THE INTERNATIONAL SUGAR JOURNAL

A TECHNICAL AND COMMERCIAL PERIODICAL
DEVOTED ENTIRELY TO THE SUGAR INDUSTRY

EDITED BY :
D. LEIGHTON, B.Sc., F.R.I.C.
M. G. COPE, A.I.L.(*Rus.*)

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1966

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ENGLAND
1966

PANEL OF REFEREES

A. CARRUTHERS, former Director of Research, British Sugar Corporation Ltd.

F. M. CHAPMAN, Technical Adviser, London Refineries, Tate & Lyle Ltd.

K. DOUWES DEKKER,
Director, Sugar Milling Research Institute, Natal, South Africa.

J. EISNER, Sugar Technology Consultant.

N. J. KING,
Director, Bureau of Sugar Experiment Stations, Brisbane, Queensland, Australia.

O. WIKLUND, Swedish Sugar Corporation.

ERRATA AND CORRIGENDA

Page 17. Line 45 of column 2. Read "Dominican Republic" for "Puerto Rico".
Page 23. Line 13 from bottom of column 1. Read "Pampanga" for "Pampaga".
Page 82. Line 25 of column 1. Read "BAJAJ" for "BAJAS".
Page 90. Line 7 of column 2. Read "1965" for "1964".
Page 218. Line 19 from bottom of column 2. Read "BHARGAVA: *I.S.J.*, 1966, **68**, 281" for "preceding abstract".
Page 246. Line 8 of column 2. Read "BOURZUTSCHKY" for "BOURUTSCHKY".
Page 263. Line 19 from bottom of column 2. Read "8.5 ml" for "9.5 ml".
Page 337. Line 6 of column 1. Read "P. DE CARVALHO" for "C. T. DE CARVALHO".

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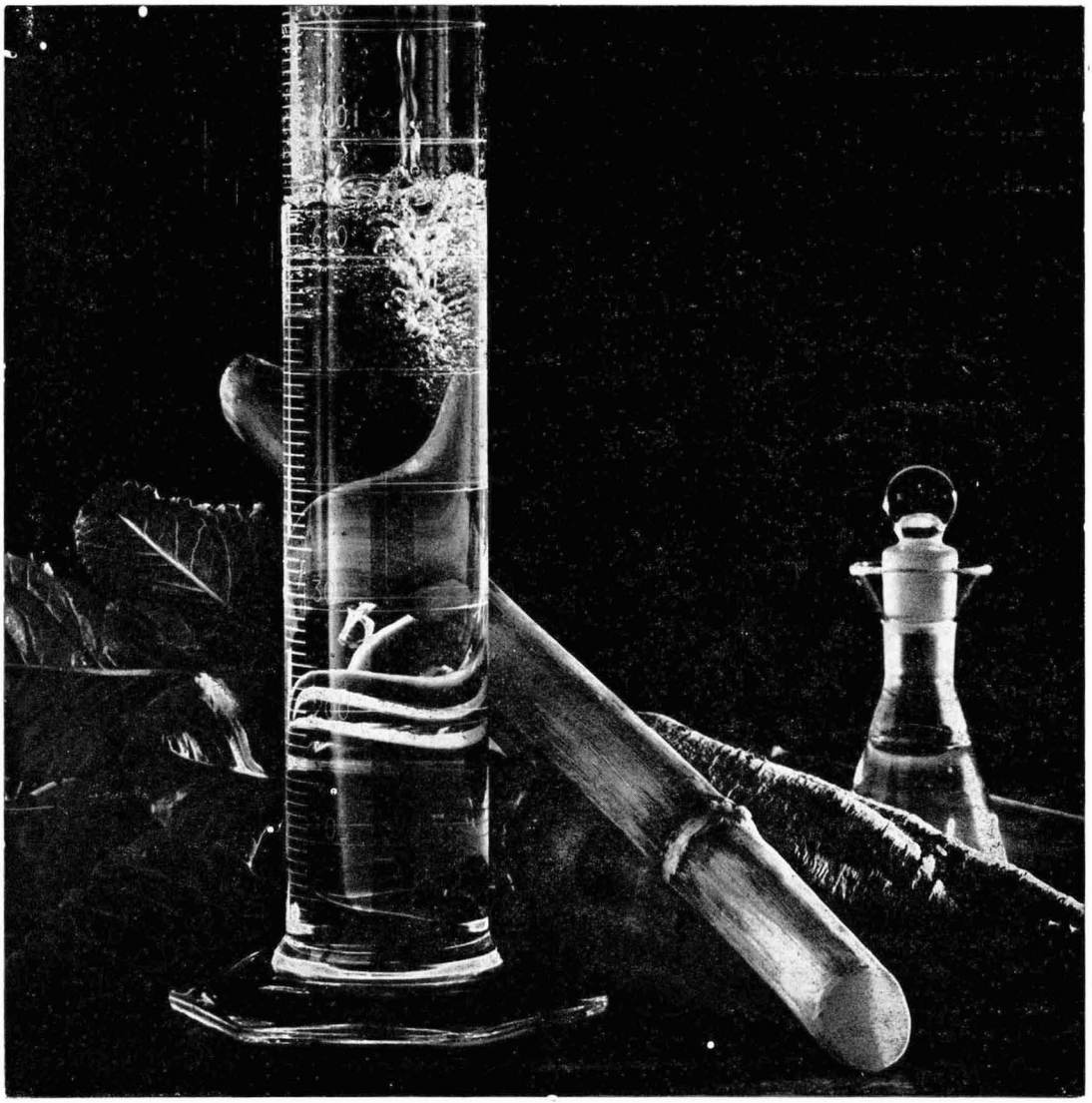

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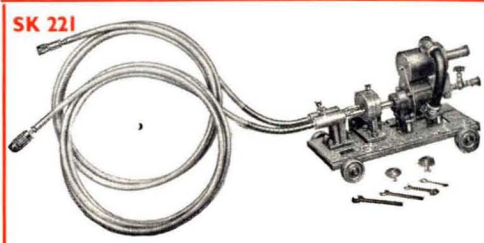

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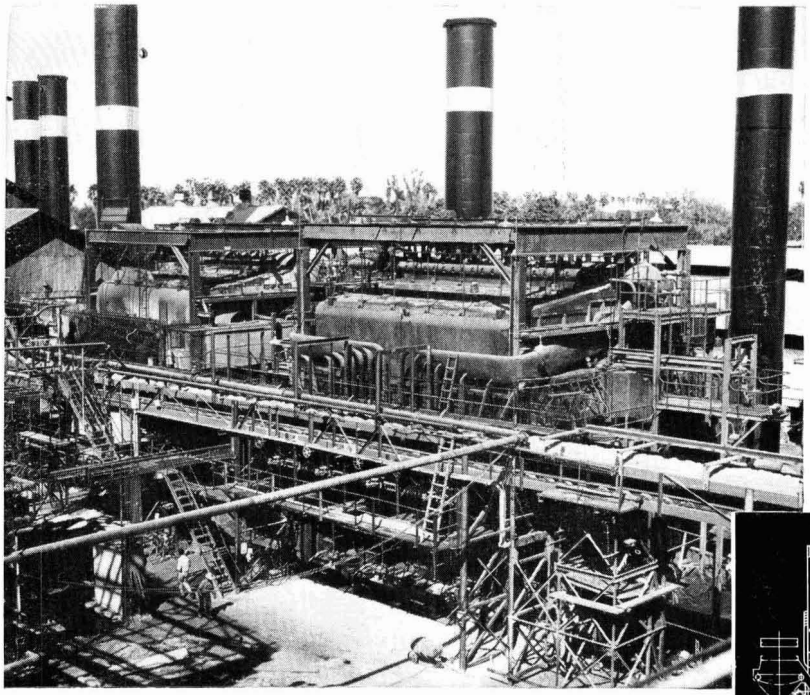

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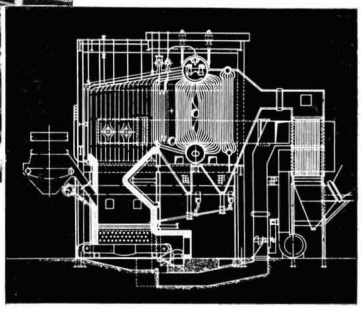

(Above) Arrangement of one of the 125,000 lb./hr. bagasse-fired boilers at Los Mochis. Steam conditions 250 lb./sq. in., 343 C.
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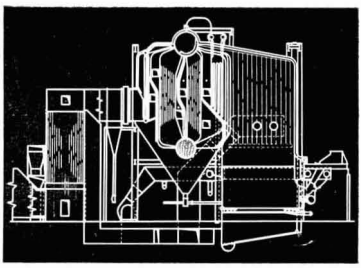

Bi-drum boiler for bagasse firing with Babcock-Detroit spreader stoker, and with auxiliary oil-firing.

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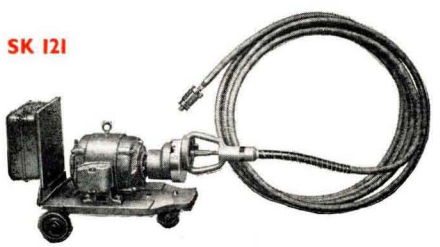

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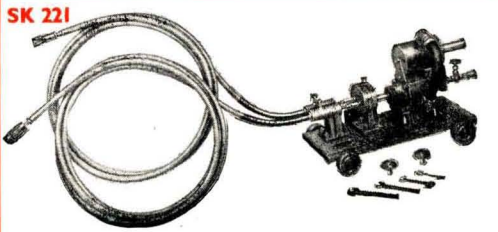

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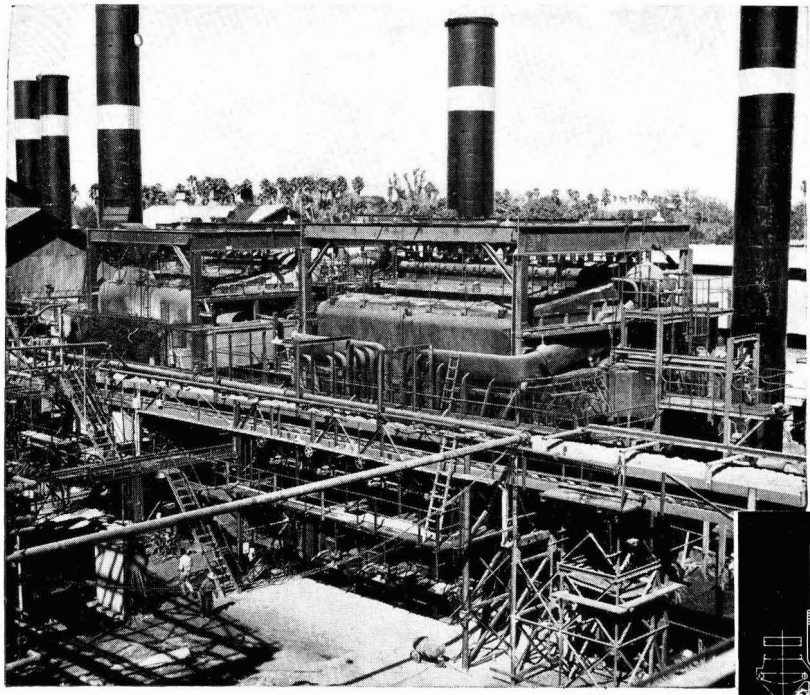

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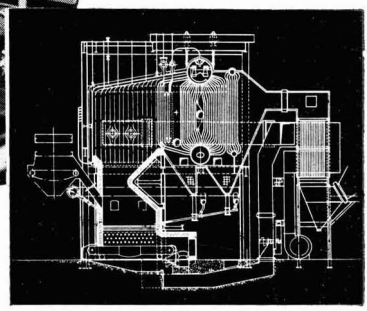

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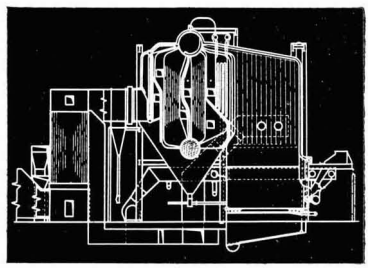

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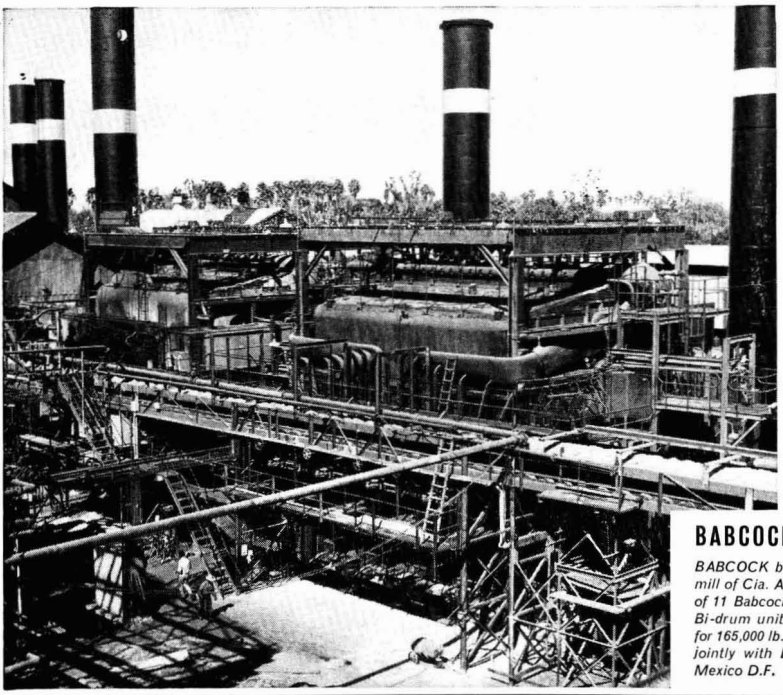

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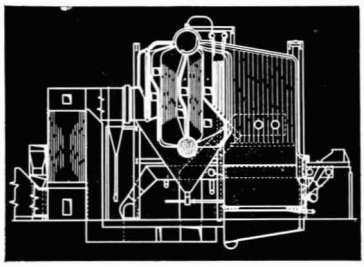

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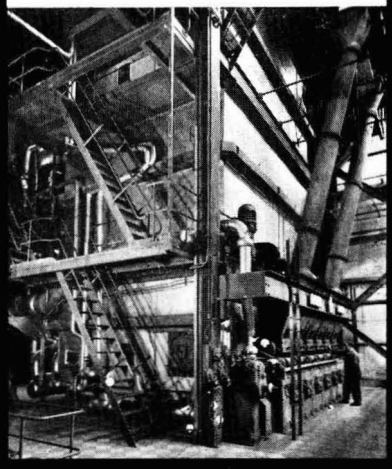

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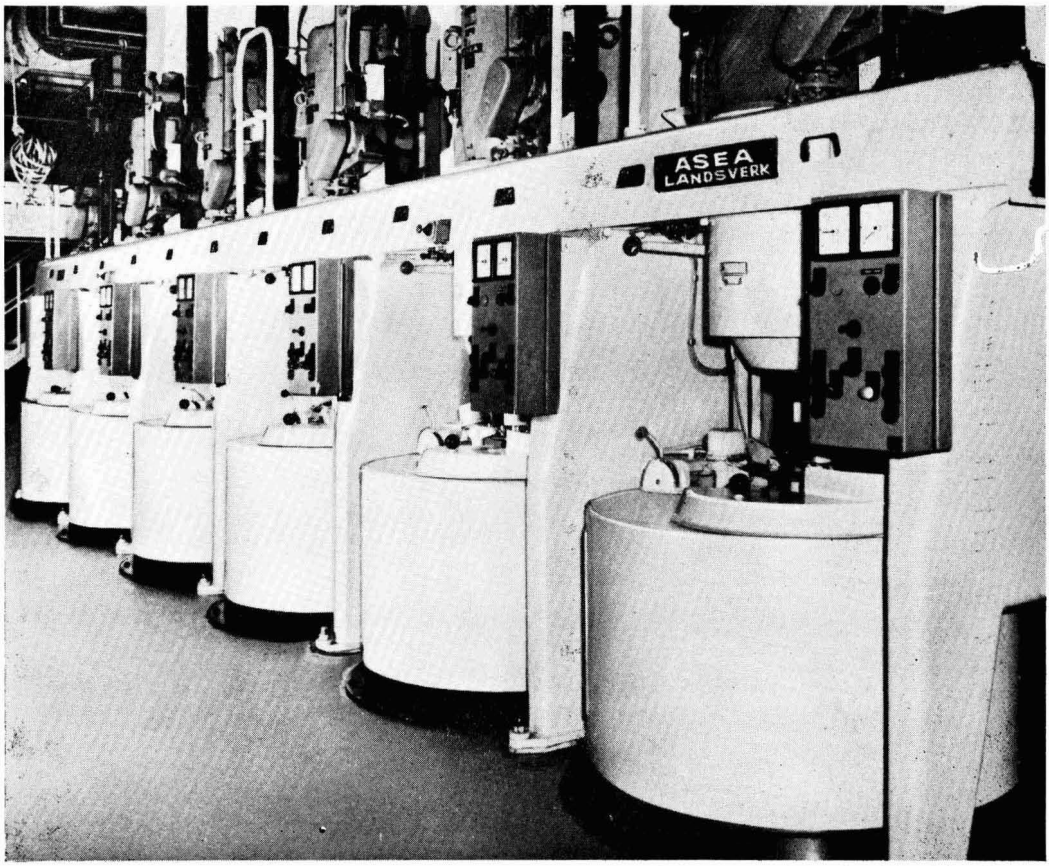

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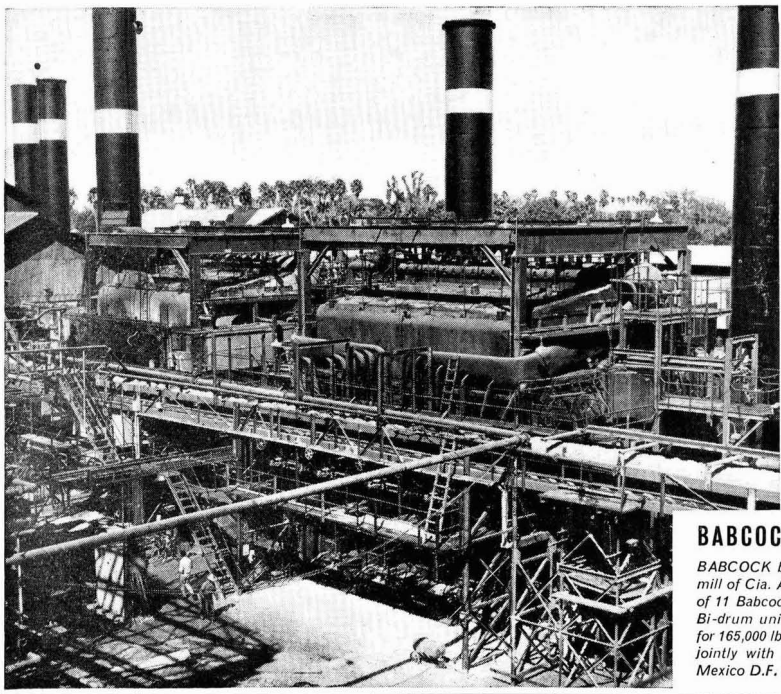

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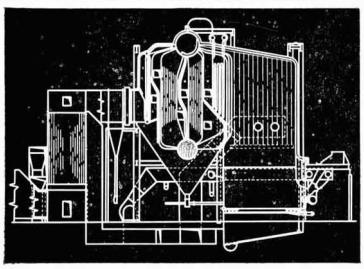

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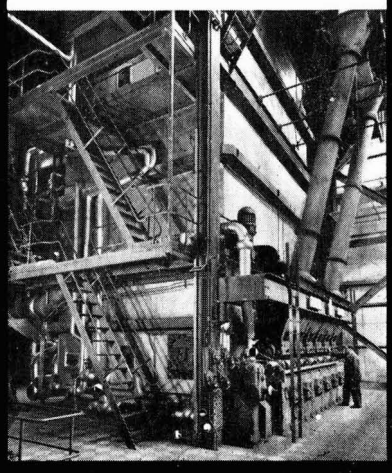

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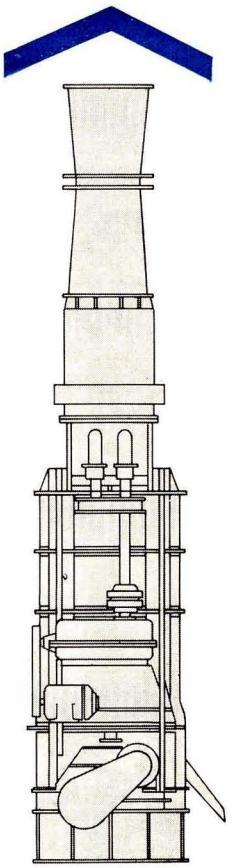

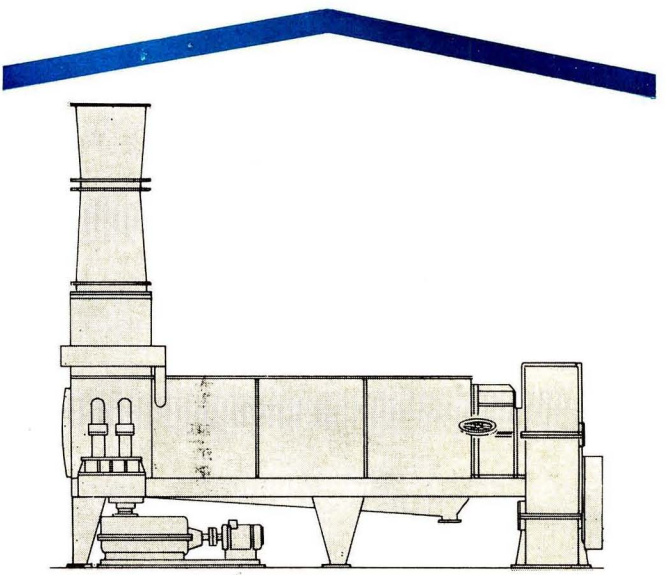

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THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXVIII JANUARY 1966 No. 805

NOTES AND COMMENTS

World sugar production, 1965/66.

