International Sugar Journal

•

Editor and Manager:
D. LEIGHTON, B.Sc., F.R.I.C.

Assistant Editor:
M. G. COPE, M.I.L.

Agricultural Editor:
F. N. HOWES, D.Sc., I.S.O.

•

* * *

Published by
The International Sugar Journal Ltd.
23a Easton Street, High Wycombe,
Bucks.
Telephone: High Wycombe 29408
Cable: Sugaphilos, High Wycombe

* * *

Annual Subscription: 32s 0d or $5.00 post free
Single Copies: 2s 6d or 45 cents plus postage

Contents

SOMMAIRES : ZUSAMMENFASSUNGEN · SUMARIOS

La vigne de Madère—une mauvaise herbe de plantations de cannes. p. 259

On décrit la vigne de Madère (*Boussingaultia basselloides*), une plante de culture ou d'ornement dans quelques pays tropicaux ou subtropicaux, qu'on a trouvée dans des plantations de cannes en Afrique du sud. On discute des moyens possibles de combattre cette mauvaise herbe et mentionne sa toxicité possible pour des animaux.

* * *

La raffination de sucre—Remarques sur des procédés individuels. 2-ème partie. La filtration de liqueur saturée. F. M. CHAPMAN. p. 260–262

Le sujet est discutée sous huit rubriques, c.-à-d. la filtration à taux constant ou à pression constante; l'effet de la turbidité sur la filtration subséquente avec le noir animal; le dessein de filtres; les tapis de filtre; la cendre dans les tapis écartés de filtre-presses; l'écoulement de la liqueur à travers de filtres; la performance comparative de stations de filtre-presses en liqueur carbonatée; et des observations variées.

* * *

Explosion de sucre au Canada. p. 272–266

On présente un rapport sur les causes et effets d'une explosion dans le bâtiment à package d'une raffinerie de la compagnie St. Lawrence Sugar Refineries Ltd. au Canada. Le rapport se base sur les témoins oculaires et comprend des détails de dommage aux équipements spécifiques. On présente une liste des changements dans le bâtiment reconstruit afin de réduire l s risques d'une explosion à l'avenir.

* * *

L'économique de contrôle biologique. p. 266

On discute les deux méthodes principales de contrôle biologique d'insectes nuisibles et de mauvaises herbes, c.-à-d. l'introduction planée d'ennemis naturels d'un insecte nuisible, spécifique, et l'élévage en masse dans les "fermes d'insectes" de parasites ou d'insectes "de proie", qu'on lâche dans des zones infestées d'insectes nuisibles. Les méthodes sont illustrées de plusieurs exemples et on considère leur économique.

* * *

La jetée pour déchargement de sucre brut à la raffinerie Thames. p. 267–268

On décrit la jetée construite dans la Tamise pour le déchargement de sucre brut en vrac, qui ensuite est transportée dans le silo de la raffinerie Thames de la compagnie Tate & Lyle Refineries Ltd. On donne des détails de l'équipement employé, et discute les avantages de la nouvelle jetée.

Die Madeira-Rebe—ein Rohrfeldsunkraut. S. 259

Man beschreibt die Madeira-Rebe (*Boussingaultia basselloides*), eine Kultur- oder Zier-Pflanze in einigen tropischen oder subtropischen Ländern, die in südafrikanischen Rohrfeldern gefunden worden ist. Man bespricht mögliche Wege zur Bekämpfung dieses Unkrauts und erwähnt ihre mögliche Giftigkeit für Tiere.

* * *

Zuckerraffination—Anmerkungen über Einzelverfahren. Teil 2. Filtration von saturierter Kläre. F. M. CHAPMAN S. 260–262

Der Verfasser bespricht das Thema unter acht Rubriken. Diese sind: Filtrierung bei stetiger Geschwindigkeit oder stetigem Druck; die Einwirkung von Trübung auf nachfolgende Knochenkohlefiltration; Filterprojektierung; Filtertücher; die Asche in abgelegten Filterpressetüchern; der Kläredurchlauf; die vergleichende Leistungsfähigkeit von Filterstationen an saturierter Kläre; und verschiedene Anmerkungen.

* * *

Zuckerexplosion in Kanada. S. 262–366

Man berichtet über die Ursachen und Einwirkungen einer Explosion im Packungsgebäude einer Raffinerie der Firma St. Lawrence Sugar Refineries Ltd. in Kanada. Die Bericht beruht auf die Beweise von Augenzeugen und gibt Besonderheiten der Schaden an bestimmte Einrichtungen. Die Anderungen im wiederkonstruiertem Gebäude, durchgeführt, um eine Explosion in der Zukunft zu verhüten, werden in eine Liste eingetragen.

* * *

Die Wirtschaft von biologischer Kontrolle. S. 266

Man bespricht die zwei Hauptmethoden der biologischen Kontrolle von Schädlingen und Unkraut, und zwar die geplante Einführung von natürlichen Feinden eines bestimmten Schädlings in ein neues Gebiet, und die Massenzüchtung in "Insekthäusen" von Schmarotzern und Raubinsekten, welche dann in von Schädlingen überschwemmte Gebiete losgelassen werden. Die zwei Methoden werden mit Beispielen illustriert, und ihre Wirtschaft betrachtet.

* * *

Der Hafendamm für Rohzuckerabladung bei der Raffinerie Thames. S. 267–268

Man beschreibt den in der Mitte der Themse für die Abladung von ungesacktem Zucker gebauten Hafendamm. Der Zucker wird dann in einen Lagerraum der Raffinerie Thames der Firma Tate & Lyle Refineries Ltd. gefördert. Besonderheiten der Vorrichtungen werden gegeben, und die Vorteile des neuen Hafendamms besprochen.

La vid de Madeira—una mala hierba del campo de caña. Pág. 259

Se presenta una descripción de la vid de Madeira (*Boussingaultia basselloides*), una planta cultivado o de adorno en varios paises tropicales o sub-tropicales, que se ha hallado en Sud-Africa. Métodos posibles para luchar contra esta mala hierba se discutieren y se menciona su toxicidad posible para animales.

* * *

Refinación de azúcar—Notas sobre procesos unitarios. Parte II. Filtración de licor carbonatado. F. M. CHAPMAN. Pág. 260–262

Se discute este sujeto debajo ocho rúbricas: filtración a velocidad constante *vs.* presión constante; efecto de turbidez sobre tratamiento con carbón animal; diseño del filtro; telas de filtrar; ceniza en tela despedida de una filtro-prensa; flujo de licor; obra comparativa de estaciones de filtración de licor carbonatado; y observaciones miscelaneas.

* * *

Explosión azucarera en Canada. Pág. 262–266

Se presenta un informe sobre las causas y los efectos de un explosión en la casa de embalaje de la refinería de St. Lawrence Sugar Refineries Ltd. en Canada. El informe se basa sobre las cuentas de testigos oculares y incluye detalles completos del daño a equipos específicos. Se presenta una lista de cambios que se incorporan en el edificio reconstruido para disminuir el riesgo de otras explosiones en el futuro.

* * *

Los económicos de control biológico. Pag. 266

Los dos métodos principales de control biológico de plagas y malas hierbas, i.e. la introducción avisada de enemigos naturales de una plaga específica en un área nueva, y la crianza en insectarios de parásitos o predatores que se libran después en áreas infestados con plagas, se discutieren y se ilustran por medio de un numero de ejemplos. Los económicos de estas técnicas se consideran.

* * *

Espolón para azúcar crudo a la refinería Thames. Pág. 267–268

Se describe el espolón construido en el Río Thames a Londres para la descargamiento de azúcar crudo a granel que es transportado después a un almacén de la refinería Thames de Tate & Lyle Ltd. Se presentan detalles del equipo usado y se discutieren los ventajas del nuevo espolón.

THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXIX SEPTEMBER 1967 No. 825

Notes & Comments

U.K. sugar surcharge increase.

As the world market price of raw sugar has again fallen, the U.K. Minister of Agriculture, Fisheries and Food has made Orders under the Sugar Act, 1956, adjusting the surcharge in conformity with this price movement. The surcharge was raised from the 11th July 1967 and is now 3¾d per lb (35s 0d per cwt) instead of 3½d per lb (30s 4d per cwt). This is the tenth change in the rate of surcharge in the past 12 months.

The surcharge is a levy made under the Sugar Act of 1956 to cover any losses incurred by the Sugar Board arising from (a) the purchase of Commonwealth sugar at fixed prices and its sale by the Board at world prices in accordance with the Act and (b) the financing of the British Sugar Corporation in the purchase of sugar beet at guaranteed prices. As the world price falls, the Sugar Board receives less for the sugar it sells and the surcharge has to be raised correspondingly to compensate for this; conversely, as the world price rises the surcharge can be reduced. The net result is a substantially steady price for sugar.

* * *

Cuban sugar crop, 1967[1].

Cuba's 1967 sugar harvest officially ended on the 25th July with a total outturn of 6,128,287 metric tons, raw value. This was the third largest crop in the country's history but also its longest, having lasted almost eight months from its start at the end of November 1966.

* * *

International Sugar Conference setback.

Following the UNCTAD sugar talks in June[2], Dr. RAUL PREBISCH has been visiting representatives of various nations concerned with a conference which might produce a reactivated International Sugar Agreement. A considerable stumbling block has been Cuba whose representatives at various meetings have indicated that they did not consider calling a conference worthwhile because of the effect of political considerations on sugar movements. However, Dr. PREBISCH succeeded in persuading the Cubans to come to the conference table and carried on with his visits to other countries.

Then, in Brussels, after a two-day visit, the President of the Common Market Commission told him that the proposed UNCTAD system for a world sugar agreement did not fit in very well with the E.E.C.'s common sugar policy, at present being worked out, since the UNCTAD proposals tended towards guaranteed export quotas for producer countries whereas the Common Market was working on the lines of limiting production rather than providing export guarantees. M. REY also said that, so far as the Common Market was concerned, a decision to participate in such a conference did not really fall within the competence of the Commission but of the member states.

The *Times*[3] comments: "If Mr. REY had given the green light, the possibility of an international agreement would have been distinctly encouraging . . . But whether a conference now is worth considering is open to doubt, for if the Common Market countries refuse to accept an agreement what chance has Dr. PREBISCH in persuading others that it is in their best interests to have one?"

* * *

World sugar production estimate, 1966/67[4].

The results of Licht's third estimate of world sugar production are summarized below with corresponding figures for the two previous crops.

	1966/67	1965/66	1964/65
	metric tons, raw value		
Cane sugar production	37,593,247	36,322,621	36,154,070
Beet sugar production	28,833,812	27,135,801	30,787,733
World sugar production	66,427,059	63,458,422	66,941,803

According to the estimate, world beet sugar production has increased by 1,698,011 tons or 6·26%; 1966/67 production in the E.E.C. countries was 100,000 tons lower than in the previous year, but production figures in Austria, Denmark, Spain,

[1] *Reuters Sugar Report*, 26th July 1967.

[2] *I.S.J.*, 1967, **69**, 226.

[3] 27th July 1967.

[4] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (20), 1–5.

