THE International Sugar Journal

AUGUST 1974

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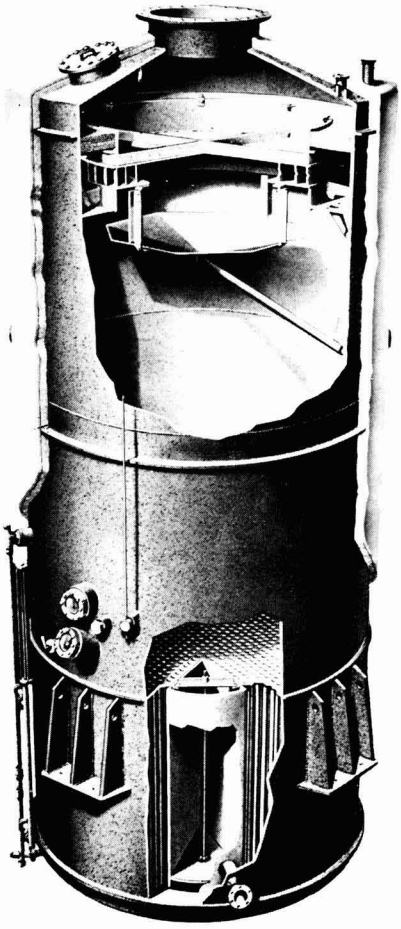

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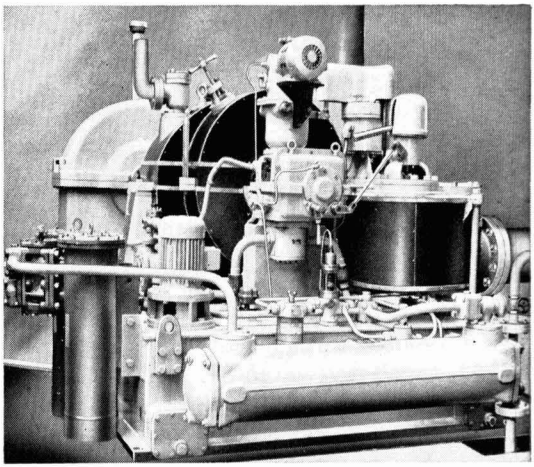

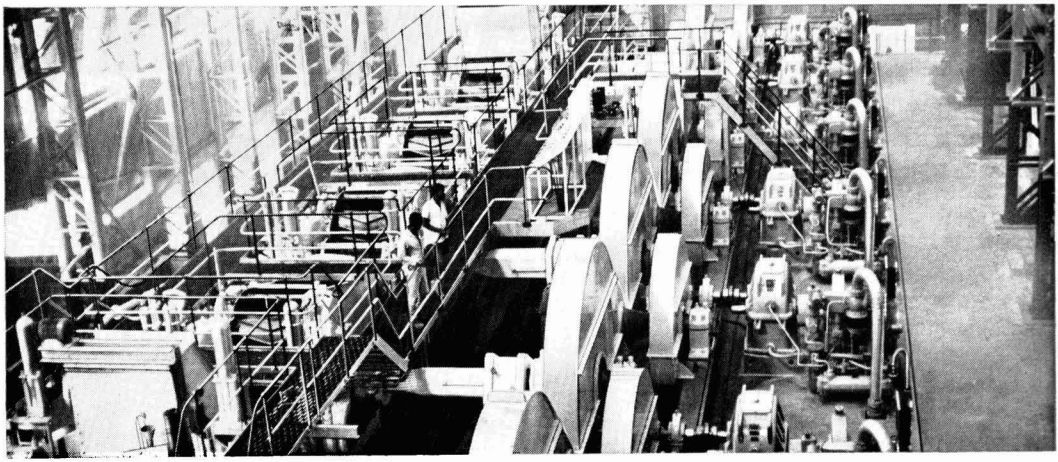

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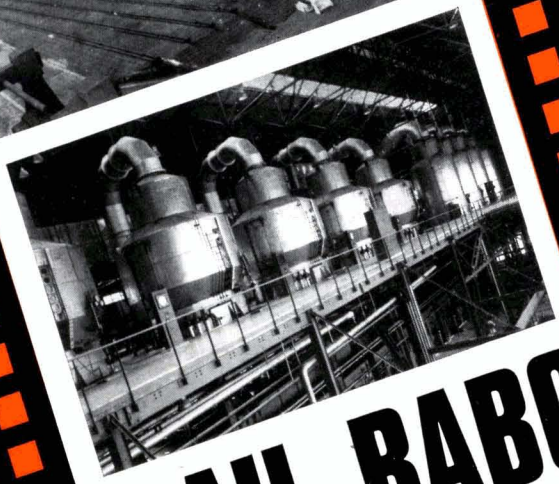

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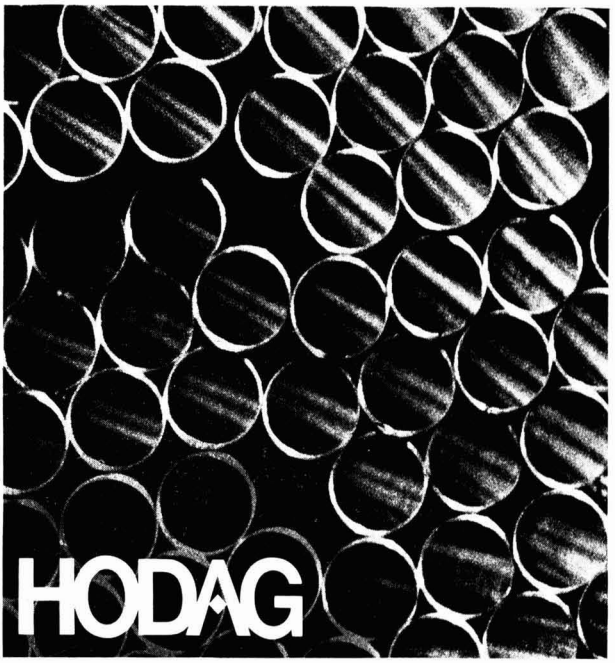

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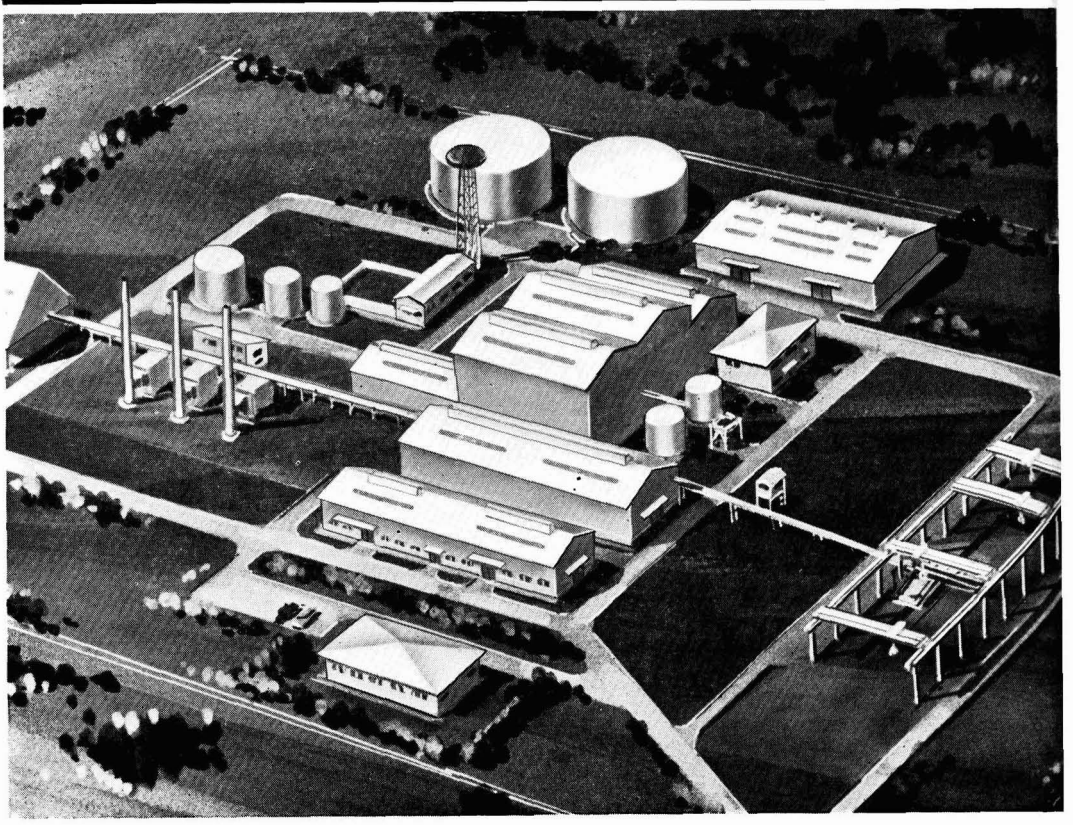

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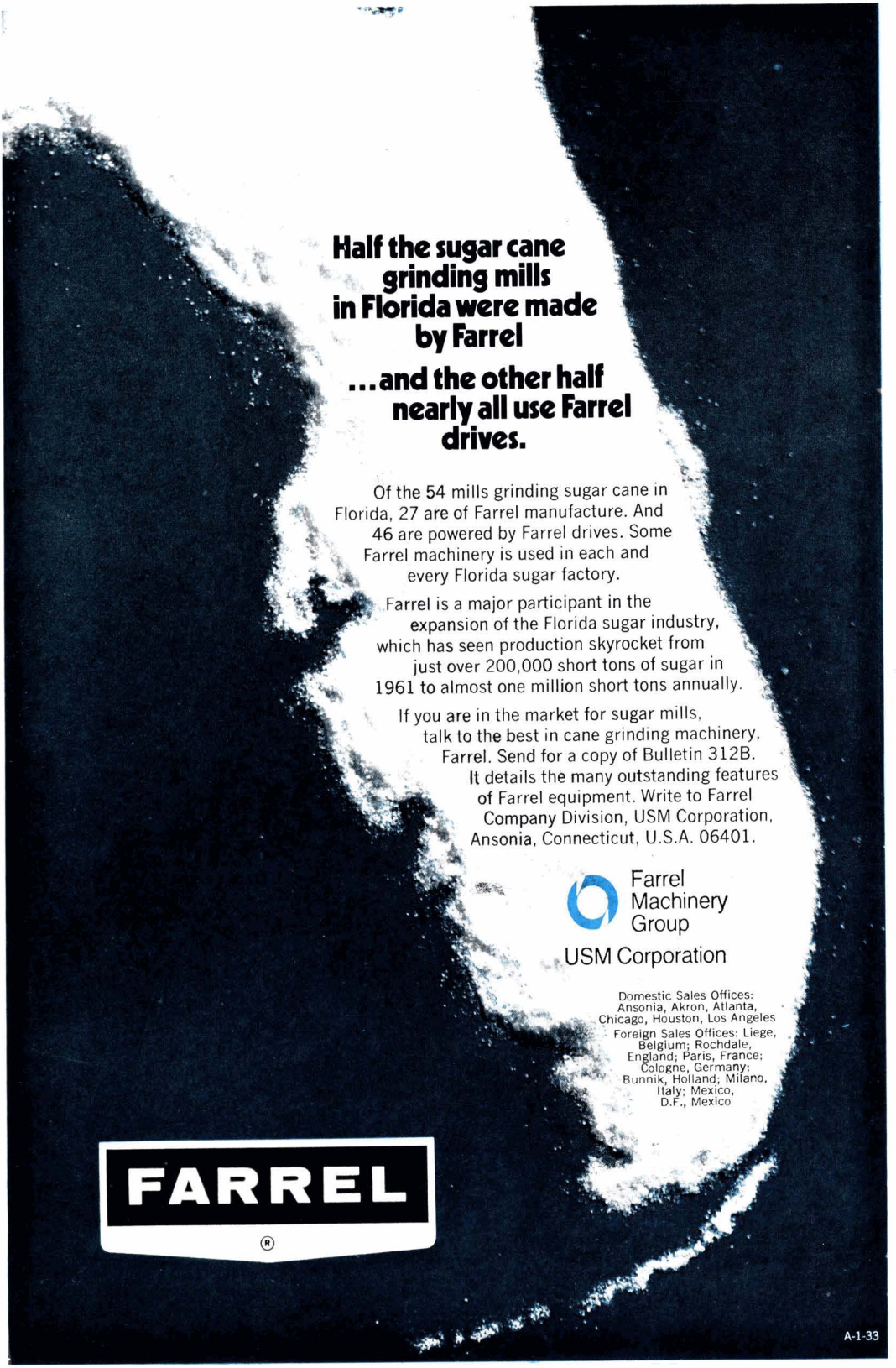
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UK ISSN 0020-8841

International Sugar Journal

August 1974

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN : SUMARIOS

British Sugar Corporation Ltd. 22e Conférence Technique. *p.* 227

On donne un bref compte-rendu de la 22e Conférence Technique de la British Sugar Corporation qui s'est tenue à Eastbourne du 20 au 23 mai 1974, et les sujets des diverses communications sont repris dans les grandes lignes.

* * *

Détermination coulométrique de composés organo-halogénés dans le sucre brut. W. P. FERREN, F. M. VALLESE et W. M. FORTINASH. *p.* 228–230

On décrit une méthode coulométrique simple, peu coûteuse et rapide pour la détermination de pesticides organo-halogénés et/ou de residus de plastifiants dans le sucre brut. Les résultats de tests effectués sur des échantillons de sucre d'origine variée indiquent une teneur en composés organo-halogénés se situant entre 0,3 et 1,25 ppm.

* * *

Nutrition azotée de la canne à sucre. S. P. JAISWAL et S. SINGH. *p.* 230–232

On discute des effets des pesticides sur la transformation de l'azote dans le sol et son utilisation par la canne, et on examine l'emploi d'inhibiteurs de nitrification en vue d'augmenter l'efficacité des fertiliseurs azotés.

* * *

Pertes en sucre au cours du lavage des betteraves. 1ère Partie. R. DE VLETTER et W. VAN GILS. *p.* 233–237

On discute des pertes en sucre au cours du lavage et du transport des betteraves et on donne des détails sur les méthodes de mesure des pertes dans les lavoirs à betteraves. Dans la première partie, on fait l'étude du type de lavoir comportant des bras tournants. Les résultats indiquent que, bien que ce type de lavoir peut donner des betteraves relativement propres, la combinaison de la vitesse de rotation et du temps de séjour en vue d'obtenir la plus grande efficacité de lavage, donnera aussi lieu à un traitement brutal des racines, d'où pertes un peu élevées.

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22. Technische Konferenz der British Sugar Corporation Ltd. *S.* 227

Ueber die 22. Technische Konferenz der British Sugar Corporation, die vom 20. bis zum 23. Mai in Eastbourne stattfand, wird kurz berichtet. Die Themen der vorgelegten Arbeiten werden in grossen Zügen behandelt.

* * *

Coulometrische Bestimmung von organischen Halogenverbindungen in Rohzucker. W. P. FERREN, F. M. VALLESE und W. M. FORTINASH. *S.* 228–230

Die Verfasser beschreiben eine einfache, billige und schnelle coulometrische Methode zur Bestimmung von organische Halogenverbindungen enthaltenden Pestiziden und/oder Rückstanden von Weichmachern in Rohzucker. Die Untersuchungsergebnisse von Zuckerproben verschiedener Herkunft zeigen einen Gehalt an organischen Halogenverbindungen im Bereich zwischen 0,3 und 1,25 $mg.kg^{-1}$.

* * *

Stickstoffernährung des Zuckerrohrs. S. P. JAISWAL und S. SINGH. *S.* 230–232

Der Einfluss von Pestiziden auf die Stickstoffumwandlung im Boden und die Verwertung durch das Rohr wird diskutiert. Ferner wird die Verwendung von Stoffen, welche die Nitrifizierung hemmen, zur Steigerung der Stickstoffdüngerwirkung untersucht.

* * *

Zuckerverluste bei der Rübenwasche. Teil I. R. DE VLETTER und W. VAN GILS. *S.* 233–237

Die Verluste beim Waschen und Schwemmen von Rüben werden diskutiert, und Einzelheiten über die Methoden zur Bestimmung der Verluste in Rübenwäschen werden mitgeteilt. In Teil I der Arbeit wird eine Knüppelwäsche untersucht. Die Ergebnisse lassen erkennen, dass diese Bauart zwar saubere Rüben geben kann, das Zusammenwirken von Drehgeschwindigkeit und Aufenthaltszeit zur Erzielung der grössten Reinigungsleistung jedoch zu einer rauhen Behandlung der Rüben und daher zu etwas höheren Verlusten führt.

22a. Conferencia Técnica, British Sugar Corporation Ltd. *Pág.* 227

Se presente una breve reporte sobre la 22a. Conferencia Técnica de la British Sugar Corporation Ltd., celebrado en Eastbourne, Inglaterra, el 20–23 mayo de 1974, y se trazan los sujetos de las varias contribuciones presentado.

* * *

Determinación culombimétrica de haluros orgánicos en azúcar crudo. W. P. FERREN, F. M. VALLESE y W. M. FORTINASH. *Pág.* 228–230

Se describe un método culombimétrico para medir pesticidas o plastificantes organo-halogénicas residuales en azúcar crudo que es sencillo, barato y rápido. Resultas de ensayos con muestras de azúcar de varios origenes han indicado un contenido de haluro orgánico en la gama 0,3–1,25 partes por milión.

* * *

Nutrición nitrogenosa de caña de azúcar. S. P. JAISWAL y S. SINGH. *Pág.* 230–232

Los efectos de pesticidas sobre transformación de nitrógeno en el suelo y su utilización por la caña se discuten tanto como el uso de inhibidores de nitrificación para aumentar la eficiencia de N-fertilizantes.

* * *

Pérdidas de azúcar en lavado de remolacha. Parte I. R. DE VLETTER y W. VAN GILS. *Pág.* 233–237

Pérdidas de azúcar en lavado y transporte por agua de remolacha se discuten y se presentan detalles de métodos de medición de pérdidas en los aparatos de lavado. En esta parte se hace un estudio del tipo de lavador con brazos giratorios; las resultas indican que, mientras que este tipo de lavador puede producir remolacha relativamente limpia, la combinación de velocidad de giración y tiempo de retención para obtener el más eficiente lavado causara tratamiento áspero de las raices y por eso algo grandes pérdidas.

THE

INTERNATIONAL SUGAR JOURNAL

VOL. LXXVI AUGUST 1974 No. 908

Notes & Comments

World sugar balance 1973/74

F. O. Licht K.G. have released revised estimates of world sugar movement for September 1973–August 1974[1]. The estimates are reproduced below:

	1973/74	1972/73	1971/72
	(*metric tons, raw value*)		
Initial Stocks	15,794,000	17,157,000	19,081,000
Production	81,021,000	77,173,000	73,852,000
Imports	25,286,000	24,405,000	24,517,000
	122,101,000	118,735,000	117,450,000
Exports	25,343,000	24,842,000	24,188,000
	96,758,000	93,893,000	93,262,000
Consumption	81,068,000	78,099,000	76,105,000
Final Stocks	15,690,000	15,794,000	17,157,000

Compared with their first estimate[2] they have reduced production in 1973/74 by some 800,000 tons and have reduced the final stocks by 600,000 tons, while consumption has been reduced by 200,000 tons. In the opinion of C. Czarnikow Ltd.[3], "1973/74 production may eventually prove to be lower than the 81 million metric tons, raw value, shown by Licht and . . . world stocks are at an even more critically low level than is indicated in the above statistics."

* * *

Cuban sugar statistics

For some time the official policy in Cuba has been not to publish up-to-date sugar statistics, so that any figures have had to be calculated from whatever material was available. However, Cuban sugar statistics are now available from the International Sugar Organization from which it is possible to calculate actual production in 1972/73 and to reconsider estimates of output in 1973/74. The figures, reproduced elsewhere in this issue, show that production in the calendar year 1973 amounted to 5,382,548 metric tons, raw value, compared with 4,687,802 metric tons in 1972, and with 5,950,029 metric tons in 1971. Exports in 1973 totalled 4,797,377 metric tons compared with 4,139,556 metric tons in 1972, while consumption in 1973 was only slightly down at 463,742 metric tons on the 1972 figure of 470,890 metric tons. With regard to consumption, C. Czarnikow Ltd. note[4]: "Clearly the earlier figures (in some years consumption has been put at more than 600,000 metric tons) must have represented disappearance rather than actual physical consumption, even though it is understood that part of it consisted of sugar utilized for animal feeding." C. Czarnikow Ltd. also point out the somewhat surprising (particularly in view of the current high sugar prices) increase in stocks regularly since end-1971, with a quantity carried forward into 1974 of 461,000 tons, the highest level for many years, and estimate an output of 5,750,000 metric tons for the 1973/74 crop year.

* * *

European sugar beet area 1974

A second estimate of European sugar beet areas published by F. O. Licht K.G.[5] indicates a total of 7,017,020 ha, a reduction of some 126,000 ha on the figure published in their first estimate[6]. The revision is mainly due to a major alteration in the figure for the Soviet Union, which has been reduced from 3,650,000 ha to 3,520,000 ha. In addition, the areas for Denmark and Ireland have been reduced by 3,000 and 4,900 ha, respectively, while the figure for Poland has been increased by 15,000 ha.

