiation and cane growth. (Abs.)...	109
		see also HU, C. H.	
		YANGOU, L. M., see SILINA, N. P.	
		YAO, K. W. Cane milling. (Abs.)...	21
		YARMOLINSKI, M. B. Sugar storage in bags. (Abs.)...	220
		YATES, R. A. Chemical cane ripening	316
		YEH, H. J., see PENG, S. Y.	
		YEN, Y. C. Cane diffusion. (Abs.)...	21
		and PI, K. W. Evaporator explosions	21



# INDEX

	PAGE		PAGE
Yu, Y. P. Cane insect pest control . . . . .	177	ZAGRODZKI, S., <i>see also</i> ZAORSKA, H.	
Factory modernization in Taiwan . . . . .	21	ZAGRODZKI, S. M. Filter-thickener performance. (Abs.) . . . . .	392
YUZHENKO, V. N. Waste water treatment with algae. (Abs.) . . . . .	23	ZAHRAĐOČEK, J., <i>see</i> SCHMIDT, L.	
<b>Z</b>		ZAKHAROV, K. P., <i>see</i> BELOUS, V. N.	
ZADRAZIL, H. W. Overhead irrigation in Portuguese East Africa. (Abs.)	246	ZAMA, F. and CEROLINI, G. Automatic control. (Abs.) . . . . .	149
ZAETS, V. A., <i>see</i> SHUREBOVANYI, N. F.		ZAMANAEV, V. G., <i>see</i> ERMOLOV, N. F.	
ZAGORULKO, A. Y. <i>et al.</i> Beet brel preparation. (Abs.) . . . . .	122	ZAMBROVSKII, V. A., <i>see</i> ANIKEEV, Y. V.	
- Sugar determination in beet coss-ettes and pulp. (Abs.) . . . . .	59	ZAMORA, A., <i>see</i> CLARK, J.	
- Undetermined losses. (Abs.) . . . . .	320	ZAORSKA, H. Beet juice active carbon treatment. (Abs.) . . . . .	149, 254
ZAGRODZKI, S. Factory heat balance . . . . .	321	and ZAGRODZKI, S. Beet juice deliming. (Abs.) . . . . .	392
Factory technology developments . . . . .	354	<i>see also</i> ZAGRODZKI, S.	
Kiln operation and lime quality . . . . .	118	ZARUDNEV, L. P., <i>see</i> ROSINSKII, V. M.	
Pre-carbonation . . . . .	139	ZAUN, R. D., <i>see</i> HOOK, R. W.	
Sugar chemistry and technology . . . . .	181	ZÁVODSKÝ, L. Lime-sucrose heat of reaction. (Abs.) . . . . .	55
and KUBIAK, J. Non-sugars and beet diffusion. (Abs.) . . . . .	59	<i>see also</i> VAŠÁTKO, J.	
- Temperature, time and beet plas-molysis. (Abs.) . . . . .	353	ZDANOVICH, I. L., <i>see</i> BRENNAN, S. A.	
and KURKOWSKA, A. Saponin re-moval from waste water. (Abs.) . . . . .	255	ZELMAN, A., <i>see</i> DÁVID, J.	
and SUDOMIR, Z. Masseците crystal-lization rate. (Abs.) . . . . .	395	ZEL'TSER, Y. V. and MAL'YAROV, B. M. Sucrose heat of solution. (Abs.) . . . . .	394
and SĘWĄCOWSKA, K. Non-sugar removal in carbonation. (Abs.)	119, 321	ZENDE, G. K. Cane varieties in India and SHAIKH, N. B. Cane grassy shoot. (Abs.) . . . . .	49
and ZAORSKA, H. Beet juice deliming	254	<i>see also</i> PATASKAR, M. R. and PHAPKE, G. V.	
		ZENON-ROLAND, L., <i>see</i> VAN STEY-VOORT, L.	
		ZETTLER, F. W., <i>see</i> SALADINI, J. L.	
		ZHIGALOV, M. S. and TANTS'YURA, N. D. Beet juice Ca and Mg salts reduction. (Abs.) . . . . .	88
		ZHIZHINA, R. G., <i>see</i> SAPRONOV, A. R.	
		ZHMYRYA, L. P. <i>et al.</i> Sucrose solution molecular diffusion coefficient. 223, 323	323
		ZHURA, K. D. <i>et al.</i> Preflocculation mud albumin and amino-nitrogen. . . . .	218
		<i>see also</i> MIROSHNICHENKO, S. S. and OLYANSKAYA, S. P.	
		ZHURAVLEVA, Z. D. and GONCHAROVA, K. P. Beet juice ion exchange treatment. (Abs.) . . . . .	354
		- Waste water treatment with algae	390
		<i>see also</i> DOBRONRAVOV, F. N. and GONCHAROVA, K. P.	
		ZICK, W. H. Beet ripening with chemical. (Pat.) . . . . .	125
		ZIDEK, V., <i>see</i> BRETSCHNEIDER, R.	
		ZIEVERS, J. F. and NOVOTNY, C. J. Ion exchange resin regeneration. . . . .	61
		<i>et al.</i> Cane molasses ion exclusion. 85, 355	355
		ZIMAN, Z. L., <i>see</i> REZNIK, K. E.	
		ZUBAKOVA, L. N., <i>see</i> PRILUTSKII, I. I.	
		ZUBCHENKO, V. P. <i>et al.</i> Continuous boiling. (Abs.) . . . . .	55
		ZUBENKO, E. N., <i>see</i> GRIT'VEVA, E. A.	

# I.S.J.

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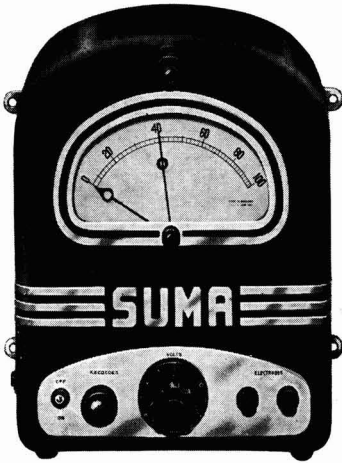
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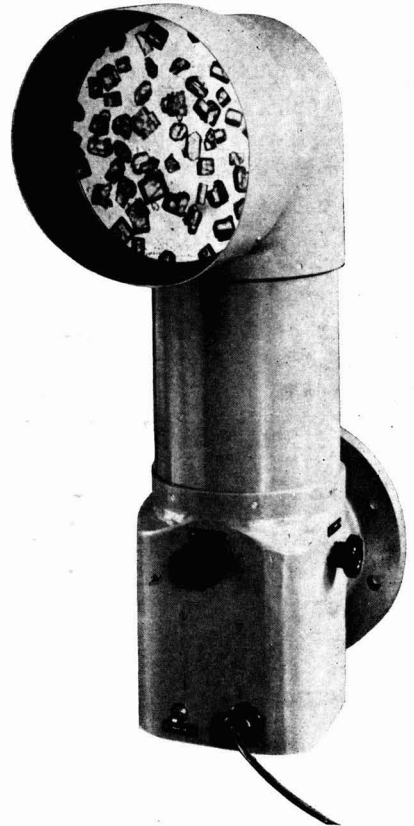
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