Yugoslavia, Finland, Turkey, East Germany, Czechoslovakia, Poland, Rumania and Bulgaria were higher than in the previous year. In the beet sugar producing countries outside Europe the increase compared with last year amounts to some 212,000 tons, above all in the United States, Canada, Chile and Iran. The increase rate in the beet sugar producing countries exceeds the probable increase of consumption and consequently a slight increase of stocks is to be expected in this sector.

World cane sugar production is expected to have increased by 1,270,626 tons or 3·50%. The developments in individual countries were very different; considerable increases in production are registered in Cuba, Mexico, South Africa, Congo (Brazzaville) and Australia. In these five countries alone the 1966/67 production was higher by 3,293,834 tons or 34·59% than in the previous year. These increases would have influenced the world sugar balance; however, in numerous other countries sugar production has been reduced—partly planned and partly due to unfavourable weather conditions or other factors. Large reductions in the cane sugar sector are registered in Argentina, Brazil, Mauritius, Indonesia and especially in India. In these five countries the 1966/67 sugar production amounted to 2,530,021 tons or 22·54% less than in 1965/66.

These reductions have partly equalized the increases in other countries and consequently, the increase of total world sugar production amounts only to 2,968,637 tons or 4·68%. This increase may essentially be taken up by consumption. This comparatively favourable development is, however, above all a consequence of the reduced Indian production, which is lower by more than 1·5 million tons than in the previous year. Without this heavy reduction in India, developments would have been quite different. Because world sugar production in normal years increases by about 2·5 million metric tons, any increase of world sugar production exceeding this quantity must lead to a worsening of the statistical situation, unless sugar production is increased in countries, which cannot yet cover the domestic demand—e.g. Mainland China—and which have not sufficient foreign currency for sugar imports.

On the basis of the present beet development in Europe as well as on the production plans in some countries of the cane sugar sector, over-production is to be feared also in the 1967/68 campaign year.

C. Czarnikow Ltd., commenting on the estimates, remark[1] that, while they are by-and-large in agreement with most of the figures, they do not agree with the estimate for the U.S.S.R., set by Licht at 9,500,000 metric tons. From the available published information Czarnikow have concluded that production during the 1966/67 campaign cannot have exceeded 9,000,000 tons, a difference which, together with the 330,000 tons difference between Licht's recent figures and his second estimates in March, make up almost the million tons which had been anticipated by the market.

Kenya sugar expansion study.

The Booker Group recently announced that an agreement has been signed with the Government of Kenya under which Bookers Agricultural Holdings Ltd. will carry out a pilot scheme for the establishment of a sugar industry at Mumias in the Western Province of Kenya, some 260 miles west of Nairobi.

The scheme is expected to extend over three to four years and the cost will be borne by the Government of Kenya. Should the pilot scheme prove the commercial viability of the project, the agreement further provides for the formation of a company (with Bookers having a small share of the equity) under Booker management, including the erection of a sugar factory to process both "outgrowers" and estate cane. Initially 1000 acres will be involved in the pilot scheme, but the complete project would cover 7500 acres and a further 9500 acres of outgrowers' cane from surrounding areas.

Mr. M. N. LUCIE-SMITH, a director of Bookers Agricultural and Technical Services Ltd., has been seconded to Kenya as Project Manager.

The target production if the project goes ahead after the pilot scheme is for 45,000 tons of sugar a year in 1975. This compares with Kenya's current 1966 output of 35,000 tons and an estimated overall national production of some 200,000 tons in 1975. Present Kenyan consumption is 120,000 tons a year and it is forecast to rise to nearly 240,000 tons by 1975.

* * *

Brazil sugar plan 1967/68.

A factor contributing to the decline in sugar prices following the Middle East cease-fire was the announcement by the Brazilian Minister for Industry and Trade that Brazil hoped to export 1·2 milion tons from the 1967/68 crop, a quantity larger than the market had anticipated. However, details of the 1967/68 sugar plan have been published by the Instituto do Açúcar e do Alcool[2].

Total sugar production is to reach 3,996,000 metric tons of which 3,036,000 tons will be white sugar for domestic consumption and 960,000 tons raw sugar for export. Raw sugar may eventually be increased by 180,000 metric tons.

The states of Pernambuco, Alagoas and São Paulo will produce the raw sugar for export and will not be permitted to produce white sugar until the raw sugar quotas have been filled.

The total quota is only 96,000 tons higher than the 1966/67 plan, and an interesting new item is the establishment of a "regulation reserve". For this purpose 270,000 tons of white sugar from the previous crop will be purchased at the official price and withdrawn from the domestic market until a balance between offer and supply is established.

[1] *Sugar Review*, 1967, (825), 139–140.
[2] Through F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (18), 15.

The Madeira Vine - a cane field weed

THE Madeira vine (*Boussingaultia basselloides*: family *Bassellaceae*), a cultivated or ornamental plant in some tropical or subtropical countries, has now been recorded as a cane field weed in South Africa[1]. In spite of its name the plant is not native to Madeira but is indigenous in South America, notably Venezuela. It probably acquired the name Madeira vine from having been grown in gardens in Madeira and seen by visitors to the island. A similar, acquired name is Canary banana, long used for the dwarf or Cavendish banana, which is native to the East, but has been cultivated in the Canary Islands from an early date. Other names for *B. baselloides* are "bridal wreath" and "lambs' tails", the latter name having been applied to this ornamental climber in Australia where it is an escape from cultivation in some parts of New South Wales and Queensland. Other countries where it also occurs as a garden escape or is naturalized are the West Indies, Florida and Texas.

Boussingaultia basselloides was introduced to cultivation in Britain or Europe in 1835 and was cultivated mainly as a stove or hothouse plant. As this climber will not withstand frost the possibilities of outdoor cultivation in temperate climates is restricted. It is interesting to observe that in an early account of the plant, published 130 years ago[2], where a description and coloured illustration appear, reference is made to its very rapid rate of growth—20 feet in a season. It was reputed to grow best in a "sandy vegetable soil", presumably a sandy soil rich in humus. It is interesting to recall that the coastal soils of the Natal sugar belt, where this plant is now threatening sugar cane, are largely of a sandy nature. This early account refers to the interesting fact that the climber, although flowering freely, did not appear to set viable seed in Britain and that the plant is easily propagated from the tubers and the tubercles that appear on the stem.

This ease of propagation or of self-propagation is one of the factors that increases the menace of the plant as a weed in sugar cane plantations. In Natal the advice given to cane growers who may be faced with the task of exterminating the weed is not to leave tubers lying about or to leave them to dry in the sun, which they do not readily do, but to burn them. Experiments are in progress to test the effects of modern herbicides on the weed. The type of herbicide likely to be most suitable is one which will be translocated to the large tubers and will effectively kill them. Until results of such experiments are known the only advice that may be given is to dig up and burn the tubers. Presumably this advice would also apply to the stems if they are bearing tubercles, which would be capable of producing fresh plants. Cultivation can easily be the cause of spreading a weed of this kind, as applies also with some other weeds, notably *Oxalis* and *Convolvulus* or bindweed.

In Natal or Zululand infestations of the Madeira vine in sugar cane have been reported in the Mount Edgecombe, Stanger, Eshowe, Amatikulu and Empangeni areas. It may be present in some other areas of the coastal sugar belt not yet reported. The suggestion has been made that the tubers might be used as pig food after having been dug up from sugar cane plantations. Like most tubers they probably have a high starch or carbohydrate content and may well prove to be a suitable pig food. One writer has described them as very mucilaginous. It may be as well to bear in mind that the plant has been suspected of being poisonous with grazing animals in Australia in areas where it has run wild. Whether the plant is, or is not toxic, does not appear to have been well established[3]. There is the possibility that it may be one of those plants whose toxicity may vary from place to place or with the seasons.

As an ornamental climber the Madeira vine has long been favoured in climates warm enough for it, particularly for covering walls, porches, arbours and shaded walks as it produces a mass of foliage and flowers. It is also useful for quickly covering old tree trunks or other unwanted objects in much the same way that *Polygonum baldschuanicum* will do in more temperate climates. These two climbers have, in fact, many points of similarity, especially in leaf characters and in ability to make rapid and dense growth. Where the Madeira vine is grown as an annual or summer plant, because of winter frosts, the tubers may be lifted and stored under frost-free conditions, to be planted out again when the danger of severe weather is past. They are treated in much the same way as is commonly done with dahlia tubers in cold climates. The climber has been known to survive the winter out-of-doors in the British Isles given the protection of a wall.

The Madeira vine branches freely in its growth, the stems being usually slightly reddish. The fragrant white or greenish white flowers are small individually but conspicuous in the mass, being produced in numerous racemes or elongated clusters 3–8 inches in length. A peculiar characteristic of the flowers is that on ageing they turn blackish in colour. The leaves are slightly fleshy, ovate in shape, 1–3 inches long with an acute apex, entire margin, and short petiole. The generic name, *Boussingaultia*, is derived from that of the well known French naturalist L. B. BOUSSINGAULT, born in 1802, who travelled widely in South America.

F.N.H.

New Algerian sugar factory[4].—Société Fives Lille-Cail is to construct a sugar factory in El Khemis which is to produce about one fourth of Algeria's annual sugar requirements. With the production from this factory, the total sugar output of the country will be increased to 80,000 tons annually.

---

[1] A. G. ROODT: *S. African Sugar J.*, 1967, **51**, 34–35.
[2] *Botanical Magazine*, 1837, 3620.
[3] E. HURST: Poison Plants of New South Wales. 1942, pp. 108–109.
[4] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (18), 15.

Sugar Refining—Notes on Unit Processes

Part II. Filtration of Carbonatated Liquor

By F. M. CHAPMAN (Chapman-Associates, Vancouver, B.C., Canada.)

(1) *Constant rate vs. constant pressure filtration*

CALCULATIONS have shown that for the same tonnage per cycle, constant pressure operation required only 0·7 times the filtering surface required for constant rate pressing (since use is made of the strength of the filter shell *all* the time).

Data accompanying these calculations indicated that the relationship applied to large plate-and-frame liquor presses on long cycles (8–10 hr) and may not apply to leaf presses on short cycles because the brightening-up period may be a larger proportion of the liquor running period.

Thames Refinery in 1961 compared Sweetland press cycles:

(*a*) allowing pressure to build up through the cycle, (*b*) operating at full pressure (50 p.s.i.) from the start, and (*c*) building up to 50 p.s.i. pressure during the first 10 min. The rates found were in proportions of 100, 108, and 114, respectively.

A further trial over a period of 10 weeks, testing the life of the cloth, showed rates for (*a*) and (*c*) proportional to 100 and 104·4, respectively.

A general formula is: $F = \frac{1}{rC}$, where r = average specific resistance, and C = original concentration of suspended solids in unfiltered liquor.

It is indicated that doubling the size of the aggregates will reduce resistance by a factor of 4 or 5.