F. O. Licht point out that although sowing was completed very early in the year, weather conditions in April were generally unfavourable for germination and seed emergence as well as for development of emerged plants, while the lack of rain has reduced the effectiveness of fertilizers, herbicides and pesticides. In many areas it has been necessary to resow the fields. The situations in individual countries vary: in the western areas of the USSR heavy rainfall has hampered sowing and the drafting of town-dwellers for the task is reported, while in Austria severe setbacks have been caused by drought. On the other hand, conditions varied in Belgium/Luxembourg, with little or no rain in some parts and very heavy falls in others.

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[1] *International Sugar Rpt.*, 1974, **106**, (15), 1.
[2] *I.S.J.*, 1974, **73**, 65.
[3] *Sugar Review*, 1974, (1181), 94.
[4] *ibid.*, 1974, (1179), 85.
[5] *International Sugar Rpt.*, 1974, **106**, (13), 1–5.
[6] *I.S.J.*, 1974, **76**, 162.

EEC sugar tax

The European Economic Community Commission has proposed that up to 80% of the total sugar produced within Quota "C" should bear an export tax during the 1974/75 season. The sugar in question, 650,000 metric tons of which was produced in 1973/74, falls outside the EEC sugar market regulations and is subject neither to quota limits nor to price support. The proposal has been made because of the continuing high level of world sugar prices compared with those within the EEC. The tax already applies to other categories of sugar. The 20% not taxed would continue to be sold without restriction outside the EEC. C. Czarnikow Ltd. note[1]: "The recommendation would appear to be basically unfair. Quota 'C' sugar may not be sold within the Community and so must be exported. At times of low world market prices producers may have to accept a return well below their production costs. It would appear reasonable, therefore, that they should reap the benefit of high world market prices when these apply. Certainly this measure, should it be accepted by the Council of Ministers, will discourage growers from sowing more beet than they anticipate can actually be disposed within the Community."

* * *

US Sugar Act

A Sugar Bill approved by the Agriculture Committee on 14th May which would have extended the Sugar Act for five years to end-1979 was rejected by the House of Representatives on 5th June, so that the 40-year-old Sugar Act will cease to be effective after this year. According to press reports, opponents of the Act apparently yielded to pressure from consumer groups and user industries which claimed that sugar prices were high enough for the annual subsidies (totalling about $90 million) to be abolished. However, it is felt in some quarters that the Sugar Act will not be allowed to lapse, although a similar bill which is to be put before the Senate is thought to have little chance of success.

* * *

Bagasse utilization research in Cuba

Following the signing of an agreement between the Cuban Government, the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO) in March of this year, a major project has been initiated to develop the industrial uses of bagasse. A research programme is to be set up and pilot plants constructed for the manufacture of newsprint and dissolving pulp. A Research and Development Centre for Industrialization of Bagasse is to be built at Quivicán, adjacent to the Pablo Noriega experimental sugar factory, about 24 miles from Havana. Work will also be conducted by the laboratories of ICIDCA and MINAZ as well as at the personnel training base of the pulp and paper mill at Cárdenas and at the viscose laboratory and industrial plant in Matanzas. Apart from a training programme, particularly for higher level staff, the research work is aimed at evaluating the economics of various processes. It is planned to produce 60,000 tons of newsprint annually within 10 years and 51,000 tons of dissolving pulp for rayon fibre manufacture by 1980.

* * *

Tongaat Sugar Ltd. 1973/74 report

Sugar production at 174,120 tons was the second highest for the 5-year period 1970–1974 but was well below the 1972 figure. However, the tons of cane per ton of sugar was the lowest figure for the same period while the overall recovery of 87·13% was the highest since 1961/62. The company's proportion of the total South African sugar crop was increased to 10·06%. A feature of the season was the number of mill stoppages caused by lack of capacity at the process end of the factory as a result of the high cane sugar content during the peak months of July-October. To overcome this problem a new water-cooled *A*-crystallizer is being commissioned and a new quadruple-effect evaporator planned. Two additional *A*-centrifugals will also be installed during the 1974/75 season. Much of the steelwork for the crystallizer and evaporator is being made in the factory's own workshops. The amount of cane grown in the company's own fields was down on the previous year's total by 26,000 tons. A replanting programme covering more than 2000 ha was successfully completed, however, and the field layout is designed to help with future mechanization. Greater involvement in extension services has aimed at improving cane supplies from local growers, while a major programme has been undertaken to increase the amount of land under cane.

* * *

Sugar supply situation within the EEC[2]

According to Mr. R. TAZELAAR, an EEC sugar expert, Community stocks of sugar are expected to be 100,000 metric tons below the normal 1 million metric tons after the next campaign's beet have been processed and even allowing for the import of 1·3 million metric tons of Commonwealth sugar. Speaking in Brussels, Mr. TAZELAAR blamed the tightening situation partly on the failure of the Commonwealth sugar producers in the Caribbean to deliver sugar under the Commonwealth Sugar Agreement. So far, he said, the deficiency in Commonwealth sugar supplies was around 300,000 metric tons. While stocks were at a low level and sugar was needed, the Commonwealth countries were not delivering. "Only two days ago, Guyana sold 20,000 tons of sugar to China, where they got a much higher price," Mr. TAZELAAR said.

New sugar factories for India[3].—Engineering Projects (India) Ltd., a public sector contracting company engaged in the implementation of large-scale industrial projects on a turnkey basis, has received orders for setting up two plants, one in the cooperative sector at Bhimasinghi in Srikakulam District and the other at Miryalguda, also in Andhra Pradesh state.

[1] *Sugar Review*, 1974, (1180), 89.
[2] *Public Ledger*, 22nd June 1974.
[3] *N.S.I. News*, 1974, **9**, (3), 7.

British Sugar Corporation Ltd.

22nd Technical Conference

TWELVE countries, including Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Holland, Ireland, Italy, Portugal, and Sweden were represented at the 1974 Technical Conference of the British Sugar Corporation, as well as Sankey Sugar Co. Ltd., Tate & Lyle Ltd. and this *Journal*. Guests assembled at the Grand Hotel, Eastbourne, on the 20th May with Corporation personnel from the seventeen sugar factories, the Peterborough headquarters, and the Research Laboratories, as well as several retired executives.

On the following morning the Conference Chairman, Mr. T. RODGERS, Production Director of the Corporation, opened the first session by welcoming the guests. He spoke of the effects of British entry into the EEC but noted that, in spite of official commercial competition between British and Continental sugar companies, the beneficial practice of technical collaboration was continuing. He introduced J. F. T. OLDFIELD, Director of Research for the Corporation, who presented the first paper on "Effects of thermophilic activity in diffusion on sugar beet processing" which discussed the economics of sugar loss by fermentation when the bacteria are permitted to develop and reduce diffuser pH in order to provide good pulp pressing. Subsequently the Bury St. Edmunds project of conversion from raw to white sugar production was described with data and illustrations by F. A. PEPPER, Works Manager, and I. S. HIGGINS, Project Manager. The third paper of the morning illustrated work on the purification of raw beet juice by means of ultrafiltration through membranes and was presented by Dr. S. LANDI of the team led by Professor G. MANTOVANI at the University of Ferrara.

Crop prospects for the 1974/75 campaign were discussed after lunch, a survey by the Agricultural Director of the B.S.C., O. ROSE, being read for him by the Conference Secretary, N. BRINTON. This referred again to changes brought about in the UK by EEC membership, especially as affecting payments to farmers. The conference was being held earlier than usual and this presented problems in forecasting so early. Although the seed had been drilled early, dry and cold weather during the spring had hindered growth; however, with good rain and weather conditions before the autumn, it would still be possible to obtain an average rather than a poor crop. Comments from other countries indicated similar conditions elsewhere in Europe except in South Germany and Italy where rainfall had been adequate. In the Azores, a good crop was expected but it would not be enough for local consumption, while in Canada, sowing was delayed through heavy snow. A point that was mentioned in some cases was the diversion of beet areas to other, more lucrative crops, and it was suggested that attention would be needed to amending payment rates to maintain beet sugar production.

D. HIBBERT and R. T. PHILIPSON of the Corporation's Central Laboratory then described the application of crystal regularity measurements to assessing the work of individual sugar factories and even individual pansmen in the same factory; the last was the most important factor and the use of a photographic technique was found to be a useful means of supplying an incentive to improve pan work. Sugar boiling was also the subject of the next paper by R. J. BASS, J. DONOVAN and M. F. BRANCH who described the application of computer techniques to this process, with especial reference to the experiments carried out at Wissington factory.

In the evening the Conference Dinner was held and guests were welcomed by K. C. SINCLAIR, Chief Executive of the Corporation, his toast meeting an amusing response by Herr K. OBERHEIDE of the Süddeutsche Zucker AG, while the evening concluded with a cabaret.

The programme of the following morning commenced with the presentation by R. DE VLETTER of his paper on sugar losses in beet washing and studies on the various kinds of washers—revolving-arm, drum and spray-type, while this was followed by a paper presented in parts by J. N. SMITH, M. F. BRANCH and R. H. ROGERS on the rôle of surface aeration in effluent treatment and its application at Wissington sugar factory. The last paper of the morning was on the application of a condensate still for the supply of boiler feed water, given by D. F. A. HORSLEY. After luncheon, delegates had a free afternoon and were able to play golf or visit a number of places of interest in the vicinity, including horse racing at Goodwood.

On the 23rd May M. SHORE and N. BROUGHTON presented a paper which discussed practical and theoretical aspects of first carbonatation end-point and its control, from which they concluded that conductivity remained the most suitable parameter for use in B.S.C. sugar factories. M. GIORGI then described the application of iron measurements in thin and evaporator juices to detect corrosion, and a technique for halting and prevention of attack. The final paper of the Conference was given by T. LUBIENSKI of Ely factory who described the batch-type ion exchange process used in most B.S.C. white sugar factories for thin juice decalcification and the trials carried out at Ely using a continuous Imacti plant. The Chairman thanked the participants and organizers of the Conference which was then brought to a close.

Coulometric determination of organohalides in raw sugar

By WILLIAM P. FERREN*, FRANK M. VALLESE* and WILLIAM M. FORTINASH†*

Introduction

IN recent years great interest has been shown in detection methods for organohalogen compounds as often found in food products as residues from pesticides (formerly such as D.D.T.) and/or plasticizers (such as the polychlorinated biphenyls). While excellent methods have been developed and described in a number of papers and review articles[1–3], which involve specific methods to determine individual organohalogen pesticides or plasticizers, relatively few screening procedures exist[4]. In our laboratories we developed a technique to determine whether or not organohalogen compounds (such as pesticides and/or plasticizers) were present in raw sugar and at what level or concentration. While coulometric methods as developed by COTLOVE *et al.*[5], for ionic chloride in biological fluids have been universally used in clinical laboratories, applications in other areas are not as wide-spread. Particularly in the determination of organohalogens the pre-measurement treatment required in the form of oxygen-combustion[6,7] has often discouraged the use of coulometry in favour of other more direct instrumental methods. Sodium biphenyl reagent has been used by a number of investigators[8,9] to "break up" organic halogens and liberate the free ionic halide. The application of the pre-measurement treatment by CZECH[10] using the Buchler Chloridometer to determine halogenated organic insecticides in livestock dips represented a significant advance in this area of application for the coulometric method. FERREN and FORTINASH[11] improved CZECH's method by using "ultrasonic-agitation" to simplify, speed up and optimize the pre-measurement treatment.

EXPERIMENTAL

Apparatus

(*a*) The coulometer used was the Buchler Chloridometer Model 4-2500 (see Fig. 1) available from the Buchler Instruments Division, Searle Analytic Inc., Fort Lee, N.J., USA; (*b*) flash evaporation when required was carried out with a Buchler flash evaporator; (*c*) ultrasonic agitation was performed in a Model 77 ultrasonic unit available from Edmund Scientific Co., Barrington, N.J., USA.

Reagents

Sodium biphenyl reagent (obtained as item A 10971 from Eastman Organic Chemicals); toluene (Pesticide Quality SC-15444 obtained from Sargent-Welch Scientific Company); *p*-chlorobenzoic acid (Item 12010 obtained from British Drug Houses Ltd.)

Stock solutions:

(1) *sodium biphenyl reagent:* Dilute a 10 ml aliquot portion of sodium biphenyl reagent 1 to 3 with 1,2-dimethoxyethane.

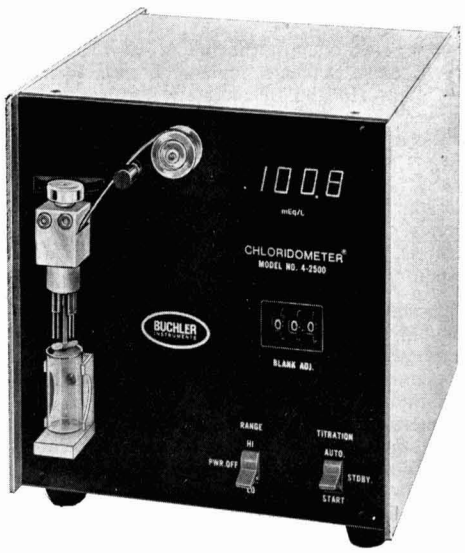

Fig. 1

(2) *coulometric titration acid reagent:* Add 39 ml of concentrated nitric acid to 30 ml of glacial acetic acid and 231 ml of distilled water. Add this solution to 200 ml of 2-methoxyethanol and 500 ml of 2-propanol. Dilute to a total volume of 1·1 litres with toluene.

(3) *sodium chloride calibration solution:* Dissolve 5·845 grams of oven-dried reagent-grade sodium chloride in distilled water and dilute to a total volume of one litre.

(4) p-*chlorobenzoic acid solution:* Dissolve 100 milligrams of *p*-chlorobenzoic acid in 50 ml of reagent-grade methanol.

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†Environmental Group, Stillwell and Gladding Testing Laboratories, New York, N.Y., USA.

[1] THORNBURG: *Anal. Chem.*, 1971, **43**, 145 R.
[2] BURKE: *J.A.O.A.C.*, 1970, **53**, 355.
[3] EAGAN: *ibid.*, 1969, **52**, 306.
[4] EDMUNSON *et al.*: *Indust. Medicine and Surgery*, 1967, **36**, (12), 806–809.
[5] *J. Lab. and Clinical Medicine*, 1958, **51**, 461–468.
[6] SCHENIGER: *Mikrochim. Acta*, 1954, 74.
[7] STEYERMARK: "Quantitative Organic Microanalysis", 2nd Edn. (Academic Press, New York) 1961, pp. 291, 332.
[8] BENTON and HAMILL: *Anal. Chem.*, 1948, **20**, 269.
[9] LIGGETT: *ibid.*, 1954, **26**, 748.
[10] *J.A.O.A.C.*, 1968, **51**, 568.
[11] *ibid.*, 1973, **56**, (6).

Method

Samples of raw sugars were ground to a fine powder by means of a mortar and pestle. 60 grams were then shaken vigorously with 200 ml of toluene. The systems were then vacuum-filtered and the filtrates reduced to a volume of 1 ml by means of the Buchler flash evaporator. This 1-ml concentrate was transferred to a chloridometer titration vial. An additional 2 ml of toluene was used to flush out the contents of the flask of the Buchler evaporator into the chloridometer titration vial. The resultant mixture of concentrate plus flush solvent was divided into two equal portions and evaporated to dryness in two chloridometer titration vials. 4 ml of the coulometric titration acid reagent and 4 drops of gelatin-indicator solution were added to the first titration vial as described in the instrument manual[12] and the free ionic chloride content was determined, i.e. the "background ionic chloride". 1 ml of the sodium biphenyl reagent was added to the second titration vial and contents stirred with the closed end of a capillary melting point tube. The vial was then placed in the ultrasonic bath and agitated for an additional five minutes. A gentle stream of oxygen was then introduced until the reagents were destroyed as signalled by a clear solution. 4 ml of our coulometric titration acid reagent plus 4 drops of gelatin-indicator solution were then added to the vial. When the pH was high (basic solution as indicated by colour of thymol blue indicator) concentrated nitric acid was added until the system became acidic. The chloride ion content was then determined in the usual manner. A toluene blank was treated as described and the 1-ml concentrate analysed for free ionic chloride and organic halogen content. It is to be noted that the Buchler Chloridometer (Model 4-2500) has two ranges. The high range has a read-out based upon a sample size of 0·1 ml. Therefore, at the high setting a read-out of 100 meq/litre indicates that 10 micro-equivalents of chloride are actually present in the coulometric titration vial. The low setting is designed for a sample volume of 10 micro-litres. Hence, a read-out of 100 meq/litre on the low range indicates that 1 micro-equivalent of chloride is present in the vial.

Hence: At high range

$$\%\ \text{chloride content}\ddagger\ \text{from organohalogens} = \left[\frac{2\ (\text{sample read-out})\ 3{\cdot}545 \times 10^{-4}}{\text{Sample weight in grams}}\right]$$

At low range:

$$\%\ \text{chloride content}\ddagger\ \text{from organohalogens} = \left[\frac{2\ (\text{sample read-out})\ 3{\cdot}545 \times 10^{-5}}{\text{Sample weight in grams}}\right]$$

Results and Discussion

The use of ultrasonic agitation increases sample contact with reagent. This is essential in the case of a solid, crystalline powder such as sugar. According to Pecherer, Cambrill and Wilcox[13], "hydrogen peroxide" was used "to remove organic matter." Further it was noted that "additional treatments with hydrogen peroxide improved the analysis." In our experience hydrogen peroxide *per se* interferes with the coulometric indicator current and, while oxidation is required to eliminate interference from organic residue, hydrogen peroxide is not desirable. Using *p*-chlorobenzoic acid as our standard we found that using hydrogen peroxide and evaporation by heating yielded errors as high as —10%. The use of ceric ion to destroy hydrogen peroxide prior to coulometric measurements reduced these errors to about —3%. Subsequently, the elimination of hydrogen peroxide in favour of a stream of oxygen gas improved the accuracy of the method to the point where the average value of ten determinations was 22·58% chloride compared with the theoretical value of 22·65% chloride. We were able to determine 4 micrograms of chloride (present as *p*-chlorobenzoic acid) with a linear relationship between read-out and chloride content for *p*-chlorobenzoic acid in the sample range 0·0 to 2·0 milligrams. The percentage of chloride in *p*-chlorobenzoic acid was determined with an absolute error of —0·07% or a relative error of —0·3%. The standard deviation was 0·06 which yields a 95% confidence interval of $\pm$0·04% which means that there are 95 chances out of 100 that the true average of the analysis lies within $\pm$ 0·04% of 22·65% chloride present in the *p*-chlorobenzoic acid standard. This confidence interval applies down to the limit of detection. The use of hydrogen peroxide is often required to oxidize any sulphide and/or sulphhydryl groups that may be present. In those situations where hydrogen peroxide is essential the elimination of the second evaporation step (just prior to coulometric measurement) in favour of destruction of peroxide by means of the ceric ion is recommended. In the case of sulphide and sulphhydryl-free systems the use of an oxygen stream and the elimination of the second evaporation step is recommended.

As shown in Table I, the amount of organohalogen in sugar was in the range of 0·3 to 1·25 parts per million. The highest concentration found was in an Australian raw sugar but another Australian raw sugar was also the lowest so that no conclusions based upon geographical origin are apparent**. Using a figure of 0·0001% (i.e. 1·0 μg/g) would mean that each 1000 tons of raw sugar refined involves the removal of about two pounds of organohalogen compounds. Further investigations are required to arrive at anything approaching an average or normal value or values for organohalide levels.

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‡ After correcting for: (a) "background ionic chloride", (b) toluene ionic chloride and (c) toluene organohalogen content.

[12] "Instructions for operation: Buchler-Cotlove Chloridometer" available from: Buchler Instruments Division, Searle Analytic Inc., Fort Lee, N.J., USA.

[13] *Anal. Chem.*, 1950, **22**, 311.

** Reduction of organohalides varied from about 79% to 47% as a result of affination. No correlation appears obvious between polarization, grain size, colour, filtrability, ash or moisture and organohalide content in the sugars analysed.

Table I

Geographical Origin	Organohalides (ppm) Raw	Washed	Pol	Grain size	Colour	"Fil"*	Ash	Moisture
Australia	1·25	0·99	98·73	23%	130	132	0·30%	0·18%
Australia	0·111	0·072	98·50	25%	173	125	0·31%	0·23%
Australia	0·069	0·047	98·61	19%	140	190	0·32%	0·28%
Australia	0·019	0·009	98·64	21%	150	201	0·32%	0·31%
Haiti	0·068	0·041	97·23	37%	267	82	0·35%	0·66%
Jamaica	0·075	0·046	96·56	34%	228	82	0·49%	0·88%
Jamaica	0·039	0·025	96·83	35%	236	86	0·53%	0·75%
Philippines	0·100	0·069	97·35	38%	223	65	0·40%	0·64%
Philippines	0·054	0·034	97·29	31%	247	—	0·41%	0·43%

* Refers to filtrability test procedure devised by the American Sugar Refining Co. to determine filtration properties of a raw sugar. The method as applied at the Stillwell and Gladding Testing Laboratories involves use of Millipore filter RAWP-047-SI.

Conclusion

A simple, inexpensive and rapid method has been presented for screening the possible presence of organohalogen pesticides and/or plasticizers in sugar. Often in environmental work initial screening and evaluation of possible pollutant level can pinpoint and even solve the problem. We hope our ultrasonic agitation coulometric technique will help serve this need.

Acknowledgement

The technical help of Mrs. Madeleine Hendrickson in preparing sugar samples at the Stilwell & Gladding Testing Laboratories is deeply appreciated by the authors.