F. O. Licht produced his first estimate of world sugar production in 1956/66 recently[1], the third estimate of the European beet sugar crop being embodied in it. We reported earlier[2] that the unusually mild and sunny weather in October, after a poor summer, had resulted in an unusual rapid reassessment of prospects for the beet crop, with an increase in the sugar outturn estimate from 21·6 to 22·2 million tons within a month. With as sharp a change as a month earlier, November in Europe produced severe frosts and in many countries beets remained unharvested. Even after thawing, the fields were wet so that mechanical harvesting was difficult, and as a result it is hard to estimate the damage suffered by this proportion of the beet crop as well as by that part which had been harvested but had been exposed to frost before processing.

Licht consequently has revised his estimate yet again and now puts the European total at 21·9 million tons, which figure is based on the assumption that a proportion of the beets remaining in the ground will be processed—a proportion which may or may not correspond to what actually is recovered.

Outside Europe the smaller beet crop in the U.S.A. is reflected in a lower sugar production forecast, while Licht believes that the 1965 drought in Cuba is likely to reduce outturn in 1966 to below the previous level. In the other countries of North and Central America a substantial increase is expected only in Mexico, although higher production is expected in most South American countries, particularly Argentina, Brazil and Peru.

Drought in South Africa has reduced by a third the expected sugar crop compared with that of 1964/65, while increases are expected in all the other African territories. A further increase is expected in India in 1965/66 above the record 1964/65 crop, and Philippines sugar production is also expected to be higher, while smaller expansions are forecast for other Asian countries. Thailand, however, is expected to show a substantial fall in production from the 1964/65 level. The estimates appear elsewhere in this issue.

Commonwealth Sugar Agreement.

The Ministry of Agriculture, Fisheries and Food announced on 30th November 1965 that the series of meetings between the Parties to the Commonwealth Sugar Agreement, which began on 27th October, had been concluded.

Agreement was reached on new methods of determining prices designed to introduce greater stability into the Agreement and the prices paid under it. In future, prices will be fixed for three years at a time. Negotiated Prices have now been settled for 1966, 1967 and 1968.

The Negotiated Price in 1963 was £46 0s 10d for bagged sugar c.i.f. (but including freight and insurance at pre-war levels). It was agreed to retain the same price for 1964 pending a review of the price-fixing arrangement. The Negotiated Price for 1965 was £42 per long ton f.o.b. and stowed bulk 96°. To this was added for less-developed Exporting Territories in the CSA the sum of £3 5s 0d per ton in recognition of the difficulties caused to them by the seriously depressed world price of sugar and the sum of £1 6s 6d per ton in lieu of the Colonial Certificated Preference.

The Negotiated Price for 1966, 1967 and 1968 is £43 10s 0d (all prices are per long ton f.o.b. and stowed bulk 96°) and, for the less-developed exporting territories in the Agreement, a special payment which will be calculated annually. The special payment will vary inversely with the world price, and will take account of the benefits that formerly accrued to exporters under the Colonial Certificated Preference system. The special payment will consist of a fixed element of £1 10s 0d and a variable element ranging from £2 10s 0d to nil.

The variable element of the special payment for 1966 will be assessed on the world price in the period 1st April 1965/31st March 1966; for 1967, on the world price in the period 1st April 1966/31st March 1967; and for 1968, on the world price in the period 1st April 1967/31st March 1968, on the following scale:

[1] *International Sugar Rpt.*, 1965, **97**, (33), 1-4.
[2] *I.S.J.*, 1965, **67**, 363.

World price	*Variable element in special payment*
Less than £31	£2 10s 0d
£31 or over but less than £33	£2 5s 0d
£33 „ „ „ „ „ £35	£2 0s 0d
£35 „ „ „ „ „ £37	£1 15s 0d
£37 „ „ „ „ „ £39	£1 10s 0d
£39 and over	Nil

On the evidence of world prices to date it is expected that the special payment for 1966 will be at the maximum.

Price Arrangements.—The new methods of determining prices result from a review of negotiated price arrangements under the Agreement. This review arose from proposals made by the British Government in the Autumn of 1964. Discussions took place in May 1965 and at the meetings which have just ended.

The agreed new methods will be incorporated in new Articles which will come into effect on 1st January 1966 and which will replace Articles 16–27 of the Agreement, signed on 21st December 1951. The effect of the new Articles is to provide as follows:

(*a*) Negotiated prices under the Agreement will be three-year prices; and they will be fixed having regard to the agreed principles of uniformity and of reasonable remuneration to efficient producers.

(*b*) Negotiated prices will be fixed at triennial reviews on the basis of annual cost data for the years up to and including the year preceding the review supplied to the Ministry in an agreed form, and such other factors and considerations as are agreed to be appropriate.

(*c*) In recognition of the dependence of the economies of the less-developed exporting territories in the Commonwealth Sugar Agreement upon the export of sugar and the effect on them of depressed world prices, the negotiated prices for those territories will also include provision for a special payment related inversely by agreed methods to the world price and taking account of the former Colonial Certificated Preference.

(*d*) If the British Government or an exporting territory is of the opinion during the period of this Agreement that any Article in Chapter VI is no longer operating to produce reasonably remunerative prices to efficient producers or is operating to produce prices which are more than reasonably remunerative, then that party may apply for the price-fixing method to be varied at a triennial review. In the event of the parties failing to reach agreement at the time of the triennial review, the parties will consult together with a view to devising some other acceptable method of price fixation.

Agreement has also been reached on the method of conducting the triennial reviews.

Negotiated Price Quotas.—The negotiated price quotas during the year 1966 will remain the same as in 1965, as follows:

	long tons
Australia	335,000
British Honduras	20,500
East Africa (Kenya, Tanzania, Uganda)	7,000
Fiji	140,000
India	25,000
Mauritius	380,000
Swaziland	85,000
West Indies and British Guiana	725,000

Rhodesia.—Having been informed of the measures taken by the British Government to suspend the Rhodesian Sugar Association from membership of the Agreement, the exporting parties to the Agreement assured the British Government of their co-operation. Rhodesian quotas under the Agreement (of 25,000 long tons) have been placed in suspense.

Duration of the Agreement.—The Agreement has been extended for a further year and will now run until the 31st December 1973.

* * *

U.S.S.R. sugar production, 1964/65[1].

Production of white sugar from domestically grown beet in the U.S.S.R. in 1964/65 amounted to 9·405 million tons, according to an article appearing in a Soviet economic paper. Of this quantity 5,839,000 tons originated in the Ukraine and 2,707,000 tons in the Russian Federation. A total of 76 million tons of roots was stated to have been processed in the factories.

These figures, which indicate an output in terms of raws well in excess of ten million tons, are far in excess of earlier estimates, including Licht's figure of 8·6 million tons, raw value, which appears elsewhere in this issue.

Moscow radio is reported to have announced that this season 60·3 million tons of beet had been delivered to the factories by 27th October, by which date the harvest was approaching its close. Sugar extraction during the past five seasons has averaged 14·44% in the U.S.S.R., according to Licht; if this were repeated this year it would indicate a sugar output from beet already delivered in the region of 8·7 million tons, raw value.

It will be recalled that the Soviet delegates to the recent Geneva Conference, who would certainly have been apprised of the latest statistical position and also future production plans, stated that as an average their net annual imports during the three years 1966–1968 would not be less than the average of the net annual imports during the four years 1961–1964, which would indicate a minimum net import requirement of 1·475 million tons during each of these years. From these figures it would seem that consumption of sugar in the U.S.S.R. is presently undergoing a marked expansion.

[1] C. Czarnikow Ltd., *Sugar Review*, 1965, (737), 193.

FILTRATION-IMPEDING MATERIALS IN RAW SUGARS OF VARIOUS ORIGINS

Part II. The Filtrability of Laboratory Carbonatation Slurries

By TOSHIO KAGA, Sc.M., KAZUMASA SUZUKI, Sc.M., and TAKEO YAMANE, Sc.D.
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THE relationships between the filtrability of raw sugars and affined sugars and filtration-retarding impurities contents were discussed in a previous paper[1], and significant correlations were found between them, although the correlation figure in the case of starch was rather poorer than in the case of other impurities.

The relationship between the filtrability of carbonatation slurries prepared from melt liquors of affined sugars of various origins, carbonatated on a laboratory scale, and filtration-impeding materials contained in the sugars are discussed in the present paper, special attention being given to the behaviour of starch in carbonatation and filtration.

Although the filtrability figures for laboratory carbonatation slurries were much lower (3–12) than those of factory carbonatation slurries (> 50), the results obtained here seemed sufficiently significant for judging the effect of filtration-retarding materials on the carbonatation slurries.

According to our finding obtained here, starch is the most deleterious impurity in affined sugar so far as the filtrability of carbonatation slurries is concerned.

The samples listed in Table I and II in this paper correspond to those listed in the tables in the previous paper.

Experimental

Carbonatation of melt liquors of affined sugars was carried out as follows: Slaked lime was added to melt liquor of 60°Bx at 60°C, the amount added being 0·8% CaO on solids in the liquor, and it was carbonatated with a uniform flow of CO_2 gas. The end of carbonatation was adjusted to pH 8·3 ± 0·2 and the time required for carbonatation was about 25 minutes.

After carbonatation, the carbonatation slurry was maintained at 75°–80°C for about 30 minutes and thereafter 250 g of the well-mixed slurry was taken for the filtration test. The test was carried out as described in the previous paper, a Nicholson-Horsley test filter being used.

The filtration-retarding impurities contents in filtered liquors, except wax content, were estimated according to the methods also outlined in the previous paper.

Discussion

The filtrability of carbonatation slurries and the filtration-impeding materials contents in the filtered liquors are shown in Table I, together with those of affined sugars.

[1] YAMANE *et al.*: *I.S.J.*, 1965, **67**, 333–337.

Table I

The filtrability of carbonatation slurries and affined sugars and the contents of filtration-impeding materials.

Sugar samples	*Filtrability of carbonatation slurries*	*Filtration-impeding materials in filtered liquors after carbonatation (p.p.m. on solids)*				*Filtrability of affined sugars*	*Filtration-impeding materials in affined sugars (p.p.m.)*				
		Gum	*Starch*	SiO_2	P_2O_5		*Gum*	*Starch*	SiO_2	P_2O_5	*Wax*
Australian											
C	10·0	175	25	9	7	70·0	420	110	61	40	29
D	10·4	350	20	4	11	65·5	320	120	109	32	34
F	5·9	600	30	7	8	53·5	860	190	60	20	79
H	6·0	345	115	13	6	51·5	570	350	105	24	101
Cuban											
A	11·5	405	35	4	3	54·5	460	120	66	32	50
B	9·4	240	10	4	8	51·0	530	100	150	33	77
C	9·2	480	10	11	6	52·0	680	110	148	24	72
E	9·2	335	35	14	4	47·0	530	150	165	33	62
Indian	6·5	240	90	20	4	58·0	570	310	103	16	35
Natal											
A	2·9	475	165	34	14	51·0	610	480	89	42	92
C	2·9	495	105	27	8	45·5	830	440	77	34	85
E	2·7	535	155	5	7	42·0	840	460	133	44	103
Taiwan											
B	11·6	120	40	trace	6	90·0	330	60	24	16	trace
C	8·5	225	25	trace	6	77·0	360	170	60	24	20
F	3·3	260	110	22	6	62·0	460	420	45	20	21
G	6·6	275	65	7	3	69·0	360	330	17	32	22
I	4·0	240	120	28	7	43·5	530	370	81	56	64
Siamese											
A	12·1	150	20	trace	3	93·5	260	60	trace	4	3
B	11·6	195	15	58	3	70·5	370	80	71	28	43

Fig. 1 shows the existence of a clear relationship between the filtrability of affined sugars and that of carbonatation slurries.

Although the filtrability of Cuban sugars was abnormal in the case of the test filtration, as described in the previous paper, a correlation coefficient of 0·65 was obtained. Excluding the Cuban sugars, a correlation coefficient of 0·85 was obtained.

The relationships between the filtrability of carbonatation slurries and the contents of individual filtration-retarding materials in affined sugars are considered below.

Gum:* The relationship between the filtrability of carbonatation slurries and gum content is shown in Fig. 2. A fairly close relationship existed between them and a correlation coefficient of -0·66 was obtained.

*Gum is defined here, as in the previous paper, as (total gum—starch).

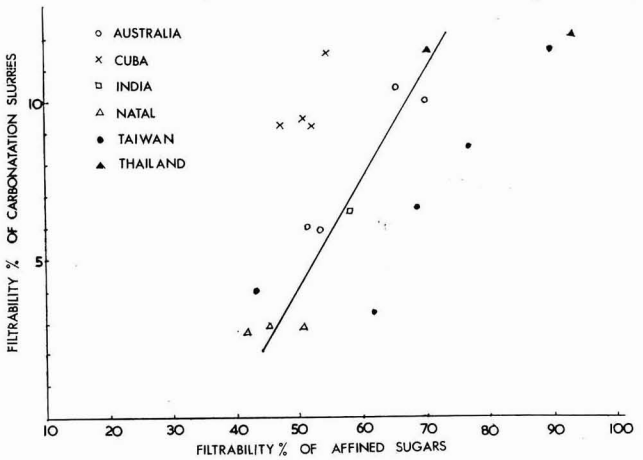

Fig. 1. The relationship between the filtrability of affined sugars and that of carbonatation slurries

Starch: As shown in Fig. 3, a remarkably close relationship existed between the filtrability and starch content and a correlation coefficient of 0·95 was obtained.

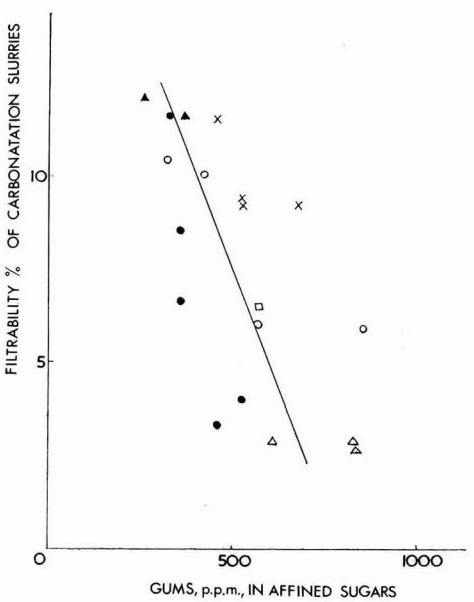

Fig. 2. The relationship between the filtrability of carbonatation slurries and gum content in affined sugars

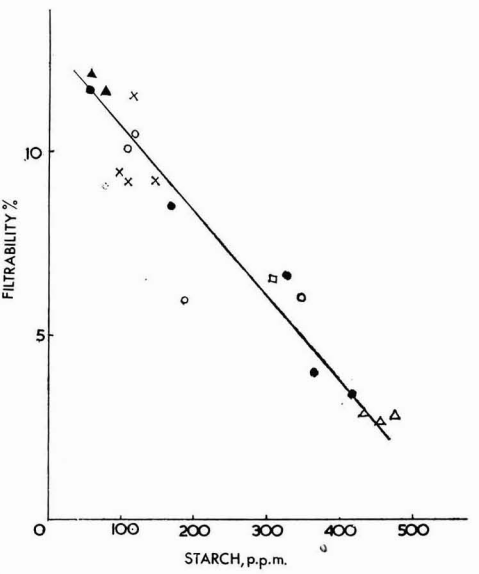

Fig. 3. The relationship between the filtrability of carbonatation slurries and starch content in affined sugars

Wax: The relationship between the filtrability and wax content is shown in Fig. 4. The relationship was not so close and a correlation coefficient of -0·56 was obtained.

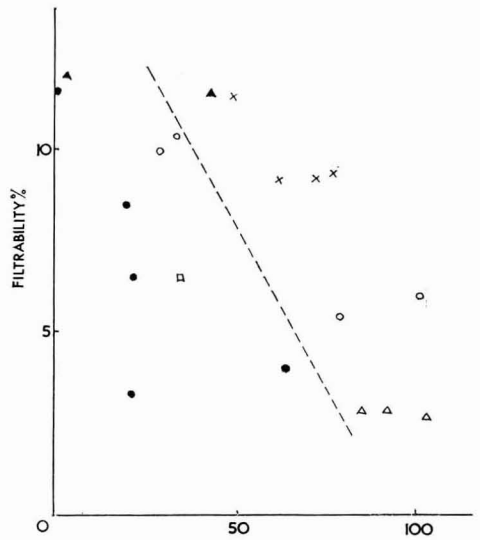

Fig. 4. The relationship between the filtrability of carbonatation slurries and wax content in affined sugars

Silica: Almost no relationship was observed to exist between the filtrability and silica content, as seen in Fig. 5, and the correlation coefficient was only -0·14.

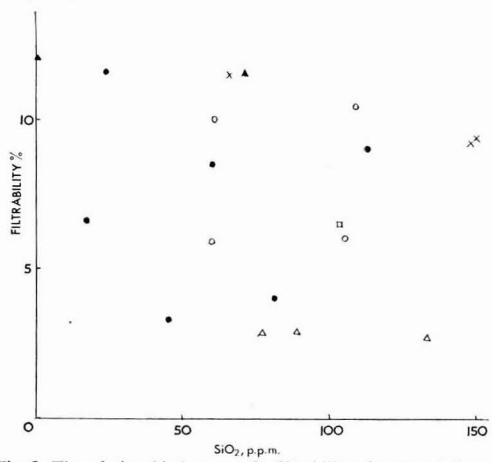

Fig. 5. The relationship between the filtrability of carbonatation slurries and silica content in affined sugars

Phosphates: As shown in Fig. 6, the relationship between the filtrability and phosphates content is not very close and a correlation coefficient of -0·42 was obtained.

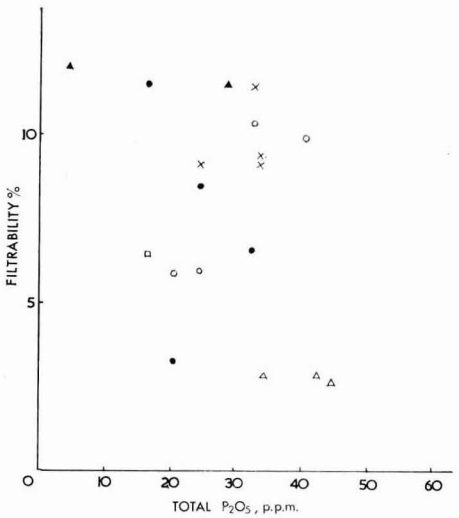

Fig. 6. The relationship between the filtrability of carbonatation slurries and phosphates content in affined sugars

By comparing the impurities contents in affined sugars and those in the filtered liquors after carbonatation, the percentage removal of filtration-impeding materials by means of carbonatation was calculated and is listed in Table II.

Table II

The removal % of filtration-retarding impurities by carbonatation.

Sugar samples	*Removal % by carbonatation*				
	Filtration-impeding impurities				*Colour*
	Gum	*Starch*	*SiO_2*	*P_2O_5*	
Australian					
C	58	77	85	83	28
D	—	83	96	66	30
F	30	84	88	60	43
H	40	67	88	75	38
Cuban					
A	12	71	94	91	44
B	55	90	97	76	35
C	29	91	93	75	39
E	37	77	92	88	45
Indian	58	71	81	75	42
Natal					
A	22	66	62	67	—
C	40	76	65	77	—
E	36	66	96	84	54
Taiwan					
B	64	33	—	63	59
C	38	85	—	75	33
F	44	74	51	70	—
G	24	80	59	91	38
I	55	68	65	88	—
Siamese					
A	42	67	—	75	62
B	47	81	18	89	52

Most of the starch, silica and phosphates was removed by carbonatation, while removal figures of gum and also colour were a little lower.

Wax content in filtered liquors was not estimated.

Summary

Melt liq ors of affined sugars of various origins were carbonatated on the laboratory scale and the filtrability of the carbonatation slurries produced was estimated, a Nicholson-Horsley test filter being used.

A close relationship was observed between the filtrability of affined sugars and that of carbonatation slurries, and a remarkably close relationship existed between the starch content in affined sugars and the filtrability of carbonatation slurries.

The effect of gum, wax and phosphates contents on the filtrability was not so marked as in the case of starch, while almost no relationship was observed between silica content and the filtrability of carbonatation slurries.

According to this finding, starch is the most detrimental impurity in affined sugars, so far as the filtrability of carbonatation slurries is concerned.

Removal of starch, silica and phosphates by means of carbonatation was significant.

SUGAR CANE RESEARCH IN HAWAII

Annual Report, 1964, Experiment Station of the Hawaiian Sugar Planters' Association

THIS report of 75 pages gives a good idea of the wide range of agricultural research that is carried on at the Experiment Station of the Hawaiian Sugar Planters' Association.

Basic Plant Physiology and Biochemistry

Ripening studies with chemicals is one of the pr ojects under this heading. Among various compounds found to be effective in the control of ripening the most effective was TBA (salts of 2,3,6-trichlorobenzoic acid). Plot work with it is planned. Further support has been obtained for the belief that control of the growing point in cane is connected with the control of ripening. Eighteen chemicals were screened to determine their effects in preventing tasseling and eight effective compounds were evaluated further for the tassel-controlling characteristics. In field plots spray applications of "Diquat" and "Paraquat" continued to give good control of arrowing or tasseling, as did "Du Pont 629" (4 lb/acre) and "Omadine" (1–2 lb/acre). Work was continued on the light interruption of night and its effect on flowering, which confirmed the results of earlier work.