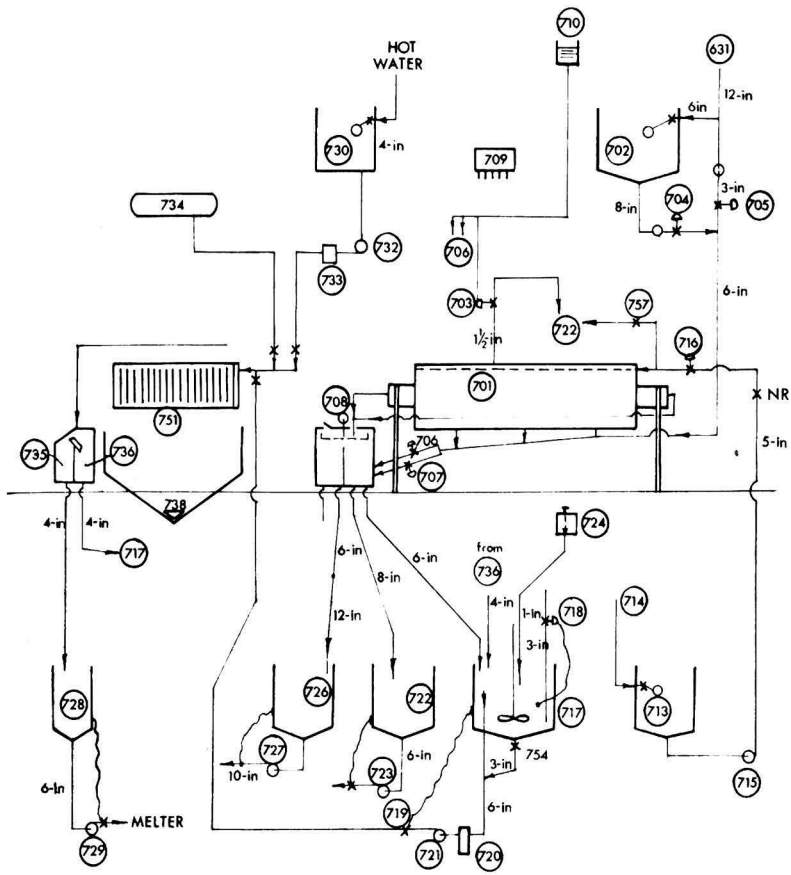
(2) *Effect of turbidity on subsequent charring*

BEAL and PENNINGTON[1] in 1961 showed that brilliance of pressed liquor was a prime factor affecting colour of liquor off char and colour of sugar. Liquor colour, *per se*, had much less effect.

It is not known if this effect is common to all liquors. Liquor off Plaistow's resin cells is strikingly brilliant, but this is not reflected in the colour of sugar (wash) or of jets.

(3) *Filter design*

Tate & Lyle Refineries employ only "Roto-filters" (1300 sq.ft. filter surface) and deep bodied Sweetland filters (910 sq.ft.). All Sweetland filters for carbonatated liquor should have extra-deep sloping bottoms (18 in between bottom of leaf and centre drain), and although steel bodies are available (from Fives Lille-Cail, Smith and Savannah) cast bodies are preferred because they are less liable to joint trouble through distortion. An exception to this is in Sweetland mud filters which need "hugging" steel bodies.



Diagrammatic arrangement of liquor and mud filters for a capacity of 4,000,000 lb/day

[1] *I.S.J.*, 1963, **65**, 207.

The author thinks that leaf spacing at 2-inch centres is too close for a Sweetland. Four-inch centres are excellent for cake release, but are wasteful in volume. Three-inch centres seem satisfactory. ("Rotofilter" leaves are at 2¾-in centres).

Metal covered leaves, successful with kieselguhr, powdered carbon and phosphate, have not been successful on carbonatation liquor. In recent years, because of its resistance to "ashing", monofilament polypropylene has started to replace cotton and "Neotex".

(4) *Filter cloth*

One refinery, by using nylon cloth, has extended the life to 6–10 months, but in this period leaves were removed for pickling 6–10 times. Consequently any advantage in labour cost was compromised.

It was shown also that 15% ash about halved the porosity of press cloth.

On investigation, it was found that gassing out to pH 9 resulted in precipitation of silica in the cloth and this could be minimized by gassing to pH 8·2. This change was effective in equalizing cloth life, but to avoid trouble with inversion on char, Plaistow Wharf back-limed filtered liquor to about pH 8·8.

The control used for cloth changing at Savannah is "15% ash" in washed cloth. Of total ash in discard cloth about half is acid-insoluble (60% silica, 40% Fe and Mg compounds).

(6) *Liquor throughput*

Excluding porosity (and consequently ash) of cloth, the most important controllable factors in liquor filtration are sluicing and care of leaves.

KEY

631. Liquor from heat tank.
701. "Rota" filters—total filtering area about 13,000 sq.ft.
702. Flooding tank—working capacity about 150 cu.ft. Maximum head on filter 4 ft. Automatic level control.
703. 1½-in bore motor head valve on "Rota" filter vent.
704. 6-in bore motor head valve on flooding pipe.
705. 3-in bore motor head valve on filter supply pipe from 631.
706. 6-in bore motor head valve on return liquor from 701.
707. 6-in bore motor head valve on sluicings from 701.
708. Rotating distributor for return (cloudy) liquor, delivering clear liquor and cloudy liquor to 726 and 722, respectively.
709. Automatic-cycling gear for sluicing, drainings and flooding filters 701.
710. High level tank for closing valves 703, 706, 707, 716, etc. These are "air to open".
713. Sluicing water tank—maximum working capacity 300 cu.ft.
714. 6-in bore (level-controlled) fresh water pipe (60–70°C).
715. Sluicing water pumps (2), each delivering 40 c.f.m. against a 230-ft head.
716. 5-in bore motor head sluicing water valve.
717. Sludge tank—working capacity 500 cu.ft.—equipped with propeller agitator, steam blower and level control on pump 721.
718. Thermostatically controlled steam blower.
719. Automatic level control.
720. Strainers ahead of pumps 721 (2).
721. Sludge pumps (2), each delivering 30 c.f.m. against 115-ft head.
722. Return liquor tank—capacity 300 cu.ft. with automatic level control set at 30 cu.ft.
723. Return liquor pumps (2), each delivering 60 c.f.m. against appropriate head.
724. Automatic doser for variable lime addition to 717. Criterion is firmness of mud in 751.
726. Tank for clear liquor to char—capacity 200 cu.ft.
727. Clear liquor pumps (2)—each delivering 100 c.f.m. against appropriate head.
728. Mud filter runnings and washing tank—capacity 30 cu.ft.
729. Mud filter runnings and washings pump (2), each delivering 20 c.f.m.
730. Wash water supply tanks for mud filters—capacity 80 cu.ft.
732. Wash water supply pumps for 751, delivering 20 c.f.m. against 120-ft head.
733. Wash water supply meter (pre-set).
734. Compressed air tank (10 p.s.i.) delivering to 751.
735. Clear runnings and washings to 728.
736. Cloudy runnings to 717.
738. Drag conveyor for mud from 751.
751. Mud filters—area about 4000 sq.ft.
754. 3-in bore drain from 717.
757. Liquor back flushing connexion for sluicing pipes.

Sluicing.—For good sluicing in a Sweetland filter, all leaves should be prefectly true and flat, because no sluicing jet can throw a curve. In addition the cloth should be taut and unwrinkled. This is possible only with metal-covered leaves, but such leaves can be used only with *heavy* precoats of kieselguhr. This prevents incrustations.

A "Rotofilter" is much less demanding, because the geometry of sluicing is so superior. The leaves rotate and the sluicing jets work at approximately ⅓ of Sweetland range. This also helps with distortion and with wrinkling of cloth.

Care of leaves.—There is no substitute for inspection and interest. Soft bridges of cake, if neglected, grow rock hard and belly the leaves. Ferguson leaves can be recrimped, while others can be restretched into rims and rewheeled. Cloths have to be tightened, sluicing nozzles inspected and cleared. Plaistow's "Rotofilter" station, the best known to the author, has shown worse performance since the retirement of an enthusiast.

Savannah in 1961 estimated the cost of recovering and changing as $3.20 a leaf ($25,000 p.a.), equivalent to 0·07% kieselguhr. Polypropylene in 1965 was found to reach 15% ash in about 6 months, the refinery using about 0·03% kieselguhr.

(5) *Ash in discard press cloth*

For many years Plaistow gassed out to about pH 9, because filtrability (checked on *new* cloth in the lab.) was better. About 1958 it was recognised that Thames gassing to about pH 8·2 achieved much longer cloth life. "Ash" in washed discard press cloth was 12–20% at Thames, 33–35% at Plaistow Wharf, and 25–45% at Liverpool, compared with 1% in new cloth.

(7) *Comparative performance of carbonatated liquor press stations*

Performance depends on many things, including area. A strong press station, by keeping filters dribbling, can run up large tonnages and minimize returns in drainings and sluicing. It is good economy

to have an extra press, providing it does not lie idle waiting for "bad pressing liquor".

Filter performance is variable, but the following table gives average figures for throughput per cycle and sluice water used.

Table I

	Type of filter	*Tons solids/press*	*Sluice water per cycle, cu.ft.*
A	Sweetland	12–15	175
B	"Rotofilter"	20–22*	100–130
C	Sweetland	12–13	210–420†
D	Sweetland	10–11	sluicing ineffective filters boiled out
E	Sweetland	18	not known

* Recalculated for the 910 sq.ft. Sweetland filter area; actual throughput was 28–31 tons through 1300 sq.ft.

† The wide variation is due to the use of two types of bottom, one of which does not sluice well.

(8) *Miscellaneous observations*

Effect of pumping.—Mr. C. H. ALLEN reported that pumping reduced the filtrability of carbonatation liquor by about 13% at Plaistow Wharf. Refinery observations indicate that the damage done increases with the degree of "churning". Oversize high head pumps can do a lot of damage, and this is understandable, because resistance varies inversely as the square of the size of the particle. Filters should be filled from a low head tank.

Fresh water vs. sweet water for sluicing.—It has been observed that the pH of sluice water will fall rapidly. If possible therefore presses should be sluiced with fresh water and runnings and washings sent direct to the melter water tank. Prolonging the life of liquor sluice has in the past led to serious problems with acidity, chalk deposition and *Leuconostoc* infection.

Automatic cycling of liquor presses.—There exist a number of automated filter stations, but in the author's opinion the best is at Plaistow. Mr. C. D. CHRYSTAL's arrangement is preferred on the grounds of simplicity, security and good components.

Filtration impeding impurities.—KAGA *et al.*[1] correlated impurities in affined sugar with filtrability.

	Correlation coefficient
Impurities in affined sugar	0·65
Gum	0·66
Wax	0·56
Phosphate	0·42
Silica	NIL
Starch	0·95

Analyses of the filtered liquors showed that most of the starch, silica and phosphate were removed in carbonatation; removal of gum ranged from 12–64% and colour removal was 28–62%.

Sugar Explosion in Canada

AT 1.03 p.m. on 6th May 1963 a series of three explosions took place in the Packing building of St. Lawrence Sugar Refineries Ltd. Extensive damage was caused to the walls and roof of the building and the dust collecting systems were destroyed. A fire resulting from the explosion destroyed sugar bins and conveying equipment in the bulk storage and conditioning plant (Fig. 1)

The Company's insurance adjusters have now given permission for release of the report on the occurrence. As an aid to understanding the report on the probable cause of the explosion, the layout and function of the equipment concerned may be described as follows:

With reference to Fig. 2, four 18-inch screw conveyors *A*, carry screened fractions into four bucket elevators *B*, feeding tripper belts *C* above a block of ten storage bins each of 750 tons capacity.