Nitrogen nutrition of sugar cane

By S. P. Jaiswal and Sukhdev Singh
(Punjab Agricultural University, Ludhiana, India)

Introduction

Nitrogen is the only major nutrient to which sugar cane consistently responds almost universally. A natural corollary of this has been increased use of nitrogen fertilizers. However, a good deal of nitrogen is lost from these applied fertilizers through leaching, volatilization and denitrification etc. so that the recovery of mineral nitrogen seldom exceeds 50%. Under sub-tropical and tropical conditions these losses become more pronounced where heavy downpour of rain occurs at short intervals of time resulting in heavy leaching, particularly in light soils. The recovery of nitrogen by sugar cane has been reported to be as low as 40%. From time to time efforts have been made to minimize these losses by resorting to variation in type, placement, rates and timings of fertilizer nitrogen application. A comparatively recent development in this direction has been the use of biological nitrification inhibitors[1,2,3], and soil pesticides[4,5].

Soil pesticides and nitrogen nutrition of sugar cane

In a number of field evaluation trials[6,7], increase in the yield of sugar cane as a result of soil application of gamma BHC and "Telodrin" was not considered entirely a result of control of the pests concerned. In the first attempt at the Sugarcane Research Station, Jullundur, to pin-point the probable causes leading to unexpected increases in yield it was found that the pesticides increase the nitrogen content of the 3–6 leaves[8]. Simultaneously, Srivastava[9] reported that "Telodrin" exercises fair control over nitrification of fertilizer nitrogen. He postulated that the yield-boosting effect is an advantage resulting from suppression of nitrification. Jaiswal and Verma[10,11] in laboratory experiments were not able to observe such effect of gamma BHC and "Telodrin" at rates comparable with field application. On the other hand, it was found that these pesticides accentuated the mineralization of soil-interlocked nitrogen and intensified nitrification. These results were in line with the observations of Bollen *et al.*[12] with gamma BHC. Since the results were at variance with those obtained by Srivastava and Ghosh[5], it was considered desirable to verify them through further experimentation.

A pot experiment was conducted by Jaiswal *et al.*[13] to study the effect of gamma BHC and "Telodrin"

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[11] *J. Research* (Punjab Agric. Univ., Ludhiana), 1971, **8**, (4), 447–450.
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[13] Jaiswal, Saini and Sharma: *Plant and Soil*, 1973, **38**, (1), 33–40.

both in the absence and presence of two nitrogen sources, viz. sodium nitrate and ammonium sulphate, on root and shoot development and nitrogen metabolism in the sugar cane plant. The concentration of nitrate nitrogen in the soil under various treatments was also determined.

In this experiment gamma BHC and "Telodrin" were found to induce shoot emergence and development of tillers and roots. Shoot growth, nitrogen intake and insoluble nitrogen content were invariably increased by pesticide application while soluble nitrogen and soluble carbohydrate content of the shoots decreased. Pesticides also increased the mineral N content of the soil. The favourable effect of the pesticides was not confined to the ammoniacal source of nitrogen; rather the pesticides, particularly "Telodrin", were found to be comparatively more effective in the absence of fertilizer nitrogen and also with nitrogen in the form of sodium nitrate. On these soils, sodium nitrate, in general, had proved inferior to ammonium sulphate in increasing sugar cane yield. The growth conditions in the absence of ammonium fertilizer nitrogen and also the presence of sodium nitrate were apparently not as favourable as in the presence of ammonium sulphate. Consistently lower shoot weights observed with sodium nitrate in the absence of pesticides in this pot experiment would support this inference. The experiment suggested that the non-pesticidal action of the pesticides is not attributable to suppression of nitrification of fertilizer nitrogen as postulated by SRIVASTAVA[9]. It was concluded, on the contrary, that the beneficial effect of pesticides on sugar cane was largely because of more efficient utilization of soil and fertilizer nitrogen which enabled the plants to get off to a vigorous start.

In the light of these findings, field experiments were conducted to study the effect of soil pesticides on nitrogen fertilization of sugar cane on two soils of varying fertility. There were six treatments which were replicated four times (Tables I and II).

Table I. Characteristics of the soils

	Soil 1	*Soil* 2
pH	7·70	7·60
Organic C, %	0·49	0·38
Total N, %	0·065	0·045
Available P, kg/ha	11·0	10·0
Available K, kg/ha	83	70

The results reported in Table II show that, in spite of the higher incidence of shoot borer and its effective control by gamma BHC on soil 2, the pesticide proved more effective in increasing sugar cane yield on soil 1. Lack of response to applied nitrogen in the presence of gamma BHC may be due to potentially higher available nitrogen in the soil, which, in the presence of the pesticide, was perhaps released at a rate the more adequately to meet the requirement of the plants. In the absence of gamma BHC, on the other hand, the mineralization of the nitrogen was probably not rapid enough and thus a gradual response to increased dosages of nitrogen was observed. On soil 2, however, potentially available nitrogen being inadequate, the nitrogen application was able to cause increases in cane yield even in the presence of the pesticide. Apparently greater efficiency of fertilizer nitrogen in the presence of gamma BHC may be attributed to findings brought out in the previous studies[18]. This amply demonstrates the necessity for extensive field trials on response to nitrogen in the presence of pesticides on soils of varying fertility as a basis for more satisfactory soil management and plant protection practices.

Soil pesticides and mode of nitrogen fertilization

Through years of experimentation it has been found that split application of nitrogen increases the efficiency of nitrogenous fertilizers. Most of these experiments were, however, carried out when soil

Table II. Effect of gamma-BHC on millable cane yield and shoot borer attack on two soils

	Soil 1				*Soil* 2				
	Millable cane yield (*Q*/*ha*)		*Shootborer attack* (%)			*Millable cane yield* (*Q*/*ha*)		*Shootborer attack* (%)	
N levels (kg/ha)	G_0	G_1	G_0	G_1	*N levels* (kg/ha)	G_0	G_1	G_0	G_1
0	767	1136	8·8	2·0	0	578	826	18·7	3·8
75	800	1120	7·2	1·9	75	630	974	19·8	4·1
125	857	1149	7·7	2·5	150	718	1000	17·4	3·2
L.S.D. P = 0·05									
gamma BHC	123·8		1·2			90·7		1·3	
N levels	N.S.		N.S.			102·9		N.S.	

G_0 = No gamma BHC G_1 = gamma BHC 5 litres/ha (20% e.c.)

Table III. Effect of mode of N application on millable cane number and yield

Treatments	*Cane number* (*thousands*/*ha*)	*Yield* (*Q*/*ha*)
1. No nitrogen	123·9	695·0
2. All N in soil at the time of planting (125 kg N/ha)	125·9	856·0
3. ½ N dose at planting + ¼ dose in May + ¼ dose in June (recommended practice)	126·1	843·4
4. ½ N dose at planting (soil) + ¼ in May and ¼ in June (foliar application)	126·6	858·0
L.S.D. P = 0·05	Not significant	159·5

application of pesticides was not a practice. Since soil pesticides have been found to influence sugar cane growth and nitrogen nutrition, it was thought appropriate to examine the effect of pesticides on this aspect. A randomized field experiment was initiated with four treatments as in Table III. Urea was used as the source of nitrogen and gamma BHC was applied at the recommended rate.

The results clearly show that split application of nitrogen either through soil or foliage has no advantage over application of all the nitrogen to the soil at the time of planting. Since application of fertilizer in a single dose was in no way inferior to split applications, in view of the increased labour costs, there seems to be little logic in the current recommendation that applications should be split. SRIVASTAVA and GHOSH[14] attributed the significantly higher yield under single dose application to growth of roots being limiting during the earlier phase of development of sugar cane which necessitated the presence of a higher concentration of nitrogen near the root zone. This could, however, more logically be explained in the light of the non-pesticidal effects of the pesticide reported in preceding paragraphs. Accentuated root and shoot development as a result of gamma BHC application (JAISWAL *et al.*[13]) is likely to make use of a larger proportion of applied nitrogen which otherwise remains partially utilized and is subject to loss through leaching, denitrification etc. These findings emphasize that, wherever soil pesticides such as gamma-BHC are used at the time of planting, the routine recommendations regarding the mode of nitrogen application should, at least, be re-examined.

Ammonium versus nitrate nitrogen for sugar cane and use of nitrification inhibitors

Ammonium nitrogen has been reported to be a better source of nitrogen for sugar cane[15]. In subsequent experiments, particularly in soil, conflicting results were sometimes reported. The majority of these experiments are, however, often subject to the criticism that the influence of environmental factors, in particular the effect of pH of the medium and of nitrification, were not adequately controlled. Moreover, the effect of level of nitrogen, an important factor influencing the reaction of plants to nitrogen sources, has not been taken into consideration[16].

A pot experiment was conducted to study the effect of several levels of ammonium and nitrate sources of nitrogen on sugar cane growth and development during the formative phase[17]. The nitrification was controlled with AM (2-amino-4-chloro-6-methyl pyrimidine). It was found that at lower levels of nitrogen application neither of the sources has a distinct advantage over the other in respect of dry matter production and N uptake but at higher levels, ammonium sources proved definitely superior. This would indicate that to gain the maximum benefits from nitrification inhibitors, the larger part of the nitrogen, if not the whole, should be applied at the time of planting. The high concentration of ammonia is not likely to affect the sugar cane adversely[18]. Reduction of losses through leaching, a reason frequently advanced in favour of split application of nitrogen, will largely be eliminated with the help of effective nitrification inhibitors.

In a field experiment, conducted at the Jullundur Sugarcane Research Station in India, the nitrification inhibitors "AM" and "ST" (2-sulphanilamidothiazole), particularly the former, significantly increased millable cane yield[19]. In subsequent years, however, the yield increase did not reach the level of significance. Similarly, in the Philippines[1], application of "N-Serve" proved beneficial, while in Mauritius[2] it gave no benefit. In the studies of SRIVASTAVA and GHOSH[5] "N-Serve" proved highly beneficial in increasing sugar cane yield. Before it can be widely recommended, however, field trials on a larger scale need to be laid out and such factors as basal rate of nitrogen application, soil type, pH, etc. should be taken into consideration.

At present, the use of suitable pesticides, particularly where there is a problem of soil pests control, seems to be the most promising approach to improving nitrogen efficiency and sugar cane yields. As revealed by our studies, this will be of greater benefit under sub-optimal conditions of growth. Widespread application of pesticides, however, needs to be preceded by studies of the interaction between pesticide applications and the amount of available nitrogen in the soil. A systematic study on the influence of pesticides on physiological and biochemical processes governing sugar cane development and growth appears potentially rewarding.

Summary

The effects of soil pesticides, viz. gamma BHC and "Telodrin", on growth and development of sugar cane in relation to their effect on nitrogen transformation in soil and utilization of nitrogen by the plants and their implications for nitrogen fertilization are discussed. The use of nitrification inhibitors in increasing nitrogen efficiency in relation to the reaction of sugar cane to forms of nitrogen and their concentration in the soil has also been discussed. It is concluded that the use of suitable chemicals, particularly in the regions where soil pests are a problem, holds considerable promise in increasing the efficiency of nitrogen fertilizers.

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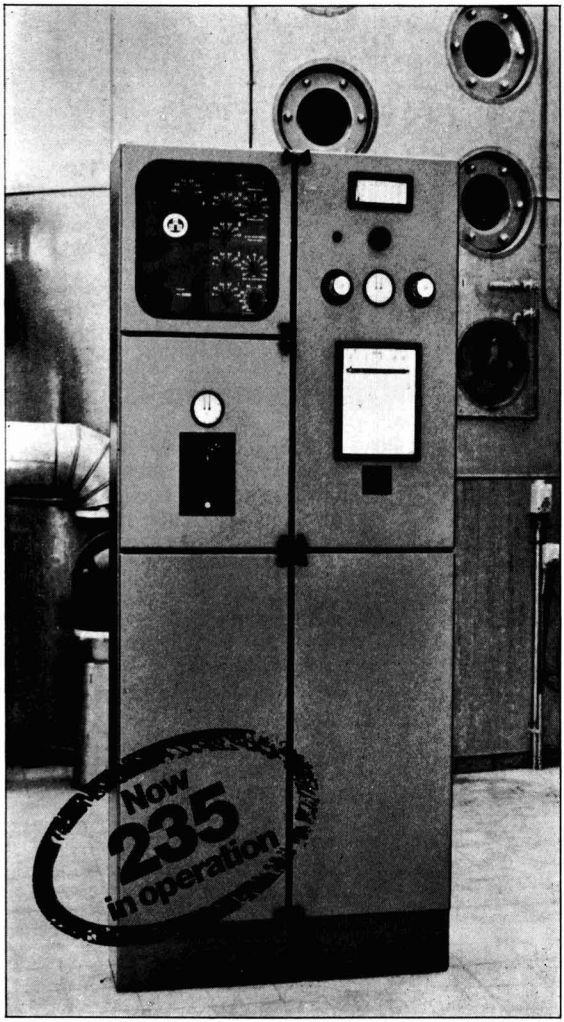

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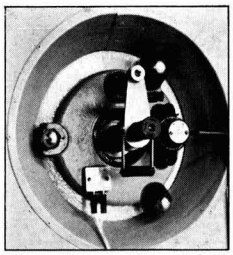

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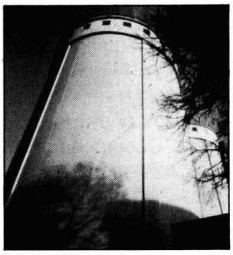

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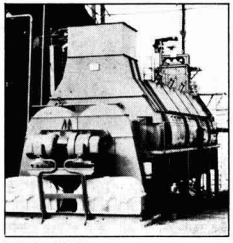

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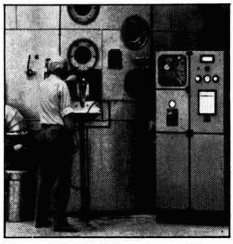

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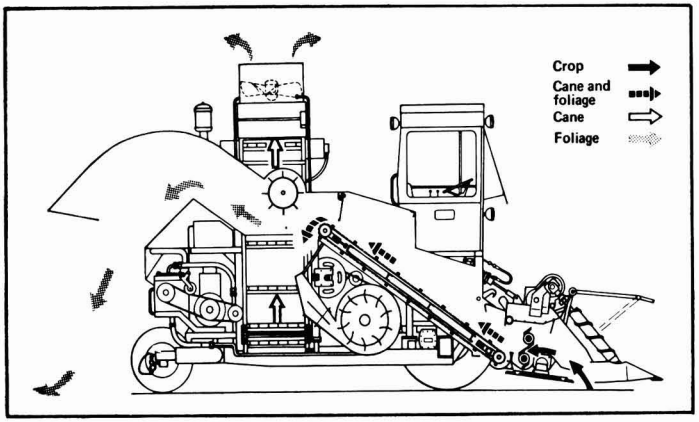

GEBR. CLAAS MASCHINENFABRIK GMBH **Dept. for Sugar Cane Machinery** **4834 HARSEWINKEL**

West Germany

Sugar losses in beet washing

By R. DE VLETTER and W. VAN GILS

(N.V. Centrale Suiker Mij., Amsterdam, Holland)

Paper presented to the 22nd Tech. Conf., British Sugar Corp., 1974

PART I

INTRODUCTION

INDUSTRIAL water pollution abatement is preferably done at the source: prevention is better than cure. In the sugar industry this principle has long been applied; continuous diffusers re-using their own press water, dry lime cake disposal and the prevention of all unnecessary leaks and overflows reduce water pollution.

In this respect sugar losses in beet fluming and washing constitute the most difficult problem. Sugar beets cannot be transported and washed without damage; and any damage, i.e. rupture of cell walls of the living beet tissue, will bring the sugar juice from those ruptured cells into the water.

Damage and loss

Although damage cannot be prevented, we can at least try to reduce it to the very minimum.

In some recent studies[1,2,3] a relationship has been established between mechanical energy exerted upon the beet, on the one hand, and surface damage and sugar loss on the other. Fig. 1 makes clear that low energy collisions, equivalent to a fall of less than one metre, cause little harm, but at higher energy levels, losses rise exponentially. Losses caused by visible breakage as well as those caused by bruising are included in these figures. Caution should still be exercised in applying this conclusion to the performance of beet washers since:

(*a*) a hundred strokes, equivalent to a negligible loss of 0·001% sugar on beet each, will give, in total, a loss as high as 0·1%,

(*b*) when a beet is hit on a prefractured surface instead of on its tough skin, the resulting loss will be up to ten times as high, as indicated in Fig. 1, and

(*c*) previous damage has no influence on the measurement; when the wounds are older than two days, the sugar from the opened cells has already been consumed by the adhering microflora, whereas sugar from more recent damage is leached out in the flumes before the beet enter the washer.

A further conclusion from our previous studies worth mentioning here is that composition, pH and temperature of the flume and wash water have no measureable influence on the level of the sugar losses.

We found a loss of about 1·5 to 3 mg of sugar per cm² of cut surface. Only when the temperature of the beet rises above about 45°C do the cells start dying off, and then a diffusion process begins to take place.

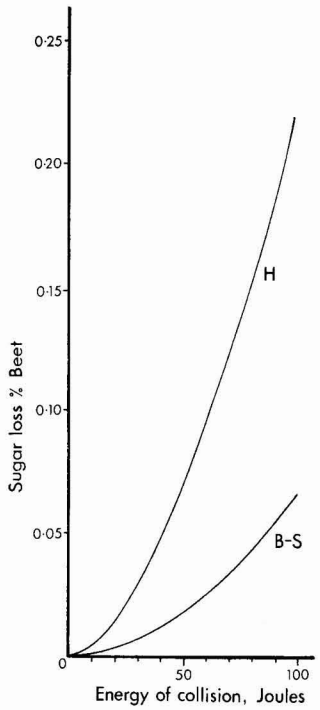

Fig. 1. Sugar losses from beet damage as a function of energy of collision under standardized extraction conditions. H—hard surfaces; B-S—beets and other soft surfaces

The only systematic factor to be taken into consideration in this respect is a gradual rise in lost sugar during the course of the campaign. At the end of our campaign in December all losses resulting from beet damage are about 60% higher than those at the start in September. This effect must be taken into account when evaluating loss figures.

Losses from beet washing

In many beet sugar factories losses in flume and wash water amount to between 0·2% and 0·3% sugar on beet, half or more of which originates from the beet washer.

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[1] KAPOL: *Doctoral thesis*, Bonn, 1973.
[2] BRINKMANN: *Paper presented to 37th Winter Congress I.I.R.B.*, 1974.
[3] DE VLETTER and VAN GILS: *ibid.*

A study of beet washing, resulting in a reduction of losses at this station to one-half or one-third, would cut down total sugar losses in effluent water and consequently total water pollution by 25 to 35%.

At Centrale Suiker Mij. factories several beet washing stations have to be renewed. The beet washing operation is one of the less studied unit operations in the beet sugar factory.

As far as we know, neither the efficiency of the washing operation itself nor the sugar losses as mentioned above have been the object of an investigation described in the literature, and we therefore set up a survey in this respect, the results of which will be described in the following pages.

Methods of Measurements

Residual tare

A beet washer is installed in the beet sugar factory in order to wash off the tare from the beets, and therefore the tare remaining after the washing operation is the principal guide to the success of its operation.

We measured this quantity by simply scraping the mud from a weighed amount of beet with a knife and weighing the collected tare as such.

The figures from different factories must be compared with caution in view of the different stickiness of the soil.

Sugar losses

Sugar losses are calculated from measurements of water flow and sugar content.

From Fig. 2 it may be seen that when the beets at point (3) are separated relatively dryly and the water at point (5) can be sampled effectively, the losses in the beet washer are equal to:

total sugar at point (5) minus total sugar at point (4) (direct measurement).

A check measurement can be made by calculating total sugar at point (6) minus total sugar at point (1) (indirect measurement).

At the same time:

Water at (1) + (4) = water at (2) + (5) = water at (6)

In many actual situations flume and wash water are somewhat mixed together and only indirect measurement is possible.

In any case, to determine sugar losses in the beet washer, we need to make two measurements: one of the sugar concentration in water, and one of water flow.

Sugar determinations in water.—The red colour developed by fructose with hydrochloric acid and resorcinol is measured colorimetrically. Reaction and colour measurement are performed on an "AutoAnalyzer". The samples are dialysed to remove turbidity and the output of the colorimeter is charted on a recorder. The scale is calibrated by standard samples.

In mud-water recirculation systems, two types of difficulty can be encountered:

(*a*) At high pH values the sugar will build up to a level of several thousand ppm, making accurate measurement of differences of a few hundred ppm an illusion. This can be overcome by stopping the lime addition for a time.

(*b*) Extremely high activity of micro-organisms in the recirculating water will destroy all the sugar in the samples in a few hours. We preserve our samples by adding a few drops of a quaternary ammonium compound.

Fig. 3 shows results from measurements made from a preserved and a non-preserved sample, taken simultaneously.

Flow measurements.—Over the years we have developed some skill in making flow measurements by means of tracer injections. The principle is easily understood from Fig. 4.

Since the amount injected is constant,

$$f_1 \times c_1 = f_2 \times c_2$$

$$\text{and } f_2 = \frac{f_1 \times c_1}{c_2}$$

f_1 is determined by measurement of the flow from our injection pump,

c_1 and c_2 are determined by analysis, whence f_2 can be calculated.