With the greater use of overhead irrigation there is great interest in the possibility of foliar application of fertilizer in irrigation water. Earlier work was carried out with urea and ammonium sulphate, both labelled with ^{15}N. During the year experiments were made with labelled nitrate. It was shown that this form of nitrogen was also absorbed by cane leaves. The same experiments emphasized the rapidity with which nitrogen moves in the cane plant.

Studies using radioactive arginine and other amino-acids indicated that the sugar cane plant can and does incorporate organic nitrogenous compounds as intact molecules. The effects of nitrogen and sunshine on tillering were also the subject of special study, reluctant tillering varieties having been "speeded up" by the judicious use of nitrogen. Co-operative work was initiated with the U.S. Department of Agriculture to study certain physiological aspects of varietal yield decline in cane, an additional physiologist being appointed for the work. So far emphasis has been on naturally occurring phytotoxins, either excreted by the plant or present in whole or decomposed plant material. *Sorghum* seedlings have been used as test plants, the close relationship to cane being considered advantageous.

Nutrition and Fertilizer Research

Several projects are reported under this heading, having reference in the main to N, P and K, but also to other minerals and to trace elements. Experiments with K suggested that some varieties may benefit, especially during the first year, from levels of K higher than previously considered optimal. This is compatible with some plantation observations.

Experiments on the internal nitrogen requirements of sugar cane indicated that for near optimum yield an average N requirement at maturity of 4 lb per ton total dry matter, or 2 lb N per ton millable cane, is needed. They also showed that N requirement is the same regardless of the variety tested and that leaf damage does not affect N uptake. Wind damage to leaves was simulated by fraying or shredding the tips ($\frac{1}{3}$–$\frac{2}{3}$ blade length). Similar damage in the field should have no effect on fertilizing practices.

In a report on a project on significance of mineralizable nitrogen in the nitrogen economy of sugar cane the concluding remarks are: "It appears that N fertilization of sugar cane should aim not at supplying the total need for the crop for N but at meeting that portion of the requirement not met by the soil itself, the magnitude of that portion depending on the N-mineralization rate and the yield potential for the area in question." Other projects were concerned with response to magnesium and to phosphate levels.

Sugar Cane Varieties

For the second consecutive year the leading variety in terms of total acreage was 50-7209 and this variety now occupies most of the leeward irrigated districts. It is also grown in some of the unirrigated and middle lands of Kohala and Hamakua. Details are given of the performance of certain other varieties.

Some preliminary tests to evaluate response of sugar cane tissue cultures to chemicals, including herbicides and tassel-control compounds, indicate a varietal difference between 37-1933 and 50-7209, with the latter being more sensitive. This possibility is being explored and, if confirmed, it might be a factor in explaining the differences in yield between the two varieties after tassel control by chemical sprays.

Irrigation

As the sugar cane growing industry of Hawaii moves towards sprinkler irrigation it becomes faced with new problems, particularly in the engineering field. Because of this the H.S.P.A. Experiment Station organized an irrigation seminar which was attended by over 100 representatives of the industry and of firms manufacturing and distributing irrigation equipment. One of the main topics for discussion was plastics for sprinkler irrigation. It was planned to arrange another similar but more extensive seminar in 1965.

Developing the optimum design for sprinkler systems received much attention at the Experiment Station. The various factors that have to be taken into account are listed. Experimental work was carried out in designing and developing machines for the laying and taking up of piping and risers used in overhead irrigation. Such machinery is necessarily intricate and somewhat cumbersome.

The development and testing of the Experiment Station's long barrel, large volume sprinkler has been completed. It permits a substantial increase in sprinkler spacing over conventional sprinklers. It may be given a throw of 300 feet and has a capacity of over 2000 g.p.m.

Furrow irrigation was also a subject of investigation, in order to assist plantations in reducing costs and improving water efficiency. Costs and water distribution characteristics of four different systems were studied at four different plantations. Key points revealed by the study are listed. With land slopes between 1·5% and 3% the herring-bone system had the highest performance. On low slope fields, less than 1·5%, the level-ditch system was preferable.

Weed Control

Over a dozen pages of the report are devoted to the Station's weed control programme, which is concerned with chemical weedkillers. During the year 20 new chemical herbicides were obtained for field and laboratory screening. Eleven of these were included in field tests and an additional 16 were carried over from the previous year. Selection of herbicides for testing on sugar cane continues to be based on the achievement of the longest period of control of the broadest possible spectrum with maximum crop tolerance. A list is given of a dozen products of major interest selected from laboratory and field tests. Experimental tests on the comparative field performance of "Diuron", "Atrazine" and "Ametryne" as pre-emergence herbicides at 4 lb active material/acre show it is impossible to predict the length of control to be expected from application of these "standard" herbicides.

An account is given (with photographs) of a new probe unit developed by the Experiment Station for special weed problems where the weeds exist in clumps, e.g. guinea grass. The unit, which is adapted to a standard pressure knapsack sprayer, has two types of feed nozzle, one being for injection in the soil (up to 8 inches).

Under the heading of special weed problems various weeds are discussed individually. "Tordon" proved effective with the Madeira vine (*Boussingaultia*) and Tritonia lily. All the Du Pont uracils so far tested showed a good degree of control with *Cyperus rotundus* (nutgrass) and *Cyperus esculentus* (water-grass).

Pests and Diseases

The principal activity of the Entomology Department during the year was the study of the beetle borer (*Rhabdoscelus obscurus*) which is regarded as the only insect pest of major concern in sugar cane plantations in Hawaii at the present time. Work was continued on breeding and releasing of the egg parasite *Patasson calendrae*, brought from Missouri last year. It is hoped it will learn to attack the eggs of *Rhabdoscelus* in cane fields as it does without hesitation under glass. As all other insect pests of sugar cane are maintained in satisfactory equilibrium by their parasites which are usually more sensitive to insecticides than their hosts, the use of insecticides against *Rhabdoscelus* involves certain risks and difficulties. Tests have been commenced to explore the possibility of introducing systemic insecticides into the cane stalk in amounts sufficient to kill the borer larvae. Seven materials are being tried. Results are not yet available.

A large grasshopper, new to Hawaii and found in Honolulu's Sand Island, is regarded as a potential pest of cane, and steps are being taken to eradicate it. It is *Schistocerca vaga*, known as an omnivorous garden and orchard pest in California and apparently partial to sugar cane. It is capable of long flights. A mild infestation of the leafroller (*Omiodes accepta*), not regarded as serious, is recorded.

Rat damage was often caused entirely by the small Polynesian rat (*Rattus hawaiiensis*). Its damage to the cane stalk is quite distinctive and readily distinguishable from that of the Norway or Black rat. Anticoagulants (e.g. "Warfarin") are not effective in controlling the Polynesian rat. For this reason experiments on alternative methods of control have been carried out. As birds are very colour-conscious while rodents are not, coloured rat baits have been found to protect many types of domestic and wild birds. The order of effectiveness in protecting birds is bright yellow, bright orange red and green.

Brown Spot disease (*Cercospora longipes*) which first appeared in Hawaii in 1961, showed increased intensity in some areas, perhaps owing to high rainfall. Of 216 varieties of cane tested through artificial inoculations, 4 were immune or highly resistant, 22 were moderately resistant while the remaining 190 showed considerable susceptibility.

Eye Spot disease (*Helminthosporium sacchari*), not seen for 20 years, was found in 1963 on the island of Hawaii. Of 408 varieties artificially inoculated, 60% proved resistant, 13% moderately resistant and 27% susceptible. A new "aluminium cap" method for testing the reaction of sugar cane varieties to leaf scald disease (*Xanthomonas albilineans*) proved to be simple and rapid.

F.N.H.

FLOATING *versus* FIXED CALANDRIAS FOR VACUUM PANS

By H. J. SPOELSTRA

PART I

Introduction

OF late, renewed attention has been drawn to the vacuum pan with floating calandria. Articles have been published on this subject,[1-3] from which by superficial consideration the conclusion could be drawn that the floating calandria is *basically* superior to the fixed one with central downtake.

Since such a conclusion is doubtful it is useful to make a more systematic comparison between some basic characteristics of both types.

Let us therefore consider two types:

(I) a fixed calandria with horizontal parallel tube plates and central downtake, and

(II) a floating calandria with flat horizontal upper tube plate and conical lower tube plate sloping parallel to the bottom of the pan.

For the sake of simplicity the conical surfaces have been considered as full cones and no corrections applied for flattened tops or steam duct connexions. Neither has any correction been made in the calculations of massecuite volumes for pipes serving for condensate removal, supply of syrup, molasses, water and steam, deaeration, etc.

For both types we have assumed an equal and constant ratio a between the total heating tube area and tube plate area and, of course, equal tube diameters. Further, we specify that the calandrias for both types should have the same specific flow resistance, which means that the average tube length for type II must be equal to the tube length of type I. If not stated otherwise, all dimensions are expressed respectively in m, sq.m. and cu.m.

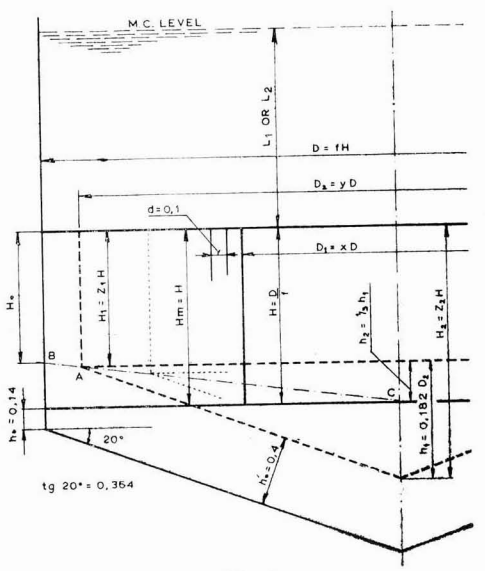

Fig. 1.

Geometrical data and relationships

In order to express the various relationships in the form of simple equations we have for all cases introduced some constant values such as: the sloping angle of the conical bottoms and the lower tube plate of type II (α) = 20°, the distance between bottom and lower tube plate of type I (h_0) = 0·14 m, the distance between the parallel cones of bottom and lower tube plate of type II, (h'_0) = 0·4 m, the ratio of total heating tube area to tube plate area (a) = 0·45, and the inside diameter of the heating tubes (d) = 0·1 m. Further, we make use of some ratio symbols which are indicated in Fig. 1.

From the condition of *equal specific flow resistance* for both calandria types it follows that $H_m = H$, or $H_1 + 0{\cdot}061\, yD = H$. Since $D = fH$,

$$H_1 = H(1 - 0{\cdot}061\, fy) \quad \ldots\ldots (1)$$

and thus $z_1 = 1 - 0{\cdot}061\, fy$ ..... (2)

$$H_2 = H(1 + 0{\cdot}121\, fy) \quad \ldots\ldots (3)$$

and $z_2 = 1 + 0{\cdot}121\, fy$ ..... (4)

If we wish to set the condition that the heating surfaces of both types are to be the same, we must make $y = \sqrt{1 - x^2}$.

For all floating calandrias with the same specific flow resistance as the fixed calandria ($H_m = H$) point A must be situated on the line B–C of which point B is defined by $y = 1$, when $H_o = (1 - 0{\cdot}061\, f)\, H$.

Seeding volume and HS : Strike volume ratio

Two important characteristics of a pan are the seeding volume % strike volume (G), and the ratio (K) of heating surface (sq.m.) to strike volume (cu.m.) (a value of K of 1 sq.m./cu.m. corresponds to 0·305 sq.ft./cu.ft.). Whereas G depends on the K required it is better to take the ratio $\frac{G}{K}$ as a characteristic which can be expressed in terms of the variables of the pan dimensions.

$$\text{In general } \frac{G}{K} = \frac{\text{seeding volume in cu.m.}}{\text{heating surface in sq.m.}} \times 100$$

For tubes of 0·1 m inside diameter (d), H ranging from 0·9 to 1·1 m and tube plates of 25 mm thickness it is sufficiently accurate to consider the heating

[1] *Sugar y Azúcar*, 1963, **58**, (2), 20.
[2] *ibid.*, 45.
[3] *Sugar J.* (La.), 1965, **27**, (12), 23.

surface HS (sq.m.) to be 40 × volume of heating tubes (cu.m.). Thus

$$\frac{G}{K} = \frac{\text{Seeding vol. in cu.m.}}{40 \times \text{vol. of heating tubes in cu.m.}} \times 100.$$

Based on the geometrical relations given above and in Fig. 1 we can develop the appropriate equations for $\frac{G}{K}$.

For the sake of simplicity we will base our calculations in all comparisons on a Type I calandria with $x = 0{\cdot}436$ giving a round figure of $x^2 = 0{\cdot}19$ when, for an equal HS for the Type II calandria, we have $y = 0{\cdot}90$. We then have the following equations:

For Type I: $$\frac{G_1}{K_1} = 3{\cdot}80 + \frac{0{\cdot}42\,(D + 2{\cdot}29)}{H} \quad \ldots.(5)$$

For Type II: $$\frac{G_2}{K_2} = 3{\cdot}80 + \frac{2{\cdot}92 - 0{\cdot}083\,D}{H} \quad \ldots.(6)$$

For $K_1 = K_2$ (equal strike volumes) equal values of G will be found for the condition:

$0{\cdot}42\,(D + 2{\cdot}29) = 2{\cdot}29 - 0{\cdot}083\,D$
or $D = 3{\cdot}9$ m (critical diameter).

For $D < 3{\cdot}9$ G_2 is $> G_1$, while if
$D > 3{\cdot}9$ G_2 is $< G_1$.

Both equations (5) and (6) have been illustrated graphically in Fig. 2. The corresponding H-lines for Type I and II cross each other on the vertical for $D = 3{\cdot}9$.

It may be of interest to observe that with the help of equations (5) and (6) for Fig. 2 we can easily see whether required seeding volumes and HS:strike volume ratios can be realized.

Suppose it is required to design a pan with $D = 4$ m having $G = 35$ and $K = 6{\cdot}25$. For these values $\frac{G}{K} = 5{\cdot}6$ and from Fig. 2 we can see that the required conditions cannot be realized, unless we go far beyond reasonable proportions. Supposing a required value of $K = 6{\cdot}0$ for a pan of $D = 4{\cdot}5$ with heating tubes of $H = 1{\cdot}10$ then we have to accept a seeding volume of $G = 6 \times 6{\cdot}40 = 38{\cdot}4\%$ for Type I and $G = 6 \times 6{\cdot}12 = 36{\cdot}7\%$ for Type II (at equal HS).

The aforementioned comparison of the seeding volumes has been based on *equal* heating surfaces for both types. As we will see later the flow resistance of the annular downtake is much greater than that of the central circular downtake.

To reduce this the value of y should be decreased and therefore it is of interest to see how the ratio $S = \frac{G_2}{G_1}$ alters with decreasing values of y at equal K values ($K_1 = K_2$).

In general $$S = \frac{\text{Seeding vol. Type II}}{\text{Seeding vol. Type I}} \times \frac{1 - x^2}{y^2}.$$

Taking $x = 0{\cdot}436$ and a typical $H = 1$ m, the following equation can be developed:

$$S = \frac{(1 - 0{\cdot}55y^2) - 0{\cdot}121\,(1 - y)\,D + 0{\cdot}426}{0{\cdot}695 + 0{\cdot}061\,D} \times \frac{0{\cdot}81}{y^2} \quad \ldots.(7)$$

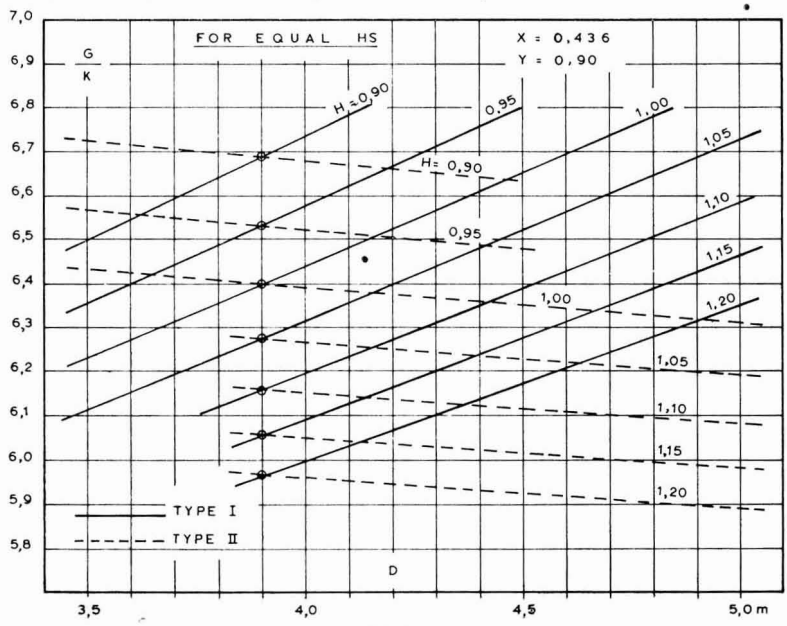

Fig. 2

This equation has been graphically reproduced in Fig. 3. The lower curve for $y = 0{\cdot}90$ gives the same values of S as we would find through the equations (5) and (6) or the diagram of Fig. 2.

The influence of H on the value of S is very small and does not affect at all the conclusions to be drawn from this diagram.

It is to be seen that S increases with decreasing values of y and for $y < 0{\cdot}87$ the seeding volume percentages G_2 for Type II are greater under all circumstances than those for Type I.

If S should be kept $< 1{\cdot}00$, then we should have to reduce K_2 accordingly, which would lead to a smaller HS for Type II resulting in a lower heating capacity.

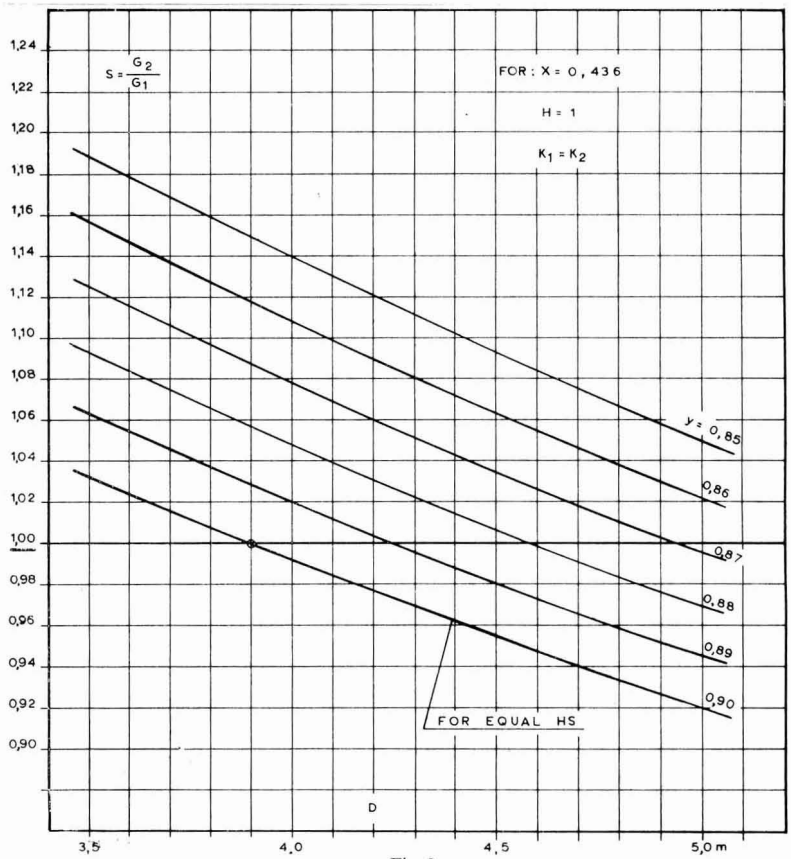

Fig. 3

(To be continued)

Correspondence

To the Editor, *The International Sugar Journal.*

Dear Sir,

Thin-Layer Chromatography of Sugar Acetates on Precoated Plastic Sheets

Sugar chemists are certainly aware of the broad potentialities of modern chromatography (*I.S.J.*, 1965, **66,** 46). Since many sugar acetates are crystalline and well-characterized, soluble in a wide range of solvents and often can be volatilized without decomposition, they have been utilized in column, paper, thin-layer and gas-liquid chromatography. A notable example is the vital rôle of acetate column chromatography in the chemical synthesis of sucrose (LEMIEUX & HUBER: *J. Amer. Chem. Soc.*, 1956, **78,** 4117). Now the quantitative analysis of complex mixtures of sugars has become feasible through the gas-liquid chromatography of their acetylated reduction products, namely sugar alcohol acetates (SAWARDEKER, SLONEKER & JEANES: *Anal. Chem.*, 1965, **37,** 1603). We have extended the thin-layer chromatography of sugar acetates (TATE & BISHOP: *Canad. J. Chem.*, 1962, **40,** 1043) from the conventional coated glass plates to polyester sheets precoated with silica gel, approx. 100 microns thick (produced by Eastman Kodak Co., Rochester, N.Y., U.S.A.). Equipment requirements were simple and minimal; only a glass jar with cover, pipettes, scissors and an atomizer were needed. Mixtures of benzene and 2-propanol were effective developers. Some typical separations of fully acetylated sugars achieved with 100:3 v/v benzene:2-propanol were as follows: arabinose from glucose, glucose from sucrose, sucrose from raffinose; fructose, sucrose, 1-kestose and nystose. Developing time ranged from 30 to 120 minutes. Spot locations were effected with water, 1-naphthol-phosphoric acid, *p*-anisidine hydrochloride and, after deacetylation, sodium metaperiodate-potassium permanganate. A simple and rapid technique has been found for the thin-layer chromatography of sugar acetates.