The bins discharge onto a set of four belts *D* feeding back into the screws *A*. Packing equipment on the third floor is fed by gravity from the screws *A* and normally operates for two out of three shifts. Refinery output on the third shift is stored in the bins until the following day.

The bulk conditioning plant consisted of ten polyester-reinforced glass fibre bins each of 2600 cu.ft. capacity with associated elevator, feed screws and discharge belts. This plant was a four-year-old addition to the rest of the installation which was thirteen years old.

The building was of monolithic construction with brick curtain walls. Above the fourth floor, only the south face had windows.

Eye witness accounts

Personnel on the 3rd floor included the Packing Superintendent, Packing Foreman, and Packing mechanic. Immediately after 1 p.m. all these men heard a sharp report and saw a large flash at the bottom of the four sugar elevators in the northwest corner of the floor. The report and flash were followed in quick succession by two louder explosions, the first of which appeared to come from the elevators and the second from the northeast region of the floor above. All three explosions occurred within about one second. One who was within fifteen feet of the elevators at the time heard a brief rumble in

[1] *I.S.J.*, 1966, **68**, 3–6.

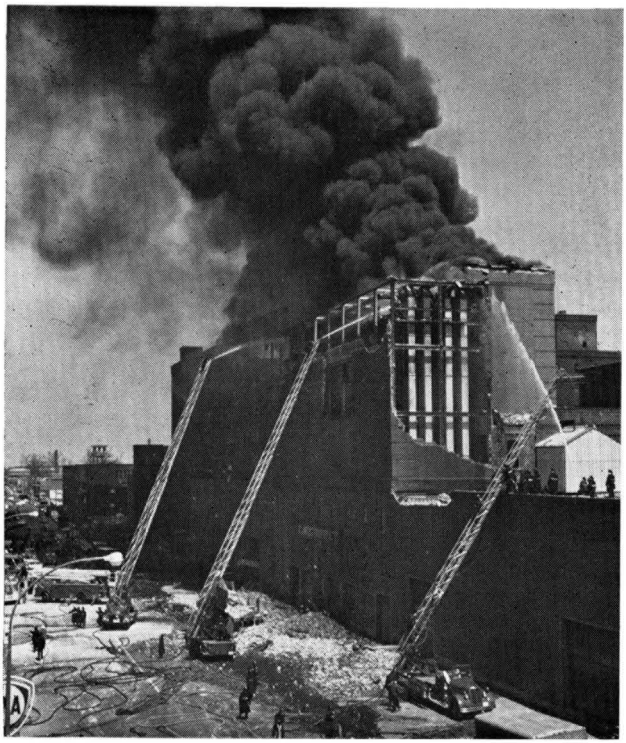


Fig. 1

the elevators prior to the explosion. This was not noticed by the other two who were within thirty-five and fifty feet respectively. The flash that accompanied the initial explosion was of very brief duration, but of sufficient intensity to ignite a cotton bag ten feet from the elevator boots. None of the three men felt any sensation of pressure or wind. All four elevators were carrying sugar at the time and everything appeared to be entirely normal before the explosions.

Personnel on the 4th floor included a mechanic and an Icing Mill attendant.

The mechanic reported that he was at his work bench in the south-west corner of the floor from 12.55 to 1 p.m., and noticed nothing out of the ordinary in the way of noise, smell, dust or smoke on the flat. A 1 p.m. he went into the Cube Room and when just through the door he heard a roaring "whoosh" followed by the sound of falling masonry. The mill attendant was on the fourth floor by 1 p.m. to start up the micro-pulverizers and had started two machines and was about to start a third when he felt a large explosion accompanied by intense heat and cloud.

Both men reported a single drawn-out explosion in contrast to the three distinct explosions heard on the floor below.

Inspection of Equipment

(a) *The elevators:*

On the third floor, both inspection doors on the boot of No. 1 elevator had been blown off and the north door on No. 4 elevator had been blown open. The casing of No. 1 elevator had bulged outward between the fourth floor and the top. At the top of the elevators, the discharge spout on No. 1 had its paint burnt off while the other three spouts appear unaffected. The conveyor belt fed by No. 1 was completely burnt at the feed point but the remaining belts at this point were intact. The casing tops on Nos. 2 and 3 elevators had been forced upwards

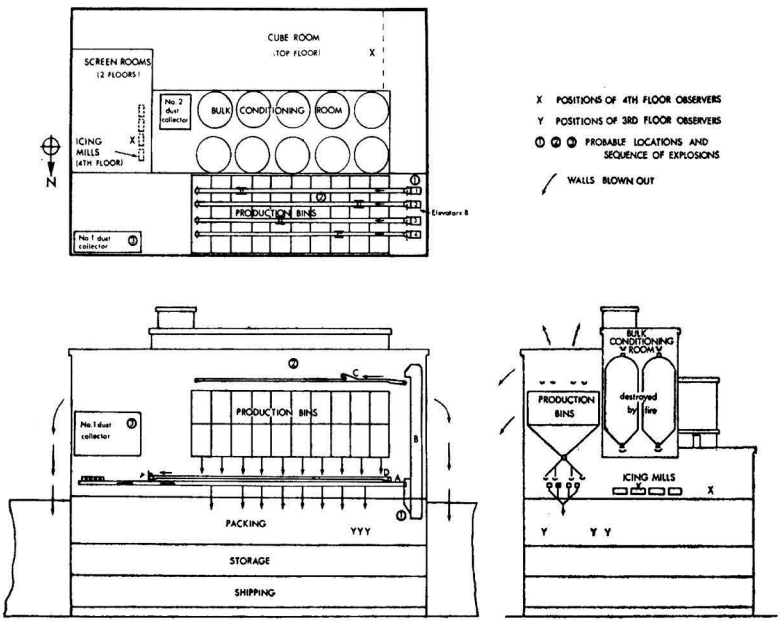


Fig. 2

and two buckets on No. 2 had collapsed at the feed inlet. No. 1 elevator appeared to be still mechanically sound with no obstruction in its boot and no evidence that the belt had been slipping on the drive pulley.

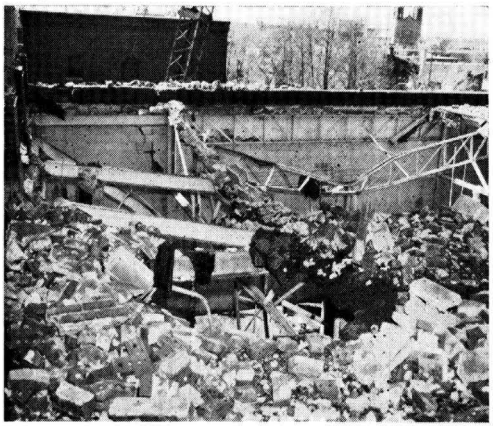


Fig. 3. Damage to the roof of the refined sugar warehouse caused by the east wall of the packing building falling through it.

Fig. 4. Remains of the conveyor belts above the production bins

(b) *No. 1 circuit 18-inch screw conveyor:*

This is the conveyor feeding sugar into No. 1 elevator. A sheared bolt was found in the shaft coupling at the westermost bearing hanger located about six feet from the entrance to the elevator. The part of the bolt remaining in the coupling was loose, indicating that the shear had taken place very shortly before power was taken off the screw. This bolt was 6 inches long by $\frac{3}{4}$-in diameter, with the portion remaining in the screw consisting of the head and one inch of shank. The remaining five inches of shank and the nut were found at the entry to the boot. It is possible for the object to have been caught up in the elevator.

(c) *The dust collectors:*

There was definite evidence of an explosion in No. 1 dust collector at the east end of the production bins. The casing of this unit was split and bulged outwards. No. 2 dust collector in the bulk system did not explode to nearly the same extent but fire spread to it through the dust collecting system destroying the bulk conditioning bins.

Both of these units were of the sock type and each had been equipped with explosion venting outside the building.

No sugar was in motion in the bulk system at the time of the explosion and all the conveying equipment connected with the bulk storage was at rest.

(d) *Micro-pulverizer:*

The two micro-pulverizers that were started before the explosion have been subsequently inspected and their screens found to be intact. There was no evidence that the starting of these units was responsible for the detonation.

(e) *General condition of equipment prior to the explosion:*

As far as can be determined the condition of dust collecting and conveying equipment in the department was quite normal.

The dust ducts are given a clean-out once a year, and this was carried out in the course of the last winter shutdown. Routine maintenance was carried out on the weekend of 4th May, on the 18-inch screws and circuit elevators. These was no indication of any lapse in the laid-down schedules of routine maintenance and inspection.

Conclusions

In reaching any theory as to the cause and origin of the explosions, considerable weight has to be given to the evidence of the people who were there at the time. The damage to equipment was so widespread that no definite conclusions on the sequence of events could be drawn from an examination of it.

The evidence of the personnel on the third floor regarding three distinct detonations, the first accompanied by flash in the region of the elevator boots and the third appearing to come from the region of the dust collector, is of significance particularly when coupled with the evidence of fourth floor personnel of one prolonged explosion.

From this it would appear that the third floor witnesses were closer to the initial explosion and further from the final explosion than the personnel on the fourth floor. If the velocity of the propagation of the explosions and the exact intervals between their detection on the third floor were known it would be possible to locate accurately their points of origin. Lacking these data, an assumption that the initial explosion took place in the boot of No. 1 elevator and that for people in the vicinity to hear the third explosion one second later, would require a propagation velocity of 200 feet per second either up

the elevator shaft and across the bin top to the dust collector or through the 18-inch screw and dust collector ducts to the dust collector. In such an event people on the floor above would be aware of a continuous roar of slightly less than one second's duration.

If on the other hand it is assumed that the initial explosion took place in the dust collector and that the first detonation felt on the third floor was the result of a shock wave travelling down the ducts, the sound of the explosion would lag behind the shock by about a tenth of a second. It is most unlikely that an observer could distinguish three or even two explosions within such a short interval.

The fact of the three distinct explosions felt at the west end of the third floor renders it almost certain that: first, the initial explosion took place near the third floor observers and, second, the spread of the explosion was at subsonic (i.e. less than 1000 feet per second) velocity.

Based on this reasoning and the results of an inspection of equipment the most likely sequence of events would appear to be as follows:—

During the lunch period the packing equipment on the third floor was idle but sugar continued to come over to the packing department from the refinery. Shortly before 1 p.m. the bin attendant came down from the top of the bins to augment the flow of sugar in the 18-inch screws from bin stock so that the packing equipment would have sufficient feed, the packing rate being faster than the refinery output.

If this increased flow had been excessive and if it took place before the packing equipment started to draw sugar from the screws, an overloaded condition in either a screw or an elevator could have resulted. This condition may have been responsible for shearing a coupling bolt in No. 1 screw which may in turn have caused the detonating spark, or the spark may have resulted from a dragging bucket due to an overload in one of the elevators.