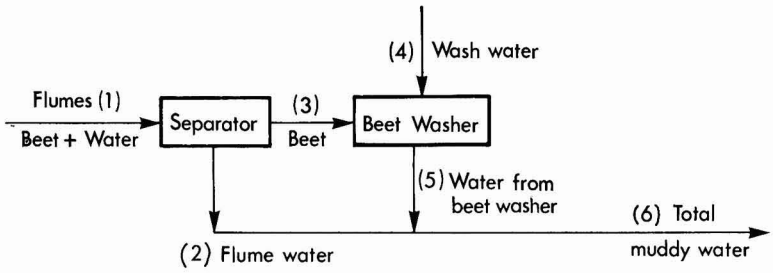

Fig. 2. Flow diagram of beet washer

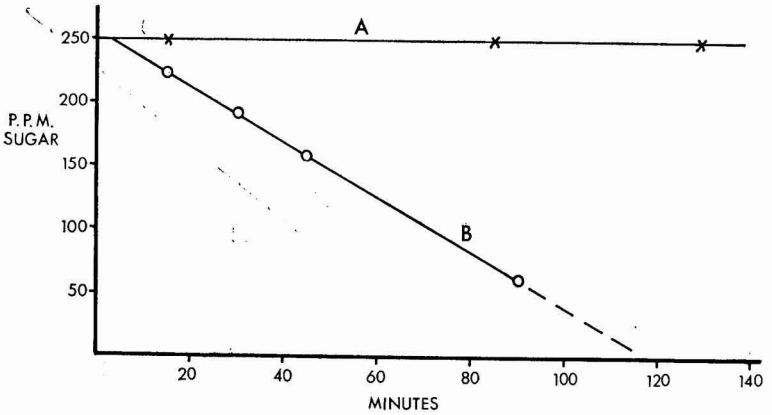

Fig. 3. Decreasing content of (B) non-preserved water from recirculation system by microbiological action, compared with constant value found in the same sample (A) after addition of a few drops of quaternary ammonium compound

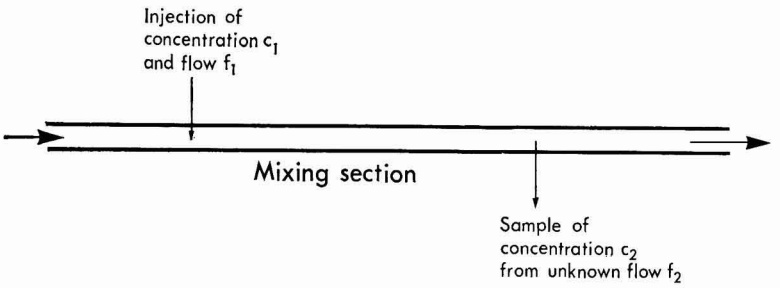

Fig. 4

Table I. Precision of flow measurements by the salt injection method

Beet washer at factory	*Factory daily capacity (tons of beet)*	*Salt injected*	*Method of measurement*	*Measured flow* $m^3.hr^{-1}$	*mean*	*Standard deviation single*	*mean*
Quévy	2950	$NaNO_3$	Ion-specific NO_3 electrode	276 256 267 257	264	3·7	1·8
Veurne 1	4300			223	219	4·5	3·2
Veurne 2		,,	,,	212 214 240	227	10·1	7·2
Attin	2500			106 122 109	112	8·4	4·9
Bazancourt	5400	,,	,,	166 172 177 151	167	7·6	3·9
,,		LiCl	Flame photometer	164	164		
Toury	4000	NaCl	Ion-specific Cl electrode	97 94 98 106 93	98	5·7	2·5
						Mean 6·7	

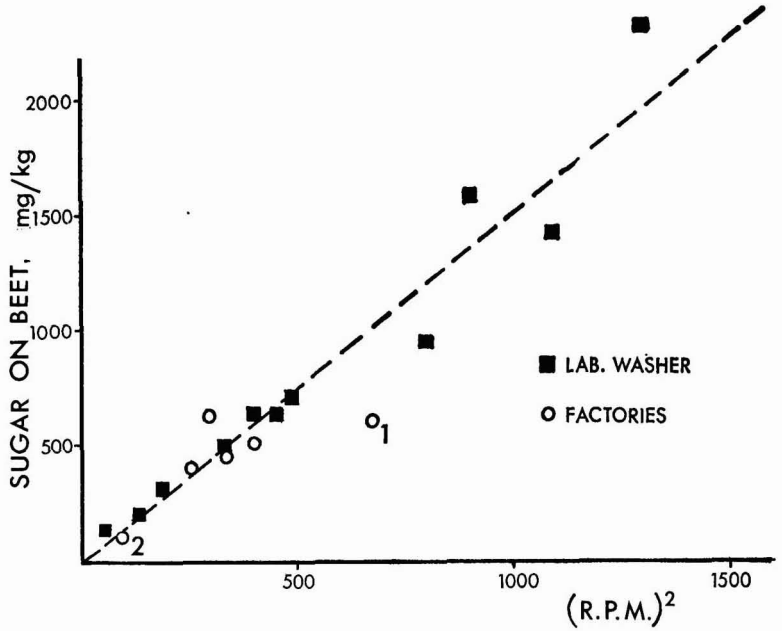

Fig. 5. Reduced sugar loss per minute at radius of 1 metre in revolving-arm beet washers

When there is a basic concentration of the tracer substance in the flow, c_2 must be determined as a difference.

We normally use NaCl as a tracer substance and, after some years of experience with flame-photometric determinations of sodium, we switched over to the Orion chloride ion-specific electrode which allows easy and relatively quick determinations on the spot by titration with the injected solution.

With salt concentrations exceeding 900 ppm this method is no longer practical. In these cases we prefer the use of $NaNO_3$, combined with the nitrate electrode.

In some cases LiCl was used, combined with flame-photometric Li determinations.

In practical situations the tracer method showed a standard deviation of about 7%, in which the actual fluctuations of the flow are included (Table I).

Test Results with Different Types of Beet Washer

The classical revolving arms-type beet washer

This type of washer has long been very popular because of its rugged construction, its built-in stone catchers and its insensitivity to load fluctuations. Indeed one of our washers is now handling about ten times the load it was built for.

Our measurements at various factories have indicated loss figures of between 0·09 and 0·15% sugar on beet and a relatively high proportion of residual tare (from 0·8 to about 5%).

An effort to improve these figures should start with an investigation into the key variables controlling the processes in the beet washer.

We succeeded in finding satisfactory inter-relationships by proceeding as follows:

(*a*) As indicated above, sugar losses caused by beet damage rise gradually during the course of the campaign by a factor of 1·6. In order to make different measurements comparable, all figures should be reduced to a median campaign value.

(*b*) It was shown by Oldfield and co-workers[4] and by ourselves[5] that sugar losses in a beet washer are proportional to the residence time.

This residence time was determined by introducing marker red beets at the entrance to the washer.

The median campaign value divided by the residence time in minutes gives a value of loss per minute.

(*c*) Our figures, obtained in various factories as well as in a laboratory beet washer, suggest that losses are proportional to the radius of the beet washer or in other words to the length of the arms.

[4] *Paper presented to the 21st Tech. Conf., British Sugar Corp.*, 1972.

[5] de Vletter: *J. Pure Appl. Chem.*, 1972, **29**, 113.

During the past four years in which the subscription price of the *International Sugar Journal* has been unchanged, costs have increased markedly, with especially high rises during the last two years. Postage costs alone have gone up by 40% within the last twelve months while the price of paper has doubled. It is no longer possible to absorb these increases and we are therefore raising the subscription rate for twelve monthly issues to £5.00 or $15.00 U.S. currency, post-paid, with effect from January 1975. The cost of a single issue, post-paid, will become 60p or $1.80. We propose, however, to introduce a three-year subscription which will cost £12 or $36.00, post-paid, and readers may wish to specify this when their subscriptions are due for renewal.

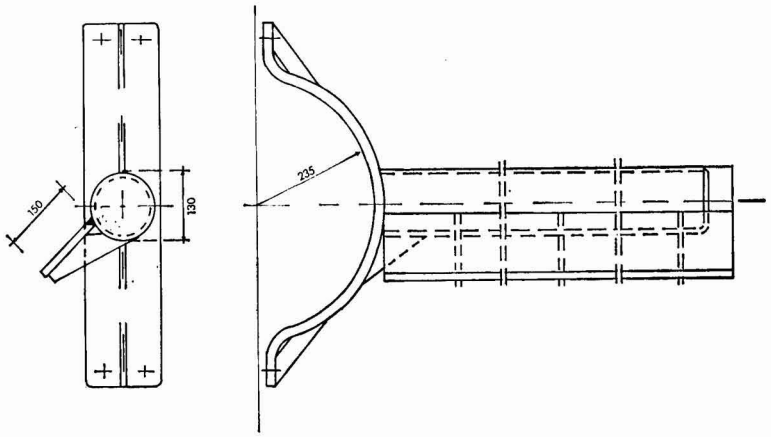

Fig. 6. Transport blades welded onto arms of beet washer in order to reduce residence time

We therefore multiplied our loss per minute value by $\frac{1000}{r}$ where r = radius of beet washer in mm.

(*d*) Experiments in our laboratory beet washer showed losses to be proportional to the square of the speed of rotation.

As a conclusion from considerations *a*, *b*, *c* and *d*, a summary of our measurements in revolving arm-type beet washers is reproduced in Fig. 5. The points found are reasonably well arranged around a straight line through the origin and there is no systematic difference between the laboratory washer (diameter 64 cm) and the factory washers (diameter 145 to 232 cm).

One, very small, very rapidly rotating washer at our Steenbergen factory (point 1) shows a 40% lower loss than could be expected.

A partial explanation may be given by the fact that this washer is equipped with about 25% fewer arms and paddles (22) than the other washers (26 to 34).

If we suppose that sugar losses at beet washing can reasonably be predicted from the key parameters *a*, *b*, *c*, *d*, mentioned above, why then do all beet washers of this type show a fairly uniform loss of around 0·12% on beet? Probably the influence of one factor is counterbalanced by another. More specifically, low speeds of revolution are counterbalanced by long residence times and *vice versa*. What will occur then, when a low speed of revolution is combined with a short residence time? An answer to this question was given by the following full-scale experiment:

Our low-speed washer at Sas van Gent (9·7 rpm: Fig. 5, point 2), with a residence time of 9 minutes, was equipped during the 1973 beet campaign with transport blades, welded on 12 out of 50 arms of the beet washer. The blades had a length of 905 mm, a width of 150 mm and were mounted at an angle of 45° (Fig. 6).

These blades had the surprising effect of reducing the residence time by a factor of $\frac{1}{2{\cdot}3}$ from 9·0 to 3·9 minutes.

More important, and entirely according to theory, the loss was reduced by the same factor from 0·135 to 0·06% sugar on beet.

Our enthusiasm in respect to sugar losses was tempered, however, by the fact that the tare remaining after washing rose by a factor of 2·5 from 1·4% to 3·5%.

The observations described in this section brought us to the conclusion, that it is entirely possible to operate a revolving-arms beet washer in such a way that it will deliver relatively clean beets. But in order to achieve this result, the combination of rotation speed and residence time which must be chosen, will inevitably result in such rough handling of the beets that sugar losses as high as 0·12% ± 0·03% will be the result.

(*to be continued*)

New sugar factories for Tanzania[1].—According to an official announcement, Tanzania plans to construct by 1978 three sugar factories with an annual capacity of 30,000 tons each. It is anticipated that these factories, to be built at Wami, Kisari and Ikonga, will reduce sugar imports which are currently 42,000 tons/year. The total cost will be £40 million. It is expected that after 4 years it would be possible to raise production of the three factories to 60,000 tons per year each, to give a total annual production in Tanzania of 445,000 tons, including the outturn from the factories already in existence. Current consumption is about 157,000 tons/year.

[1] *Amerop Noticias*, 1974, (6), 7.

Sugar cane agriculture

Replanting operations on Hawaii. J. W. EDNIE. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 127–130.—Replanting machines used on Hawaii Island and the various practices followed in mechanized replanting are described. Most of the machines can be used for planting as well as replanting.

* * *

The DR-564 Toft cane harvester experiment. R. E. EVANS and J. R. MARSHALL. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 142–150.—Tests of this throat-type chopper-harvester in Hawaii are reported. While hourly cutting rates were high and the performance very good as regards soil pick-up and trash removal, the machine suffered from two major defects: large quantities of cane left on the ground and damage in the field as a result of poor balance and heavy weight. Modifications to the machine are described which were aimed at curing these and other problems.

* * *

Recent developments in Toft cane machinery. R. J. STEPHENSON. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 151–162.—Harvesting problems in some cane-growing countries are briefly listed and the economics of mechanical cane harvesting in Queensland and Florida using Toft "Robot" chopper harvesters examined with the aid of examples. Features of the "Robot" Mark II wheel- and track-mounted harvesters are described and the changeover from whole-stalk to chopper harvesting in Australia examined. Details are given of the J-250 whole-stalk harvester and brief information given on Toft infield cane transport.

* * *

The effect of mudpress as soil ameliorant on the yield of sugar cane. G. V. URGEL and C. C. HERNANDEZ. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 19–25.—Application of 10 and 20 tons of filter cake per ha to plant cane improved cane and sugar yields, but above this level there was no response. With ratoon cane there was a significant increase in cane yield with 20, 40 and 80 tons.ha^{-1} but sugar yield per ha was not improved. Juice quality was reduced in all cases by filter cake application but not significantly so.

* * *

Mechanization of sugar cane farming in the Philippines. O. S. LIBUNAO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 26–29.—A survey is made of farm implements and machinery, including ploughs, harrows, rotavators, lime spreaders, etc. The scarcity and high cost of hand labour is making inevitable the introduction of mechanized cane planting, harvesting and loading. It would be desirable to introduce the stubble shaver (for improved ratooning), gang coulters, land planers, etc.

* * *

Mechanical harvesting and handling of cane in the Philippines. T. R. ESCOBER. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 30–35.—See *I.S.J.*, 1973, **75**, 144.

* * *

Comparative effects of different herbicides on the control of weeds in sugar cane fields. R. AFENIR, C. R. TADEO, E. B. DIMSON, S. SAMIANO and J. PAYUMO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 36–54.—Trials on the use of a number of herbicides, alone and in combinations, showed that the best return came from the use of S-6115 which also gave immediate 100% killing of weeds and residual effectiveness even if spraying was followed by heavy rain. The next most profitable treatment was a combination of "Flocon 4VCS-438" with "Banwell D."

* * *

Reaction of some promising Phil varieties to leaf scorch disease of sugar cane. F. R. HUSMILLO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 112–115. Of 14 varieties tested, two (Phil 58260 and Phil 6025) were rated as highly resistant to leaf scorch and five as resistant.

* * *

Elemental uptake of some sugar cane varieties at Canlubang Sugar Estate. II. R. A. CRUZ and E. B. PUYAOAN. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 133–138.—The uptake of N, P and K by a cane crop is calculated as well as its replacement by fertilizers. The contents of the various elements in by-products such as bagasse, filter cake and molasses can be used as an indication of their value for reduction of the amount of mineral fertilizer needed.

* * *

The development of Hda. Guisok's hydrosol, sodic and acidic soils for sugar cane and other crops. T. R. ESCOBER and F. Y. PANOL. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 116–132.—Hacienda Guisok, an area of 56 ha originally bought to provide a right-of-way and not for agricultural use, suffered from salinity, poor drainage and low pH (3·8–4·9). In order to render it suitable for cane growing, a reclama-

tion programme was instituted in which the fields were levelled and graded, a drainage system built with an automatic tidal gate, the soil limed and the salts leached by rainfall. The water table has fallen, salinity decreased and pH has risen to about 5·7; as a consequence, it has been possible to grow cane successfully on part of the area.

* * *

Recent advances in sugar cane agronomy and varietal improvement. J. N. GIBE. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 139–146.—The advances described include asexual cane breeding by tissue culture, use of gamma irradiation and chemicals for mutation induction in cane, acceleration of breeding processes and evaluation of seedlings, use of a computer programme for parent-progeny analysis, standardized naming of clones, use of a 0–9 system for rating cane characteristics, and use of epidermal character analysis for varietal identification.

* * *

Effect of lime and calcium silicate on the yield of sugar cane. D. R. CUNANAN and V. M. PECHO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 182–185. Application of lime to soil increased cane yield but application of calcium silicate raised yield even more, indicating a positive response to the silicon.

* * *

Response of sugar cane to "Diquat" for tassel control. S. S. GARRUCHO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 251–260.—See *I.S.J.*, 1973, **75**, 207.

* * *

Fallow flooding: its significance in sugar cane agriculture. G. ARCENEAUX. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 1–4.—See *I.S.J.*, 1972, **74**, 243.

* * *

Effects of water table depths on sugar cane yields in Louisiana. C. E. CARTER and J. M. FLOYD. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 5–7.—While no significant differences were found in cane yields over the range of water table depths maintained at 24, 32, 40 and 48 inches in small plots during 1967–70, the yields from the treated plots were about 60% greater than from the untreated plots. However, sugar content was reduced as a result of increased vegetative growth compared with the controls, but the higher cane yields more than compensated for this, so that the sugar yield per acre was considerably increased by irrigation. Even 3rd ratoon crops yielded an average of 3·1 tons of sugar.acre^{-1} with irrigation, whereas normally in Louisiana the cane sugar content after 2nd ratoons is too low to justify a 3rd ratoon crop.

* * *

Relationship of soil pH to sugar cane responses on Everglades peat. G. J. GASCHO and C. E. FREEMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 8–20.—Cane was pot- and field-grown in peat in experiments to determine the effect of soil pH and incorporation of lime, sulphur and slag (the last containing a number of elements) on cane and sugar yield. Results indicated no significant effects of pH in the range 5·2–7·2, while an increase in pot-grown cane weight brought about by slag incorporation was attributed to the high silicon content; otherwise the mineral additives had no effect, except for sulphur which could make certain micro-nutrients available but did not significantly affect pH.

* * *

The relationship of P, K, Ca and Mg extractable from soils to P, K, Ca and Mg contents of sugar cane leaf blades. L. E. GOLDEN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 21–27.—While high positive correlation was found between extractable soil P and K and the respective cane leaf contents, the only relationships between soil Ca and Mg on the one hand and the leaf contents on the other were negative, whereby the leaf Ca and Mg were considerably greater than levels considered to be critical, although they were within normal ranges of leaf values. It is concluded that Ca and Mg are not required as plant nutrients under Louisiana conditions. There was evidence of cation antagonism between leaf K and leaf Mg.

* * *

Experimental mechanical harvesting and cleaning sugar cane at the United States Sugar Corporation. J. P. SEXTON. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 28–29.—Experience in mechanical cane harvesting, using a United States Sugar Corp. machine, is briefly described and information given on operation of an experimental cane cleaner which has a rated throughput of 120 tons.hr^{-1} and uses air to remove light trash and stripping rolls to remove tops and trash attached to the stalks. Trash content was reduced from about 10·25% to 7·17% at a total throughput of 40,000 tons of cane. Green cane has also been handled. Modifications are to be made to the cleaner to increase efficiency.

* * *

The Toft "CH-364 Robot" cane harvester at Florida Sugar Corporation. T. L. SWAGER and R. L. WALKER. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 30–32. Trials with the harvester are briefly reported. Its performance, including a burnt cane trash reduction to 5·63% compared with 3·79% with hand-cut cane and higher juice purities than with manual harvesting, is considered promising, although some comparatively minor modifications to the harvester are suggested.

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Sugar cane seed pieces: heat treatment and inoculation with sugar cane mosaic virus. G. T. A. BENDA. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 33–38.—See *I.S.J.*, 1973, **75**, 143.

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Strains of sugar cane mosaic virus in Florida. J. L. DEAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 48–51.—Of 140 isolates of cane mosaic virus taken from CP 31-294 and CP 31-588 cane in Florida (where the disease is now rare in commercial cane varieties),

121 were strain E, two were strain A, three were possibly strain D, one was strain H, and 13 were not identified.

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Ratoon stunting disease virus: problems in purification. A. G. GILLASPIE. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 52–56.—See *I.S.J.*, 1973, **75**, 143.

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Influence of strains of sugar cane mosaic virus on stands, stubbling ability and yields of sugar cane varieties. H. KCIKE and R. L. TIPPETT. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 57–60.—See *I.S.J.*, 1971, **73**, 176; 1972, **74**, 47.

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Yield of a major sugar cane variety in Louisiana planted with different levels of mosaic in the seed cane. R. J. STEIB and S. J. P. CHILTON. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 61–62.—Studies indicated that the relationship between mosaic infection of seed cane and losses in plant cane and ratoons was not regular from year to year, sometimes no significant differences being found in yield between disease-free and 50% mosaic-infected cane, while in other cases the difference was considerable.

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Galleria mellonella: **an alternative laboratory host for mass rearing tachinid parasites of sugar cane borers,** *Diatraea* **spp.** T. E. SUMMERS, M. G. BELL and F. D. BENNETT. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 63–65.—Experiments have shown that Cuban fly (*Lixophaga diatraeae*), a parasite of cane borers, can be successfully reared on the greater wax moth, *G. mellonella*, which lends itself well to laboratory conditions.

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Grading varieties for yield in clonal plots and yield trials. R. D. BREAUX. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 95–104.—In the grading system used at the USDA Sugarcane Field Station, Houma, Louisiana, cane varieties are graded from 1 to 10 for estimated cane yield (carried out visually) and for sugar yield on the basis of data obtained previously and the two figures added together. Comparison between the visual yield assessments and yields estimated by sampling or weighing cane from whole plots showed close correlation.