Yours faithfully,

W. W. BINKLEY, Chemist in Charge,

The New York Sugar Trade Laboratory Inc,

JUICE PRESERVATION DURING SHUTDOWNS

By J. DUPONT DE R. DE SAINT ANTOINE and E. C. VIGNES
(Mauritius Sugar Industry Research Institute, Réduit, Mauritius)

Paper presented to the 12th Congress, I.S.S.C.T., 1965.

PART I.

IT has long been recognized that clarified juice stored for a number of hours deteriorates to an extent which varies with the conditions of storage. In Mauritius, storage of clarified juice over the week-end shutdown is normal practice. The conditions under which this juice is stored, however, vary considerably from factory to factory, the only practice common to most factories being an increased addition of lime about 3 hours prior to shutdown to bring the pH of the clarified juice up to 7·3–7·5. A survey carried out in 1962 also revealed that in a few factories the temperature of the heated juice was slightly reduced to 90°C a few hours prior to closing down, whilst in others sodium carbonate was added either prior to or immediately following the shutdown. The amount of carbonate used was not large, averaging about 250 kg for a 300-ton capacity clarifier. In a few cases juice preservatives–"Caporit" or formalin–were added, but without great success, as the juice temperature was not simultaneously lowered. Finally in two factories it was the normal practice to add milk-of-lime to the clarified juice, either continuously during the shutdown period or after the pH had dropped to a certain value, and to recirculate this juice from the sump tank back to the flocculating chamber in the clarifier.

As a result of these different practices, purity drops from factory to factory varied between the limits of 1·5 and 10·0 points, averaging about 3·5 points for the industry as a whole. For a factory equipped with a 300-ton clarifier a purity drop of 3·5 points over the week-end is equivalent to a loss of about 2·7 tons of sugar. For a crushing period of 20 weeks the total loss incurred thus amounts to about Rs. 27,000 (about £2000). Yet it is known that this loss can be considerably reduced if proper control is exercised over the pH and especially over the temperature of the stored juice. Thus SPENCER and MEADE[1] report that juice limed to a pH of 7·6–8·3 can be kept for twenty-two hours at 160–180°F (71–82°C) without increase in acidity or inversion; the temperature, however, should not fall below 160°F (71°C) as otherwise bacterial action begins to develop.

Early in 1963 it was decided to study the problem of clarified juice deterioration, under local conditions, in the laboratory and on an industrial scale, with the object of making recommendations for reducing the financial losses suffered yearly by the industry. In the meantime two papers on the subject appeared in the *Proceedings* of the Queensland Society of Sugar Cane Technologists (1963). NOBLE[2] reported that "the best method of maintaining purity in clarified juice over a long storage period is by addition of 200 p.p.m. of formalin and careful control of the temperature of the juice within the range 150–165°F". On the other hand HENDERSON[3] concluded that "for best results the temperature must be reduced to at least 190°F but not fall below 160°F . . . At the same time the pH must not fall below 6·5. This is achieved by the addition of sodium carbonate at the rate of 1400 p.p.m. . . . If the temperature should fall below 160°F then the addition of formalin at the rate of 300 p.p.m. would prove beneficial."

While in Australia investigations centred around the use of sodium carbonate, caustic soda and formalin, it was decided to use lime, which in Mauritius is a cheap chemical, to increase the pH of the clarified juice and to compare the results obtained with those resulting from the use of the more expensive sodium carbonate. In preliminary laboratory experiments lime and sodium carbonate were therefore added to clarified juice in concentrations up to 1500 p.p.m. and the juices stored for 40 hours at temperatures of 192°F (98°C) and 180°F (82°C). These temperatures were strictly controlled thermostatically.

Laboratory results

The results obtained are shown graphically in Figs. 1 and 2. As may be observed from these graphs, the higher the temperature of storage, the more marked the purity drop, corresponding figures being

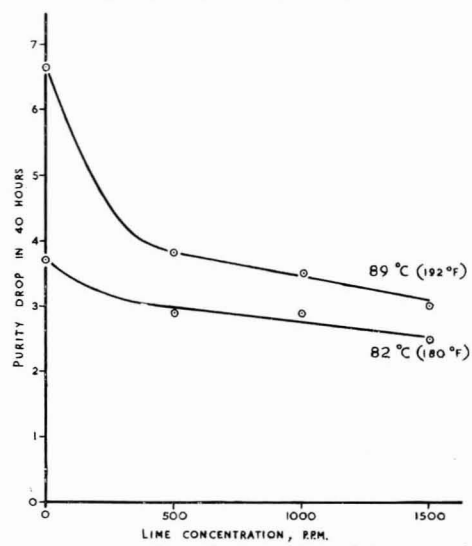

Fig. 1. Influence of large concentrations of lime on purity drop

[1] "Cane Sugar Handbook" 8th Edn. (Wiley, New York) 1945. Chap. 10.
[2] *Proc. 30th Conf. Queensland Soc. Sugar Cane Tech.*, 1963, 141–146; *I.S.J.*, 1964, **66**, 18.
[3] *ibid.*, 147–156; *I.S.J.*, 1964, **66**, 18.

6·7 units at 192°F and 3·7 units at 180°F. This situation was to be expected since there is ample evidence that at temperatures above 165°F (74°C) the extent of chemical decomposition increases with temperature[2,4].

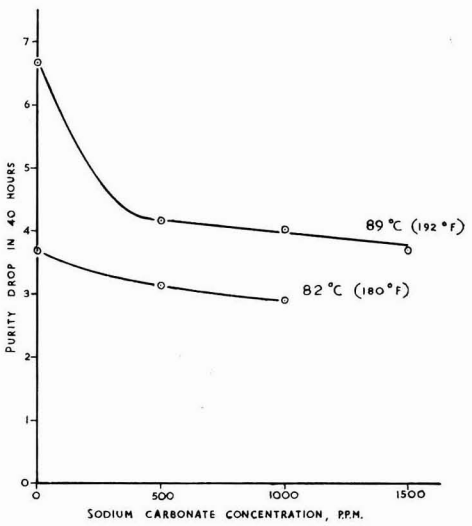

Fig. 2. Influence of large concentrations of sodium carbonate on purity drop

Another conclusion that may be drawn from the results is that the mere fact of raising the pH is sufficient to reduce the deterioration, the effect being more marked at higher temperatures. However, as evidenced by Figs. 1 and 2, temperature reduction is more effective than increased alkalinity. This is further substantiated in Fig. 3 which illustrates the influence of temperature on purity drop.

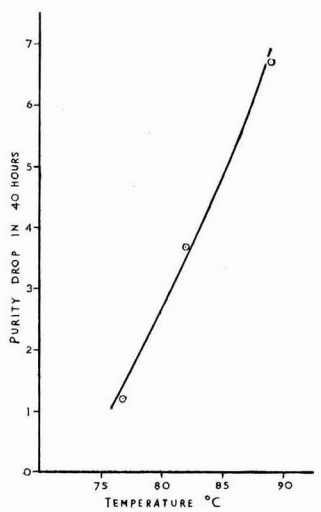

Fig. 3. Influence of temperature on purity drop

NOBLE[2] also found that the purity drop rose sharply as the pH of the juice fell below 7·2 at the end of the storage period. In contrast Fig. 4 shows that, with the juices obtained in Mauritius, the fall in pH is accompanied by a gradual drop in purity for a storage temperatur of 192°F (89°C).

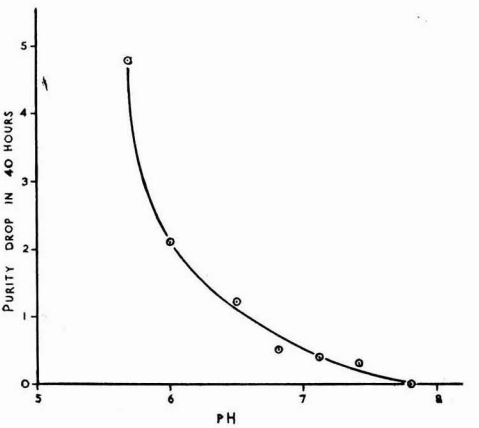

Fig. 4. Relationship between final pH and purity drop

It will also be observed from Figs. 1 and 2 that, for a given concentration, lime is slightly more effective than sodium carbonate for controlling deterioration. Further, the purity drops measured after the storage period of forty hours are still large even at the lower temperature of 180°F (82°C). This may be explained by the fact that when lime or sodium carbonate is added to clarified juices under the conditions prevailing in Mauritius and in concentrations within the range 500 to 1500 p.p.m. high alkalinities are generated and sugars destroyed. Table I below shows the influence of various additions of lime and sodium carbonate on the initial pH of clarified juice.

Table I

Effect of addition of lime and sodium carbonate on initial pH of clarified juice

p.p.m.	*Lime*	*Sodium Carbonate*
0	7·2	7·2
500	9·1	8·9
1000	9·4	10·3
1500	9·5	10·7

Since in practice it cannot be recommended to work at such high alkalinities because of the detrimental side effects likely to be produced, namely formation of acid decomposition products, increase in soluble lime salts and coloration of juices, and since the results obtained during the first series of tests were far from satisfactory, it was decided to carry out a new series of tests in the laboratory

[4] OWEN: "The microbiology of sugars, syrups and molasses." (Burgess Publishing Company.) 1949.

at much smaller alkali concentrations and for a storage period of 24 hours, which is almost the length of a normal week-end shutdown in Mauritius.

For the purpose of these tests, up to 150 p.p.m. of lime and 300 p.p.m. of sodium carbonate were added to clarified juice and the latter kept at 194°F (90°C) and 176°F (80°C) for 24 hours. In addition the effect of "Magox" was tested at the latter temperature. "Magox" is a grade of magnesium oxide prepared by burning magnesite ore to a moderately high reactivity. It neutralizes 1·8 times as much acid as lime. The manufacturers claim that it can be substituted for lime in juice clarification with beneficial results.

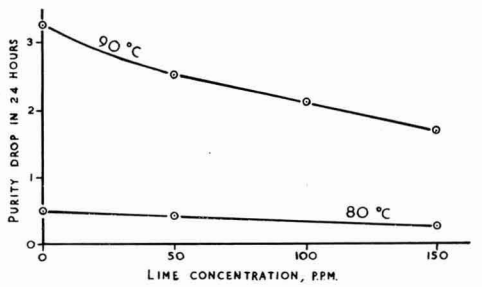

Fig. 5. Influence of small concentrations of lime on purity drop

All the data obtained are recorded in Table II and III and are expressed graphically in Fig. 5 to 13. Several interesting features, some of which had already been observed, became apparent on examining the new results, namely:

(*a*) Further evidence is obtained that the exent of chemical decomposition in the untreated juice is greater at the higher temperature as witnessed by the larger drop in purity: 3·2 units at 90°C, 0·5 units at 80°C.

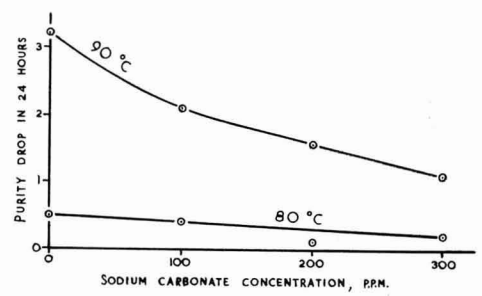

Fig.6. Influence of small concentrations of sodium carbonate on purity drop

(*b*) Whatever the temperature at which storage takes place, addition of lime or sodium carbonate reduces deterioration. As the initial pH values are increased, purity drops fall.

(*c*) It would appear that lime is almost twice as effective as sodium carbonate at the concentrations employed. For example 150 p.p.m. of lime or 300 p.p.m. of sodium carbonate reduce the purity drop to practically the same level after 24 hours (Figs. 5 and 6).

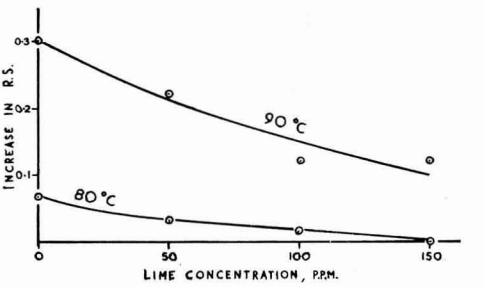

Fig. 7. Influence of small concentrations of lime on reducing sugars

(*d*) The findings outlined above are reflected in Figs. 7 and 8 which illustrate the increase in reducing sugars at the end of the storage period. To prevent

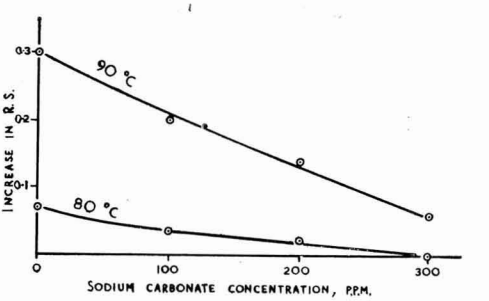

Fig. 8. Influence of small concentrations of sodium carbonate on reducing sugars

any increase in reducing sugars it is necessary to add 150 p.p.m. of lime or 300 p.p.m. of sodium carbonate provided the temperature is lowered to and maintained at 80°C.

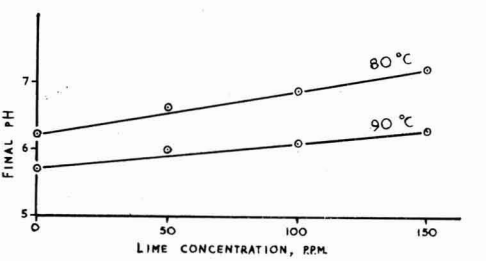

Fig. 9. Influence of small concentrations of lime on final pH

(*e*) It has been said that the most suitable method of control is to raise the pH sufficiently high that it does not fall below 7·0 before crushing starts again.[3] This aim is achieved in the present case by the addition of either 150 p.p.m. of lime or 300 p.p.m. of sodium carbonate and by maintaining the juice at 80°C (Figs. 9 and 10). However the use of these concentrations would raise the initial pH to about 8·5.

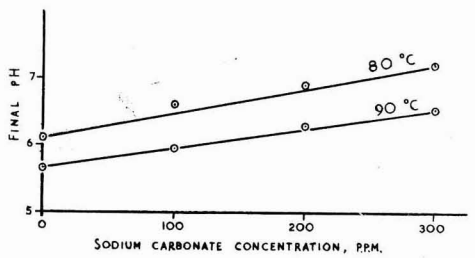

Fig. 10. Influence of small concentrations of sodium carbonate on final pH

(*f*) It would appear that the effect of "Magox" (Figs. 11 to 13) closely parallels that of lime (Figs. 5, 7 and 9) whether it is reduction in purity drop, increase in reducing sugars or final pH which is being considered. Since in Mauritius lime may be obtained cheaply while "Magox" is an expensive chemical which is not manufactured locally, it may be concluded that the use of "Magox" for the control of deterioration in clarifiers is not warranted under local conditions. The same reasoning applies to sodium carbonate.

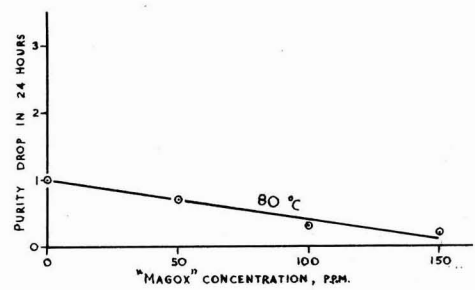

Fig. 11. Influence of small concentrations of "Magox" on purity drop

Fig. 12. Influence of small concentrations of "Magox" on reducing sugars

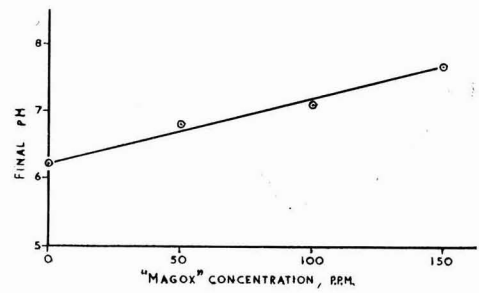

Fig. 13. Influence of small concentrations of "Magox" on final pH

Table II

Effect of addition of lime and sodium carbonate to clarified juice stored at 90°C for 24 hours

Agent	*Lime*				*Sodium carbonate*			
p.p.m.	0	50	100	150	0	100	200	300
Initial pH	7·0	8·0	8·4	8·6	7·0	7·9	8·3	8·6
Final pH	5·7	6·0	6·1	6·3	5·7	6·0	6·3	6·5
Drop in purity	3·2	2·5	2·1	1·7	3·2	2·1	1·6	1·1
Increase in R.S.	0·30	0·22	0·12	0·12	0·30	0·20	0·14	0·06

Table III

Effect of addition of lime, sodium carbonate and "Magox" to clarified juice stored at 80°C for 24 hours

Agent	*Lime*				*Sodium carbonate*				*"Magox"*			
p.p.m.	0	50	100	150	0	100	200	300	0	50	100	150
Initial pH	7·1	8·0	8·5	8·7	7·0	7·7	8·2	8·4	7·5	8·2	8·4	8·6
Final pH.....	6·2	6·6	6·9	7·2	6·1	6·6	6·9	7·2	6·2	6·8	7·1	7·7
Drop in purity	0·5	0·4	—	0·2	0·5	0·4	0·1	0·2	1·0	0·7	0·3	0·2
Increase in R.S.....	0·06	0·03	0·02	0·00	0·07	0·03	0·02	0·00	0·06	0·02	0·01	0·00

(*To be continued*)

Efficacy of "Telodrin", a new chlorinated hydrocarbon insecticide, against some sugar cane pests. A. N. KALRA *et al. Indian Sugarcane J.*, 1964, **9,** (1), 23–26. The need for a chemical that would be effective both as a soil insecticide and as a foliar spray is emphasized. This claim has been made for "Telodrin". The results of a comprehensive series of tests comparing it with other established insecticides are given.

* * *

New virulent strain of *Glomerella tucumanensis*. K. KAR *et al. Indian Sugarcane J.*, 1964, **9,** (1), 27–31.—The damage caused by a more virulent strain of sugar cane red rot in North India is referred to, varieties formerly resistant having succumbed to it. A detailed description of this strain, called R.135, based on laboratory cultures, is given.

* * *

Effects of nitrogen, phosphate and potash on the yield and quality of gur. G. N. MISRA *et al. Indian Sugarcane J.*, 1964, **9,** (1), 32–39.—The results of 3 years' work at the Shahjahanpur Research Station are given. N increased the yield of gur per acre but quality (as judged by pol, purity, invert sugar, colour and moisture) was adversely affected. The effects of P and K were not conspicuous.

* * *

Herbicides in sugar beet. G. W. CUSSANS. *Brit. Sugar Beet Rev.*, 1965, **33,** 127–128.—The last two years have witnessed an increase in knowledge of the way herbicides act. The herbicides used with the sugar beet crop are discussed under 3 headings—contact pre-emergence treatments; soil-acting herbicides (for control of wild oats); soil-acting herbicides (for general weed control).

* * *

Insecticides for control of beet pests: review of the current position. R. A. DUNNING. *Brit. Sugar Beet Rev.*, 1965, **33,** 129–130, 135–136.—Statistics show that the area of beet treated with insecticides in Britain may vary from 100,000 acres to 390,000 acres in successive years, depending on the prevalence of aphids. The control of aphids is discussed under 3 headings—(a) sprays, (b) granules and (c) seed dressings. Regarding insecticides for the control of pests other than aphids it is pointed out the Ministry of Agriculture has restricted the use of "Aldrin", "Dieldrin", and "Heptachlor", limiting their use as seed dressings by seed merchants.

* * *

Weed control in sugar beets. W. F. MEGGITT. *Sugar Beet J.*, 1965, **28,** (3), 10–11.—"Pyramin" plus TCA has been the most effective herbicide treatment evaluated in the last 2 years, the rate of "Pyramin" recommended being 4 lb per acre in combination with 6 or 8 lb of TCA applied as a pre-emergence treatment. "Pyramin" is particularly effective against lambsquarter (*Atriplex patula*), the worst annual weed with sugar beet.

* * *

Exterminate those rats. ANON. *Victorias Milling Co. Expt. Sta. Bull.*, 1964, **12,** (1), 5.—Attention is drawn to the severity of the rat problem in Philippine sugar cane fields and the need to exercise more control. "Warfarin" and thallium sulphate, used alternately, are the poisons recommended. Details of approved methods of baiting are given.

* * *

Recent developments in weed control in sugar beets. R. FRANK. *Up and Down the Rows* (Canada & Dominion Sugar Co. Ltd.), 1965, (137), 1–3.—A combination of "Pyramin" plus TCA, applied as a band over the row at planting time and combined with inter-row cultivation, is considered the most practical approach to weed controls in south western Ontario. This mixture controls the majority of the weed species present. Three weeds (lambsquarters, pigweed and foxtail) account for 67% of the weed population. Details of setting up a planter for band application are given.

* * *

Weed control in sugar beets by application of "Pyramin". H. LÜDECKE and L. SIPOS. *Zucker*, 1965, **18,** 14–18.—Results are given of field trials with "Pyramin" used both as a pre- and post-emergence weed killer. These were satisfactory.

* * *

The influence of some herbicides on the emergence and juvenile development of sugar beet. H. W. STRICKER. *Zucker*, 1965, **18,** 59–64.—In pot experiments the effect of applying various herbicides, applied direct to the seeds, was tested, viz. : "Alipur" (OMU-BiPC), "Pyramin" (PCA) and "Stentan" (Triazin-Propham). The effect of degree of moisture present was also studied. Application of 4 kg/ha of "Pyramin" was the rate recommended.

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Report on ten year sugar beet variety trials. E. KNAPP and R. LICHTER. *Zucker*, 1965, **18,** 121–124.—Reference is made to trials carried out in southern Germany. Tables summarize the more important results and graphs are used to show sugar yield and sugar content. The progress resulting from the use of modern seed (polyploid) is clearly shown.

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Weeds in association with sugar cane. F. T. AALA. *Sugar News*, 1965, **41,** (1), 17–22.—Information is given on about 20 Philippine cane field weeds with notes on their control.