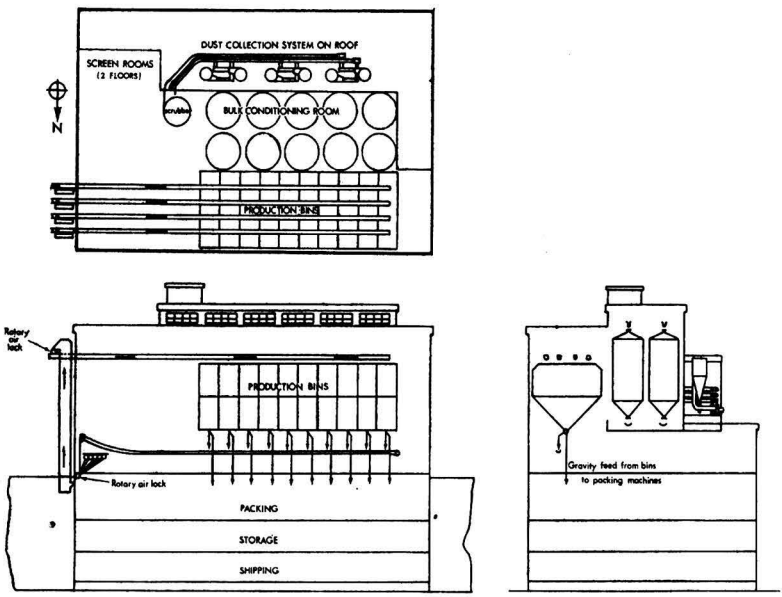


Fig. 5

With a relatively small dust explosion in an elevator a dust-charged compression wave was created at the exit of the elevator above the bins and was ignited by flash from the first explosion. A similar wave may have travelled back through the 18-inch screw and into the dust collector by a dust duct. The explosion above the bins and in the dust collector blew the walls and roof off the bin enclosure and started a number of small fires. The second dust collector in the bulk room had collection outlets in the regions of these explosions which carried the fire into the bulk room.

In the reconstruction of the damaged area, a number of changes have been made in order to reduce the probability of a future explosion. Fig. 5 shows the new installation in which the following changes are incorporated:

(1) All electrical switchgear above 4th floor is either explosion-proof or in an approved control room.

(2) For dust collecting purposes, the plant is divided into six independent zones each having its own fan and cyclone. Fans and cyclones are located on the roof of the building and exhaust air from the cyclones is passed through a wet scrubber.

(3) Three bucket elevators (not shown) have been eliminated. The four circuit elevators have been relocated outside the building and one elevator remaining within the building is explosion vented through the roof.

(4) The 18-inch screws have been relocated above the bins replacing the tripper belts. Bin discharge is by gravity direct to packing and the conveying equipment so arranged that it is impossible to overload an elevator.

(5) Elevators are isolated by rotary air locks at feed and discharge points.

(6) Explosion sashes are provided in the walls of the building in the ratio of 1 sq.ft. of sash to 50 cu.ft. enclosed.

(7) Internal partition walls above the 4th floor have been removed to eliminate confined areas.

(8) Where sugar is conveyed from one building to another, both conveying equipment and man ways are installed so as to eliminate the possibility of passage of an explosion between the buildings.

Whether due to an increased rate of throughput, lower moisture content, or some undetermined factor, the explosion hazard in granulated sugar as currently handled has been convincingly demonstrated. Considerable expenditure is justified to reduce or eliminate this hazard.

The Economics of Biological Control

THIS was the title of a lecture given at the Royal Society of Arts, London, on the 11th April, 1967, by Dr. F. J. SIMMONDS, Director of the Commonwealth Institute of Biological Control. Dr. C. G. JOHNSON, Head of the Department of Entomology at Rothamsted Experiment Station, was in the Chair.

The speaker pointed out that there are two main methods of biological control: (1) There is the planned introduction of natural enemies into a new area against a pest—the classical method of control. This has been successful with a large number of problems, two good examples being the control of cottony cushion scale in citrus in California and the virtual elimination of some species of cactus or prickly pear (*Opuntia*) over some 60 million acres of land in Australia and elsewhere. (2) The second method of biological control is the mass production, in insectaries, of parasites or predators for subsequent release on pest populations, examples being the breeding of *Trichogramma* egg parasites for sugar cane pest control and of ladybirds for scale insect control. Another method of biological control practised is the introduction and use of insect pathogens or diseases. Other methods of biological control brought to light in recent years involve the use of male pest insects sterilized by irradiation or chemically and the use of sex attractants.

The speaker pointed out that there is little documentation available on the costs and results obtained from biological control. Even so he was able to refer to numerous examples where the economic benefits derived from a small outlay of funds was very great. One of the most interesting of these was the control of coconut scale on the island of Principe in the Gulf of Guinea by the introduction of the ladybird *Cryptognantha nodiceps* in 1955.

The economics of weed control by means of insects he discussed at some length, notably control of *Cordia macrostachya*, a South American weed firmly established in Mauritius.

With regard to sugar cane and pests of the crop Dr. SIMMONDS stated: "It is possible, because of the nature of the damage, to give a fairly accurate balance sheet with regard to the biological control of sugar cane moth borers *Diatraea* spp. (particularly *D. saccharalis*) in the West Indies and South America, where in some areas very successful control has been achieved from the introduction of parasites. I shall only give here the economic data and the reference where details of the calculation can be found."

"In Antigua (WARREN, 1945, and BOX, 1960) the costs of liberations of *Lixophaga diatraeae* in the years 1931–45 were some £8500. The cash return from this, in terms of increased sugar in the factory and an improvement of yield in the field of at least the same magnitude, has been some £16,000 per annum since 1934, or £512,000 in thirty-two years, some 200% per annum on the outlay. In St. Kitts (BOX, 1960) the total initial cost of introducing *Lixophaga* in 1934, and reducing *Diatraea* damage, permanently I must stress, was £200. The resulting benefits have been some £50,000 per annum, or £1,600,000 in thirty-two years—on a £200 outlay; 25,000% per annum.

"In St. Lucia (BOX, 1938) successful control of *D. saccharalis* was obtained in 1933 with another parasite *Metagonistylum minense* (more adapted to wetter areas). The total expenditure was far less than £1,000, and the increase in sugar of the order of £12,000 per annum—£396,000 in thirty-three years or 1200% per annum on the outlay.

The same cane borer control has also been very successful elsewhere in this general area—in Guyana, Guadeloupe, Martinique, the Virgin Islands, and also in Venezuela, Peru and Ecuador, but though the benefits here are impressive the balance sheets have not been worked out. In Panama and Mexico, limited efforts with allied cane borers have been unsuccessful, while fairly extensive efforts in U.S.A., Puerto Rico, Barbados, Trinidad, Grenada and Montserrat, have to date also been unsuccessful."

F.N.H.

Thames Refinery Raw Sugar Jetty

Fig. 1

Fig. 2

BULK raw sugar delivery to the Thames refinery of Tate & Lyle Refineries Ltd. has been greatly facilitated by the construction of a new jetty by Taylor Woodrow Construction Ltd[1]. The jetty is L-shaped (Fig. 1) having its head lying parallel with the flow of the River Thames. It is some 520 ft long by 43 ft wide and its outer face is 440 ft out in the river from the existing wharf. Built of reinforced concrete supported on steel piles, the jetty has been designed to serve as a terminal for ocean-going ships up to 21,000 tons displacement. By dredging some 200,000 cubic yards of silt and chalk from the river bed, the water adjacent to the jetty has been deepened to approx. 45 ft at high water and 27 ft at low water.

The raw sugar is unloaded from the holds by two 12½-ton electro-hydraulic travelling jib cranes built by Clyde Crane & Booth Ltd. (Fig. 2). These carry Priestman Bros. Ltd. grabs, larger ones of approx. 6-ton capacity for the bigger bulk-carrying ships, and the smaller 4-ton grabs for unloading from 'tween-deck cargo vessels, for which a Fourways Engineers Ltd. transportable conveyor is also available. The time taken to pick up sugar from the hold and drop it into one of two hoppers feeding a longitudinal conveyor is approx. 50 sec, giving an unloading rate per crane of 400 tons of sugar per hr. The 48-in wide longi-

[1] *See also I.S.J.*, 1966, **68**, 254.

tudinal conveyor is the first in the system of conveyors supplied by Spencer (Melksham) Ltd. It runs inside a trough which is provided with a hinged cover to keep out rain water. From this conveyor the sugar is transferred to an inclined 48-in wide conveyor housed in a 10-ft diameter lagged steel tube. This takes the sugar to the top of the 20,000-ton capacity raw sugar shed, and feeds it via two Servo-Balans batch weighers to two conveyors which transfer it to a Sandvik steel band conveyor. The control room in which the weighings are checked contains an Elliott Automation Ltd. mimic diagram indicating, by means of lights, all operations involving the jetty and the warehouse. Two Elliott continuous band weighers, to be supplemented by a further two in the future, are used to balance the input of the sugar to the melters. The sugar from the steel band conveyor is taken by one of three inclined conveyors and drops from the end of this onto the top of the raw sugar pile (Fig. 3). Overflow sugar is conveyed to an older 10,000-ton warehouse. Sugar is reclaimed from the raw sugar shed for transference direct to melt. This is carried out by means of International Harvester Hough "Payloaders", which dump the sugar onto a conveyor belt feeding the sugar to the refinery at 150 tons/hr.

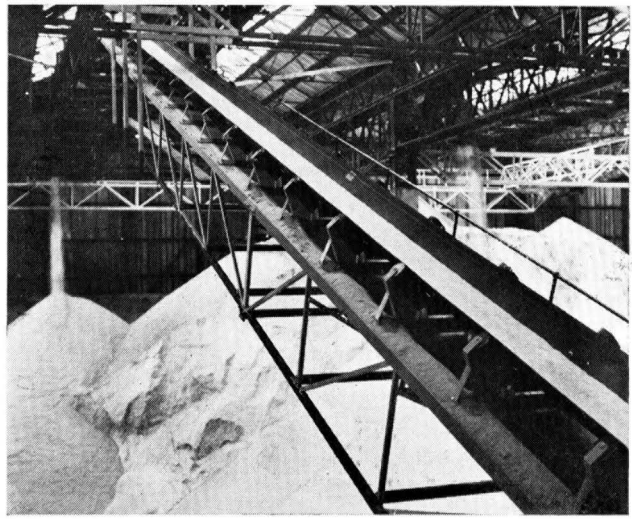


Fig. 3

It is thought that some 15–20% of imported raw sugar will still have to be handled in the old conventional manner by lightermen who will transfer it from deeper-draft ships to barges at another wharf and bring the barges to the new jetty. Nevertheless, the savings brought about through the construction of the £1¾ million jetty will be sufficient to offset the capital costs in 3 years. In fact, during the first 14 weeks that the raw sugar was discharged, an estimated £60,000 was saved. The turn-round time has been considerably cut, an average of 33 hr being required to unload a 15,000-ton cargo of raw sugar, compared with several days under the old system. A shorter turn-round time enables vessels to increase their earning time at sea, and this is of particular significance in the case of the Company-owned fleet of eleven vessels, which have a total cargo capacity of 120,000 tons and can be used to carry other types of bulk cargo, e.g. iron ore, apart from the sugar for which they were primarily intended. A further two vessels are being built which will be able to bring 16,500 tons of sugar alongside the new jetty or 20,000 tons of cargo to berths where draft is not restricted to 28 ft 6 in.

As part of a reorganization scheme, it is planned to place Thames refinery on continuous working throughout a 7-day week. Refining at Plaistow Wharf refinery will cease, but the refinery will act as a packaging and storage plant to which the refined sugar from Thames refinery can be taken by road tankers when it is not immediately required for export and/or distribution within the U.K. Once these changes have been effected, Thames refinery, with an annual melt capacity of 1,200,000 tons of raw sugar, will be supplying most of the sugar requirements in Southern England. Of this quantity, nearly 1 million tons will be in the form of imported cane raw sugar.