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New gene sources for subtropical sugar cane: a review. P. H. DUNCKELMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 105–111.—The subtropical cane breeding programme of the USDA in Louisiana is surveyed, attention being focused on the situation arising from the narrow genetic base (inbred lines from three initial *Saccharum* nobilizations) on which Louisiana varieties have been bred and which could restrict future advances in breeding. Promising sources of new germ plasm are *Saccharum spontaneum* genes crossed with locally-adapted varieties, although it is emphasized that new clones of *S. officinarum*, *S. robustum* and *S. sinense* must continue to be used for breeding cane with desirable characteristics.

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Comparison of estimated and weighed yields in sugar cane variety trials: preliminary results. H. P. FANGUY. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 112–114. Comparison of yield estimates, obtained by multiplying the number of millable stalks per plot by the average stalk weight, with values obtained by weighing the cane cut in the plots (allowing for trash by determining the amount in a hand-cleaned 200-lb sample) showed significant correlation. While the ranking of varieties for yield per acre was very similar with both methods, the coefficients of variation were lower in the weighed cane method.

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New sugar cane clones with superior cold tolerance. J. E. IRVINE and P. H. DUNCKELMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 115–117.—Of sixty clones selected as having cold tolerance as good as or better than N:Co 310 or CP 61-37, four proved to have superior cold tolerance as well as being erect with solid stalks and a high stalk population. They were: US 66-56-4, US 66-56-7, US 66-56-9 and US 66-56-15. They are the progeny of a cross between L 60-25 and US 56-15-8, a clone of *Saccharum spontaneum* from Thailand.

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Evaluation of sugar cane varieties for borer resistance by artificial infestation. R. D. JACKSON, W. J. MCCORMICK, R. D. BREAUX and P. H. DUNCKELMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 118–120.—Results of artificial infestation experiments to determine cane varietal resistance to the borer *Diatraea saccharalis* showed that varieties in the US series were more resistant than CP and L series but, as a group, tillered more profusely, were smaller in diameter, had lower sugar content and higher fibre content than the CP and L varieties.

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Early testing for higher yielding varieties: USDA in-field variety programme. R. J. MATHERNE. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 127.—See *I.S.J.*, 1972, **74**, 372.

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Maturity studies of commercial sugar cane varieties in Florida. L. P. HEBERT and E. R. RICE. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 127.—See *I.S.J.*, 1972, **74**, 305.

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Nitrification inhibitors applied with anhydrous ammonia to sugar cane. J. F. PARR, B. R. CARROLL and S. SMITH. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 127.—See *I.S.J.*, 1972, **74**, 372.

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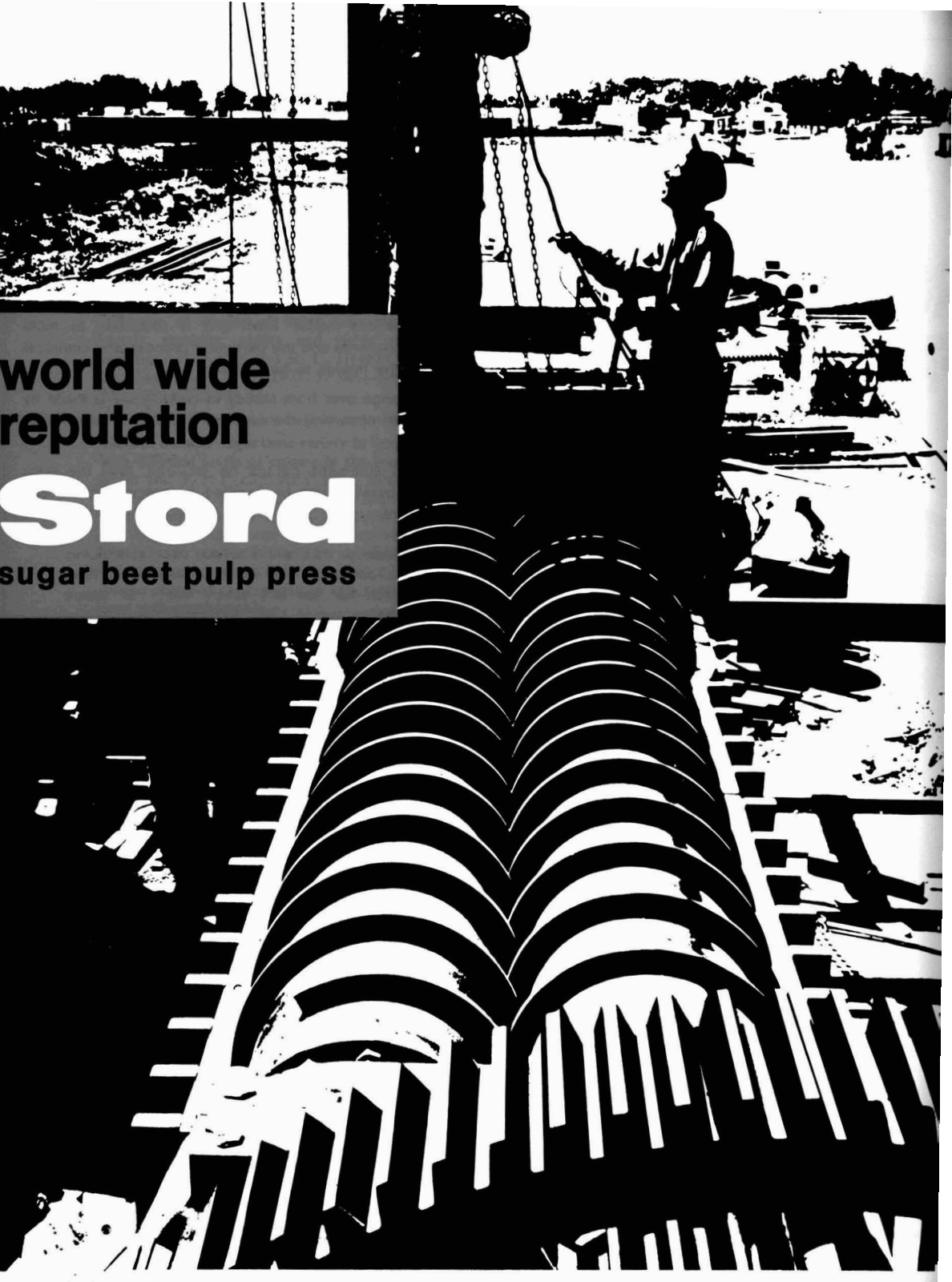
Rôle of chemical insecticides, parasites and predators in control of the sugar cane borer in Florida, 1965-1970. T. E. SUMMERS. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 127.—Annual losses as determined by borer



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surveys at harvesting are presented and chemical control experiments and the rôles of parasites and predators in borer control in Florida are discussed.

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Pattern of germination and control of *Rottboellia exaltata* L.F. (Raoul grass) with "Trifluralin" and "Terbacil". R. W. MILLHOLLON. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 128.—"Trifluralin" at 2 lb.acre^{-1} and "Terbacil" at 3·2 lb.acre^{-1} completely checked germinating Raoul grass for 60 days, while control after 90 days was 80% with "Terbacil" and 90% with "Trifluralin". Other tests demonstrated the superiority of "Trifluralin" over "Terbacil" when incorporated in the soil, but neither was effective if sprayed on the soil surface without incorporation.

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Effects of subsoiling on the production of sugar cane. R. RICAUD. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 128.—Subsoiling with a vertical mulcher designed to open a furrow about 26 inches deep and 10 inches wide at the soil surface gave significantly higher yields than did use of a regular subsoiler, while both increased yield compared with the absence of subsoiling where heavy field equipment had caused compaction. Incorporation of partially decomposed bagasse in the soil after use of the vertical mulcher did not increase yield over subsoiling alone.

* * *

Physical and mechanical properties of sugar cane. D. L. ROBERTS and B. J. COCHRAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 129.—While no significant correlation was found between physical properties (Brix, fibre content and hardness) and mechanical properties (under conditions of bending, tension and compression loads) of cane, significant varietal differences were observed.

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Two-row sugar cane harvesting combine. R. FANJUL. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 129.—See *I.S.J.*, 1972, **74,** 367.

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Broadcast *versus* the band method of fertilizer application to stubble cane on Everglades peaty muck soil. H. J. ANDREIS. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 138–140.—Comparison of the two methods used to apply P and K to ratoons growing in a soil deficient in this elements showed that both were equally effective. Application of the P and K resulted in increased cane sugar yields per acre.

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USDA sugar cane selection programme in Florida. J. D. MILLER. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 145–148.—The four stages in cane varietal evaluation at Canal Point and the seedling selection criteria applied are explained.

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The effects of late mowing on frosted sugar cane in Florida. E. R. RICE and L. P. HEBERT. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 149–152.—Mowing frozen plant cane 2–3 inches above the ground after formation of fully developed internodes in April retarded maturation in samples taken in December, gave more but lighter stalks and reduced cane yields at harvest in March. In contrast, unmowed cane gave 13% more sugar per ton of cane in December, and at harvest in March yielded 10% more cane and 14% more sugar per acre than did the mowed cane.

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Rat control in Florida sugar cane fields. H. H. SAMOL. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 153–156. The four species of rats found to damage cane in Florida are *Sigmodon hispidus* (cotton rat), *Oryzomys palustris* (rice rat), *Rattus rattus* (roof rat) and *Neofiber alleni* (Florida water rat). Annual cane losses from rat damage in the state are estimated at $2–3 million. Laboratory tests showed that zinc phosphide as a 1% bait gave better control of both cotton and rice rats than did anti-coagulants. A 2% bait is to be tested on the roof rat, good control of which has been obtained with a 1·88% zinc phosphide bait in Hawaii, although the 1% bait proved ineffective. Tests on controlling water rats were not possible under laboratory conditions because they could not survive in small cages. The field tests proved inconclusive because of lack of efficient procedures for evaluation.

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Nutritional deficiency symptoms of sugar cane. G. J. GASCHO and F. A. TAHA. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 157.—Symptoms of N, P, K, Ca, Mg, S, Cu, Mn, Zn, B and Fe deficiencies in cane were studied in the greenhouse and discussed in regard to distinguishing characteristics, development with time, probable effect on crop yield, field conditions conducive to deficiency, normal and critical leaf tissue and soil test levels, and varietal differences.

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A review of land grading in Louisiana. L. B. AGNEW. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 158–163. See *I.S.J.*, 1972, **74,** 112.

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Mechanical cane planting in Louisiana—1970. D. L. ROBERTS. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 172–176.—See *I.S.J.*, 1972, **74,** 80, 112.

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The German Claas green cane chopper-harvester. ANON. *Producers' Rev.*, 1973, **63,** (6), 21–25.—See *I.S.J.*, 1973, **75,** 62.

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New varieties are a most important function of Meringa. O. W. STURGESS. *Producers' Rev.*, 1973, **63,** (6), 27–29. Reference is made to the cane breeding work at Meringa Experiment Station in Queensland and particularly to Q 90, considered an outstanding cane with regard to vigour and yield but also tending to lodge in pre-harvest burns and having a fibre and trash content somewhat on the high side. Other varieties showing great promise are also mentioned,

particularly Q 100 and Q 101, both of which are resistant to leaf scald; Q 100 is also resistant to red rot while Q 101 is yellow spot-resistant. Irrigation, especially its economics, is also discussed.

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With cane disease, prevention is better than cure. O. W. STURGESS. *Producers' Rev.*, 1973, **63,** (6), 35–37.—Measures to prevent spread of leaf scald and Fiji disease, serious outbreaks of which have occurred in Queensland, are discussed and reference made to certain new Queensland cane varieties and to the need to extend the cane quarantine period at the Dept. of Primary Industries horticultural station at Bowen in order to allay fears of cane growers that early release would increase the risk of disease. Although the rapid spread of Fiji disease in the Bundaberg area was attributed to the distribution and planting of infected cane, increases in leaf-hopper populations also constituted a major danger.

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The most effective use of water. ANON. *Producers' Rev.*, 1973, **63,** (6), 39.—Ways in which maximum benefit may be obtained from available water supplies in cane fields are examined in relation to furrow, overhead and trickle irrigation. Measurement of soil water status and the recording of daily evaporation rates as a contribution to water budgeting are advocated.

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Additional cleaning system for harvesters. ANON. *Producers' Rev.*, 1973, **63,** (6), 48.—The system briefly described, which was developed by a Queensland cane farmer, Mr. PATULLO, comprises a number of cleaning members welded across the spirals of the pick-ups. They may be of any cross-section profile and rub off dirt from the cane before it proceeds to the chopper where normally adhesion of soil is increased by the presence of juice. The seal of the dirt around the cane is broken and further removal during normal cane cleaning by the harvester is thus facilitated. The system has been provisionally patented.

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The sugar industry in Sri Lanka. D. WICKRAMANAYAKE. *Sugar y Azúcar*, 1973, **68,** (7), 21–25.—Cane agriculture and sugar production in Sri Lanka are surveyed and some information given on future plans.

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The hand refractometer. R. B. MOLLER. *Cane Growers' Quarterly Bull.*, 1973, **37,** 4–7.—Guidance is given on the use of a hand refractometer to measure cane juice Brix as an aid to the farmer in deciding the best harvesting combination for his cane fields.

* * *

Pigs as a problem to sugar cane. R. E. KERKWYK. *Cane Growers' Quarterly Bull.*, 1973, **37,** 8–9.—Damage caused by wild pigs to cane in Queensland is described (3556 metric tons were destroyed on 88 farms in one district alone in 1972) and methods of control indicated.

Q 63 in the Mackay district. A. W. FORD. *Cane Growers' Quarterly Bull.*, 1973, **37,** 10–12.—The fate of Q 63, which is being replaced by Q 96, is discussed. Although a high sugar yielder, it suffers from a number of limitations and is susceptible to several diseases.

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Variations in the leaf scald organism. ANON. *Cane Growers' Quarterly Bull.*, 1973, **37,** 12.—Differences in leaf scald bacterial strains, ranging in potency from weak to strong, have been observed in screening trials in Queensland, so that inconsistencies arise between results of the trials and reaction of varieties in the field. The weak strains were found to exist in the north of the state, the strong ones in the south and a mixture of both in the central districts.

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The approved plant source scheme at Bundaberg. B. T. EGAN. *Cane Growers' Quarterly Bull.*, 1973, **37,** 13–16. The growing of disease-free cane in mother plots many miles removed from other cane in the area, and planting seed cane at eight isolated secondary increase plots totalling 240 ha, is the basis of a scheme to control Fiji disease. Volunteer labour is used to plant the cane in the secondary increase plots. Only plant cane and 1st ratoons will be used, after which the mother plot will be ploughed-out.

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Inoculum for legume seed. ANON. *Cane Growers' Quarterly Bull.*, 1973, **37,** 16.—Brief mention is made of the increased availability of cultures of root nodule bacteria which work in conjunction with legumes, grown as green manure crops in cane fields, to fix atmospheric nitrogen.

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Irrigation scheduling—what is it? G. KINGSTON. *Cane Growers' Quarterly Bull.*, 1973, **37,** 21–23. Examination of irrigation costs in the light of prevailing local conditions and scheduling to obtain efficient water usage are discussed, reference being made to soil texture, the aim of irrigation and the amount of water needed to achieve that aim.

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"Heptachlor" and "aqua ammonia". ANON. *Cane Growers' Quarterly Bull.*, 1973, **37,** 23.—Mixing of "Heptachlor" insecticide as an emulsion with "aqua ammonia" during normal fertilizer application is not recommended because of instability of the emulsion and its consequent uneven distribution as well as conversion to "Heptachlor" epoxide.

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Be wise—sterilize. E. A. PEMBROKE. *Cane Growers' Quarterly Bull.*, 1973, **37,** 27–30.—Advice is given on cleaning and sterilizing of cane harvester parts, particularly base cutters, to prevent spread of disease and weeds.

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The Isis land use scheme. C. D. JONES. *Cane Growers' Quarterly Bull.*, 1973, **37,** 31–33.—The scheme described was set up to solve the problem of soil erosion

and cane farming on steep slopes. Major items in the scheme are enticement of cane farmers away from steep slopes and use of such land for afforestation, and acquisition of land suitable for cane growing with use of irrigation water from a major scheme.

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A useful stool trimmer attachment for ratooning. J. A. CURRIE. *Cane Growers' Quarterly Bull.*, 1973, **37**, 34. The attachment, designed by P. MORELLINI, fits onto conventional ratooning discs and is driven by the tractor p.t.o. It consists of six blades, with fins attached, fitted to the base cutter; the blades trim any ragged stools left by the harvester while the fins throw all cut material and tops into the interrow. A high operating speed minimizes stool movement and the raking and burning of tops is obviated. By combining stubble shaving with 1st ratoon cultivation, the attachment (for which a provisional patent has been granted) results in a considerable saving of time and labour.

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Giant termite damage in sugar cane. I. T. FRESHWATER. *Cane Growers' Quarterly Bull.*, 1973, **37**, 35–36. Damage to cane caused by the giant termite, *Mastotermes darwiniensis*, is described. Since the termites enter the cane from below ground level and eventually eat out the entire interior from point of entry to the growing point, there is little external sign of damage until the top of the cane suddenly dies. When the nest can be located, control with Paris green, "Dieldrin" or "Heptachlor" is effective.

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Dominant variety's rôle in Fiji disease spread. O. W. STURGESS. *Australian Sugar J.*, 1973, **65**, 137–139. The fact that N:Co 310 is susceptible to Fiji disease but does not reveal symptoms sufficiently clearly or quickly is regarded as a major factor in the serious outbreak of the disease in the Bundaberg area of Queensland. The part played by leafhoppers in spread of the disease is also mentioned, and a description and illustration given of the two new hot houses under construction at Bundaberg Experiment Station for use in the Fiji disease control programme. Leafhoppers bred in a new insectary and infected with the disease will be released on cane undergoing screening trials. The exposed cane will be grown for about 5 months.

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Sugar cane variety recommendations for Louisiana for 1973. Some varietal characteristics of the more important commercial varieties. ANON. *Sugar Bull.*, 1973, **51**, (21), 6–8.—Among the varieties listed, the two major recommendations are L 62-96 and CP 61-37, while L 65-69, L 60-25, CP 48-103, CP 52-68 and N:Co 310 have advantages applicable to certain areas. The merits and demerits of the seven above-mentioned varieties are listed.

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Recommendations for the control of ratoon stunting disease in sugar cane in Louisiana, 1973. ANON. *Sugar Bull.*, 1973, **51**, (21), 12–13.—Guidance is given on heat treatment of cane for RSD control, and the order in which to treat the seven varieties mentioned in the preceding abstract according to their susceptibility is presented.

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Controlling Johnson grass seedlings and annual weeds in sugar cane planted in Louisiana in summer and fall, 1973. ANON. *Sugar Bull.*, 1973, **51**, (21), 14–15. Measures and herbicides recommended for control of Johnson grass in Louisiana cane fields are given.

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Research on sugar cane mechanization and harvesting by USDA at Belle Glade, Florida. ANON. *Sugar J.*, 1973, **36**, (2), 27.—Present research at Belle Glade and past lines of research conducted by staff of the US Dept. of Agriculture are briefly reported.

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Florida sugar cane mechanical harvesting field trials. B. HUNTER. *Sugar J.*, 1973, **36**, (2), 31–34.—The two-day mechanical harvesting trials in Florida (held in March 1973), involving seven different harvesters, including one- and two-row machines, are reported.

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Mechanical harvesting at Talisman Sugar Corporation. ANON. *Sugar J.*, 1973, **36**, (2), 36.—Results from the 1972–73 season at Talisman Sugar Corporation in Florida, which harvested all its cane mechanically using Toft crawler-mounted harvesters, showed that cutting, pick-up and chopping were very good, but the trash content has doubled and fibre and bagasse % in the mills has increased, as has the quantity of bagacillo needed and of mud in the clarifiers and filters, although sugar quality has not suffered. However, cutting and loading costs were reduced from $2.29 to $1.13 per ton of cane, and the transfer stations and cane carts have been eliminated.

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Current research at the U.S. Sugarcane Field Station, Canal Point, Florida. N. I. JAMES. *Sugar J.*, 1973, **36**, (2), 38–42.—The current research programme, which is outlined, covers cane crossing[1], pathology (the major diseases involved being eye spot, leaf scald, ratoon stunting disease and mosaic) and entomology, the most important pest in south Florida being the wireworm (*Melanotus communis*), although the borer (*Diatraea saccharalis*) and white grubs (*Bothynus subtropicus* and *Anomala marginata*) have been responsible for considerable losses in cane fields. Other minor insect pests which occasionally cause high losses and which are also the subject of research are mentioned. A number of special studies on various aspects of cane agriculture are also conducted at Canal Point.

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Sugar cane varieties. J. FRITZ. *Rpt. Inst. Recherche Agron. Trop. Réunion*, 1972, 17–20, 143.—Trials reported showed the marked superiority of R 526 over R 464, used as control, in terms of cane and sugar yield per ha particularly as ratoons (up to 4th ratoon).

[1] *See also* JAMES & MILLER: *I.S.J.*, 1974, **76**, 377.

Sugar beet agriculture

Effect of allyl isothiocyanate on the respiration rate of beet tissue. J. HAŠEK, A. PUJMANOVÁ and J. ZAHRADNÍČEK. *Listy Cukr.*, 1973, **89**, 195–198.—Laboratory tests with aqueous solutions of allyl isothiocyanate fungicide showed that it had an inhibiting effect on the respiration of beet tissue (measured with a Warburg manometric device) at higher concentrations, 100% inhibition being achieved with a 10^{-2}M concentration while 10^{-5}M had practically no effect.