The seed-bed and germination in sugar beet. F. ADER. *Zucker*, 1965, **18,** 143–150.—An account is given of germination trials in western Germany using sands of different degrees of coarseness as germinating medium. The fine grained quartz sands gave the highest germination results and were more moist.

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A mammoth tandem. G. S. BARTLETT. *S. African Sugar J.*, 1965, **49,** 115–117.—Tractor-drawn trailers are considered to represent the most economical form of cane transport, where conditions are favourable. The call for bigger payloads has resulted in a locally designed and produced 25-ton tandem for cane, which is described and illustrated. Special attention was given to the question of brakes and braking.

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Cane borer control. ANON. *Sugar y Azúcar*, 1965, **60,** (3), 43.—Details are given of the life cycle and kinds of damage caused by the borer, *Diatraea saccharalis*. The recognized borer control techniques, as practised in Louisiana, are discussed. "Endrin"-resistant populations may be controlled with "Guthion" or "Sevin".

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Ratoon failure problem. ANON. *Producers' Rev.*, 1965, **55,** (3), 81.—Investigation has shown that a common cause of ratoon failure is attack by soldier fly larvae. This may be countered by incorporating crude BHC dust in the soil. A bulletin on soldier fly is in the printer's hands and will be sent to growers in areas where damage is likely to occur.

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Chopped-up cane deterioration. ANON. *Producers' Rev.*, 1965, **55,** (3), 89.—Investigations on this difficult bacterial problem in Queensland are now in their third year. "One trouble was that in machine cutting there was some pinching and when the fibres opened again the *Leuconostoc* spores entered and it was then very difficult to get at them with germicides which were applied at the end of the billet. That was why certain antibiotics were being tried".

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Facts about Co 658. ANON. *Sugar Cane Varieties Quarterly Newsletter* (Coimbatore), 1965, **11,** 8–10. This variety is making its mark in Madras State as an outstandingly rich and early cane with a good yield. It is a cross between Co 443 and Co 605 (released in 1947) and is well suited for sandy loam soils. It is also doing well in other parts of India.

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Importation of sugar cane and quarantine. ANON. *Cahiers d'Agric. Pratique des Pays Chauds*, 1965, **1,** 29–32, [Supplement to *L'Agronomie Tropicale*, 1965, **20,** (1)].—The danger of indiscriminate importation of sugar cane planting material by those African countries desirous of becoming rapidly self-supporting in sugar is stressed. Without quarantine measures the risk of introducing serious pests and diseases is considerable.

Botanical and agricultural characters of sugar cane varieties of Mauritius. E. ROCHECOUSTE. *Mauritius Sugar Ind. Res. Inst. Occ. Paper*, 1964, (18), 18 pp. This is the second of a series of papers describing the botanical and agricultural characters of commercial sugar cane varieties raised in Mauritius. It deals with M 202/46, M 93/48, M 253/48 and Ebène 50/47.

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Enzymes in sugar cane. A. G. ALEXANDER. *J. Agric.* (Univ. Puerto Rico), 1965, **49,** (1), 1–75.—Three papers on enzymes in sugar cane, giving an account of the author's recent work, are presented. They are: "Changes in leaf-sugar content and enzyme activity of immature sugar cane following foliar application of indole-3-acetic acid, 2,4-dichlorophenoxyacetic acid, and maleic hydrazide", "Physiological studies of enzymes catalysing the synthesis and hydrolysis of sucrose, starch and phosphorylated hexose in sugar cane", and "Induction of varying sugar levels in leaves of sugar cane by use of acid phosphatase inhibitors."

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The handling of sugar cane trash in the humid areas of Puerto Rico. G. SAMUELS *et al. J. Agric.* (Univ. Puerto Rico), 1965, **49,** (1), 76–87.—The results of experiments on 17 consecutive crops are discussed, these being on the basis of trash burned, trash buried, and trash aligned (in alternate rows). Where trash was burned yields were significantly lower than where trash was aligned but this did not become evident until the 7th ratoon. Burying the trash gave results intermediate between burning and aligning. The different treatments did not affect sucrose content.

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Sex-attractant and mating behaviour of the sugar cane moth borer. R. P. PÉREZ. *Bull. Agric. Expt. Sta.* (Univ. Puerto Rico), 1964, (188), 28 pp.—Sticky traps baited with virgin female sugar cane borer moths or with solvent extracts of female abdomens, were used to trap male moths in the field. Benzene and methylene chloride were found to be the most effective solvents. The attractive substance was highly volatile. Females produced it mainly during the first 3 days of life and not after mating.

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Phil. 54-60 continues to excel in yield. ANON. *Victorias Milling Co. Expt. Sta. Bull.*, 1965, **12,** (2/3), 3.—The good performance of this variety is described. It produced the highest sugar yields in 4 tests and gave the best juice quality in 3 out of 4 tests.

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Monogerm seed and precision drills in Holland. ANON. *British Sugar Beet Rev.*, 1965, **33,** 169–171. An account is given of the up-to-date methods employed by the Dutch growers in the newly reclaimed lands that were once the Zuider Zee.

Trials of commercial varieties of sugar beet. L. A. WILLEY. *British Sugar Beet Rev.*, 1965, **33,** 173–178. An account is given of 18 commercial variety trials carried out in 1964, 14 different varieties being involved. There are tables showing number and yield of roots, percentage of sugar, purity of juice and percentage of bolters at harvest.

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Weed control in sugar beet in Scotland. D. S. C. ERSKINE. *British Sugar Beet Rev.*, 1965, **33,** 179–183. This article aims at helping sugar beet growers in the Cupar sugar factory area, and it is hoped in other areas, to select suitable chemical weedkillers and employ them to the greatest advantage. Most of the advice given has resulted from experiments carried out in co-operation with the agricultural staff of the Cupar factory.

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Sugar cane insect control. J. A. COX. *Sugar Bull.*, 1965, **43,** 204–205.—The sugar cane borer (*Diatraea saccharalis*) is regarded as Louisiana's worst pest. Methods of control are discussed. Recommended insecticides formulated on 30/60 mesh clay granules, which are recommended (at the rate of 15 lb/acre) are—"Endrin" 2%; "Guthion" 7%; "Sevin" 20% and "Thiodan" 3%. Borers resistant to "Endrin" and "Thiodan" may be controlled with "Guthion" or "Sevin". Reasons why timing of applications is important are given.

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N:Co 310—a second wonder cane. C. G. HUGHES. *Cane Growers' Quarterly Bull.*, 1965, **28,** 112–113. This variety succeeded POJ 2878 as the wonder cane in Queensland. Other countries where it is important are indicated. In recent years the total area planted has exceeded half a million acres.

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A unique method of land levelling. J. WRIGHT. *Cane Growers' Quarterly Bull.*, 1965, **28,** 121–122.—Cane growers in the lower Burdekin area of Queensland rely heavily on furrow irrigation, a prerequisite of which is a uniform land gradient. The methods now employed, keeping the top soil separate and utilizing very heavy equipment, are described.

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A revised approach to chlorotic streak. O. W. STURGESS. *Cane Growers' Quarterly Bull.*, 1965, **28,** 135–137.—The results of 6 years of research on this disease are outlined. Control measures are discussed. The known survival of the disease for long periods in the soil presents a difficult problem. The rôle of water in spreading the disease stresses the importance of drainage in any system of field control.

Fiji disease in the Rocky Point area. D. R. L. STEINDL. *Cane Growers' Quarterly Bull.*, 1965, **28,** 138–139.—A recent increase of infection is discussed. It is considered to be due to increased planting of the susceptible variety Q 71 and to inadequate inspections resulting from a false sense of security created by the apparent absence of the disease during the last few years. All the disease found was on ratoon cane.

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Preserving and mounting of sugar cane disease specimens. C. A. WISMER and B. P. HUTCHINSON. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 11 pp. Preliminary studies in preserving and mounting specimens are reported as well as a method of pretreating diseased material for convenient shipment from one country to another. A method of mounting sugar cane disease specimens in plastic blocks is described.

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A study of declining sucrose yields in Puerto Rico. K. SHOJI and G. SAMUELS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 9 pp.—The sucrose content of sugar cane has dropped alarmingly since 1958. Among factors concerned unsuitable weather and trash mixed with harvested cane are given prominence.

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Disease reactions by observation. C. G. HUGHES. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 4 pp.—This is a general discussion on the testing of varieties for resistance to disease and of the disease resistance trials carried out in Queensland.

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The rhizosphere of sugar cane. II. Preliminary isolations of fungi from an uncultivated, heavy clay soil and from similar soil in which sugar cane is being cultivated. J. T. MILLS and A. J. VLITOS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 11 pp. The root area of first ratoons, 84 days after harvesting plant cane, contained a third to a half of the genera of fungi in fallow soil. The fungal genera of the root area of young ratoons were generally those which utilize sugar substrates more readily than cellulose, while in fallow soil the cellulose-utilizing species were more abundant.

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Variety testing procedures at Central Romana. C. W. LINGERFELT *et al. Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 12 pp.—The Central Romana sugar cane area in Puerto Rico covers close on 1000 square miles with a wide range of climatic and soil conditions. For varietal selection purposes it has been divided into 9 zones. An account is given of final variety trials which are dispersed throughout these zones.

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Strip-tilling for sugar cane cultivation. R. G. MENON. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 12 pp.—The normal shallow ploughing, 15–20 cm deep, is compared with strip tilling (20 cm wide) to a depth of 50 cm.

Row spacing experiments with sugar cane in Louisiana. L. P. HEBERT *et al. Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 18 pp.—Row spacing in Louisiana is probably wider than in any other part of the world and may have arisen among farmers to facilitate weeding with implements. Results of row spacing tests, with rows 3⅝–6 feet apart, are given. It is concluded that rows spaced less than 5 feet apart are not economically profitable with the cane varieties now grown in Louisiana.

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In vitro effects of "Diuron" upon enzymes catalyzing the synthesis and hydrolysis of sucrose, starch and phosphorylated hexose in sugar cane. A. G. ALEXANDER. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 10 pp.—A series of sugar cane enzymes were assayed in the presence of variable "Diuron" concentrations. Some were unaffected, others stimulated. Sucrose synthesis was severely curtailed by even small amounts of "Diuron".

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A sour storage rot of mechanically harvested chopped up sugar cane. B. T. EGAN. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 8 pp.—This trouble, due to bacteria and encountered in Queensland in recent years with cut-up cane stored over the week-end, is fully described.

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Diseases of sugar cane in Puerto Rico. L. LIU *et al. Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 7 pp.—This paper reports the principal diseases observed in variety-regional tests and their present status. The major diseases described are mosaic (probably the most important), chlorotic streak, brown stripe (*Cochliobolus stenospilus*) and ratoon stunting disease. Reference is made to ten minor diseases.

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Sugar cane diseases in Réunion island. M. HOARAU. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 10 pp.—This is a general account of the present disease position with sugar cane in Réunion where cane has been cultivated for approximately 150 years. Some 21 diseases have been recorded, 4 being of major importance—gumming, ratoon stunting, chlorotic streak and leaf scald.

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A note on a simple technique for the isolation of sugar cane stalks for crossing purposes and for other investigational purposes. H. EVANS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 4 pp.—This technique is a modification of that developed in Hawaii for preserving cane arrows and well known to sugar cane breeders. The proprietary organo-mercurial compound "Aretan" is used as a pre-rooting stimulant and a water marcot (of polyethylene tubing) to provide additional water or nutriment.

Tissue and cell culture for sugar cane research. L. G. NICKELL. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 7 pp.—Modern tissue and cell culture techniques as applied to sugar cane are described. The author (from Hawaii) lists 14 possible major areas of research in connexion with sugar cane where these techniques might be applied.

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Refining sugar cane breeding methods to increase yields. J. DANIELS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 21 pp.—The author discusses four ways whereby, in his view, the problem of increasing yields might be tackled. These include better use of wild germ plasm, broadening the genetic base, utilizing recent findings in cytogenetics and re-creating a pathway of evolution in *Saccharum*.

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Diseases of sugar cane and their control at Central Romana. L. LIU *et al. Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 12 pp.—The purpose of this paper is to report on the principal diseases at Central Romana (Dominican Republic) and their distribution, and on methods employed in controlling them. The three principal diseases are mosaic, ratoon stunting disease and brown stripe.

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Notes on variations in Co 421 derivatives. C. N. BABU. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 3 pp.—This is a brief account of the breeding behaviour and chromosome make-up of the variety Co 421 and its derivatives or offspring.

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Correlation between Brix in juice and fibre in commercial hybrid sugar cane populations. A. H. D. BROWN. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 12 pp.—The variety testing scheme in Fiji is discussed, where rigid limits are imposed for fibre with varieties for commercial use. Fibre too low means extraneous fuel for processing and a high fibre content entails a lower ratio of sugar produced.

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Breeding behaviour of resistance to mosaic in sugar cane progenies and its association with some agronomic characteristics. R. D. BREAUX and H. P. FANGUY. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 18 pp.—The background of mosaic disease in Louisiana is discussed, also the resistance behaviour of various crosses to four strains of the mosaic virus (strains A, B, D and H). The degree of mosaic resistance exhibited by the progeny was dependent upon the resistance of the parent varieties.

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Deterioration of varieties after cutting. A. W. TURNER. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 10 pp.—The rates of deterioration during a period of 16 days after cutting of several commercial sugar cane varieties grown in Mexico are discussed.

The taxonomic significance of morphological characters and physiological studies in *Saccharum*. T. A. BULL. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 12 pp.—This paper reports on a study of vegetative morphology within the species *Saccharum spontaneum*, *S. robustum* and *S. officinarum* and a survey of their growth under different temperature régimes. Some of the enzymes thought to be important in sugar storage were also investigated.

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Chemical ripening of sugar cane: a review of field studies carried out in Trinidad over a five-year period. A. J. VLITOS and I. D. LAWRIE. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 20 pp.—Desiccants, defoliants and plant growth regulators are all considered potential ripeners of sugar cane. About a dozen products were tried, the most promising being "Pesco 1815" (TBA + MCPA) at 4 gal/acre, a highly refined petroleum oil ("Sucrol") and monopotassium phosphate, at 50 lb/acre.

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Tissue diagnostic analyses and their interpretation in sugar cane. H. EVANS. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 36 pp.—This lengthy paper is a review of the main techniques of tissue diagnosis in sugar cane. The foliar diagnostic technique is considered particularly suitable for sugar cane crops reaped annually, provided samples are not taken under conditions of moisture stress.

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Production of true seed of sugar cane in Louisiana. ST. J. P. CHILTON *et al. Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 3 pp.—The results of work on the induction of flowering in sugar cane during the last decade are summarized. In Louisiana a satisfactory breeding programme can be initiated by the use of controlled day-length for flowering and of greenhouse temperatures for pollen and seed production.

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Investigations on earth pearls in Queensland cane fields. B. E. HITCHCOCK. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 8 pp.—This is an account of investigations initiated with a view to determining the life history and pest status of earth pearls in Queensland. Four species of earth pearl (*Margarodidae-Homoptera*) are known to feed on the roots of sugar cane in that country.

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The effects of row spacing on sugar cane crops in Natal. G. D. THOMPSON and J. L. DU TOIT. *Paper presented to the 12th Congr. I.S.S.C.T.*, 1965, 10 pp. A comprehensive series of row spacing experiments indicated that under normal field conditions in Natal the tendency is for higher yields of sugar cane to be obtained at closer spacings than $4\frac{1}{2}$ ft between rows. With very close spacing soil moisture may be inadequate in some seasons.

Beet pseudo-yellows virus, transmitted by the greenhouse whitefly. J. E. DUFFUS. *Phytopathology*, 1965, **55,** 450–453.—An account is given of a previously undescribed yellowing disease of sugar beet and of other economic plants and weeds. The common greenhouse whitefly (*Triuleurodes vavorariorum*) can transmit the virus.

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Transmission of sugar cane mosaic virus by *Myzus persicae*. L. ANZALONE and T. P. PIRONE. *Pl. Dis. Reptr.*, 1964, **48,** 984–985; through *Rev. Appl. Mycol.*, 1965, **44,** 227.—This aphid acquired the virus from infected sorghum in 40–80 sec probes and transmitted it to sorghum during 2–6 hr feeding, indicating that it was stylet-borne. Transmission ranged from 12·5% with 1 aphid plant to 50% with 5.

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Beet cultivation without manual labour. E. STROOKER. *Landbouwmechanisatie*, 1964, **15,** (5), 437–441; through *Field Crop Abs.*, 1965, **18,** 107.—An account is given of machine-thinning trials with sugar beet in the Wieringermeer polder (Holland). Yield obtained depended on the beet population; within the range 56,000–100,000 plants/ha root yield increased by 2·5 tons/ha for each additional 10,000 plants/ha.

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Sugar beet yellows. H. R. KRISTENSEN *et al. Tidsskr. Planteavl.*, 1964, **68,** (2), 209–263; through *Field Crop Abs.*, 1965, **18,** 108.—An account is given of spraying trials against the virus yellows vector at eleven sites in Denmark with "Metasystox" and "Parathion". In 1958 and 1960 only about 33% of the treatments were economical whereas in the other two years, when infection was more severe, more than 50% were economical. Applying insecticides more than twice during the growing season was usually unprofitable. A spray warning device is needed.

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Topical questions on pest and weed control in sugar beet. C. WINNER. *Landtechnik*, 1964, **19,** (1–2), 20–25; through *Weed Abs.*, 1965, **14,** (1), 6–7. This is a review of current practice in the chemical control of weeds in sugar beet, in which nozzle and pump design and factors involved in obtaining a uniform distribution of spray applied overall or in bands over the rows are among the items discussed.

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Mechanization in sugar beet cultivation. W. BRINKMANN. *Landtechnik*, 1964, **19,** (1/2), 10–19; through *Weed Abs.*, 1965, **14,** (1), 7.—Several types of mid- and front-mounted inter-row cultivators in current use are discussed, as are the economic advantages in cultivating overall with drag or spring-tine harrows as an alternative to controlling weeds with chemicals during early stages of crop growth.

The influence of "Dalapon" on growth and development of autumn sown sugar beet. S.J. ELLERN and A.MARANI. *Weed Res.*, 1964, **4,** (3), 223–238; through *Weed Abs.*, 1965, **14,** (1), 7.—Results of field trials in Southern Israel indicate that "Dalapon", at rates of less than 4·5 kg/ha applied between mid-November and mid-January, is a safe treatment for October sown sugar beet in conditions where grass weeds predominate. Higher rates inhibited growth and had a toxic effect on the beet.

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Chemical weed control in sugar beet: comparative trial with "Endothal" and "Tillam". C. COZZANI, U. MANTAUT and F. MUSSI. *Notiz. Mal. Piante*, 1964, **68,** 45–52; through *Weed Abs.*, 1965, **14,** (1), 7.—In Italy "Endothal" (19·2%) at 20 kg in 6 hl spray/ha applied in March just before sowing and lightly incorporated by harrowing gave good control of broad-leaved weeds and *Setaria viridis* during 3 months. It was rather more effective than "Tillam" (PEBC 76·8%) at 10 kg/ha.

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The effect of foliar fertilizing on yield and technological quality of different varieties of sugar beet. E. SOMMER. *Albrecht-Thaer-Arch.* (Germany), 1964, **8,** 724–728; through *Soils and Fertilizers*, 1965, **28,** 298.—Foliar application of K and P caused insignificant differences in sugar yield except in the case of the variety "Plenta".

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Mineralizable soil nitrogen in relation to fertilizer needs of sugar cane in Hawaii. G. STANFORD, A. S. AYRES and M. DOI. *Soil Sci.*, 1965, **99,** (2), 132–137; through *Biol. Abs.* 1965, **46,** 4012.—An account is given of 15 field experiments involving varying N application rates and different sugar cane varieties which were conducted co-operatively with 7 irrigated plantations. Total N uptake was determined at various ages in 11 of the experiments. Basic considerations involved in predicting N fertilizer application are discussed.

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Improved inoculation method for testing sugar cane varieties for resistance against wilt disease. A. GANGULY and T. N. JHA. *Sci. and Cult.*, 1964, **30,** (9), 456–458; through *Rev. Appl. Mycol.*, 1965, **44,** 309.—The "open hole method" proved to be the best of 8 different inoculation methods tested. A composite culture of 3 strains of the fungus (*Cephalosporium sacchari*) is inserted into holes made in the internodal regions of cane setts, which are then kept in a moist chamber for 24 hours before planting in sandy loam soil, the holes remaining open.

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Some physiological studies on sugar cane smut (*Ustilago scitaminea*). P. APPALANARASAYYA. *Indian Phytopathology*, 1964, **17,** 284–286.—This relates to spore germination under varying temperature conditions, spores having proved difficult to germinate under laboratory conditions in Delhi. The optimum temperature was found to be 25°C. Various sugars, at concentrations of 0·5, 1, and 1·5%, increased germination.

Mutation in *Colletotrichum falcatum*, the causal organism of red rot of sugar cane. IV. Morphological and biochemical mutants induced by ionizing radiation. B. S. BAJAJ *et al. Indian Phytopathology*, 1964, **17,** 296–303.—Morphological and biochemical mutants induced by ionizing radiation. Different kinds of ionizing radiations were used, e.g. beta particles from ^{32}P, gamma rays from ^{60}Co and radon gas, X-rays and fast neutrons. A number of mutations were induced.

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Sugar cane weeds in Madagascar. E. ROCHECOUSTE. *Agronomie Tropicale*, 1965, **20,** 262–264.—This is a brief account of observations made by the author, (botanist at the Mauritius Sugar Industry Research Institute) on a visit to Madagascar to study weed problems in cane fields.

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Sugar beet variety trials in Belgium, 1960–64. N. ROUSSEL. *Publ. Tech. Inst. Belge pour Amél. Betterave*, 1964, (4), 213–234.—The results of variety trials are summarized in a series of tables. The trials were carried out on an anonymous basis, each variety being given a number.