Brevities

Czechoslovakian sugar factory for Pakistan[1].—Erection has recently started of a cane sugar mill for the Husein Sugar Mills, Jaranwala, in the vicinity of Lahore in Pakistan. The equipment was produced in the Chepos Works at Hradec Králové, under a contract concluded with Technoexport, Prague. This is the first sugar mill supplied from Czechoslovakia to Pakistan since World War II. The mill will handle 1500–2000 tons of cane per 24 hours and will be put into operation by the end of 1967 or early next year.

* * *

Taiwan sugar crop restriction[2].—The Taiwan Sugar Corporation intends to produce 800,000 metric tons of sugar this year, as compared with the 950,000 tons produced by the Company in 1966. According to an announcement by the president of the Company, Mr. M. H. YUAN, the Company sustained a loss of U.S. $9,800,000 last year, as a result of the low world market prices for sugar.

* * *

Automatic cube sugar plant[3].—A new automatic sugar cube plant, the third of its kind, has been installed in a Czechoslovakian sugar factory. The first two installations of the plant, which is made by Maschinenfabrik Buckau R. Wolf A.G., are in Finland and Austria.

[1] *Czechoslovak Heavy Industry*, 1967, (7), 17.
[2] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (17), 18.
[3] *Czechoslovak Heavy Industry*, 1967, (7), 16.

Sugar cane agriculture

The oxidizing enzymes of sugar cane: tyrosinase (polyphenol oxidase). A. G. ALEXANDER. *J. Agric.* (Univ. Puerto Rico), 1966, **50,** 113–130.—A study is reported of the distribution, properties, and methods of extraction of tyrosinase in sugar cane. Meristematic tissue (young shoots) was found to be the richest source. Leaves were also rich. Possible rôles and significance of cane tyrosinase are discussed.

* * *

Some factors affecting the translocation of radioactive "Paraquat" in *Cyperus* species. G. H. WOOD and J. M. GOSNELL. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 286–292.—In Natal "Paraquat" has been used with some success on an extensive scale for the post-emergence control of two bad weeds of sugar cane—nut-grass (*Cyperus rotundus*) and water-grass (*Cyperus esculentus*). As regrowth originates from underground parts of the plant, spraying under conditions favouring maximum translocation would be an obvious advantage. An account is given of a series of pot experiments with "Paraquat" labelled with radioactive carbon and applied under various soil moisture régimes, different stages of growth, different times of day, etc. Autoradiographs showed that optimum "Paraquat" translocation occurred when the plants were sprayed 1–4 weeks after emergence. Recovery from "Paraquat" application may be related to the starch reserves in the tuber.

* * *

Pest control problems at Mazabuka, Zambia. D. S. HUGHAN and D. R. C. BOOTH. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 317–318.—Four sugar cane insect pests are newly recorded for the area, viz.—trash caterpillar, top borer, leaf roll caterpillar and black beetle. A description is given of each and methods of control outlined.

* * *

The progress of an untreated outbreak of *Numicia viridis*. A. J. M. CARNEGIE. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 319–327.—This pest, the green leaf-sucker, indigenous in southern Africa, was first recorded as a pest of sugar cane in 1962 and is now known to have several natural predators or parasites. An outbreak on a large sugar estate in Swaziland is referred to. After fluctuations in numbers of all stages of the insect the infestation gradually dwindled and the cane which had suffered badly recovered. Likely causes are discussed, notably the presence of two egg parasites.

The sugar cane nematode problem. J. DICK. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 328–332.—Results of recent investigations on nematodes in sugar cane fields are recorded and a list of those nematodes known to occur in South African cane fields is given. The difficulty of finding out which of these actually attack the cane plant and which do not is stressed. Various soil fumigants so far used are not economical on a large scale. The use of resistant cover crops is also discussed.

* * *

The production of trash and its effects as a mulch on the soil and on sugar cane nutrition. G. D. THOMPSON. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 333–342.—The effects of trash mulching compared with trash burning on soil properties and crop nutrition as a result of three long-term experiments are again discussed, as are the results of some additional experiments. There were no detectable differences in available soil nutrients between samples from burned plots and trashed plots, even after 33 years of treatment. Trash caused notable differences in organic matter, total exchange capacity, wilting point and water stability of soil crumbs greater than 0·5 mm in diameter.

* * *

Studies of the effect on sugar cane of damage caused by frost and associated micro-organisms. G. ROTH. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 343–350.—In 1964 sugar cane in South Africa was damaged in many areas by an exceptionally severe frost. Details are given of the nature of the damage caused by different degrees of frost severity. This information is supplemented by data on controlled damage obtained by the use of cool chambers. No difference could be found in the susceptibility of local cane varieties to frost damage.

* * *

Streak disease reappears. ANON. *S. African Sugar J.*, 1966, **50,** 923.—This virus disease of cane has reappeared in a commercial field in Natal after absence for many years. Years ago the disease was prevalent on the then major variety of sugar cane, "Uba", this being one of the reasons why that variety was replaced. Characteristics of the disease are given.

* * *

Bacteria as agents of plant disease. G. ROTH and C. WHITEHEAD. *S. African Sugar J.*, 1966, **50,** 930–939.—This is the fourth of a series of articles on the

biological background to sugar cane diseases. It deals primarily with gumming disease (*Xanthomonas vasculorum*) and leaf scald (*Xanthomonas albilineans*), the only two bacterial diseases likely to interest South African cane growers at the present time. Red stripe (*Xanthomonas rubrilineans*) and some other bacterial diseases, troublesome in other countries, are mentioned.

* * *

Protect your crops against grub damage. ANON. *Cane Growers' Quarterly Bull.*, 1966, **30**, 41–42. Damage to cane in Queensland during the past season due to grubs or borers, notably the greyback, frenchi and Rhopoea grub, is reviewed. Suggestions for treatment are given.

* * *

Culture for the inoculation of green manure seed. D. R. L. STEINDL. *Cane Growers' Quarterly Bull.*, 1966, **30**, 42.—Cane growers in Queensland are reminded that they should inoculate the seed of green manure crops for cane with the correct bacterial culture before planting, in order to obtain the best results. This is especially important on new land and fields that have not grown a legume crop for some years. Cultures for the inoculation of velvet beans, cowpeas, mung beans and related crops are available through the sugar cane experiment stations.

* * *

Greyback grub control in a dry season. G. WILSON. *Cane Growers' Quarterly Bull.*, 1966, **30**, 43–44. Emphasis is placed on the need to avoid placing BHC too high in the soil and reasons for this advice are given. This is particularly important in a dry season.

* * *

Another cowpea variety is available. C. A. REHBEIN. *Cane Growers' Quarterly Bull.*, 1966, **30**, 44.—Following closely on the release of the two cowpea varieties Meringa and Musgrave as green manure or cover crops with cane, another cowpea, Brandon, is in the process of seed multiplication. Its large leaf makes for early ground cover. Other characteristics of this new variety are described.

* * *

Legume cropping on the Bundaberg Sugar Experiment Station. S. O. SKINNER. *Cane Growers' Quarterly Bull.*, 1966, **30**, 47–49.—Six photographs are reproduced showing various aspects of experimental field work with cover crops for cane, to cover the ground during fallow periods between cane crops. The superiority of velvet beans to cowpeas for relatively long fallows is stressed.

* * *

Salt affected areas in cane blocks. C. G. STORY. *Cane Growers' Quarterly Bull.*, 1966, **30**, 41.—Reasons for the occurrence of these salt areas in cane fields are given and remedial measures suggested. The value of heavy applications of bagasse or mill ash under certain conditions is pointed out.

Legume varieties for the central district. L. S. CHAPMAN and D. GARIOCH. *Cane Growers' Quarterly Bull.*, 1966, **30**, 57–59.—To assist Queensland cane growers desirous of growing a cover crop on fallow land details are given of the available varieties of cowpea, nine in all, also details of other legumes such as velvet bean, mung bean, Dolichos and rice bean. New varieties to suit the central district have been bred but have not yet been released.

* * *

A new nitrogenous fertilizer. J. R. BURGE. *Cane Growers' Quarterly Bull.*, 1966, **30**, 60–61.—Reference is made to the opening of a new factory at Brisbane for the manufacture of anhydrous ammonia and the likelihood of this causing cane growers in the southern districts of Queensland to take stock of their methods of nitrogen application. Results of trials on cane with anhydrous ammonia or "aqua ammonia" (anhydrous ammonia plus water) and sulphate of ammonia are given—with nitrogen at 60 lb/acre. No appreciable differences were recorded.

* * *

Q.84—another new variety. C. M. MCALEESE. *Cane Growers' Quarterly Bull.*, 1966, **30**, 62–63.—The characteristics of this new variety, bred from the famous variety Pindar, are outlined. It is intended for the northern districts of Queensland. The stalks are yellowish green in colour turning to light brown to mauve on exposure to sunlight. They carry a heavy coating of wax.

* * *

Trends in soldier fly control at Bundaberg. R. B. MOLLER. *Cane Growers' Quarterly Bull.*, 1966, **30**, 64–66.—Results of trials with BHC and other insecticides ("Lindane" and "Gammexane"), involving shoot counts and other observations on young ratoon cane, are given. It was concluded that crude BHC formulations, made from 13% gamma isomer BHC, were effective against soldier fly. "Lindane" formulations were partially to totally ineffective.

* * *

Soldier fly control in Mackay area. S. GREENAWAY. *Producers' Rev.*, 1966, **56**, (10), 59.—Reference is made to the damage by this pest in recent years and to the pamphlet "The soldier fly pest of sugar cane" sent to all growers in 1965 by the Bureau of Sugar Experiment Stations. Recommendations for treatment are given, i.e. soil treatment with "Dieldrin" soon after the last ratoon is ploughed out.

* * *

Some essential considerations for improving sugar cane irrigation practices in the Philippines. A. P. AGLIBUT. *Sugarland*, 1966, **3**, (6), 18–25.—In some parts of the Philippines, notably in Negros island and parts of Luzon, rainfall is inadequate for profitable commercial sugar production and irrigation is practised—both surface and sprinkler irrigation. More than 1400 hectares of cane are irrigated. The need for basic

information regarding soils in relation to irrigation of cane in the Philippines is stressed.

* * *

What makes for poor or good germination. ANON. *Sugarland*, 1966, **3**, (6), 44–45.—Points to be kept in mind in selecting, treating and planting seed cane are discussed. The 3-eye sett is strongly advocated. Reasons for this are given, an important consideration being the protection against disease given to the central eye by the fact that there is nodal tissue on either side, this being more resistant to disease organisms than the internal tissue.

* * *

Economic fertilizer doses for sugar cane. ANON. *Internat. Fertilizer Correspondent*, 1966, **7**, 1167. Results of extensive NPK fertilizer trials in São Paulo are recorded, São Paulo accounting for 45% of Brazil's sugar cane crop. Few fertilizer trials have been recorded so far for the State. Results of the trials reported showed that response to N was significant in 10 experiments and to K_2O in 15 experiments. In only four cases was there response to P_2O_5. Fertilizer recommendations are made, having regard to their costs, on the basis of these results.