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The technological value of sugar beet under conditions of high nitrogenous fertilization. J. TRZEBIŃSKI. *Gaz. Cukr.*, 1973, **81**, 277–279.—The effects of high N applications (160–200 kg.ha^{-1}) on beet processing quality are discussed in the light of results of experiments carried out by other authors.

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Vegetative characteristics of sugar beet in the growing areas of Adapazari sugar factory in 1972, and reasons for decrease in sugar content. R. GÜRAY. *Seker*, 1973, **23**, (88), 7–13.—After normal sowing and early growth, beets in the Adapazari region were subjected to heavy and prolonged rain which increased root and leaf weight but did not promote sucrose accumulation, so that the pol% beet was reduced. In addition, there was early damage by hail and heavy incidence of *Cercospora* which could not receive proper control treatment because of the rain. Although the last two months of the growing season were warm they were not sufficient to raise the sugar content above an average of 11·61% compared with 15·16% for the whole of Turkey.

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Salt accumulation in soils, its influence on agriculture and measures to be taken. H. TASCI. *Seker*, 1973, **23**, (88), 14–19.—The basic facts about saline soils are presented and an account given of the situation in Turkey where incorrect irrigation procedures have resulted in salt accumulation in certain beet areas.

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The influence of row spacing on yield and quality for various plants. Y. BILGIN and M. CAGATAY. *Seker*, 1973, **23**, (88), 20–37.—Experiments have been made at various locations in Turkey to determine the effects of row spacing and plant population on beet yield, sugar content and sugar yields. Optimum values varied with location but individual root weight and beet yield were generally reduced by high plant population, while the sugar content rose with smaller roots so that the optimum population was intermediate between those calculated for optimum beet yield and for maximum sugar content.

Pests, other than insects, causing damage to sugar beets in Turkey. G. ONAT. *Seker*, 1973, **23**, (88), 38–39. A list is given of the nematodes, spiders, diplopods, gastropods, birds and rats attacking beets in Turkey.

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Sugar beet fertilization. L. SCHMIDT, V. STEHLÍK and J. ZAHRADNÍČEK. *Listy Cukr.*, 1973, **89**, 217–226. While addition of "Synborit" C (containing 6·37% B, 6·37% Mn and 1·19% Zn) and of "Superstop C" (containing 18% P_2O_5 dissolved in 2% citric acid solution, 1% free P_2O_5, 0·03% Mn, 0·05% B, 0·015% Zn and 0·015% Cu) to beet increased beet and sugar yield per ha compared with untreated controls, addition of a mixture of ammonium nitrate (containing 30% N) and 2% borax at a rate equivalent to 1 kg B per ha was found preferable as regards increase in beet sugar content and ash content. Maximum beet yield was obtained at a root population of 80–95,000 per ha. Tests to determine the effect of irrigation and of applications of P_2O_5 and N in large doses, individually, as well as various mixtures of N, P_2O_5 and K_2O on white sugar yield are also reported.

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Precautions to be taken for protection of beets against frost. A. VIGOUREUX. *Le Betteravier*, 1973, **7**, (69), 7. The harmful effect of frost on beets is mentioned and circumstances when piles should be covered and left uncovered are described.

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Photosynthetic activities of isolated sugar beet chloroplasts. I. General principles and methods. M. BURBA and E. F. ELSTNER. *Zeitsch. Zuckerind.*, 1973, **98**, 609–615.—The fundamentals of photosynthesis in higher plants and the processes involved are explained and biochemical methods of examining photosynthetic electron transport described. The problems encountered in isolating active chloroplasts from green leaves and ferredoxin, a cofactor in the reduction of NADP, are discussed. Modifications to the method generally used for chloroplast isolation from the leaves of higher plants were found necessary in order to obtain photosynthetic activities usually observed in beet leaves. Measured values of photosynthetic activities with various cofactors are tabulated.

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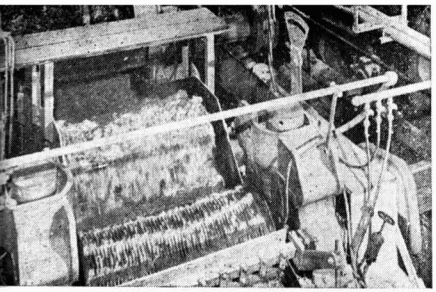
Sugar beet responds remarkably well to better agronomic practices. H. C. SHARMA, S. S. SAINI and M. K. MOOLANI. *Indian Sugar*, 1973, **23**, 455–457.—Cultivation trials indicate that sugar beet would be a profitable crop for northern India. For higher profits, irrigation should be applied at 50% available soil moisture, while application of 80 kg N per ha and planting at 40 × 20 cm spacing will give higher returns.



Cane sugar manufacture

Ingenio Tambaca. I. CARMICHAEL. *Sugar y Azúcar*, 1973, **68,** (8), 30–31.—Details are given of the equipment installed in the new cane sugar factory at Tambaca in Mexico. The factory will have an initial capacity of 4000 t.c.d. expandable to 6000 t.c.d. A. & W. Smith & Co. Ltd. are the general contractors responsible for design, engineering, know-how and site organization.

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Ingenio Xicoténcatl—Silver Anniversary. ANON. *Sugar y Azúcar*, 1973, **68,** (8), 37–38.—Stages in the development and expansion of this Mexican sugar factory are briefly described.

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Capacity (centri)fugalling—Racecourse 1972. C. S. HENDERSON and L. K. KIRBY. *Producers' Rev.*, 1973, **63,** (6), 18–20.—See *I.S.J.*, 1974, **76,** 147.

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The best practicable control of environmental discharges. D. C. COX. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 58–74.—The author defines "best practicable control" as "that means of treatment or control which is technologically feasible and which is best from the standpoint of the overall, long-term welfare of the public". Within this context he examines the problem of cane sugar factory effluent disposal in Hawaii, as exemplified by discharge along the Hilo-Hamakua coast, and examines the various pieces of legislation relevant to the problem.

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Typical noise problems and some practical solutions. R. A. DARBY. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 75–80.—The subject is discussed generally and in particular reference to noise emission from sugar factory equipment and cane transport. Particular mention is made of cane milling equipment, Roots blowers used for bagasse transfer and steam turbines.

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Emerging water quality criteria considerations. G. L. DUGAN. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 96–99.—The effect of sugar factory effluent on aquatic life is examined with regard to the question of nutritional compatibility with the receiving water and hence "quality of life" rather than merely with reference to the maintenance of life.

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Diffuser losses. R. D. MOUNTS. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 109–112.—A discrepancy between pol in prepared cane and the total of the true losses at Paia factory, where diffusion is used, was equivalent to an apparent loss of over 3% of the initial pol. Examination of sampling and analysis methods, checking of the weighers, and investigation of the various loss sources revealed errors in raw juice and prepared cane weighing; modifications to avoid inaccurate loss assessment are to be made.

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Rock removal pilot plant for dry-cleaning. B. A. MCELHOE and D. K. LEWIS. *Rpts.* 1972 *Meeting Hawaiian Sugar Tech.*, 163–169.—Although dry-cleaners have been shown in tests to give greater sugar recovery (by more than 5%) than wet-cleaners, it is pointed out that most factories in Hawaii cannot adopt dry-cleaning until a suitable rock removal method is available. Details are given of tests on a pilot plant in which cane placed in a gathering conveyor by a grab loader is combed out by a carding drum, falls onto a feed conveyor and passes in falling trajectory through a directed air stream and is blown over a splitter, into which the rocks fall; trash is blown up into a curved chamber where it settles onto a conveyor. Results showed that at an air velocity of 200 ft.sec^{-1} the amount of net cane lost with the rocks was minimum at about 2½%. (It is emphasized that this cane would be recoverable from the splitter.) Cane throughputs of 80–100 tons.hr^{-1} were achieved with conveyors 8 ft wide and rock removal was at an acceptable level.

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Effects of trash on recoveries. J. M. BINUEZA. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 55–74. Formulae are derived for determining the effect of trash in cane on sucrose extraction, mixed juice purity, syrup purity, available sucrose in syrup, and on losses. Calculated results are tabulated.

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Between the two knives. P. R. PERALTA. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 75–80.—A review of the literature is concerned with the falls in sugar extraction which result from excessive delays between harvesting and crushing of cane.

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Extent and control of microbial inversion of sucrose in diffusion-type mills. R. G. CAMURUNGAN and F. I. CONSOLACION. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 87–93.—Because of the high temperature of juice and imbibition water (70°C) employed in factories with diffusers, it has been thought unnecessary to use bactericides. Investiga-

tion at four such factories has shown considerable inversion taking place in the mills, however, and it is shown that the use of a bactericide is beneficial in reducing sugar losses.

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The electronic computer in a sugar central. H. OLIVEROS. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 94–105.—See *I.S.J.*, 1973, **75**, 53.

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Coagulation and removal of suspended solids in boiled water. D. CORSBIE. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 147–149.—An account is given of the use of "Fabfloc" for flocculation of suspended solids in boiler feed water to assist in its removal. Experience at three Jamaican sugar factories is quoted in this connexion.

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Mechanical cleaning of all tubes in a sugar mill. M. H. R. NEVILLE. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 150–153.—Methods of cleaning scale from evaporator and other tubes are discussed and more detailed information is given of the use of flexible shaft equipment for this purpose.

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The SCMCO automatic cane juice sampling system. C. JUSTINIANI *et al. Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 154–162.—A description is given of the automatic sampling unit developed at San Carlos Milling Co. and its operation.

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Bagacillo as filter aid in mud filtration. C. M. MADRAZO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 179–182.—Use of bagacillo increases the fibre content of the muds sent to vacuum filtration and helps to reduce sugar loss in filter cake.

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The boiling house of Sonedco. A. M. ALCALA. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 197–203. A description is given of the instrumentation and control facilities in the boiling house of Southern Negros Development Corp.

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The evaporator implosion. H. A. NAQVI. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 204–209. An account is given of the collapse of a 3rd effect evaporator body and the circumstances leading to it, and studies made are reported. The collapse was attributed to inadequate thickness of the plate used, corrosion within the vessel, and operation at too high a vacuum. Measures to avoid a repetition are indicated; these include regular testing of metal thickness, pressure testing of the vessel and use of supports and stiffening rings, and internal painting with anti-corrosion paints.

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Low purity final molasses from continuous centrifugals at First Farmers. V. A. CUSTODIO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 210–212.—See *I.S.J.*, 1973, **75**, 53.

Range values of some important manufacturing data affecting factory performance. J. C. FANDIALAN and E. P. OCAMPO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 212–218.—Manufacturing data from the Philippine sugar factories have been assembled and studied, and the range of values for juice quality, Java ratio, reduced extraction, imbibition % cane, etc. are discussed. Over recent years the non-sugars content of cane juice has been increasing and the yield of sugar on cane has fallen correspondingly. It is recommended that only clean cane should be delivered to the mills, that boiling house capacities should be enlarged to cope with the extra non-sugars, and that research on clarification should be carried out to permit handling of the high non-sugars juice.

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Improving filtrability of raw sugar at Kaohsiung sugar factory. I. H. CHEN. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 234–236.—See *I.S.J.*, 1973, **75**, 115.

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Studies on bulk sugar keeping quality at C.S.E. E. B. PUYAOAN. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 236–242.—Bulk sugar keeping quality was improved by ensuring that its pol was not lower than 97·8%. The internal temperature of the pile should not rise above 108°C and a recording thermometer with a sensing element deep in the pile was useful for monitoring this temperature in order to take remedial measures should the temperature rise too high.

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Phosphorus up-take in relation to clarification of sugar cane varieties grown in Binalbagan sandy loam soil. S. S. GARRUCHO and J. L. T. MANINANTAN. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 261–268. See *I.S.J.*, 1973, **75**, 86.

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Full continuous *C*-crystallizer station. A. ACOSTA. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 66–69. Information is given on the system at the Atlantic Sugar Association factory where six low-grade Blanchard batch crystallizers were connected by troughs to provide a continuous system, and massecuite is now dropped from the pan into the first two units instead of via a distribution trough as previously. At a grinding rate of 171–185 t.c.h. average final molasses apparent purity is 34·71 compared with 35·83 with the batch system. No difficulties in massecuite flow have been experienced despite a Brix of 96–97°. Cooling is used only in the last three crystallizers, and the temperature drop from pan to No. 6 crystallizer is from 145–135° to 100°F.

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Colour in the raw sugar cane industry. Causes and consequences. R. A. CATALA. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 73–75.—See *I.S.J.*, 1972, **74**, 342.

Problems in full seeding of low grade strikes. T. R. RAY. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 81–84. The JENKINS method of calculating the quantity of seed to be used for low-grade massecuite seeding[1] has been adapted to the US practice of using purities and Brix for such calculations and is explained. Graphs of *C*-sugar crystal size *vs.* weight of seed and showing the location of the safe seeding zone (apparent purity *vs.* supersaturation) are also reproduced.

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Farmer, help my extraction. A. L. WEBRE and G. ALEMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 85–94.—As a continuation of an earlier article[2], in which mill extraction was shown to rise and losses (expressed as pol % fibre in bagasse) to fall with reduction in Brix, the authors examine the possibility of applying the phenomenon in practice where irrigation water absorbed by the cane is considered more effective than water added in milling. The problem is examined from both the factory and the agricultural angle.

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Thoughts on sugar house waste streams. J. C. P. CHEN, F. J. BLANCHARD and R. W. PICOU. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 129.–See *I.S.J.*, 1972, **74,** 342.

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About massecuite systems. G. ALEMAN. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 130–135.—A comparison is made, mathematically, between the conventional 3-massecuite system and the 2½-massecuite system[3]; this demonstrates the superiority of the latter system over the former in quantitative and chemical terms.

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Experimental cush-cush screw press operation at Bryant. R. A. CATALA, E. DEL VALLE and A. M. BLANCHARD. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 141–144.—The performance of the French Oil Mill screw press used to dewater bagacillo at Bryant is discussed. Preliminary data from 1970/71 indicate a significant improvement in the ability of the mills to grind certain canes of high pith:fibre ratios, although no noticeable reduction in final bagasse sugar content was observed.

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Methods of dry-cleaning sugar cane in the handling process. J. E. CLAYTON and D. L. ROBERTS. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 164–169.—See *I.S.J.*, 1972, **74,** 82.

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Automatic crusher feeder. J. M. CAMPANERIA. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 177–178.—See *I.S.J.*, 1972, **74,** 82.

* * *

The French screw press on cush-cush. W. B. KIMBROUGH. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 179–182.—See *I.S.J.*, 1972, **74,** 82.

From the notes of a sugar technologist. IX. S. M. ANAND. *Sugar News* (India), 1973, **5,** (1), 18–20.—In a brief discussion on the merits and demerits of cane diffusers compared with cane mills, the author is of the opinion that diffusers fail to justify their installation on the grounds of costs (for these, a diffuser is compared with a 12-roller milling tandem), greater non-sugar extraction and failure to increase the capacities of existing mills where a diffusion-milling system is used. However, the author does admit that extraction by diffusers is greater than by a comparable mill, but emphasized that only part of the extra material is bagged. The need for greater research on the subject in India is underlined.

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Organization of research and development in the Indian sugar industry. D. P. KULKARNI. *Sugar News* (India), 1973, **5,** (1), 21–24.—The level of sugar technology and cane agriculture research in India and the major problems requiring investigation are briefly discussed, and organization and financing of such research is examined.

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Certain technological myths clarified. K. N. PAUL. *Sugar News* (India), 1973, **5,** (1), 29–31.—The author explains the difference between the saccharimeter and polarimeter and conversion of angular rotation to °S, discusses reasons for avoiding excessive vacuum in boiling (a value above the optimum of 25·5 in Hg established by WEBRE gives crystals with soft, rounded edges), and argues against the use of formalin to combat microbial action in clarifiers during shutdown, since he accepts the view of HONIG that a drop in juice pH is not necessarily the result of fermentation but more likely a consequence of calcium phosphate transformation to tricalcium phosphate or hydrolysis of hexose phosphates which are unstable at high temperatures.

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A note on sugar recovery in India. M. LAKSHMIKANTHAM. *Sugar News* (India), 1973, **5,** (1), 32–34.—Cane sugar recoveries in six of the more important Indian sugar-producing states are examined for a number of years up to 1971/72 and the poor results obtained attributed to low cane quality.

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Boiler stack emissions—Clewiston Sugar House. B. F. SANFORD. *Sugar J.*, 1973, **36,** (2), 23–24.—As part of a programme aimed at reducing boiler chimney emission to conform with legislation in Florida, a cyclonic wet scrubber and an impingement-type scrubber were installed in the chimneys of the two Riley Stoker boilers at Clewiston. The performances of the two scrubbers and difficulties associated with their operation are discussed.

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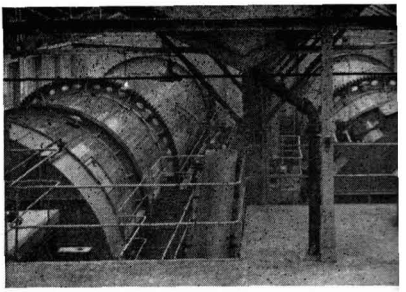
[1] "Introduction to cane sugar technology" (Elsevier, Amsterdam) 1966, pp. 274–275.
[2] WEBRE: *I.S.J.*, 1969, **71,** 307.
[3] MEYER: *ibid.*, 1966, **68,** 55.

Beet sugar manufacture



Application of experiment planning to investigation of complex intensification of heat transfer during boiling of sugar solutions. I. M. FEDOTKIN, M. N. NUD'GA and V. T. DEREVYANCHENKO. *Izv. Vuzov, Pishch. Tekh.*, 1973, (3), 130–133.—A regression equation is developed which adequately describes the heat transfer and vapour generation processes in vertical tubes of a heat exchanger and which is shown, by substitution of empirical values, to be of use in comparing the effects of various thermodynamic factors.

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Some aspects of the 1972 campaign (in West Germany). E. REINEFELD. *Zucker*, 1973, **26,** 459–468.—Among the various aspects discussed are: difficulties in diffusion caused by the high number of bolted beet in the northern part of the country and in the Rhineland, leading to higher losses and increased molasses sugar; a juice heater having a spiral element; juice purification (which was not subject to any problems); the use of "Condur" light alloy steel tubes in evaporators, which, although less expensive than conventional steel tubes, exhibited no corrosion (with one exception of slight cavitation) in comparison with the normal tubes which in many cases were so badly corroded that replacement was necessary; sugar house work, particularly the use of various automatic boiling schemes; waste water treatment, with mention of the aerobic scheme used at Tirlemont refinery in Belgium, where the effluent (refinery plus Steffen waste) is exposed to an air stream during 4 hours' retention in a fermenter; and the permitted levels of certain elements in beet pulp used as animal fodder, with some guidance on analysis, particularly for aflatoxin.

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Beet cossette shape for continuous trough-type diffusers. H. DABROWSKI. *Gaz. Cukr.*, 1973, **81,** 197–200.—The effect of cossette shape on diffuser performance and the criterion of a suitable shape are discussed. Slicing resistance and means of determining this are examined and different shapes are compared, from which it is found that cossettes of "sinusoidal" shape have the best mechanical properties, followed by flat cossettes and finally by V-shaped cossettes.

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Evaluation of beets after prolonged storage in piles. J. ORLOWSKA. *Gaz. Cukr.*, 1973, **81,** 211–216. Results of storage in 154 piles throughout Poland are examined and a number of recommendations made. Major criticisms included excessive time taken to establish the piles, inadequate pile height and lack of forced ventilation in some cases.

Acid cleaning of the heating surfaces of evaporators. S. LAWNICKI and E. ZABIEREK. *Gaz. Cukr.*, 1973, **81,** 229–230.—The addition of "Tardiol D" (dibenzyl sulphoxide) as corrosion inhibitor when evaporator tubes are cleaned with HCl is proposed, maximum effect being achieved with 0·5% "Tardiol D" by volume added with HCl of 10% concentration. Inhibition efficiency falls with temperature rise (a range of 50–90°C was tested); at 50°C the HCl-steel reaction rate was reduced by 74%.

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Power house problems at Szczecin sugar factory during the 1972/73 campaign. J. SOLTYSIAK and J. WOLAŃSKI. *Gaz. Cukr.*, 1973, **81,** 233–238.—The situation at this Polish sugar factory, where breakdown in power supply from the 2500 kVA generator necessitated installing an additional transformer to permit use of grid electricity while the generator was being repaired, is reported. Despite the difficulties, the sugar factory was able to maintain the level of beet slicing planned for the campaign.

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Experience with shut-off valves. H. LANGNER. *Zucker*, 1973, **26,** 521–523.—Advantages of the shut-off valve over the slide valve are discussed with reference to experience at Gross Munzel sugar factory where shut-off valves have been installed on a number of feedlines.

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Explosion preventive measures at dust extraction units. G. SCHNEIDER. *Zucker*, 1973, **26,** 524–532.—Tests at a disused sugar factory and in a test mine drift are reported in detail and minimum requirements in the construction of dust extraction plants in order to provide adequate blast resistance are presented.

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Application of the mean data technique in the sugar industry. A. WICHMANN. *Zucker*, 1973, **62,** 541–547. The application of the mean data technique as a centralized accounting system is described with reference to its use at Brühl sugar factory. The system is particularly suitable for smaller firms which otherwise would have to hire the services of a data processing centre. The author advocates training staff selected from within the company.