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400 years of sugar cane in Tucumán. ANON. *La Ind. Azuc.*, 1965, **71,** (858), 145.—The early introduction of sugar cane in the 16th century is summarized in the light of recent historical research.

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Alternatives in weed control. C. G. AURELIO, *Sugar News*, 1965, **41,** 194–200.—An account is given of trials with various weedkillers in cane fields in the Philippines, the reaction of 7 bad weeds being individually recorded. The weedkillers tested were: "Fernac", 2,4-D ester, "Genasprim" and "Karmex", the last two proving more efficient than the first two but expensive on a cost basis. Inadequate soil moisture had a very adverse effect. At present the chances of chemical weedkillers wholly replacing hand weeding in the Philippines seem small.

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Some special problems in mechanization in the South African sugar industry. ANON. *Australian Sugar J.*, 1965, **57,** 129–133.—Factors impeding field mechanization include: (*a*) hilly nature of much of the cane land, (*b*) the practice of trash blanketing to retain soil moisture and prevent soil erosion and (*c*) the cost of introducing new techniques to facilitate mechanization.

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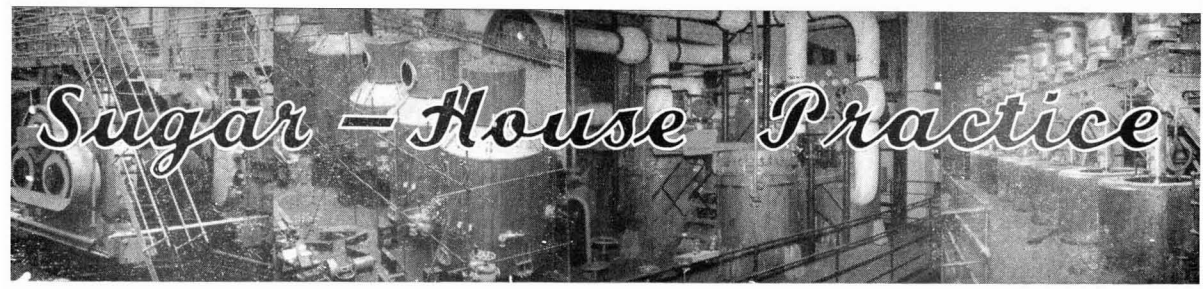
Mangrove swamp land for cane. ANON. *Australian Sugar J.*, 1965, **57,** 197.—Reference is made to the fact that the Colonial Sugar Refining Co. Ltd. has purchased 2000 acres of mangrove swamp land, across the inlet from the Cairns wharves, with the idea of reclaiming it for sugar cane cultivation. A sea wall will be built. A similar operation has been carried out in Fiji.



Thoughts on future developments in vacuum pan design. A. G. SKYRING. *Proc. 32nd Conf. Queensland Soc. Sugar Cane Tech.*, 1965, 231–236.—A batch vacuum pan design is described in which a circular girder, which can be raised or lowered by means of a screw mechanism, carries a set of inter-connected pairs of thin tubes fitted with pistons at their lower ends, these pistons fitting inside the heating tubes which rise from the bottom tube plate, short-circuiting and thus altering the heating level in the pan. Surrounding the tubes is a cylindrical sleeve in the form of five telescopic sections which extend to match the height of the heating level. The massecuite is forced to follow a desired path up through the heater and down the outside of the sleeve, and the height of the latter, approx. 6 inches below the massecuite surface, ensures that there is no large free body of massecuite with consequent eddy currents, false grain formation, etc.

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Some practical notes on filtration by the "Rapifloc" process. L. LINCOLN. *Rev. Agric. Sucr.* (Mauritius), 1965, **44**, 37–43.—Process data from three campaigns at Médine sugar factory with "Rapifloc" mud filtration showed a 20% increase in continuous clarifier capacity, a 40–50% increase in filter capacity, and a reduction in the maintenance costs of the brass screens. The treated juice can be sent direct to the evaporator. An additional 555–560 g of sugar per ton of cane can be recovered using the process compared with 765 g of sugar per ton with conventional Dorr-Oliver filters. Details are given of the economics of the system.

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Mutual Milling Control Project. Progress report No. 3. E. J. BUCHANAN, K. DOUWES-DEKKER and A. VAN HENGEL. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 43–56.—Milling data obtained from Natal sugar factories participating in the project for the 1963/64 season are presented and discussed. The average cane feed rate per unit volume of rollers was 10% higher than in the previous season without any significant increase in juice losses. The results confirm the trends indicated in the second progress report[1]: the higher performances were achieved where the milling tandems were preceded by a shredder following directly after two knives. A 1st mill preceded only by two knives gave the lowest performance. Higher pressures and lower speeds contribute to high 1st mill efficiency, indicating the advantage of using gravity chutes and pressure feeders. The following formula is valid for calculation of mill settings in Natal: $K = \frac{167 \times C \times f}{n \times D \times L \times F}$, where K = work opening (in), C = t.c.h., f = fractional fibre content of cane, n = r.p.m. of top roller, D = roller diameter (in), L = roller length (in) and F = target fractional fibre content of bagasse. There is no indication that high imbibition rates contribute towards overall efficiency, but on the contrary they may adversely affect the purity of expressed juice.

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Some aspects of the design of modern piping systems. R. N. NEVIN. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 61–65.—Some aspects of steam and boiler feed water piping system design are discussed, the author emphasizing the need for proper designing in order to minimize shut-downs and avoid damage to equipment, especially with the use of higher pressures and temperatures than in past years.

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Sugar mill drives. D. L. HUGHES. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 66–73.—A brief survey is presented of constant- and variable-speed electric drives as used in the sugar factory, and particular attention is paid to the limited-range variable-speed drive used for cane mills. The characteristics of the A.C.-D.C. cascade drive are described and its performance and costs compared with those of a steam turbine of the same h.p. rating. While overall costs are basically the same for both types, it is claimed that the electric drive costs can be reduced by installing a system having a more realistic h.p. rating. The main disadvantage of the steam turbine is considered to be its efficiency drop when operating at a speed other than that for which it is designed, since it is basically a constant-speed drive.

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Comparison of various electrical drives suitable for cane-crushing mills. A. GRADENER. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 74–81.—The operational characteristics of various electric drives for cane mills are described and their torques, capital costs and efficiencies compared. The most suitable drives in the power range up to 500 kW are considered to be the A.C.-D.C. cascade, A.C.-D.C.-A.C. cascade, the Ward Leonard set and a D.C. motor with silicon rectifier. For cane mills requiring larger motors (up to 800 kW) the cascade drives are considered the most suitable. In a subsequent discussion of the paper, opinions are expressed concerning the relative costs of electric and steam turbine drives (the former considered more expensive when increased alternator capacity is taken into account), while also mentioned is the question of varying loads. While the cascade system is shown to be capable of tolerating varying loads under varying speed conditions, it is also felt

[1] *I.S.J.*, 1964, **66**, 325.

that robust drives which, when run slowly, will place a considerable overload on the gears may involve replacement of the gears after a comparatively short time, e.g. two years.

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Some notes on gums in a defecation raw sugar factory. P. N. BOYES and M. WILSON. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 82–86, 92–96.—A study of the gum content of final molasses from three seasons showed that either the gums do not affect boiling as much as had been assumed or that incomplete exhaustion in the boiling-house obscured the effect of the gums. Of the filtrability-impeding substances in *A*, *B* and *C* sugars, the gums are considered to have considerable effect on filtrability, since an increase in gums from *A* to *C* sugars was accompanied by a decrease in filtrability. (The standard affination procedure was found to remove significant quantities of all impurities except waxes, which, it is suggested, are more evenly distributed throughout the sugar crystal.) It was found that defecation removed only 35–53% of the gums and that the "apparent" gum content increased throughout the process, giving a sugar gum content of 0·21–0·27% by weight and a molasses gum content of 4·05–4·89% by weight. It is suggested that the apparent increase in gum content could be due to further chemical reaction of the gum components or to defects in the acidified alcohol precipitation technique used for gum analysis.

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Improving sugar quality at Illovo. R. POLE. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 97–101.—A number of different methods used for boiling remelt sugar from *A* sugar melt are briefly described. Filtrability of the remelt sugar ranged from 17% to 300% better than that of the original *A* sugar depending on the method used. Phospho-lime tests on *B* and *C* sugar melt in a Williamson flotation clarifier to remove Ca phosphate floc gave highly unsatisfactory results, despite a large number of tests with all possible alteration of the variables. In contrast, an Alfa-Laval separator proved highly successful on laboratory and plant scale, and a larger scale experiment treating the entire syrup throughput from one quadruple-effect evaporator, i.e. approximately one-third of the total throughput, is to be carried out. In the proposed scheme the syrup from the 3rd effect is mixed with *C* sugar melt, monocalcium phosphate and lime to give a 30–35°Bx solution. This is stirred at 180°F and fed via a flocculating tank to a battery of Alfa-Laval separators, from which the mud is sent to the Oliver filter mud mixer and the over-flow is passed to the 4th evaporator effect and thence to syrup storage tanks.

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A practical steam balance. H. J. M. ZONDERLAND. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 106–109.—A steam balance drawn up for the 250 t.c.h. Amatikulu sugar factory and based on a high degree of steam economy with a consequent surplus of bagasse is discussed. In involves the use of electric drives for the cane mills, a high degree of vapour bleeding, partial heating of cold mixed juice by condensate and the application of thermo-compression using some of the vapour from the 1st and 2nd effects of the quintuple-effect evaporator plus live steam. The scheme uses 60% imbibition on cane and all *B* and *C* sugars are remelted. The steam consumption is 50% on cane (equivalent to 11% fibre on cane), giving a bagasse surplus of 700 tons per day. Possible uses for this surplus bagasse are briefly discussed.

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Filtrate recirculation eliminated at Umzikulu. A. E. RABE. *Proc. 38th Congr. S. African Sugar Tech. Assoc.*, 1964, 110–113.—One of the two Eimco filters was converted to the "EimcoBelt" system, thereby doubling the filter capacity. The use of 0·004 lb of "Separan AP-30" per ton of cane gives satisfactory flocculation and filtrate clarity, the purity of the filtrate over two weeks being 85·90 compared with a clarified juice purity of 86·93, while the filtrate contained 1% suspended solids (by volume) and had a Kopke clarity of 14 compared with the corresponding values of 4% and 11 for clarified juice. Filter-cake sucrose content averaged 2·34%, ranging from 0·5% to 4% (the wide fluctuation is attributed to variations in bagacillo supply and in mud solids content). It is considered doubtful whether clarifier capacity has increased. Treating cold juice with "Separan AP-30" without settling gave a high filtration rate and well-formed filter-cake, while starch appeared to be completely removed from the mixed juice.

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Improving the efficiency of the filtration of the first carbonatation juice by means of (a) continuous filter. W. CHEN, M. T. TSAI and Z. H. HSU. *Taiwan Sugar Quarterly*, 1965, **12**, (1), 9–16.—While conventional 1st carbonatation resulted in only partial coagulation of the juice colloids, lowering the ζ-potential by only a few millivolts so that it was still well above the isoelectric point, the addition of a polyelectrolyte such as PMA or "Separan AP-30" (2–4 p.p.m.) after gassing gave excellent settling, but filtration of the muddy juice on a pre-coat drum filter was slow, owing to rapid blinding of the filter medium by the fines remaining in suspension. Details are given of a specially-designed continuous belt filter provided with a nylon filter medium. The juice solids content was kept between 12·9 and 25·1% and the average moisture of the cake was 61%. The filtering and cake removal rates were respectively approximately 13–16 kg/sq.m./min and 3–4 kg/sq.m./min. Generally the filtrate was clear enough to be sent to the 2nd carbonatation tank without polish filtration.

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Efficient operation of clarifier mud filters. C. SOUR P. *Bol. Azuc. Mex.*, 1965, (187), 13–15.—The author has studied sugar losses in filter-cake at Cía. Industrial Azucarera San Pedro S.A., where the sucrose content of the cake was high at 4·90%, resulting in a loss of 0·156% sucrose on cane. It was found that various modifications to existing procedure reduced the

sucrose in filter-cake to between 1·8 and 2·0%, and the possibility of further improvement is shown by the figure of 0·97% reported by Ingenio El Potrero. The mud should be limed to pH 8 and the cake should be washed by spraying with clean warm water at no higher than 60°C, the vacuum maintained at 15–17 in, preparation and addition of clarifying agent should be correct (e.g. 0·35 lb "Separan AP-30" per 100 tons of cane at San Pedro); bagacillo added should be adequate (3–6 kg/ton of cane), and excessive dilution of the cake should be avoided. An example is given of calculating the filter area needed to deal with mud from a factory, given the grinding rate, mud production, filter speed and cake thickness and density, in order to give a sucrose content of 2%. It is shown that reducing the sucrose in filter-cake by 1% will give an additional recovery of 280 tons of sugar in a season for a 5000-ton cane sugar factory, and this is considered important enough to warrant shift chemists to be in charge of the filter department alone.

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Sulphitation with ejectors. E. ESPINOSA M. *Bol. Azuc. Mex.*, 1965, (187), 16–18.—An account is given of the use of sulphitation using an ejector at Ingenio La Margarita S.A. It is concluded that it is important to maintain a juice velocity of at least 50 f.p.s. across the nozzle in order to draw in sufficient air for combusion of the sulphur, and to ensure that the combustion chamber and gas conducting tubes are held firm. No appreciable inversion occurred when using 200 g of sulphur per ton of cane and, instead of a long barometric column, thought by some to be necessary, a column of only one metre was found sufficient, so that with a mixer tank of only 750 litres capacity, the juice could go straight to the scale or limer. Successful operation was achieved after increasing milling capacity by 2500 tons of cane per day by increasing the size of the ejector nozzle to maintain a juice velocity of 50 f.p.s.

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The problem of water and water-borne illnesses in sugar factories. L. T. JULIEN. *Bol. Azuc. Mex.*, 1965, (187), 19–20.—A brief review is given of methods of water treatment to produce pure potable water for the factory personnel and local inhabitants of the cane region.

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Pampaga sugar mills. ANON. *Sugarland* (Philippines), 1965, **11,** (2), 38–44.—Pampanga Sugar Mills (Pasumil) is a company which operates one factory in a district of which about 25,000 hectares are planted to cane. Some information is given on the factory, which in 1965 was expected to produce 1,300,000 piculs of sugar (1 picul = 140 lb).

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The bulk sugar programme (in Australia). J. T. ALLEY. *Sugar y Azúcar*, 1965, **60,** (6), 57–59.—A survey is given of the bulk handling facilities in Australia, with brief descriptions of the equipment used for bulk handling at the factories, at the six harbour installations and at the refineries.

A second look at Victorias Milling Company. ANON. *Sugarland* (Philippines), 1965, **11,** (2), 45–46.—A brief summary is given of the history and development of one of the largest factories in the Philippines.

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Colonial Sugar Refining—a giant still growing. ANON. *Sugar y Azúcar*, 1965, **60,** (6), 60–62.—The history and development of C.S.R. Co. Ltd., the second largest commercial enterprise in Australia, are reviewed.

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Moving carbon bed system cuts costs, improves quality. TECHNICAL STAFF, CENTRAL RIO TURBIO. *Sugar y Azúcar*, 1965, **60,** (6), 63–65.—Filtered liquor of about 60°Bx is treated in two decolorizing columns at 175°F. The plant uses Pittsburgh "CAL" granular carbon and is designed to handle over 600 metric tons of refined sugar daily. Details are given of the moving bed process used. Results indicate an improved liquor decolorization and a lower sugar and ash content than with a previous system, while less than one-tenth of the carbon used previously is required. The monetary savings expected are briefly discussed.

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Sanitizing sugar tankers. A. CHICK. *Sugar y Azúcar*, 1965, **60,** (6), 66.—The interiors of road trailer tankers used by California & Hawaiian Refining Corp. for liquid sugar transport are cleaned out once a day when in regular use and each time there is a change in the type of liquid sugar carried, with water at 200°F provided by six Malsbary 500-H heaters delivering 50 g.p.m. The water is pumped through the heater coils at 150 p.s.i. and the total cleaning operation takes 5–15 min. At the Portland (Oregon) refinery the Malsbary heaters are also used to help dissolve granulated sugar to liquid sugar, supplying water at 160–180°F and about 90 g.p.m. Experience has shown that water at 200°F applied for 5–15 min is bacteriologically more effective than chemicals.

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Purification of sugar solutions by selective ion dialysis. K. KOJIMA. *Denpunto Gijutsu Kenkyu Kaiho*, 1961, (24), 31–44; through *S.I.A.*, 1965, **27,** Abs. 223.—The operation conditions are described for the demineralization of raw sugar solutions with application of perm-selective ion-exchange membranes on an industrial scale. The electric power consumed decreases with increase in the area of the membrane, and the optimum area must be decided in relation to costs. The optimum membrane characteristics are discussed. An apparatus suitable for this purpose was constructed; preliminary tests are reported showing satisfactory results with raw cane sugar, beet sugar and glucose solutions.

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Theoretical and experimental development of a screen for bagasse. J. GUERRA. *Nuestra Ind. Rev. Tecnol.*, 1962, **1,** (4), 24–31; through *S.I.A.*, 1965, **27,** Abs. 237. A rotary drum screen was constructed in the form of an inclined horizontal cylinder of hexagonal cross-section for the separation of bagacillo. A separation

of 14% on bagasse was achieved with a screen of 16 meshes/in. The capacity of the screen, in g/min, is shown to be 3 (kD^3nd tan a)/8, where k = ratio of blanket thickness to drum dia. D, n = r.p.m., d = mean bagasse density (g/cu.m.), and a = angle of inclination. For good separation, n should not be too great (e.g. $\not> 6$ for $D = 61$ cm) and k should be an optimum (e.g. 0·083).

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A study of keeping quality of cane juice syrup for reprocessing in low recovery periods or off-season. S. C. SHARMA and A. K. SHARMA. *Indian Sugar*, 1965, **15**, 11–18.—Thick juice from the last evaporator effect was sulphited to pH 4·6–4·8 and stored for up to 183 days at various Brix values in the range 57·00–75·55° while unsulphited juice was stored for up to 69 days (in one case 86 days) at Brix levels in the same range as the sulphited juice. The sulphited juice kept better than the untreated juice and could be stored for up to 90 days without deterioration at the highest Brix used in the tests. The optimal Brix should be as near to the saturation Brix as possible.

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"Full seeding" crystallization of sugar. R. ESPARZA T. *Bol. Azuc. Mex.*, 1965, (188), 12–19.—Basic principles of crystal structure and crystal growth are discussed, together with WEBRE's supersaturation zones. The technique of full seeding requires accurate judgement of the numbers of crystal nuclei needed for a *C*-strike, and a sample calculation of the amount of powdered sugar of various sizes to produce a massecuite of the desired crystal size (0·35 mm and 0·30 mm) is presented. A table is presented relating the quantities of powdered sugar to its size and another relates the final grain size to the quantity of seed used of a fixed size (Fleischmann, 10μ).

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Bulk sugar terminal in operation. ANON. *S. African Sugar J.*, 1965, **49**, 440–447.—An illustrated account is given of the bulk sugar terminal at Maydon Wharf, Durban, which started operations in April 1965.[1]

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Philippines bulk raw sugar facilities. ANON. *Sugar y Azúcar*, 1965, **60**, (7), 51–52.—Information is given with illustrations of the Pulupandan and Guimaras bulk handling installations.

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The danger of circulating non-sugars. J. G. MEYER. *Sugar y Azúcar*, 1965, **60**, (7), 53–56.—Two hypothetical boiling schemes are compared. In a straight two-boiling scheme the *C*-massecuite contains 4016 lb of non-sugars per 10,000 lb of massecuite, while the corresponding non-sugars quantity in the *C*-massecuite obtained in a three-boiling system in which the *A*-molasses is recirculated is 4158 lb/10,000 lb. Double-curing of the *C*-sugar is advocated as a partial means of reducing the non-sugars, but more satisfactory methods of completely eliminating the non-sugars are yet to be found.

Control of crystallization in sugar manufacture. M. KAMODA. *Kemikaru Enziniyaringu*, 1964, **9**, (3), 235–241; through *S.I.A.*, 1965, **27**, Abs. 328.—Various methods for obtaining uniform crystals in sugar manufacture and the effects of various factors on them are discussed. The crystallization must be undertaken in the unstable region of the supersaturated sugar solution, but the variables defining these regions change with the impurity content of the solution. The floating crystals must be circulated in order to obtain uniform sugar crystals. For seeding of the supersaturated solution, introduction of powdered sugar as a slurry is preferable to blowing the dried powder into the solution.

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Use of ion-exchangers in sugar refining. S. MIYAHARA. *Kagaku Kojo*, 1963, **7**, (8), 29–33; through *S.I.A.*, 1965, **27**, Abs. 330.—The current position of the ion-exchange technique in sugar processing in Japan is summarized. In processing raw cane sugar the exchangers are used for decolorization, and in beet sugar manufacture they are used for de-liming, decolorization and salt removal. Ion-exchangers are also used in the purification of glucose. The effects of the various components of the crude solution on the effectiveness of the ion-exchangers for these purposes are discussed.

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Automation of lime-phosphoric treatment for sugar refineries. L. PÉREZ G. *Bol. Azuc. Mex.*, 1965, (190), 12–17.—An account is given of the operation of a simple and low-cost automatic control system adopted at the author's refinery. The melter is provided with a density meter which provides a pneumatic signal directly proportional to Brix; this governs a diaphragm valve in the hot water feed line to the melter, so giving a constant density melt. The melt passes through a screen to a constant level storage tank and thence to two reaction vessels; in the first it is treated proportionally with phosphoric acid, after 10 sec contact time passing to the second vessel where it is treated with calcium saccharate to bring it to the desired pH. After 30 sec it is delivered to a surge tank and thence to an aeration system and a heater where the melt is heated to 90°C, by admission of steam regulated by a temperature recorder/controller, and then goes to the Jacobs clarifier. The system produces a clearer liquor which does not exhibit after-precipitation on standing 6 hours. In consequence, the filter station can run for 8 hours at a time instead of 3 hours. The process is now continuous and within precise pH limits. Clarification is efficient and not sensitive to changes in material. Inversion is reduced as are labour and material costs. Efficiency is increased and human error eliminated.