* * *

The November 3, 1966 freeze. L. L. LAUDEN. *Sugar Bull.*, 1966, **45**, 52, 60.—Most of the Louisiana sugar cane belt was affected by this freeze, the cane in some areas being much more severely damaged than in others. The nature of the damage is discussed and advice given to growers as to how to estimate damage with a view to harvesting the worst damaged cane first.

* * *

Reaction of some commercial and unrelated varieties of sugar cane to mosaic in Louisiana. N. ZUMMO. *Sugar Bull.*, 1966, **45**, 54–58.—The severity of mosaic disease of sugar cane, notably the strain H, in Louisiana, is discussed. It causes growers more concern than any other disease at present. Tables are given showing degree of infection of different varieties registered in mosaic planting trials.

* * *

Prolific nut-grass growth. L. S. CHAPMAN. *Producers' Rev.*, 1966, **56**, (10), 59.—Interesting figures are given showing the rate of increase of nut grass (*Cyperus rotundus*), one of the worst weeds of sugar cane fields in many parts of the world. The yield of fresh leaf and tubers after 8 weeks' growth was estimated to be over 19 tons per acre. It is pointed out that this sedge competes seriously for soil moisture with young cane.

* * *

New varieties of sugar cane that improve yield. R. F. DE ULLIVARRI and D. M. MORIN. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 5–21.—The history of varietal cultivation of sugar cane in Argentina is traced from the days when noble canes only were cultivated, such as purple and striped Creole, to the present day. In Tucumán the variety CP 34/120 has made remarkable strides in the last decade among commercial varieties, now occuping the premier position, having ousted the variety Tuc 2645, which now occupies second place.

* * *

How new varieties of sugar cane are produced. C. M. GUERINEAU. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 23–53.—In this long paper the work carried out in Argentina during the present century for the improvement of sugar cane and the results obtained are considered. Details of present day methods of breeding and selection are discussed. Confidence is expressed that this work will, in due course, produce superior, more disease-resistant varieties for cultivation by cane growers in Argentina.

* * *

Quality and the economics of sugar production. R. F. DE ULLIVARRI and W. KENNING. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 73–91.—The writers deplore the fact that in some quarters in Argentina tonnage of millable cane and tonnage only is all-important, with little regard to the actual quality of the cane or its sucrose content. The various factors or overhead expenses that enter into the production of a ton of cane are discussed and considered in detail.

* * *

Insecticidal treatment of seed cane before planting. J. A. MARIOTTI. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 93–112.—The methods adopted in various cane growing countries in the insecticidal pre-treatment of cane setts for planting are outlined. The results of experimental work in this subject in Argentina with various insecticides such as "Lindane", "Endrin", "Heptachlor" and "Dieldrin" are discussed. A bibliography of 120 references is included.

* * *

The effects of hot air treatment (8 hr at 58°C) on the germination of sugar cane setts. E. CERRIZUELA and J. A. MARIOTTI. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 113–122.—Experiments carried out in Argentina on hot air treatment (for disease control) with five varieties of sugar cane are discussed, the varieties being Tuc 2654, N:Co 310, CP 44-101, CP 34-120 and CP 48-103. No deleterious effect on germination was noted, but on the contrary germination was improved.

* * *

The effect of various herbicides on the germination of sugar cane setts. E. CERRIZUELA and J. A. MARIOTTI. *Rev. Agronomica Noroeste Argentino*, 1966, **5**, (1–2), 123–129.—The effect on germination of the buds of cane setts treated with seven different proprietory herbicides (momentary immersion) is recorded. The setts were those of the variety N:Co 310. "Simazine" and "Karmex" gave the most favourable results and hastened germination.

Sugar beet agriculture

The relation of annual incidence of beet yellowing viruses in sugar beet to variations in weather. M. A. WATSON. *Plant Pathology*, 1966, **15**, 145–149. Incidence of sugar beet yellows in Britain in August is related to the number of freezing days in January, February and March (beet yellows virus and beet mild yellowing virus being considered together). It was found that there was a relationship to the number of days in these months when the temperature fell below 0°C and mean weekly temperatures in April, the cold weather killing off overwintering colonies of the aphid *Myzus persicae*.

* * *

The possible correlation between sugar beet yellows incidence and sunspot activity. A. J. GIBBS. *Plant Pathology*, 1966, **15**, 150–152.—Records kept since 1946 of the incidence of virus yellows in British sugar beet crops show that the incidence of the disease in each of the months July, August and September is closely correlated with its incidence in the previous month. Incidence in June is independent of the incidence in the previous year but appears to be correlated with sunspot activity during the previous summer. A possible mechanism for the relationship is suggested.

* * *

The cultivation of sugar beet for fodder. M. WITT. *Zucker*, 1966, **19**, 519–524.—The sugar beet is becoming of more importance as a fodder plant as the price of starch units in basic concentrates increases. Beet leaf silage is highly suitable for dairy stock and for fattening and the same applies to dried beet pulp and "troblako" (dried leaves). Further utilization may be dependent upon removal of the leaf in as clean a condition as possible within a few days of lifting.

* * *

Results of trials of mechanical singling carried out over several years. H. LÜDECKE and H. SCHAFMAYER. *Zucker*, 1966, **19**, 549–549.—Efficient or fully mechanized singling is one of the goals in the reduction of hand labour in sugar beet cultivation. Since 1961 singling machines produced by several different makers have been tested in different parts of Germany. The trials are discussed.

* * *

Monogerm sugar beet seed and its evolution. L. DECOUX. *Sucr. Belge*, 1966, **86**, 33–57.—The history of the development of monogerm seed in the United States and in Europe is discussed at some length. In the bibliography 54 reference to the literature appear.

* * *

Investigations on the influence of pelleting of processed seed on its emergence capacity. O. NEEB. *Zucker*, 1966, **19**, 578–583.—Extensive trials over two seasons in Germany, to find out whether pelleting affects the germination capacity of sugar beet seed, are reported. Different soils, sowing times, methods of soil preparation, etc. were employed in these experiments. It was found that pelleting did not adversely affect germination but on the contrary often improved it, on an average to the extent of 25–30%.

* * *

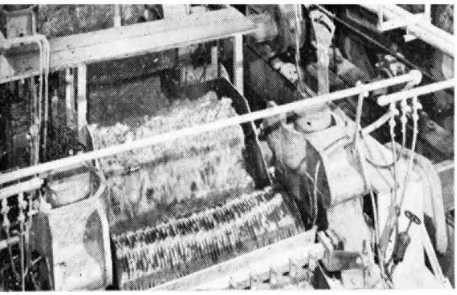
Sugar plant experiments in sugar beet segmented seeds. N. NEAMU. *Ind. alimentara*, 1966, **17**, 77–79; through *Abs. Rom. Tech. Lit.*, 1966, **2**, (3), Abs. 726.—Comparative experiments carried out on areas planted with sugar beet in the Bailesti and Corabia-Calafat zones showed that, compared with unsegmented seed, segmented seed germinates quicker (by 4–5 days), root yield is higher as is sugar content (by 3·333 kg/ha), the beets obtained present improved technological qualities and thinning in the field requires less work (about 35%). In addition, mechanization in cultivation is facilitated.

* * *

Pests and their control. W. C. SHAW. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **14**, 10–18.—This is a general discussion on the pests and diseases that attack crops or economic plants and the many facets of research now being carried out in the United States for their control, much of which is applicable to sugar beet. It is pointed out that man's environment includes more than 1000 species of injurious insect and more than 1500 plant diseases. There are more than 600 weeds that compete with crops for water and food and over 1500 nematodes as well as numerous other animal parasites.

* * *

Homozygous diploid sugar beets. B. L. HAMMOND. *J. Amer. Soc. Sugar Beet Tech.*, 1966, **14**, 75–78.—The development of a new homozygous strain or line of sugar beet is described, to be known as C 5600. The use of homozygous seed should greatly facilitate basic experimental work with the physiology, chemistry and genetics of sugar beet.



Cane sugar manufacture

Further reduction of sulphur consumption in (the) carbonatation sugar factory. M. MOHAN and K. K. SHARMA. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 97–102.—A 25% reduction of SO_2 consumption (from 0·025 to 0·018% on cane) was achieved by scrubbing the exhaust gas from a syrup sulphiter with 2nd carbonatation juice before sending this for sulphitation. Occasionally the overflow pipes for sulphited juice and syrup from their respective sulphitation tanks would be open to the atmosphere because of an interruption in the supply of syrup or juice. The gases would then take this path of less resistance instead of going through the scrubber; by providing a U-bend these bends were sealed and all the gases left via the scrubber, sulphur consumption falling in consequence to 0·012% on cane. By neutralizing the lime in the juice with CO_2 instead of SO_2, but retaining syrup sulphitation, the sugar produced still met I.S.S. 30 for colour, while SO_2 consumption is reduced still further, it is expected to 0·009% on cane, although this cannot be proved definitely because the trials were made at the end of the season.

* * *

Power in the sugar industry. A comparison of mill drives. F. J. ALDRIDGE. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 103–107.—The relative advantages and disadvantages are considered of a number of alternatives for mill drives, including the horizontal reciprocating engine, the single-stage turbine, the turbo-alternator driving a variable-speed electric motor, and the turbo-alternator driving a constant-speed motor connected to the mill through a variable-speed hydraulic coupling. It is suggested that under Indian conditions a vertical high-speed engine, operating with saturated steam, might be a suitable drive.

* * *

Use of phosphate in the clear juice. A. C. CHATTERJEE. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 109–111.—Addition of phosphate to mixed juice was stopped at Pennadam sugar factory, Madras, where the natural phosphate content is low, and replaced by addition of 40–50 mg/litre (as settled saturated superphosphate solution) to clear juice from the clarifier overflow. The clarifier mud was thinner and the filter had to be stopped at intervals to allow it to settle, but the pH was not affected, and benefits were obtained in respect of thinner and more easily removable evaporator scale, better sugar colour and reduced load on the *C*-massecuite centrifugals.

D.M.C. process for production of white sugar without sulphur. S. C. GUPTA and N. A. RAMAIAH. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 203–212.—Encouraging results have been given by short factory trials of the process[1].

* * *

Studies on (the) removal of aconitic acid from *B*-heavy molasses for better performance of low grade massecuites in (the) sugar factory. S. C. GUPTA and U. CHETAL. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 225–230.—*B*-molasses, diluted to 55°Bx and limed to pH 7·2–7·6, is heated to 85–90°C and treated with $CaCl_2$ (or a mixture of $CaCl_2$ and NaCl) and stirred for 30 min, after which the aconitic acid precipitate is separated by centrifuging. The technique is shown by aconitic acid analyses on the treated and untreated molasses to reduce the aconitic acid content from 2·9%–3·8% to approx. 2·4%–3·2%, reducing the viscosity of the molasses.

* * *

A plea for the use of "Instol" for lowering the viscosity of low-grade massecuites. S. C. GUPTA, N. A. RAMAIAH and J. P. BANSAL. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 231–235.—"Instol", a synergistic mixture of two surface-active agents commercially obtainable in India, has been tested at six factories as an additive for final massecuites. A total of 6 kg/100 tons added in four increments reduced curing time by 35–40% and gave a rise in purity of 5–8 units for single-cured *C*-sugar.