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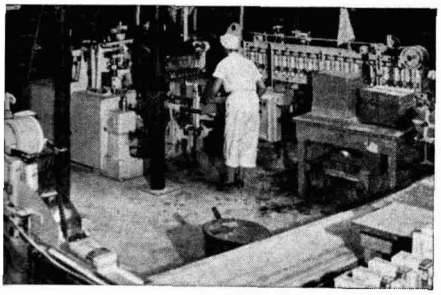
The manufacture of sugar loaves. N. MARIGNETTI. *Ind. Sacc. Ital.*, 1973, **66,** 79–83.—The history of loaf sugar production is surveyed and an account given of two modern techniques. The traditional process and the more modern process using granulated sugar are described.



Sugar refining

Change in physical and chemical properties of decolorizing anion exchange resins during prolonged use under refinery conditions. G. A. CHIKIN, V. P. MELESHKO and S. Z. IVANOV. *Paper presented at 2nd Int. Conf. Chem. Tech. Sugar*, 1973.—Decolorization of refinery syrups by anion exchange resin at higher temperatures and viscosities affects the mechanical and chemical stability of the resin, reducing exchange capacity, decolorizing efficiency and destroying resin granules, and thus having greatest effect on the economics of the process. The deterioration is attributed to the effect of the higher temperatures and sucrose on the resin and to a specific interaction between the resin and colorants in the syrup.

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Experiences in the operation of decolorizing ion exchanger units in Soviet refineries. V. P. MELESHKO, S. Z. IVANOV and G. A. CHIKIN. *Paper presented at 2nd Int. Conf. Chem. Tech. Sugar*, 1973.—Advantages of decolorization with AV-16GS anion exchange resins in Soviet refineries are discussed on the basis of many years' experience.

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Establishment of theoretical and experimental bases for continuous decolorization. II. Verification of fundamental relationships in an experimental unit. M. FRIML, R. ŠTENGL and B. TICHÁ. *Listy Cukr.*, 1973, **89**, 125–130.—Laboratory and semi-factory scale tests in which remelt liquor was fed through a vertical column of bone char are reported in which it was found that the degree of colour adsorption was governed by initial colour content, rate of throughput and condition of char (whether fresh or regenerated). At a feed temperature of 80–84°C and a discharge temperature generally in the range 63–70°C, there was a smaller drop in colour content (in liquid phase) with prolonged retention than with shorter retention, the reduction being 10% with fresh char and 8·5% with regenerated char.

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Caking of powdered sugar. A. KORBONITS and K. VUKOV. *Cukoripar*, 1973, **26**, 129–136.—The caking of icing sugar and factors contributing to it, including moisture content of the sugar and surrounding air, temperature, grain size, pressure, sugar purity, etc., are discussed on the basis of data from the literature. Tests indicated that under identical moisture conditions caking tended to increase with greater grain size distribution, with increase in colour and ash content and with reduction in the mean grain size. A classification system for icing sugar based on these factors is proposed.

Stainless steel tubing—solving the problem of corrosion in sugar refineries. R. FULTON. *Rpts. 1972 Meeting Hawaiian Sugar Tech.*, 113–116.—Advantages of austenitic stainless steel tubing in refinery evaporators and heaters are discussed.

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Production of high quality refined sugar. A. ALVAREZ. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 70–72. The boiling system used at the Atlantic Sugar Association factory consists in boiling *A*-massecuite on *B*-sugar grain, *B*-massecuite from *C*-sugar and *A*-molasses, and *C*-massecuite from *A*-molasses (with *B*-molasses used for purity adjustment). Advantages of the system are listed.

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Production and processing of liquid sugar. S. A. BRENMAN, N. S. IVOL'GA, R. M. YASHCHUK, E. F. PRISHCHEPOV and YA. G. KHANTSIN. *Sakhar. Prom.*, 1973, (9), 23–26.—Details are given of tests on liquid sugar production (with decolorization by resin) and storage, during 4 months of which at 5–20°C no quality change occurred. The scheme used at Berdichev refinery for liquid sugar manufacture is briefly described and the transporting of the product to the plant for non-alcoholic beverages explained. Brief mention is made of the quality of the beverages produced.

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Method of calculating (the parameters of) a device for measuring refined sugar moisture in a drying plant. V. A. DEMCHENKO. *Sakhar. Prom.*, 1973, (9), 40–44. A system of equations for calculating the electrical resistances and other parameters of a device for measuring refined sugar moisture[1] is set out and the performance characteristics of the device as determined by statistical evaluation are indicated.

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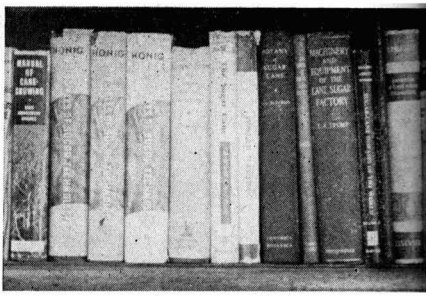
Use of starch as an agent for protection of icing sugar against lump formation. K. ČÍŽ. *Ind. Alim. Agric.*, 1973, **90**, 969–972.—Adsorption isotherms have been measured for samples of icing sugar containing starch added in various proportions; the rates of moisture adsorption were also measured. Icing sugar was prepared on this basis and stored for six months under various climatic conditions and it was established that the optimum addition was 2% of corn starch or 0·2–0·5% of "Amylin"; even under bad climatic conditions, the sugar remained in powder form for three months. Microbiological studies showed that micro-organisms did not develop on the sugar during storage.

[1] KON *et al: I.S.J.*, 1973, **75**, 59.

New books



The sugar cane. 2nd Edn. A. C. BARNES. 572 pp; 15·0 × 22·6 cm. (Leonard Hill Books, Kingswood House, Heath & Reach, Leighton Buzzard, Beds., England.) 1974. Price: £10.50.

The first edition of this book was published ten years ago[1] and the author notes in his foreword that selling-out of the original book has required a new edition to meet a continuing demand. The same arrangement is followed as before, chapters retaining their original names in almost all cases, while the material included has been expanded and brought up to date to take into account developments which have become more important in the interim, such as the use of spray irrigation, field mechanization, advances in cane sampling and testing, increased used of milling-diffusion for sugar extraction and the great extension of handling, storage and transportation of sugar in bulk. Place names which have changed, especially in Africa, have been amended, while units have been converted to the metric system.

The index has been revised and production data brought up to date as far as possible at the time of going to press. Most of the illustrations are the same as those of the first edition and in some cases appear to have been produced from proofs of the blocks rather than the original photographs. Also, some of the equipment illustrated is outdated, an unnecessary fault, since photographs of the current machines would be readily available from the manufacturers. The section on the 1968 International Sugar Agreement has been overtaken by the failure of the 1973 negotiations for continuation of its control of marketing. But aside from these criticisms, we find the new edition equally pleasant to read and a valuable survey of the sugar cane growing and processing industry.

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West Indian sugar cane varieties. Ed. D. MACCOLL. 39 pp; 21·0 × 30·0 cm. (West Indies Central Sugar Cane Breeding Station, Groves, St. George, Barbados, West Indies.) 1971. Price: $EC 10.00; £2.25.

In 1954 G. C. STEVENSON wrote a bulletin which described the nine varieties then the most important in Barbados[2]; these included B 3337, B 3439, B 34104, B 37161, B 37172, B 4098, B 41211, B 41227 and B 4362. In the intervening period new varieties have been introduced and this new work is a description of such canes which have contributed at least 5% of the total cane area of one or more sugar-producing countries of the Caribbean, although some of those described are already being superseded.

Patterns of variety change in some of these countries are discussed and illustrated with graphs, while a section of the book gives notes on botanical descriptions of the canes, with explanatory illustrations. Notes on the descriptions of field characteristics are provided, and the bulk of the book is then concerned with individual varieties, providing colour photographs and details of parentage, botanical descriptions of stalks, buds, leaves, arrows, hair groups, and chromosome numbers, as well as field characteristics in respect of germination, tillering, growth pattern, habit, trashing, handling, flowering, ratooning, quality, adaptability, disease and pest reactions and breeding value. The varieties concerned are B 42231, B 43337, B 45151, B 46364, B 4744, B 47258, B 47419, B 49119, B 51116, B 51129, B 52107, B 54142, B 57150 and D 141/46, the last being a variety bred at the Sugar Experiment Station in Guyana and the remainder in Barbados.

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IAA relatório 73. ANON. 30 pp; 20·8 × 27·4 cm. (Instituto do Açúcar e do Alcool, Praça 15 de Novembro 42 4° andar, 20000 Rio de Janeiro, Guanabara, Brazil.) 1974.

This beautifully printed booklet is the report for 1973 of the organization which directs the sugar industry of Brazil, the IAA. Plentifully illustrated with colour photographs, it provides information on the production of sugar during the current crop year, including comparisons with previous seasons, as well as the production of alcohol, domestic sugar consumption in Brazil, sugar exports, and application of amounts from the Special Export Fund derived under Law No. 1266 and covering restructuring and rationalization of sugar factories and their re-equipment, as well as acquisition of machinery and implements for improvement of cane cultivation, the research programme "Planalsucar", land reclamation, price equalization subsidies, and sugar terminals. The report then describes the social assistance programme and finally provides a summary in English.

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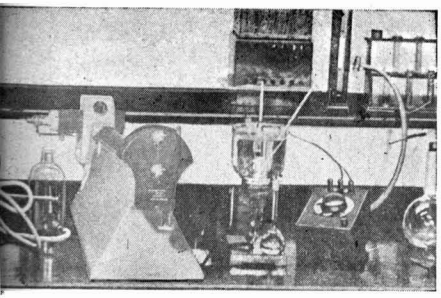
EEC beet crop.—The EEC Statistical Office in Luxembourg has stated[3] that the EEC beet crop forecasts for 1973/74 are revised upwards to 68·5 million metric tons compared with a previous estimate of 67·6 million metric tons and with a total for the 1972/73 campaign of 65·5 million tons. Raw sugar production for 1973/74 is put at 10·2 million metric tons compared with 9·6 million metric tons in 1972/73.

[1] *I.S.J.*, 1965, **67**, 153.
[2] *ibid.*, 1955, **57**, 34.
[3] *The Times*, 10th May 1974.



Laboratory methods & Chemical reports

Cane pol *vs.* cane sucrose. J. C. P. CHEN, C. O. WALTERS and F. J. BLANCHARD. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 76–80.—See *I.S.J.*, 1972, **74**, 346.

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Automatic juice sampling. A. ALFONSO. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 136–137.—The system used at the Atlantic Sugar Association factory in Florida since 1968 is described.

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Trash determination and sampling procedures for mill cane. B. L. LEGENDRE. *Proc. Amer. Soc. Sugar Cane Tech.*, 1971, 170–171.—The subject is discussed in general terms under Louisiana conditions.

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Basic purity concepts—how good is your factory? J. B. SANTOS. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 163–179.—For comparison of factory performances it is possible to use the concept of "basic purity" (*Jb*) which should be as low as possible; this is calculated from the formula

$$Jb = J + \left(\frac{Pol}{10} - \frac{PS}{TC}\right) \div 0{\cdot}02$$

where *J* and *Pol* are the apparent purity and pol of crusher juice, respectively, and *PS*/*TC* is the rendement, expressed in piculs of sugar per ton of cane (1 picul = 140 lb).

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A study of the mineral constituents of cane mixed juice and raw sugar in relation to the amount of molasses produced. J. C. FANDIALAN and N. P. AGUILA. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 186–193. Analyses were made daily of mixed juice, raw sugar and molasses to study the range and variation of K, Na, Ca, Mg, Al, P and SiO_2 contents in order to discover the reason for the high inorganic non-sugars present in juice at Central Don Pedro. It was found that the major component was K, and it was discovered by soil analysis that the area providing the cane for the factory had a high K content.

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Some aspects of the browning reaction of raw cane sugar in storage. C. M. MADRAZO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 227–229.—Colour formation in storage should be minimized by reducing the molasses coating on the crystals by application of wash water in the centrifugals and use of viscosity-reducing substances in the pans, avoidance of stratification of raws of differing qualities in the store, and avoidance of excessive temperatures during evaporation.

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Statistical evaluation of polarization results as analysed by three sugar laboratories. E. C. QUE and A. P. GUERRERO. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 229–233.—*I.S.J.*, 1973, **75**, 222.

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The incidence of thermophilic spoilage bacteria in Philippine refined sugar. R. R. DABALUS and M. C. BOURNE. *Proc. 19th Ann. Conv. Philippines Sugar Tech.*, 1971, 243–250.—Methods used and the observations recorded of micro-organisms present in 55 samples of refined sugar are presented.

* * *

Physico-chemical fundamentals of sugar technology. Sucrose decomposition. S. E. KHARIN. *Izv. Vuzov, Pishch. Tekh.*, 1973, (3), 25–31.—From a study of sucrose decomposition, mathematical expressions are derived for calculation of the pH at which the rate constant is minimum, both in acid and alkaline medium. The increasing effects of temperature and of KCl and NaCl on sucrose decomposition were also established. The pH values corresponding to minimum decomposition of other sugars (arabinose, maltose and glucose) are also tabulated. From the findings it is concluded that strict control of pH is a requisite for minimizing losses in factory processing.

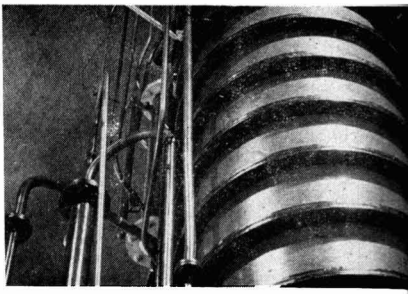
* * *

The activity of peptides in colorant formation during sugar manufacture and its inhibition. L. D. BOBROVNIK, G. P. VOLOSHANENKO, A. R. SAPRONOV and S. S. MIROSHNICHENKO. *Izv. Vuzov, Pishch. Tekh.*, 1973, (3), 32–34.—The effects of peptides on melanoidin formation in invert sugar solutions heated for varying periods were investigated. While some peptides helped to increase colorant formation, the most active being glycyl-DL-leucine, others had an inhibiting effect on colorant formation, the most noticeable of these being glycyl-β-alanine. The presence of sodium sulphite reduced colorant formation appreciably, both with and without peptides.

* * *

Levulose and invert sugars. R. D. MOROZ, J. P. SULLIVAN, J. P. TROY and C. B. BROEG. *Sugar y Azúcar*, 1973, **68**, (8), 46–52.—A review is given of the literature (with 54 references) on the subject of invert sugar and levulose physical and chemical properties, manufacture and applications in the food industry.

By-products



Cattle feeding and dried pulp. M. VANBELLE. *Sucr. Belge*, 1973, **92**, 223–241.—The composition of dried beet pulp, molassed pulp, beet and cane molasses, barley and maize as determined in West Germany, Holland and the USA are tabulated as well as their energy values, while detailed chemical and amino-acid analyses of beet pulp are also reproduced. The author then discusses the advantages of feeding beet pulp (with or without molasses addition) to milch and beef cattle in comparison with other forms of fodder on the basis of experiments conducted in different countries, including the UK, Holland and the Lebanon. Thirty-six references are given to the literature.

* * *

Utilization of bagasse. ANON. *Taiwan Sugar*, 1973, **20**, 46–47.—A brief survey is presented of the bagasse utilization programme of the Taiwan Sugar Corporation, including bagasse board manufacture at Changhwa and Kaohsiung and pulp production at Pingtung. Also mentioned are trials on the growing and utilization of kenaf, sunn hemp and roselle for pulp production. Large-scale tests were to be conducted at pulp and paper factories.

* * *

Studies on improving the quantity and quality of bagasse particle board. C. C. TU. *Taiwan Sugar*, 1973, **20**, 48–55.—After a description of the individual stages in the board manufacturing process at Kaohsiung, some information is given on problems that have arisen and the means used to overcome them. These include installation of two sets of cutting mills to help the bale breakers to handle the bagasse fibre, found to be too coarse for the bale breakers alone, the capacity of which was also increased. Trimming of the board 10 days after curing was replaced by trimming immediately after separation of the caul plates once the board had left the heating press. A major cause of limited capacity, which was below the rated output of 2,315 kg of board per hr (a throughput of 2,600 $kg.hr^{-1}$ of bagasse at below 20% moisture content was recently considered possible), was found to be considerable fluctuation in bagasse moisture, which may be avoided by installing pre-dryers and other measures such as improving the composition of the glue used for the board and by shortening of the pressing cycle. However, "spring-back" will take place at too short a pressing cycle and excessive mat moisture content, but drying the bagasse to 3% moisture and reducing the degree of dilution of the glue improved board quality. Spraying raw bagasse with propionic acid to prevent fermentation helps raise board quality and reduce production costs and bagasse losses. Tests were to be conducted in Taiwan with imported propionic acid.

* * *

Studies on wet acid storage of bagasse in bulk form. W. C. HSIEH, Y. T. LIU, M. S. CHEN and S. I. WANG. *Taiwan Sugar*, 1973, **20**, 56–60.—As an alternative to storage of bagasse in bales, bulk storage of 8,000 kg of bagasse for more than 300 days was tested. By 300 days the height of the pile had fallen from about 270 cm to 225 cm through use of a solution of molasses plus bacterial culture sprayed onto the bagasse to maintain the pH below 5. Normally, the molasses was only added, after initial treatment of the bagasse, whenever the pH needed reducing; otherwise, the solution sprayed onto the pile was the liquor draining from the pile which contained acetic and lactic acids. The bagasse moisture content was thus also maintained at 75–80%. Analyses indicated that the pentosan and lignin contents in the treated bagasse were lower and the cellulose content 2·5–3·0% higher than in the original bagasse. Pulping tests showed that the physical properties of the pulp were as good as those of pulp from conventional stored bagasse.

* * *

Utilization of pith as fuel in bagasse pulp mills. W. W. Y. CHOU. *Taiwan Sugar*, 1973, **20**, 64–67.—The use of bagasse pith as fuel is discussed and methods of depithing examined. The question of the calorific value of pith (lower than that of bagasse because of a higher ash content) is considered and requirements in the design of pith furnaces discussed. A pith-fired furnace with a boiler of 60,000 lb/hr steam capacity at the Hsinying factory of Taiwan Pulp & Paper Corp. can burn dry pith alone or a pith-coal mixture. Burning the mixture plus fuel oil has given 82% efficiency in tests.

* * *

Chlorine dioxide bleaching of bagasse pulp. S. T. S. KING. *Taiwan Sugar*, 1973, **20**, 68–70.—Details are given of the chlorine dioxide system of bagasse pulp bleaching used at Hsinying factory which has replaced a hypochlorite bleaching system. Comparison of the two schemes shows the advantages of the new method in terms of brightness and colour quality as well as tearing strength, opacity and porosity.

* * *

Aspects of furfural manufacture. J. P. GUPTA. *Indian Sugar*, 1973, **22**, 915–924.—The physical properties, application and production (batch and continuous) of furfural from various raw materials including bagasse are described in relation to Indian conditions.

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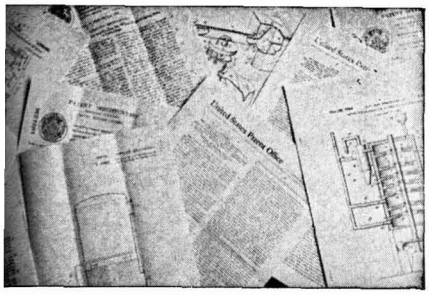


Patents

UNITED STATES

Cane planter. C. V. ALLAIN, of Franklin, La., USA. **3,754,682.** 21st April 1972; 28th August 1973.

* * *

Drying crystallized sugar. G. F. DUCHATEAU and P. J. DEWULF, *assrs.* RAFFINERIE TIRLEMONTOISE, of Brussels, Belgium. **3,756,855.** 28th May 1971; 4th September 1973.—Crystallized sugar is dried in a heated environment having a relative humidity less than but close to (between 85% and 100% of) the equilibrium relative humidity of the sugar at the temperature of the environment (75–85°C). When the sugar has been moulded and compressed before drying, these operations are carried out at the same temperature and relative humidity as the drying environment.

* * *

Bagasse reinforced vinyl roofing composition. R. BOTZ, of Mercedita, Puerto Rico, *assr.* PLASTI-FIBER FORMULATIONS INC. **3,761,431.** 16th April 1971; 25th September 1973.—The composition is an aqueous dispersion comprising 55–65% of a vinyl polymer of 100,000–500,000 M.W., formed from vinyl acetate with up to 30% lower alkyl (ethyl, ethyl plus butyl) acrylic ester, plus 5–15% of a bagasse filler containing 0·1–0·4% on filler of alum, plus 15–35% of a pigment (plus 0·5–1·5% of free alum).

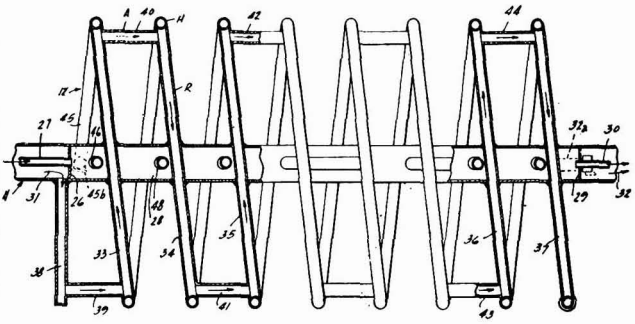
* * *

Drying bagasse. M. J. C. BARRE, of Faches-Thumesnil, France, *assr.* SOC. SUCRIÈRE DE L'ATLANTIQUE (ENGINEERING). **3,762,314.** 2nd December 1970; 2nd October 1973.—See UK Patent 1,319,365[1].