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Damage to sugar crystals in continuous centrifugals. W. SIEPE. *Indian Sugar*, 1965, **15**, 77–80.—See *I.S.J.*, 1964, **66**, 148–151.

[1] *See also* BOSCH: *I.S.J.*, 1964, **66**, 156.

BEET FACTORY NOTES

Technological processes in continuous juice purification. K. VUKOV. *Cukoripar*, 1965, **18**, 129–138.—Details are given of the juice purification methods (covering all stages from raw juice flow to predefecation to 2nd carbonatation mud removal in hydrocyclones) proved by experiment to be the best under Hungarian conditions. Diagrams are given of a raw juice tank for regulating the feed, a predefecation and 1st and 2nd carbonatation vessels.

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Control of massecuite feeding to continuous centrifugals. M. BRUNKE. *Zucker*, 1965, **18**, 297–299.—The "Teleperm" controller, manufactured by Siemens & Halske A.G., is a proportional integrating device which receives current from a converter proportional to the centrifugal motor power consumption (this is dependent on the massecuite) and compares the true power consumption with the target value. Should there be any deviation, a command signal is transmitted to the variable-speed motor controlling the diaphragm valve* in the massecuite feed line. Manual control is also possible. The device is intended to overcome difficulties in curing low-grade massecuites of varying viscosities.

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Press water from high-pressure pulp presses. P. DEVILLERS and M. LOILIER. *Sucr. Franç.*, 1965, **106**, 137–139.—Analyses of press water from Choquenet, Weigelwerk and Stord pulp presses indicate a wet pulp content of up to 14% on beet. Means of removing the pulp are discussed. The sugar content approached that of the pulp, the final pressing apparently giving a water of higher sugar concentration. The organic substances are present in approximately the same quantity as sugar, but the content varies little with pressure. The pH of the diffusion water has a considerable effect, a low pH (5·7–6) considerably reducing the organic content, which constitutes 2–3% of the pulp solids. The ash content is negligible. The press water impurities may thus be mainly precipitated by carbonatation to raise the purity from 40–60 to that of 2nd carbonatation juice.

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Tests on beet storage at Sidi Slimane (Morocco). L. LOISIL, D. BONAMOUR and J. TRZEBINKSI. *Al Awamia*, 1964, (10), 1–17; through *S.I.A.*, 1965, **27**, Abs. 211.—Tests during June–August 1962 are reported with analyses of beets stored under various conditions for up to 7 days, and of corresponding factory products. Stored beet could not be adequately preserved for more than 7–8 days in June or 3–4 days in July. Beets stored in open sheds or under straw retained their weights better than beets exposed to the sun. In all cases whole beets deteriorated less than topped beets. The application of a 0·3% formalin solution to exposed beets inhibited the effects of bacteria, particularly in reducing the inversion of sucrose. Topped beets left in the ground retained their weights and sucrose contents better than topped beets stored in open sheds. Beets left in the ground with only their leaves removed showed the smallest losses of all.

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The use of instruments during various stages of development of automatic boiling control for *B*- and *C*-product. A. JOSEPH. *Zucker*, 1965, **18**, 317–322. Tests at the Waghäusel factory of Süddeutsche Zucker A.G. are discussed. A scheme in which the juice feed valve is adjusted on the basis of comparison between the actual and target conductivities, whereby opening of the valve increases the conductivity, proved unsuccessful in *C*-boiling, since there was a time lag of about 15 min between conductivity change and valve adjustment. Adjustment of the valve in the vacuum line by the conductivity controller resulted in almost instantaneous alteration of massecuite boiling temperature when the absolute pressure was altered. Conductivity control by juice valve adjustment was modified to make the target value time-dependent, but constant juice Brix and conductivity are requisite, otherwise the height and slope of the control characteristic must be readjusted after a specimen boiling; a sample boiling is also necessary for the determination of the conductivity-level relationship. In both these systems a certain period of time after seeding is operational only if crystallization occurs in step with evaporation, although the systems will permit control of 60% of a boiling time (of 12–14 hr). For the "hungry régime" after seeding either the heating must be throttled, if mechanical circulation is provided, or water must be added or the vacuum reduced. With all three variants control can be maintained by a single controller in split range of the adjustable drives. With increasing supersaturation (decreasing conductivity) the juice valve can be opened to complete lift followed by the water valve, and both left in these positions from seeding to boiling up. Automatic control of seeding is of advantage only if the seed can be kept in suspension in the isopropyl alcohol with a small agitator, in which case a limit switch is required for the conductivity. For the start of boiling up, a limit switch for level control is required; when the maximum is reached the juice valve is closed. The advantages and disadvantages and costs of the various schemes described are compared and discussed.

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Simplified data processing. Correlation and factor analysis. W. SCHMIDT. *Zeitsch. Zuckerind.*, 1965, **90**, 320–325.—The merits and applicability of the cosine model for analysis of correlations between variables are discussed and the method described. Multiple factor analysis based on the cosine model is described with worked examples. A table of multiple factor correlation coefficients, drawn up by GUILFORD[1] using the cosine formula, is reproduced.

* Manufactured by Emile Egger & Co., S.A./A.G., Switzerland

[1] "Fundamental Statistics" (3rd edn.) (McGraw-Hill Book Co., New York) 1956.

Critical consideration of the special problem of foam in the sugar industry. W. BAENITZ. *Zucker*, 1965, **18**, 322–324.—The causes of foaming in the sugar industry and the structure of foams are discussed. A guide is given to the use of anti-foaming agents, particularly "Witten 748" (manufactured by the author's firm), in various sugar factory processes and especially regarding the method of dosing.

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Multi-speed pole-change squirrel-cage asynchronous motors for sugar centrifugals. J. WÖLL. *Zeitsch. Zuckerind.*, 1965, **90**, 317–319.—The use of internally-cooled three-phase asynchronous motors for sugar centrifugals is discussed with mention of the various types of pole-change motor available for different operational requirements. Methods of reducing losses in the squirrel-cage rotor are given and the effect of these losses on motor design are discussed.

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Effect of automation on the size of sugar factory machinery. O. BÖHM. *Listy Cukr.*, 1965, **81**, 107–109. It is shown by a number of mathematical expressions describing beet factory processes from fluming to the end-product that with automatic continuous processing the size of the equipment could be reduced and the resultant savings could offset much of the cost of automation.

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Evaluation of diffuser performance. K. ČÍŽ. *Listy Cukr.*, 1965, **81**, 109–110.—The degree of extraction (E) is used as criterion for diffuser evaluation, whereby $E = 1 - Z/Dg$, where Z = sugar losses and Dg = original cossette sucrose content (both expressed as % weight of beet). A table is given of calculated values of E for cossette sucrose contents in the range 15–20% (in 0·5% intervals) and losses in the range 0–0·20% (in 0·05% intervals). Thus, for a known cossette sucrose content and a given value of E it is possible to find the corresponding loss figure. Calculations using campaign loss and sucrose values in Czechoslovakia have given values ranging from 96·13 (for Olier diffusers) to 97·81 (for RT diffusers) compared with 96·84 for a battery diffuser. The values for BMA and DDS diffusers were 97·64 and 97·72 respectively.

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Some problems of level measurement and level control in the sugar industry. M. TEGZE. *Elemezési Ipar*, 1964, **18**, 235–239; through *S.I.A.*, 1965, **27**, Abs. 452. Two different types of vessel or tank are distinguished: those used for a particular technological purpose, and those used as buffer tanks between processes. The characteristics of level range Δh, run-up number F (minimum time required for unit rise in level), and time constant ($F\Delta h$) are all small in the former case and large in the latter case. Floats are recommended for level control of process tanks, a pneumatic membrane apparatus being preferred when the tanks are closed. Bubble tubes are preferred for level measurement in buffer tanks. Effective control of flow is obtained with two buffer tanks in series, with measurement of the level in each tank. Measures to avoid cavitation in control valves are considered.

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Water economies in Czechoslovakian sugar factories. F. KASTNER. *Listy Cukr.*, 1965, **81**, 78–83, 111–117. The extent to which sugar factory effluent reduces the quality of water in reservoirs during the campaign is discussed and the techniques used to purify effluent in Czechoslovak factories are described. Disposal of press water and its purification and recycling to diffusion are considered. Calculation of hydrocyclone parameters is demonstrated.

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Management of sugar beets stored in clamps. G. OLTENAU and G. RIZESCU. *Ind. Alimentara*, 1964, **15**, 577–580, 593; through *S.I.A.*, 1965, **27**, Abs. 407. The influence of temperature on sugar losses in storage and the practical measures for efficient storage of beets are summarized. It is recommended to make routine temperature measurements at several points in each pile, in order to estimate sugar losses, and as a check on local temperature rises indicating the beginning of deterioration.

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Some views on the handling of raw sugar factory waste waters. H. HIDENHEIMO. *Rakennusinsinoori*, 1963, **19**, 344, 346; through *S.I.A.*, 1965, **27**, Abs. 469. Modern methods of treatment and re-use of beet factory waste waters are summarized. The basic principles are the separation of different classes of waste water and the prevention of fermentation. Wash waters are clarified in basins, after removal of sand, with the addition of 0·01% of CaO, and chlorinated before re-use. Press waters are preferably strained and sterilized by heating to 85–90°C. Condenser waters are cooled and chlorinated and may then be used for washing. The final purification of discharged waste waters may be carried out by spray irrigation, or by flood irrigation with horizontal movement of water into ditches removing the purified water; marsh lands are suitable for this purpose. Preliminary purification in storage basins or cesspools is practised if sufficient land is not available.

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Industrial wastes treatment by activated sludge. II. Treatment of beet sugar factories' wastes. M. DAZAI, Y. YOSHIDA and H. ONO. *Hakko Kyokai*, 1963, **21**, (4), 20–25; through *S.I.A.*, 1965, **27**, Abs. 470. Optimum conditions for the treatment of beet sugar wastes by activated sludge were investigated. Under favourable conditions ("Kd value" $5{\cdot}8 \times 10^{-2}$, initial pH 6–8), BOD loads of 3·6 kg/cu.m./day in Steffen waste, 2·5 kg/cu.m./day in flume water, or 3·7 kg/cu.m./day in a 1:1 mixture of the above were continuously treated with 4–5% of activated sludge to give 80–85%, 95% and 85–86% removal of BOD respectively. The activated sludge process can

therefore be applied to the treatment of beet sugar wastes. It is recommended to treat the Steffen waste after diluting it to >5 volumes with water or flume water.

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"Stellar" filters. S. BANCZAK. *Gaz. Cukr.*, 1965, **73,** 109–112.—The "Stellar" filter is described and its advantages discussed by a member of the Polish factory that has obtained a licence from The Paterson Engineering Co. Ltd. to manufacture the filters.

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Preliminary laboratory tests on the application of Polish resins for refinery remelt liquor decolorization. S. GAWRYCH and I. OGLAZA. *Gaz. Cukr.*, 1965, **73,** 112–113.—Some information is given on preliminary tests using a weakly and a strongly basic (SM 2) resin, both in Cl^- form. In static tests the weakly basic resin achieved 80–90% decolorization of remelt liquor at a temperature of 75–80°C without causing any adverse change in pH. The SM 2 strongly basic resin achieved 86–92% decolorization at 80°C. Regeneration of the weakly basic resin is two-stage, that of the strongly basic single-stage.

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The automatic control of Stord presses. I. S. HIGGINS. *Stord Press Review*, 1965, (3), 20–23.—The arrangements at the British Sugar Corporation factories at Ely, Selby and Wissington are described. The typical installation comprises three Stord presses each handling the pulp from 900–1000 tons of beet per day, so that the final press runs at reduced speed. Since the press is a positive displacement machine, if run lightly it will not yield a sufficiently high dry solids and the fuel consumption will increase. A Vulcan Sinclair fluid drive and an air motor to regulate the position of the scoop are used to control the speed of the final press, a controller and tacho-generator in its own closed loop control system being used to overcome difficulties of speed variation with a fixed scoop position. To eliminate difficulties in batch discharge from the RT diffuser, a double screw conveyor is used to feed the pulp to the presses; the final press is fed from the end of the return screw and the load on the return screw motor is used as a measure of the quantity of pulp available to the final press, the speed of which is regulated by a signal transmitted from the motor circuit. At Wissington and Selby press speed is governed by changes in the level of pulp in the chute, which is provided with a number of electrodes located one above the other, and by load variations in the press. A computer receives a signal from the chute and one from the tacho-generator connected to the press drive, and transmits a signal via a 3-term controller to the press drive controller. Considerable hunting takes place, but longer feed chutes and distribution of the electrodes at the chute over a wider range will, it is considered, minimize this.

Aspiration plant in sugar factories. R. SCHULZE. *Zucker*, 1965, **18,** 365–375.—A survey of various types of dust control equipment is given and the factors to be considered in the choice of type and number are discussed.

* * *

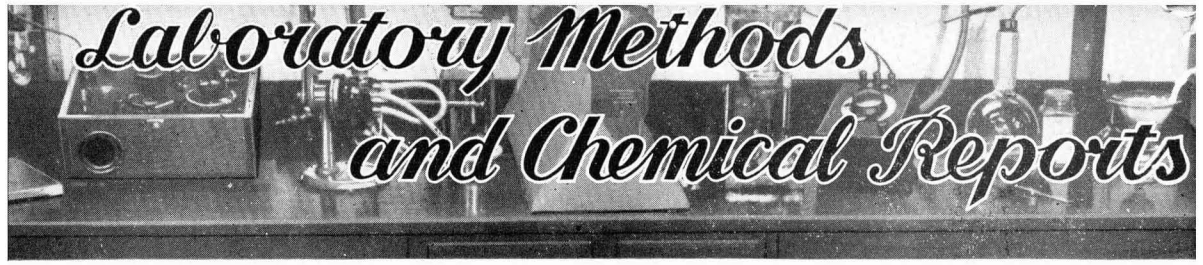
The beet washing plant at Gross-Gerau sugar factory. R. SEBASTIAN. *Zucker*, 1965, **18,** 375–378.—The scheme is based on that at Plattling. The beets from two points (one for rail truck unloading, the other for road vehicle unloading, both using water jets) are flumed to a vibratory screen water separator and thence by inclined conveyor to a wash tower equipped with two pivoting spray jets in series delivering at 8 atm pressure. The beets are exposed to spraying for 16–20 sec. From the wash tower the beets pass via a series of conveyors to the beet storage point whence they are reclaimed by water jets and, if required, fed to another wash separator feeding them direct to the slicer.

* * *

Determination of sugar loss in stored sugar beet. S. VAJNA and T. VAJNA. *Zeitsch. Zuckerind.*, 1965, **90,** 387–394.—The sugar loss in stored beet is determined as the difference between (sucrose content × beet weight) before and after storage. However, whereas the sucrose content in the beet crown is greater than that in the tail at lifting, after a short storage period (10 days) the two halves have almost the same proportion, with the maximum content in the tail. Thus, determination of the sucrose content before storage will give a lower value for the other parts of the beet than after the storage; however, since the source of error is absent after storage, the sucrose loss seems smaller than the true value. Therefore the beets should have their crowns intact for sucrose determination. The relative standard deviation in sucrose content determination was much smaller than with weight determination of individual beets, so that scatter and reliability of sugar loss values depend on the distribution of beet weights. No relationship was found between sucrose content and beet weight. A study of the possibilities of error in determining both factors revealed that the most accurate loss figure is obtainable by the method of storing random samples continuously. With other methods the error is too great or the results do not represent the whole range of the beets. The sugar loss must be determined for each individual sample and a mean value obtained. A guide is given to the minimum number of beets to sample for reasonably accurate loss figures, or for indication of losses, as dependent on storage time.

* * *

The effect of foaming of low-grade massecuite on the viscosity and exhaustibility of the molasses obtained (from it). K. WAGNEROWSKI, D. DABROWSKA and C. DABROWSKI. *Sucr. Belge*, 1965, **85,** 441–453.—See *I.S.J.*, 1964, **66,** 196.



Modification of the method of determining the calcium content of sugar juices. A. LEMAITRE and M. F. DEGRAND. *Sucr. Franç.*, 1965, **106,** 138–140.—Difficulties have been encountered in the method described earlier[1] in connexion with the addition of the indicator. To overcome the difficulties, $MgCl_2$ is added before titration. The modified method is as follows: 10 c.c. of the test solution containing less than 15 mg of lime is diluted to 50 c.c. with distilled water and treated with 2 c.c. of a buffer solution (6·75 g NH_4Cl + 57 c.c. NH_3 + 0·1 g K_2CrO_4, made up to 100 c.c.) followed by 4 drops of diethyldithiocarbamate solution (saturated in 95% alcohol), 1 c.c. of N/28 magnesium chloride and 2–4 drops of Eriochrome Black T indicator (0·25% alcoholic solution) in this order. The solution is then titrated with EDTA until the colour changes to greenish-blue, 2 further drops of indicator solution being added just before the end of titration. The lime salts concentration per 100 c.c. is 10 $(n - 1)$, where n = the volume of EDTA.

* * *

An improved spectrophotometric method for the determination of starch in sugar crystal. W. CHEN and M. W. CHEN. *Taiwan Sugar Quarterly*, 1965, **12,** (1), 27–32.—In a comparison of various methods of starch determination in sugar, sources of error are discussed and on the basis of experiments a modified method has been developed which has been tested on 94 samples from different periods at 11 different factories. In the method, 100 g of sugar is dissolved in 100 ml of water, and 3 ml of 6N HCl added together with 240 ml of 95% ethyl alcohol in a 500-ml beaker with vigorous stirring. After standing overnight, the solution is centrifuged at 4000 r.p.m. for 10 min, the supernatant discarded and the precipitate washed by mixing with 70% ethyl alcohol before centrifuging at 1800 r.p.m. for 10 min, the supernatant again being discarded. The washed precipitate is vigorously mixed with 40 ml of saturated $CaCl_2$ solution and 3 ml of 0·6% acetic acid, and the mixture heated on a water bath at just below boiling point for 18 min. It is then transferred to a 100-ml flask with water, cooled to room temperature and made up to volume. The mixture is then centrifuged for 10 min at 1800 r.p.m. and an aliquot of the clear solution, containing about 2–5 ml of starch, transferred to a 100-ml flask. After dilution to about 75 ml, 5 ml of 10% acetic acid, 1 ml of 10% KI and 10 ml of 0·01N KIO_3 are added in sequence for colour development. Five minutes after making up to volume the colour is measured at 570 mμ against a reference solution, and the starch content read off a calibration curve. While large quantities of kieselguhr prevent complete separation of the starch, a small quantity (0·5 g) is recommended as a coagulation aid and does not retain any starch.

Determination of invert sugar in sucrose with 3,6-dinitrophthalic acid.[2] T. MOMOSE, J. TOMITA and Y. YANO. *Japan Analyst*, 1964, **13,** 877–879; through *S.I.A.*, 1965, **27,** Abs. 265.—2 ml of sucrose solution (e.g. 5%) are heated with 1 ml of 3,6-dinitrophthalic acid solution (0·3%) and 1 ml of alkaline solution (25% K_2CO_3 and 5% of $Na_2S_2O_3$) in a boiling water bath for 10 min. The mixture is then cooled, diluted with water to 20 ml and its absorbancy measured at 450 mμ using the reagent blank. The calibration curve is prepared from pure glucose solutions (10–100 μg/ml). Results of recovery tests with added glucose (13–50 μg/ml) nearly all agreed to within 1 μg/ml. Results with various grades of sugar are tabulated beside those of the Hagedorn-Jensen titration method. The present method is simple, gives reproducible results and may be suitable for routine analysis.

* * *

Determination of α′-pyrrolidone-α-carboxylic acid and glutamic acid in beet molasses. G. C. ARTUSI and G. C. SCAPINI. *Ateneo Parmense*, 1963, **34,** 706–714; through *S.I.A.*, 1965, **27,** Abs. 266.—A method is described which entails two-dimensional paper chromatography using saturated aqueous phenol and lutidine:collidine:water (1:1:1) as solvents, followed by a colorimetric procedure based on the ninhydrin-hydrindantin reaction. The molasses was found to contain 0·37% of free glutamic acid and 1·98% of α′-pyrrolidone-α-carboxylic acid.

* * *

Formation and composition of beet molasses. III. Influence of some typical non-sucrose substances on sucrose solubility. G. VAVRINECZ. *Zeitsch. Zuckerind.*, 1965, **90,** 311–316.—Non-sucrose substances are divided into four groups according to the effect they have when added to an aqueous sucrose solution. Group (1) strictly speaking contains water-insoluble substances, but also comprises those substances which, because of their high solubility, require little water. Hence the substances in this group do not affect the water or the sucrose and include compounds similar to sucrose (e.g. fructose) and strongly hydrated salts which do not bind water of crystallization. Group (2) substances use some of the water required for sucrose solution and can be split into two subgroups: (i) where the bound water is proportional to the non-sugar content, and (ii) where the water binding power approaches a limiting value. The group includes substances containing water of crystallization, e.g. glucose and glucose mixtures, as well as inorganic salts with a high crystallization water content, whose ions do not interfere with the sucrose. Many of the group (2) substances form

[1] SAUNIER & LEMAITRE: *I.S.J.*, 1952, **54,** 111.
[2] See *I.S.J.*, 1965, **67,** 280.

compounds that come under group (3), i.e. substances that bind some of the sucrose and thereby increase the amount of sucrose going into solution. Group (4) contains substances which bind both water and sucrose and includes the largest number of non-sucrose substances (mainly electrolytes). Two well-known examples are KCl and NaCl, and the effects of these are mentioned in some detail. Summarizing the work of various authors, it is shown that KCl has a weaker salting-out and melassigenic effect than NaCl and that the temperature effect on the saturation function is weak with KCl while it is not evident with NaCl. Approximately half of the non-sucrose substances consist of organic and inorganic salts ("positive" melassigenic substances) and belong to groups (3) and (4), while most of the non-salts are unable to bind sucrose and come under groups (1) and (2) (non-melassigenic). There are some non-sucrose substances that mask others and so weaken their sucrose binding power. Equations and graphs relating to the saturation function of non-sucrose examples are given for each group and it is shown that the Wagnerowski saturation function in an appropriate form is applicable to each case.