* * *

Crystallizer. C. ORMSTEIN, F. L. CARSON and F. W. SCHENCK, *assrs.* CPC INTERNATIONAL INC., of Chicago, Ill., USA. **3,762,947.** 12th October 1971; 2nd October 1973.

The internal rotating parts of the crystallizer include a hollow shaft 11 which supports a helical coil H by means of radial tubes *R* which are joined by axial connexion tubes *A*. The tubes *R* are sealed from the helical coil H and from the inside of shaft 11, the latter being provided with partitions 26 and 29, to form a closed chamber in which a first heat transfer liquid circuit is formed with delivery through pipe 27 and discharge through pipe 30.



A second circuit permits heat transfer liquid 31 to pass into the radial tube 38 from the end of shaft 11, through axial pipe 39 and into radial tube 33. It passes thence through axial pipe 40 into radial pipe 34 and so continues in a zig-zag path, eventually entering radial pipe 37 from axial pipe 44. The end of pipe 37 delivers into the helical coil *H* through which the liquid returns to the other end 45 of the coil system. This is blanked off and the liquid is delivered into the first radial pipe 46 of a second radial/axial pipe system at right-angles to the first. The flow through this system takes it again in a zig-zag path which ends with a radial pipe 32a delivering into hollow shaft 11 on the outer side of baffle 30. The two circuits, being independent, can either be provided with cooling liquid or heating liquid for masse-cuite reheating; in the event of build-up of crystallized sugar on the shaft or on the pipes, hot liquid can be supplied to the appropriate circuit to melt the adhered sugar partially and so free it, while cooling liquid continues to flow through the other circuit.

* * *

Regeneration of spent resins. D. E. MORTON and R. S. LEISER, of Decatur, Ill., USA, *assrs.* A. E. STALEY MFG. CO. **3,762,948.** 2nd July 1971; 2nd October 1973.—Spent (weak base) anion exchange resin from sugar solution treatment is treated with a concentrated (mineral) acid solution (at least 4N) (5-10N) at a temperature of at least 170°F (>180°F) (190–210°F) for a time sufficient to remove occluded organic impurities and restore anion exchange capacity to at least 50% of the original value.

[1] *I.S.J.*, 1974, **76**, 125.

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Production of mannitol. A. J. DE BERARDINIS, of Wilmington, Del., USA, *assr.* I.C.I. AMERICA INC. **3,763,246.** 9th March 1970; 2nd October 1973.—A 25–75% (40–60%) solution of partly (85–98%) inverted sucrose is slurried with 0·006–0·020 pounds of nickel hydrogenation catalyst per pound of invert sugar, and hydrogenated at >1500 (1600–2400) p.s.i.a. and at a temperature of at least 100°C (140–170°C) in two stages, the first at a feed pH of 8–12 and the second at a pH of <6. The first stage is continued until substantially all (>96% of) the levulose is hydrogenated (10–60% of the residence time) and the second until all the sugar present is hydrogenated. The first stage pH is achieved by adding an alkali or alkaline earth hydroxide, and the second by adding a mineral acid (H_2SO_4, H_3PO_4) or acetic, gluconic, propionic or citric acid.

* * *

UNITED KINGDOM

Beet weed herbicide. BAYER A.G., of Leverkusen, Germany. **1,324,320.** 30th June 1972; 25th July 1973.—The herbicidal composition includes (a) imidazolin-2-one-1-carboxylic acid *iso*-butylamide and (b) 3-cyclohexyl-5,6-trimethylene-6-hydroxy-5,6-dihydrouracil in a ratio of 1·5–9 (3–5, approx. 5) parts of (a) per part of (b). The herbicide may be used as a composition containing 0·1–95% of active ingredients and may be applied at the rate of 0·5–10 kg active ingredients per hectare.

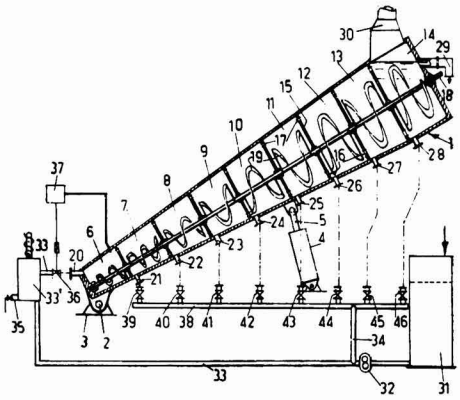
* * *

Digesting system for bagasse. BELOIT CORPORATION, of Beloit, Wis., USA. **1,324,395.** 7th August 1970; 25th July 1973.—(Partially depithed) Bagasse is wetted (with black liquor) to form an aqueous slurry [of 10–25% (15–20%) solids content] and wet-depithed by a (toothed disc) shredder to detach the pith from the fibre. The mixture is further diluted [to 1–5% (2–4%) solids], screened to separate the pith and the fibre slurry partly dewatered [to 25–40% (30–35%) solids]. It is then treated with an aqueous alkali and/or alkaline earth metal hydroxide solution (aqueous NaOH) and chemically digested at high temperature and under pressure by the soda, neutral sulphite or kraft processes, or by a modification of the soda process in which a small amount of elemental sulphur is present.

* * *

Continuous vacuum pan. SUIKER UNIE HOLDING N.V., of Rotterdam, Holland, and STORK-WERKSPOOR SUGAR N.V., of Hengelo, Holland. (A) **1,325,333.** 29th June 1970; 1st August 1973. (B) **1,326,215.** 29th June 1970; 8th August 1973.

(A) The conical vessel 1 is adjustably mounted at an angle to the horizontal by means of hinge 2 on frame 3 and the hydraulic piston 4, which is linked to the vessel by rod 5. The vessel is divided into chambers 6–14 separated by partitions 15 which include apertures 16,17 and also apertures for the driven shaft 18 which, by means of the attached helical strips 19, agitates the contents of the chambers. Each chamber has a supply connexion 20–28 while chamber 14 has a liquid discharge 29 and a vapour discharge 30 connected to a vacuum pump.



Seeding crystals admitted through pipe 35 are mixed in vessel 33′ with saturated liquor delivered from vessel 31 by pump 32 along pipe 33, and the mixture is fed into the supply connexion 20 of chamber 6. A valve 36 is governed by a controller 37 sensitive to the pressure in chamber 6. Liquor is also sent by pump 32 through pipe 34 and valves 39–46 to the supply connexions of chambers 7–14, the valves also being regulated in relation to valve 36 to maintain even distribution. The pressure within chamber 6 is lower than in the mixing chamber 33′ so that auto-evaporation occurs; crystal growth occurs, too, however, so that the increase in supersaturation is cancelled out, the same effect occurring as the mixture passed up through the chambers. For all the chambers the drop in pressure is identical and the concentration and cooling which occurs maintains a constant rate of crystal growth, which may be kept at a predetermined value by adjusting the duration of the process.

(B) Variations of the above general design include use of telescopic parts provided with seals for adjustment of vessel length, means of adjusting the angle of the unit, for variation in flow rate, stirring and conveying means.

* * *

Beet weed herbicide. BAYER A.G., of Leverkusen, Germany. **1,326,330.** 12th June 1972; 8th August 1973.—The herbicidal composition includes (a) imidazolin-2-one-1-carboxylic acid *iso*-butylamide and (b) 1-methyl-3-(2-benzothiazolyl) urea or (c) 3-cyclohexyl-5-trimethylene uracil, in a ratio of 0·25–4 (0·5–2) parts by weight of (a) per part of (b) or 1·5–9 (3–5) parts by weight of (a) per part of (c). The herbicide is used as a composition containing 0·1–95% of active ingredients by weight and applied at the rate of 1–6 kg active ingredients per hectare.

* * *

Method of increasing recoverable sugar from sugar beets. VELSICOL CHEMICAL CORP., of Chicago, Ill., USA. **1,329,201.** 15th January 1971; 5th September 1973.—See US Patent 3,619,169[1].

[1] *I.S.J.*, 1973, **75**, 125.

Cuban sugar statistics[1]

	1973	1972	1971
	—— (*Metric tons, raw value*) ——		
Stocks 1st January	339,201	261,845	438,765
Production	5,382,548	4,687,802	5,950,029
	5,721,749	4,949,647	6,388,794
Exports	4,797,377	4,139,556	†5,510,860
	924,372	810,091	877,934
Consumption	463,742	470,890	*616,089
Stocks 31st December..	460,630	339,201	261,845
Exports			
Albania	13,855	15,108	23,278
Algeria	5,974	25,417	24,619
Belgium/Luxembourg ..	—	1,086	1,092
Bulgaria	212,634	154,257	210,655
Chile	46,681	31,125	73,367
Canada	129,609	172,129	191,424
China	302,030	295,176	463,947
Czechoslovakia	163,018	151,132	189,638
Egypt	5,172	21,342	42,590
Finland	26,399	16,005	11,936
France	—	—	7,721
Germany, East.....	259,488	243,028	338,096
Germany, West	—	525	2,622
Holland	11	551	787
Honduras	11,157	—	—
Hong Kong	—	7,965	10,292
Hungary	52,422	38,069	59,396
Iran	—	51,845	25,458
Iraq	—	55,528	52,117
Japan	984,558	909,381	†912,234
Kenya	37,739	27,278	46,095
Korea, North	135,576	119,233	196,704
Lebanon	9,322	—	44,878
Malaysia	29,223	87,691	140,551
Malta	—	2,108	2,283
Mongolia	2,670	10,739	—
Morocco	61,757	55,204	165,312
New Zealand	13,282	—	—
Panama	1,150	—	—
Poland	55,124	22,247	30,313
Rumania	78,174	72,583	109,312
Senegal	—	5,117	6,518
Sierra Leone	—	1,087	—
Singapore	14,280	—	37,560
Southern Yemen	—	10,539	—
Spain	103,522	97,702	81,881
Sri Lanka	—	—	23,134
Sudan	—	24,835	36,535
Sweden	56,308	64,561	47,307
Switzerland	2,282	550	2,607
Syria	106,754	101,147	115,995
UK.....	121,880	28,848	50,603
USSR	1,660,681	1,097,406	1,580,988
Venezuela	5,193	—	—
Vietnam, North	75,910	75,633	76,106
Yugoslavia	11,804	43,478	72,300
Other Countries‡	1,738	1,901	2,609
	4,797,377	4,139,556	5,510,860

* Including 53,587 tons for animal feeding.
† Includes 1,087 tons for animal feeding.
‡ Donations of sugar.

Bagasse depithing.—The Western States Machine Co. have been granted a licence by the Process Evaluation and Development Corporation (PEADCO), a subsidiary of W. R. Grace & Co., to design, manufacture and market PEADCO centrifugal bagasse depithers. Centrifugal depithing (dry, wet or moist) gives substantially pith-free fibre of relatively low solubles content and can be carried out at the sugar factory or at the pulp mill.

Taiwan sugar exports[2]

	1973	1972	1971
	—— (*metric tons*) ——		
Refined sugar			
Cambodia	0	1,200	0
Hong Kong	411	320	992
Indonesia	21,957	0	13
Japan	0	160	2,180
Jordan	1,088	0	1,255
Laos	359	0	545
Malaysia	1,839	0	177
Saudi Arabia	6,576	0	0
Singapore	1,196	2,100	0
Sudan	0	20,000	0
Vietnam, South	0	0	6,800
Yemen	5,381	0	0
Other countries	999	2,193	886
Total	39,806	25,973	12,848
Raw sugar			
Cambodia	0	10,293	3,088
Indonesia	0	0	10,911
Japan	143,563	135,250	149,349
Korea, South	226,428	203,182	266,061
Malaysia	0	5,661	0
USA	78,227	78,304	77,902
Vietnam, South	19,660	59,083	20,586
	467,878	491,773	527,897

Cuban season ends.—The Cuban 1973/74 season has now ended, and although no production figure has been released, a total of 5,850,000 metric tons of sugar has been suggested, compared with an output of 5,361,482 metric tons in 1972/73.

* * *

New Hungarian sugar factory[3].—A new sugar factory of 6000 tons daily slicing capacity is to be built by Poland in Hungary. Operation is planned for 1978.

* * *

Sugar machinery orders.—In addition to the order placed earlier for the supply of equipment to Thailand[4], Walkers Ltd. have received orders for similar machinery to be supplied to Hawaii and for equipment to be delivered to Queensland sugar factories, the contracts now totalling nearly A$9 million.

* * *

Italian beet price.—The Italian beet price for the 1974/75 campaign has been fixed at 2,060 lire per 100 kg of beet of 16% sugar content compared with 1,454 lire/100 kg in the 1973/74 campaign.

* * *

Cameco contract.—Cane Machinery & Engineering Co. Inc. have received an order worth $3·7 million for the supply of field equipment (tractors, scrapers, land levelling equipment, cane loaders, harvesters and combines) and sugar factory equipment (cane handling equipment, rail dumpers, cane tables, vacuum pans, evaporators and cane knives) to Sena Sugar Estates Ltd. in Mozambique. The sugar company is expanding their existing cane area of 50,000 acres by a further 12,500 acres. Cameco have supplied all cane handling equipment since Sena started to mechanize operations in 1966.

* * *

Jamaican cane plantation purchase[5].—The Jamaican Government has recently purchased Gray's Inn Estate, involving about 4,400 acres of land which are eventually to be switched from cane growing to banana cultivation.

[1] C. Czarnikow Ltd., *Sugar Review*, 1974, (1179), 86.
[2] *I.S.O. Stat. Bull.*, 1974, **33**, (3), 30.
[3] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (16), 6.
[4] *I.S.J.*, 1974, **76**, 32.
[5] *Barclays International Review*, May 1974, 40.

India sugar exports[1]

	1973	1972	1971
	(metric tons, raw value)		
Bangladesh	20,543	0	0
Canada	0	0	98,173
Indonesia	50,753	0	0
Iran	22,446	0	0
Malaysia	3,796	0	31,631
Persian Gulf	8,696	0	0
Sri Lanka	0	0	65,130
Uganda	0	0	18,650
UK	26,781	26,851	32,987
USA	75,702	77,667	75,667
Vietnam, South	0	0	31,592
	208,717	104,518	353,664

New Egyptian sugar factory.—Erection of a sugar factory at Deshna, started in 1963 but stopped because of a fall in currency reserves, is to be resumed[2]. The Egyptian General Organization of Food Industries plans to raise credit in order to buy the necessary machinery. Annual production capacity of the factory is expected to be about 100,000 tons. The erection of a sugar factory at Mouditiet-el-Tahrir has been discussed within the context of an agreement between Egypt and Kuwait concerning the financing of development projects.

* * *

The late Professor Hirschmüller.—It is with deep regret that we record the death of Professor HERMANN HIRSCHMÜLLER who for 24 years was Director of the Institut für Zuckerindustrie in Berlin and was one of the sugar industry's most prominent scientists. Born in Windhoek, South West Africa, in 1910, Dr. HIRSCHMÜLLER was educated at Berlin University. After receiving his doctorate from the Institut für Zuckerindustrie in 1937 he was placed in charge of the Physical Department of the Institute. He became Deputy Director of the Institute in 1944, Director and Professor in 1947 and Professor at the Technical University of Berlin in 1950. Under his leadership the Institute's work expanded to include cane sugar technology and Dr. HIRSCHMÜLLER travelled widely throughout the sugar-producing world to gain first-hand knowledge of the subject. However, his prime concern was with the physico-chemical and analytical chemical aspects of sugar production, and above all with scientific education of students. He developed new ideas in lecturing, for which he considered films invaluable; he was responsible for a 20-hour film on the whole subject of sugar technology. In addition, he organized and extended the Sugar Museum at the Institute. In 1954 he was elected Vice-President of ICUMSA. The reputation which the Institut für Zuckerindustrie now enjoys will stand as a lasting memorial to Dr. HIRSCHMÜLLER, while his ideas will be perpetuated by the many students in the industry who have benefited from his wide knowledge and experience.

* * *

Australian mill to close[3].—Bundaberg Sugar Co. Ltd. plans to streamline its group milling operations through the closure of the smallest of its three sugar factories. Gin Gin mill is to be closed at the end of the 1974 sugar season and the crushing capacity of the Fairymead and Bingera mills significantly increased to equip them to handle the whole of the crop from the area currently serving the three mills.

* * *

US sugar refinery ownership change[4].—Sucrest Corporation announced in March that an agreement in principle had been reached for the acquisition of Revere sugar refinery from United Brands Company. Revere refinery in Boston discontinued its cane sugar refining operations earlier this year and plans are being made for an early resumption of granulated and liquid sugars production for the New England market.

* * *

Argentina sugar exports target[5].—The Argentina Ministry of Economy has announced a target of 412,000 metric tons for export during 1974 as against 362,000 tons in 1973.

Poland sugar exports[6]

	1973	1972	1971
	(metric tons, raw value)		
Bahrein	216	5,543	32
Bulgaria	13,533	0	0
Chile	0	0	1,032
Dubai	2,593	1,546	434
EEC—Denmark	0	0	10,680
Germany, West	1,668	1,948	438
Italy	0	0	222
UK	0	0	2,728
Finland	2,681	5,365	0
Gambia	1,028	379	0
Ghana	117	0	325
Hong Kong	0	541	0
Hungary	7,351	10,833	0
Iceland	569	628	608
Indonesia	7,568	0	11,367
Kenya	32,985	26,239	11,367
Kuwait	5,035	11,935	1,334
Liberia	2,504	2,078	2,275
Libya	36,657	27,449	0
Malta	1,191	0	0
Morocco	10,567	20,142	0
Nigeria	27,606	1,299	7,460
Norway	9,966	12,914	14,597
Saudi Arabia	11,125	4,547	0
Sierra Leone	0	945	1,207
Spain	23,711	0	0
Sri Lanka	12,888	0	0
Sweden	5,029	11,979	0
Syria	22,981	0	0
Tanzania	23,865	17,592	11,097
Togo	0	0	108
Tunisia	16,088	5,630	10,728
Uganda	10,956	0	0
USSR	107,399	109,063	0
Yugoslavia	23,998	53,156	0
Other countries	963	520	163
	422,848	332,339	88,202

New South African sugar factory possibility.—It is reported[7] that permission has been given by the South African Department of Industries to the local subsidiary of an international group to carry out a feasibility study on the possible construction of a new sugar factory at the Kwazulu border near Melmoth. The factory would produce about 100,000 tons of sugar a year, requiring about 1 million tons of cane. At present, growers in the area annually produce only about 250,000 tons of cane which is processed by a factory some distance away.

* * *

Sierra Leone sugar imports, 1973[8].—During 1973 imports of sugar into Sierra Leone totalled 27,098 long tons, tel quel, as compared with 20,197 tons in 1972. As in the previous year, the major supplier was France, with 12,351 tons, while 5323 tons came from the UK, 3945 tons from West Germany, 1879 tons from Belgium and 1407 tons from East Germany, the balance being supplied by other countries.

* * *

Dominican Republic sugar authorizations[9].—Decree No. 4280 authorizes the production of up to 1,270,000 tons of sugar in 1974; of this total 745,479 tons are for export to the USA, 207,747 tons for the world market, 175,996 tons for internal consumption and the balance for contingencies.

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[1] *I.S.O. Stat. Bull.*, 1974, **33**, (3), 56.
[2] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (16), 7.
[3] *Producers' Review*, 1974, **64**, (1), 6.
[4] *Lamborn*, 1974, **52**, 58.
[5] *Public Ledger*, 30th March 1974.
[6] *I.S.O. Stat. Bull.*, 1974, **33**, (3), 83.
[7] F. O. Licht, *International Sugar Rpt.*, 1974, **106**, (16), 7.
[8] C. Czarnikow Ltd., *Sugar Review*, 1974, (1175), 68.
[9] *Bank of London & S. America Review*, 1974, **8**, 224.

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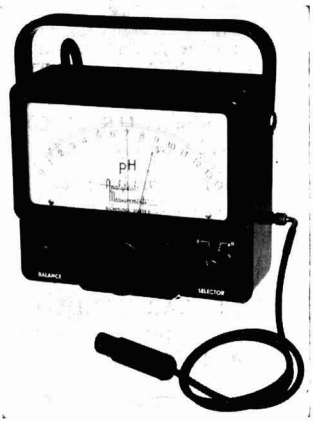

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The illustrated model 700 has a scale length of 7 in from 0 to 14 pH with a readability of 0·02. This instruments is supplied with the exclusive polythene shielded pH probe unit. The amplifier is a printed circuit high output electronically modulated unit with a single operating control giving an accuracy and overall stability of better than 0.05 of a pH Unit. Operating the instrument is so simple that untrained personnel can make pH determinations with no danger of damaging sensitive components. The instrument is plugged into the mains supply, standardized with the buffer solution and is then ready to operate. An adjustable index pointer is provided so that frequent buffer checks are eliminated.

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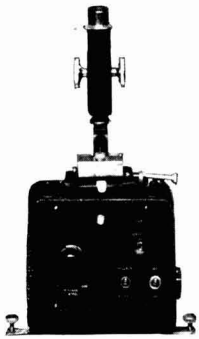

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Printed by JOHN ROBERTS & SONS, Salford, Manchester; and published by the Proprietors THE INTERNATIONAL SUGAR JOURNAL LTD. at 23a Easton Street High Wycombe, Bucks. Entered at the New York Post Office as Second-Class Matter.

PRINTED IN GREAT BRITAIN.