* * *

Labelling with polarographically active substances in sugar factory operation. J. BURÍANEK and V. ULRICH. *Listy Cukr.*, 1965, **81**, 99–107.—Polarographic tests were carried out in which the chloride anion was used as label. $CaCl_2$ was added to the clarifier at a beet factory and samples (diluted 1:1) taken at intervals for determination of the sucrose concentration, Brix and dissolved inorganic matter (the last after diluting to 30°Bx). The chloride:Brix and calcium:Brix ratios were then determined polarographically as a function of time, and the colour content measured after filtration. The method gave well-defined distribution curves for Cl and Ca; time-dependent data are also tabulated. Equally good results were obtained in a study of pan boiling in a refinery, where sodium chloride was added to the massecuite. After determining the sucrose content in the 1:1 diluted sample, this was diluted to 30°Bx and 20 ml of 1M sulphuric acid was added to a 40-g sample, which was then made up to 200 ml and the chloride wave then measured. Time-dependent data are again tabulated.

* * *

Reproducible crystallization and its application in determining crystallization properties of sugar juices. F. SCHNEIDER, D. SCHLIEPHAKE, R. OELJESCHLÄGER and E. ZEICHNER. *Zucker*, 1965, **81**, 345–353.—By "reproducible crystallization" is meant that process which will give identical results provided the so-called "guide" values are the same; guide values include juice composition, concentration at the end of heavying up, amount of footing used, crystal size distribution in the footing, initial temperature of the cooling process and rate of cooling. The dependence of crystallization results (crystal distribution, syrup and crystal mass composition and rate of concentration change) on time is discussed. The closest approximation to theoretically reproducible crystallization is obtainable by using the cooling technique, and a laboratory apparatus is described. Tests using this are described and two crystallizations are compared, the results being given in table and graph form. Particular importance was attached to the change in crystal size distribution with time, and reproducibility was determined by plotting the change in the standard deviation against the change in average crystal diameter. The graph indicated identical courses of crystallization. The process in terms of concentration was within the limits of experimental error and hence reproducible. There is thus no need to simulate pan boiling to gauge the crystallization properties of a juice.

* * *

Rapid method of determining invert in juices and sugar products. J. ZALESKI and J. KULWIEĆ. *Gaz. Cukr.*, 1965, **73**, 115–118.—The sugar, juice or molasses in a 50-ml flask is dissolved in hot distilled water, cooled to 20°C and made up to volume with more distilled water. Of this solution, 15 ml is used as standard and 15 ml is dissolved (in water) in another 50-ml flask and cooled to 20°C. Then 1 ml each of reagents (I) and (II), respectively 173 g of Rochelle salt and 50 g of NaOH made up to 1 litre solution, and 0·5% methylene blue solution, is added and the contents transferred to two large test-tubes. The time taken to decolorize (reduce) the methylene blue is a measure of the invert content; the true content is read off a standard graph and a table of values. The total determination time is 5 min and accuracy is $\pm$ 0·01% for up to 0·75% invert content.

* * *

Colouring matter and colouring matter formation in sugar manufacture. V. PREY, R. GOLLER and F. STRESSLER. *Zeitsch. Zuckerind.*, 1965, **90**, 375–382. Press juice was treated with ion exchange resin and bone char, respectively, together with acetone (to precipitate floc). The resultant decolorized thin juice had a lower total N content, while the blue number (g of noxious N/100°Bx) remained almost unchanged. While a normal factory thin juice had U.V. absorption bands at 190, 265 and 340 mμ, as did a press juice treated only with acetone, thin juice from press juice treated with "Asmit" resin or bone char did not have an absorption band at 340 mμ, nor did thin juices obtained from model raw juices. Elution with NaCl solution of the "Asmit" used to decolorize the press juice or evaporation of the acetone filtrate after floc separation yielded N-constituents which on hydrolysis with 2N HCl gave galacturonic acid and a small quantity of lactic and oxalic acids, and with 6N HCl gave lactic acid, lactyllactic acid, oxalic acid and 9 amino acids. Addition of a small quantity of these constituents to model raw juices gave a U.V. absorption band at 340 mμ. The same absorption band is found for model colouring substances formed from fragments of sugar and tripeptides.

TRADE NOTICES

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

"Accelerator C". Fabcon Inc., P.O. Box 187, Chagrin Falls, Ohio, 44022 U.S.A.

"Accelerator C" is a powdered chemical formulation developed specifically to accelerate the penetration and softening of scale in sugar juice evaporators during the boiling with caustic soda and/or soda ash. It is particularly valuable for use with caustic where evaporator scales are relatively light, and intensive caustic cleaning with this accelerator may well obviate the need to use brushing or acid.

Use in the U.S. and the Caribbean islands has shown that from 0·5 to 1·5 lb per 100 sq.ft. of evaporator heating surface added to the normal caustic wash solution will penetrate and soften scale up to twice as fast as the caustic wash used alone.

It has been particularly effective in preparing hard scales for easier final cleaning with acid, or for permitting the complete removal of relatively mild scales with the use of this special caustic wash solution alone.

* * *

Renold stock drive range increased. Renold Chains Limited, Renold House, Wythenshawe, Manchester.

The well known range of off-the-shelf chain drives manufactured by Renold Chains Limited has been increased by the addition of drives employing 1·25 in and 1·50 in pitch simple, duplex and triplex chains, thus increasing the top power limit from the previous 190 h.p. to 430 h.p. at 900 r.p.m. In each size, pinions are available with 19, 21, 23 and 25 teeth and wheels with 38, 57 and 76 teeth.

The new pinions and wheels follow normal Renold practice in being provided with a minimum plain bore commensurate with power capacity and a boss of sufficient diameter to permit reboring and keyways over a wide range of sizes.

The complete Renold stock range covers ratios from 1:1 up to 8·82:1 and no less than 338 different drives are now available. In addition, the existing range of standardized design drives up to 4250 h.p. at 300 r.p.m. can be supplied to handle heavier loads.

* * *

Reverse air fabric filter. Midac Dust Control Divn., Midland Heating & Ventilation Co. Ltd., Bedford Road, Birmingham 11.

A new design of reverse air fabric filter suitable for trapping sugar and carbon dust contains envelope-type filter bags housed in parallel across an air-tight frame. Dust-laden air is introduced at the side of the filter towards the bottom. The heavier particles settle here, while the finer particles pass upwards to the filter envelopes where they are trapped in the weave of the cloth. A high-pressure reverse air jet is then directed into the mouth of the envelope and the dust particles are discharged into hoppers.

The cleaning cycle is continuous. The high-speed blowing head, fan and motor unit are part of a carriage assembly which moves across the filter-cloth and ensures constant pressure loss while maintaining a stable air volume. The filter fabric has a longer life than with mechanical shaking gear and stoppages for bag cleaning are infrequent. A filtration efficiency of almost 100% with particles of 1μ is obtainable.

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PUBLICATIONS RECEIVED

DIRECT AMMONIA INJECTION. Direct Nitrogen Ltd., Cedar House, London Rd., Reigate, Surrey.

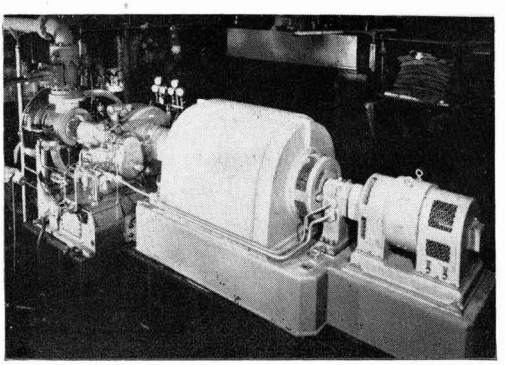
A publication has been issued giving details of a system for direct injection of liquid ammonia into the soil. The basic equipment described comprises a tractor-drawn tiller with a nozzle behind each of the tines (11 is the normal number of tines, but up to 20 can be fitted) and a nurse tank for refilling the application feed tank. A "Nitromatic" pump on the tiller ensures a constant application rate at all tractor speeds.

* * *

Sugar factory exports from Poland.—Under a five-year agreement signed by Poland and Spain, Poland has sold a sugar factory to Spain and in return bought heavy lorries from the Spanish firm of Pegaso. Poland has received an order for the construction of two sugar factories in Western Pakistan, each with a daily output of 200 tons of sugar. A new organization has been set up to design and supply complete industrial plants; known as Chemadex, the enterprise will specialize in the design of chemical plants, sugar factories and food industry plants. It will design the factory, supply all the machinery, equipment and materials and supervise the building and assembly work.

* *

Power plant for Jamaica.—The illustration shows a single-stage steam turbine, manufactured by W. H. Allen, Sons & Co. Ltd., driving a 750 kW alternator while on test at the firm's Bedford works. It is one of a range of the recently introduced Allen-KKK turbines that is to be shipped to the Duckenfield factory of Jamaica Sugar Estates Ltd.



WORLD SUGAR PRODUCTION ESTIMATES, 1965/66[1]

(*metric tons, raw value*)

BEET SUGAR (*Estimate*)	1965/66	1964/65	1963/64
WESTERN EUROPE			
Austria	235,000	340,000	329,661
Belgium/Luxembourg	410,000	556,638	354,607
Denmark	258,000	436,000	368,000
Finland*	49,000	60,972	57,731
France	2,380,000	2,438,690	2,085,331
Germany, West	1,575,000	2,182,836*	2,108,077*
Greece	100,000	68,867	38,544
Holland	565,000	663,432*	427,382
Ireland	118,000	141,080	145,408
Italy	1,200,000	1,039,322	948,893
Spain	400,000	492,182	284,442
Sweden*	220,000	296,167	245,396
Switzerland	49,000	56,965	46,403
Turkey	575,000	794,922	524 002
United Kingdom	960,000	1,045,876	834,248
Yugoslavia	315,000	357,090	347,777
Total	9,409,000	10,971,039	9,245,902
EASTERN EUROPE			
Albania	12,000	12,000	11,000
Bulgaria	125,000	224,700	158,556
Czechoslovakia	720,000	1,115,000	1,103,889
Germany, East	640,000	818,333	789,317
Hungary	475,000	495,222	457,200
Poland	1,700,000	1,837,678	1,454,400
Rumania	425,000	466,600	318,127
U.S.S.R.	8,400,000	8,600,000	6,150,000
Total	12,497,000	13,569,533	10,442,489
Total Europe	21,906,000	24,540,572	19,688,391
OTHER CONTINENTS			
Afghanistan	9,000	9,000	8,500
Azores†	12,000	16,498	10,514
Canada	157,000	160,138	154,519
Chile	117,000	105,842	110,712
China (Manchuria)†	500,000	460,000	390,000
Iran	200,000	190,000	156,910
Iraq	30,000	25,000	11,750
Israel†	42,000	41,087	36,500
Japan	220,000	174,662	162,294
Morocco†	30,000	20,000	10,000
Pakistan	9,000	9,844	13,446
Syria†	25,000	22,000	21,407
Tunisia†	7,000	5,187	6,459
United States	2,800,000	2,996,665	2,796,881
Uruguay	157,000	160,138	154,519
World beet sugar production	26,114,000	28,831,495	23,617,683

CANE SUGAR			
AFRICA			
Congo (Brazzaville)	25,000	—	30,000
Congo (Léopoldville)	40,000	30,151	29,142
Egypt	430,000	411,918	388,407
Ethiopia	73,000	68,553	66,700
Kenya§	40,000	32,286	38,923
Madagascar	105,000	75,000	117,390
Madeira	3,500	3,065	6,557
Mauritius§	650,000	518,994	685,597
Portuguese East Africa§	165,000	151,042	182,348
Portuguese West Africa§	67,000	66,876	68,233
Réunion§	240,000	200,645	224,240
Rhodesia	225,000	190,114	136,985
South Africa§	915,000	1,353,186	1,147,314
Sudan	30,000	18,436	21,689
Swaziland§	90,000	87,265	85,638
Tanzania§	73,000	72,926	68,264
Uganda§	141,000	127,847	139,471
Total	3,312,500	3,408,304	3,436,898

CANE SUGAR (*Estimate*)	1965/66	1964/65	1963/64
EUROPE			
Spain	40,000	43,822	31,204
NORTH AND CENTRAL AMERICA			
Antigua†	20,000	14,265	21,411
Barbados†**	195,000	199,109	164,083
British Honduras	46,000	35,853	34,129
Costa Rica	102,000	100,000	98,000
Cuba†	5,600,000	6,000,000	3,810,000
Dominican Republic§	700,000	644,000	864,976
Guadeloupe§	186,000	184,813	166,894
Guatemala	166,000	146,392	149,162
Haiti	68,000	65,317	61,688
Honduras	30,000	29,900	29,774
Jamaica†	542,000	532,800	481,956
Martinique†	75,000	72,000	65,655
Mexico	2,300,000	2,080,000	1,931,548
Nicaragua	107,000	98,656	96,000
Panama	61,000	55,560	50,449
Puerto Rico†	953,000	813,689	897,598
St. Kitts†	40,000	39,138	43,825
El Salvador§	106,000	105,800	103,472
Trinidad†	285,000	254,596	230,155
United States, Hawaii†	1,080,000	1,089,000	1,069,357
" " Mainl'd	991,000	1,036,466	1,069,159
Virgin Islands†	16,000	7,000	14,098
Total	13,669,000	13,604,354	11,453,389
SOUTH AMERICA			
Argentina§‡	1,200,000	931,409	1,100,433
Bolivia	95,210	104,047	103,961
Brazil	4,094,000	3,737,874	3,243,211
British Guiana	340,000	325,000	262,507
Colombia	550,000	525,000	440,695
Ecuador	177,000	169,761	172,591
Paraguay‡	40,000	53,563	39,006
Peru†§	830,000	780,000	802,161
Surinam	17,600	12,500	12,143
Uruguay‡	12,000	11,089	9,581
Venezuela	390,000	356,216	321,886
Total	7,745,810	7,006,459	6,508,175
ASIA			
Burma	70,000	67,000	65,000
Ceylon	6,500	6,120	5,347
China†	1,750,000	1,650,000	1,450,000
India—Khandsari	280,000	262,119	259,131
—White sugar	3,850,000	3,590,000	2,855,569
Indonesia‡	750,000	650,000	653,529
Iran	25,000	20,000	15,000
Japan	90,000	88,000	55,340
Ryukyu	300,000	278,000	128,365
Pakistan	280,000	262,119	259,131
Philippines	1,708,000	1,555,792	1,683,627
Taiwan§	955,000	1,005,547	795,101
Thailand§	150,000	252,000	167,973
Vietnam, South	3,000	5,000	15,000
Total	10,217,500	9,709,578	8,428,982
OCEANIA			
Australia‡	2,032,000	1,934,464	1,704,848
Fiji‡	322,000	312,928	303,784
	2,354,000	2,247,392	2,008,632
World cane sugar production	37,338,810	36,019,909	31,867,280
World sugar production	63,452,810	64,851,404	55,484,963

* including sugar made from foreign beets.
† 1966, 1965, 1964.
** including "fancy molasses".
§ tel quel.
‡ 1965, 1964, 1963.

[1] F. O. Licht, *International Sugar Rpt.*, 1965, **97**, (33), 1–4.

BREVITIES

Sugar industry proposal for Senegal[1].—The second four-year plan for Senegal includes provision for establishment of a sugar industry in that country. Senegal imports about 50,000 tons of sugar per year for domestic needs and it is proposed in the plan that sugar cane will be grown and processed in the Fleuve region to eliminate eventually much of these imports. The date proposed for the first sugar campaign is 1969, when 1500 ha will be under cultivation to produce 150,000 tons of cane and, from this, 15,000 tons of sugar. The final objective is an area of 4500 ha, corresponding to a production of 40,000 tons of sugar, to be achieved probably towards 1975. Construction of the sugar factory, with an initial capacity of 1500 tons/day, is to start in 1967 and it is expected to cost 2000 million francs.

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Sugar factories for Indonesia[2].—According to the Indonesian News Agency Antara, five new sugar factories with capacities of 15,000 to 16,000 tons each are to be built during the next few years. It is planned to finance the construction of these factories with loans from foreign countries; Japan, the Netherlands and Czechoslovakia have been mentioned in this connexion.

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Indian cane crop, 1964/65[3].—The All-India final estimate of sugar cane for 1964/65 places the cane area and crop at 6,286,700 acres and 122,126,600 metric tons, respectively, the cane area being 12·7% greater than for the 1963/64 crop.

Stock Exchange Quotations

London Stocks (*at 17th December*, 1965)	CLOSING MIDDLE s d
Anglo-Ceylon (5s)	5/3
Antigua Sugar Factory (£1)	10/–
Booker Bros. (10s)	19/6
British Sugar Corp. Ltd. (£1)	23/6
Caroni Ord. (2s)	2/1½
Caroni 6% Cum. Pref. (£1)	16/9
Demerara Co. (Holdings) Ltd.	3/3
Distillers Co. Ltd. (10s units)	25/4½
Gledhow Chaka's Kraal (R1)	14/–
Hulett & Sons (R1)	14/9
Jamaica Sugar Estates Ltd. (5s units)	3/–
Leach's Argentine (10s units)	12/6
Manbré & Garton Ltd. (10s)	32/–
Reynolds Bros. (R1)	16/–
St. Kitts (London) Ltd. (£1)	12/6
Sena Sugar Estates Ltd. (5s)	7/9
Tate & Lyle Ltd. (£1)	30/–
Trinidad Sugar (5s stock units)	2/9
West Indies Sugar Co. Ltd. (£1)	9/6

New York Stocks (*at 16th December*, 1965)	CLOSING MIDDLE $
American Crystal ($5)	21
Amer. Sugar Ref. Co. ($12.50)	30½
Central Aguirre ($5)	25⅝
Great Western Sugar Co.	39⅝
North American Ind. ($10)	14½
South P.R. Sugar Co.	18
United Fruit Co.	28⅛

New sugar factory for China[5].—Construction of a large sugar factory at Nanning, capital of the Kwangsi Chuang region, is nearly completed, according to the New China News Agency. The factory, which will have a daily capacity of 2000 tons of cane, is among eleven big and medium sized mechanized plants scheduled for construction or expansion in China before the end of this year, and will bring the total number of modern factories in the region to eight.

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French beet price, 1965/66[4].—The prices paid for sugar beet in France for the 1965/66 campaign were announced on the 10th November 1965 by the French authorities and are unchanged from the previous two campaigns at 71·76 francs per metric ton, basis 8·5 degrees sugar content (which corresponds to approximately 17% sugar in the fresh beet) at the factory. The taxes on the above price lower the net return to the grower to 63·51 francs per ton, reports *Agra Europe*. This is unchanged from the 1964/65 season, but in 1963/64 the ruling taxes were lower and resulted in a net return for the beet of 70·44 francs per ton. The price paid for beet, however, is only guaranteed for the sugar production quota of 1,569,058 metric tons, white value, for the 1965/66 season which compares with most estimates for the entire output of about 2–2·2 million tons, white value.

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Automatic control lecture course.—Special lecture courses are to be held in 1966 at the Enfield College of Technology, near London, on "The Application of Low-cost Automation to Industry". The two courses are for manufacturing and process industries, respectively, and have a common first week of studies on the economics and social aspects of automation, methods of control, mechanical systems, pneumatics, electrical systems, electronic devices, logical design (boolean algebra), methods of logical switching, M.T.S. and the management view of automation. In the second week of the manufacturing industries course subjects covered will include product design for automation, materials handling, automatic size control and inspection, etc., while the process industries course will include process design for automation, fluidized flow, control of liquids, control of processes, case studies, the computer's part in control and systems comparison, etc. The fee for the courses is £31 10s per person and will include light refreshment and luncheon each day, with a printed copy of notes covering various aspects of the course.

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Argentina sugar production policy[6].—It was announced early in November that the Argentine authorities were sanctioning the export of 300,000 tons of sugar from the current crop. It is now understood, however, that while the export of this tonnage has been authorized, no subsidies have so far been allocated which would make it unlikely that sugar producers in the Argentine would be willing to export to countries other than the U.S.A. while the present low price structure exists in the world market. In future years production in the Argentine is to be kept to a level more in line with domestic needs, and it may be that the present export reserve of 300,000 tons, together with the 80,000 tons already held in a domestic reserve, in compliance with an earlier decree, will eventually be absorbed into home consumption if no marked improvement takes place in the world price of sugar.

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West Germany sugar factory closures[7].—After the end of the 1965/66 campaign the sugar factories at Hedwigsburg and Othfresen are to be closed. The factory in Hornburg was closed in 1965.

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[1] *Sucr. Franc.*, 1965, **106**, 259.
[2] F. O. Licht, *International Sugar Rpt.*, 1965, **97**, (31), 19.
[3] *Indian Sugar*, 1965, **15**, 404.
[4] C. Czarnikow Ltd., *Sugar Review*, 1965, (742), 214.
[5] *Public Ledger*, 13th November 1965.
[6] C. Czarnikow Ltd., *Sugar Review*, 1965, (739), 199.
[7] F. O. Licht, *International Sugar Rpt.*, 1965, **97**, (34), 9.