* * *

A process for the manufacture of khandsari sugar without sulphur. S. C. GUPTA, N. A. RAMAIAH and S. K. D. AGARWAL. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 237–242.—The process involves the use of simple defecation of cane juice followed by prevention of caramelization during the open-pan boiling by addition of inhibitors such as phosphates, sulphites, calcium sulphate, etc.

* * *

A method for the determination of performance of individual mills of a tandem. B. L. MITTAL. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 255–264. Examination of bagasse entering and leaving a mill, followed by application of the MITTAL whole reduced extraction formula[2] gives the reduced extractions for the tandem up to and including the mill, the difference being the extraction due to the mill itself. Variation

[1] *I.S.J.*, 1966, **68**, 340.
[2] *ibid.*, 1964, **66**, 119.

in the mill's performance under different conditions can indicate a need for investigation and can also be used to determine optimum conditions.

* * *

Preventive maintenance for (the) sugar industry. V. B. SINGH. *Proc. 34th Conv. Sugar Tech. Assoc. India.* 1966, 273–275.—The necessity for proper maintenance in industry is explained and the development of the different types of maintenance described. Scheduling, record-keeping, inspection, use of hand tools, proper lubrication and budgeting are discussed, with an indication of how maintenance does not involve a cost reduction by itself but aims at reducing production costs indirectly.

* * *

Fairymead diffuser—First in Australia—Operating well. ANON. *Australian Sugar J.*, 1966, **58**, 457–459. Illustrations and a brief description are given of the cane diffuser at Fairymead sugar factory[1], built to the Company's own design. At the time of its installation in 1965 it was the largest single unit of its kind in the cane sugar world and it has operated well in the 1965 and 1966 seasons, certain modifications having been introduced in between for improvement of cane preparation and bagasse drying. The diffuser is located outside the main mill building, and cane is carried to it by belt conveyor from No. 2 mill. It falls from the conveyor onto a perforated metal slat conveyor on which it is carried as a blanket 9 ft wide and 7 ft deep through a series of five tanks. It is then carried by another belt conveyor to No. 3 mill. The dilute juice expressed in Nos. 3 and 4 mills is pumped onto the bagasse over the last tank of the diffuser, draining through into the tank, from which it is pumped over bagasse above the next but last tank. This counter-current flow of liquid from tank to tank ends with juice withdrawn from the first tank and pumped onto the cane between the 1st and 2nd mills.

* * *

The Spanish cane sugar industry and two De Smet cane diffusion installations. F. CORDOVEZ. *Sugar J.* (La.), 1966, **29**, (6), 10–14.—Brief details are given of the Spanish cane sugar industry, on the method of cane payment and the subsidy provided by the Spanish Government in the form of a discount in the duty on alcohol made from cane molasses. Most of the cane sugar factories also processed beets at one time, but this became unprofitable; however, the cane juice processing technique is similar to that used for beet juice, employing double carbonatation, sulphitation and filtration of juice. Two De Smet diffusion plants are described, one a mixed milling-diffusion plant at Salobreña, and the other a full diffusion plant employing mills only for bagasse dewatering, at Azucarera Larios, Torre del Mar, near Málaga. In both cases, two sets of knives are used for cane preparation, although this has proved inadequate at the Larios plant to allow achievement of the 97% extraction which is possible with the diffuser. Details of the construction and operation of the diffuser are described, and a list of the plants in operation and to come into service in 1967 is given.

* * *

New method for improving pan boiling efficiency. ANON. *Sugar J.* (La.), 1966, **29**, (6), 37–41.—The use of "Hodag CB-6" is discussed[2] with data showing improvements in the form of faster boiling and lower molasses purities at Caro beet sugar factory, Michigan, U.S.A., Yonkers, New York, sugar refinery, and at cane sugar factories in Puerto Rico, Trinidad, Florida and Mexico.

* * *

Zacatepec, example of human collaboration. ANON. *Bol. Azuc. Mex.*, 1966, (205), 22.—An account is given of the history, recent results and equipment of the Ingenio Emiliano Zapata, Zacatepec, Morelos, the third largest sugar factory in Mexico, which crushes 6000 t.c.d. and also produces animal feeds and alcohol as well as sugar and molasses.

* * *

Modern methods for the application of lubricants. ANON. *Bol. Azuc. Mex.*, 1966, (204), 36–38, (205), 30. The importance of lubrication is discussed and the complexity of lubrication in a sugar factory, because of the number of points for attention, is reviewed. Centralized lubrication is an answer to the problems, and illustrations and descriptions are given of components for such a centralized forced lubrication system.

* * *

Advantages of small-diameter flows in the evaporators. ANON. *Bol. Azuc. Mex.*, 1966, (206), 36–39.—HUGOT[3] recommends the use of evaporator tubes of $1\frac{3}{8}$, $1\frac{7}{16}$ or $1\frac{3}{4}$ inches diameter, although he mentions that smaller diameter tubes, e.g. of $1\frac{1}{4}$ in dia., as used in the beet sugar industry, have a theoretically better heat transfer owing to the shorter distance between the centre of the tube and the hot metal surface. It is believed, however, that this higher heat transfer rate is due to the higher flow rate through the tube. Velocities have been calculated from heat and materials balances for four quadruple-effect evaporators, each being provided solely with tubes of the same size, respectively 2 in, $1\frac{3}{4}$ in, $1\frac{1}{2}$ in and $1\frac{1}{4}$ in, and demonstrate the higher velocities achieved in the tubes of smaller diameters. These higher velocities will result in less scale formation as well as higher heat transmission.

* * *

The sick sugar factory. J. J. SEIP. *Sugar J.* (La.), 1966, **29**, (7), 10–13.—Fiscal statements on the financial aspects of sugar factory operations are necessarily

[1] *I.S.J.*, 1965, **67**, 255.
[2] Manufactured by Hodag Chemical Corp., Skokie, Ill., U.S.A.
[3] Handbook of Cane Sugar Engineering. Trans. JENKINS. (Elsevier, Amsterdam.) 1960, p. 362.

produced *after* these operations and do not provide a basis for countering factors which result in unsuccessful operation. In order to be able to carry out daily or weekly reviews it is necessary to examine the results of chemical process control—the operating report which gives details of weights and measures, analyses and critical operating conditions. Factors which should be considered are listed and some briefly discussed.

* * *

Magnesium oxide can reduce cane sugar production costs. M. F. SMITH. *Sugar J.* (La.), 1966, **29**, (7), 40–43.—Advantages of using MgO in clarification instead of lime are discussed, as is the theory of its use. Factory operations at Negociación Tumán, Peru, are reported where MgO (as "Magox") was used to replace 75–80% of the usual CaO. The juice clarity and mud separation and composition were excellent and so were the syrup and sugar produced. The evaporators remained clean even during a period when heavy rains resulted in extremely dirty cane entering the factory.

* * *

Fondant seeding for boiling final massecuite. T. C. JHINGAN. *Indian Sugar*, 1966, **16**, 537–539.—An account is given of the practice adopted at Upper Doab Sugar Mills Ltd., Shamli, and Haryana Coop. Sugar Mills Ltd., Rohtak, whereby fondant sugar slurry in Esso "Fomax 40" or Standard-Vacuum "Prorex D" light oil is prepared with a ball mill and admitted to the *C*-massecuite pan, in which graining is carried out using *A*-molasses. A "Cuitometer" is used for determining supersaturation.

* * *

Application of "Separan AP 30", a flocculating agent for increasing the efficiency of the clarification process of juice and treatment of vacuum filtrate in cane sugar factories. S. BOSE, K. C. GUPTA, P. A. A. MENON, S. MUKHERJEE, S. B. PENDSE and A. N. SHRIVASTAVA. *Sharkara*, 1966, **8**, 18–20.—When refractory juices are being processed, slow settling may cause a reduction in crushing rate. Use of polyelectrolytes as aids to flocculation can then produce benefits which are reviewed for a khandsari (open-pan) factory and a white sugar factory. Operation of separate lime-sulphitation or lime-phosphate plus "Separan" treatment of vacuum filtrate produces a clear juice which can be sent direct to process.

* * *

A management view of cane sugar diffusion. C. E. S. BURNS. *Producers' Review*, 1966, **56**, (12), 39.—A brief account is given of the success of the Silver ring diffuser at Pioneer mill in terms of improved extraction and overall recovery compared with the results achieved with milling. Liming the entering cane has permitted a clarification and filtration effect to take place in the diffuser, and the diffuser lends itself to precise control.

Defeco-melt crystallization process for the manufacture of white sugar without sulphur. S. C. GUPTA, N. C. VARMA and N. A. RAMAIAH. *Sharkara*, 1966, **8**, 42–48.—The D.M.C. process[1] is described and an account given of its successful application in a number of Indian sugar factories.

* * *

Treatment of sugar factory effluents. ANON. *Sharkara*, 1966, **8**, 49.—A description is given of a plant designed at the National Sugar Institute, Kanpur, and tested over two seasons at Purtabpore sugar factory. Highly polluted waste—washings from the mill house, clarification and boiling house, presses, centrifugals and the laboratory—is passed through a screen, a grit separator, and a grease removal pit and sent to an equalizing tank where it is aerated. It is then mixed with domestic sewage water and activated sludge in another aerated tank after which it passes, with considerably reduced B.O.D., to a sludge settling tank. The sludge, which is partly returned and partly removed, has excellent value as a fertilizer. The settled liquid is then mixed with some more domestic sewage water and transferred to a biological trickling filter after which its B.O.D. level is only about 10% of the original level, e.g. 380–430 *vs.* 4000 B.O.D., and it can be mixed with low pollution wastes (condensate overflow, mill journal cooling water, boiler blow-off, etc.) for use on the fields or in the river. The cost of the plant is discussed and operational recommendations are summarized.

* * *

Mill setting calculations. T. T. OOMMEN and K. G. HATHI. *Indian Sugar*, 1966, **16**, 601–608.—See *I.S.J.*, 1967, **69**, 244.

* * *

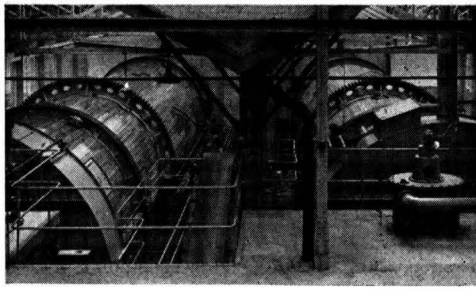
Manufacture of white sugar without sulphur: DMC process. S. C. GUPTA and N. A. RAMAIAH. *Proc. 21st Conv. Deccan Sugar Tech. Assoc. (India)*, 1966, (1), 1–10.—See *I.S.J.*, 1967, **69**, 273.

* * *

Manufacture of white sugar without the use of sulphur. T. T. OOMMEN and B. S. GURUMURTHY. *Proc. 21st Conv. Deccan Sugar Tech. Assoc. (India)*, 1966, (1), 11–14.—Short factory trials were made for comparison of sulphitation of syrup following simple defecation of juice, juice sulphitation without syrup sulphitation, and juice defecation without any sulphitation of juice or syrup but with double-curing of *A*-sugar. Analysis of syrups and sugars are tabulated. The latter were almost the same except for colour; however, the last process gave ISS E-28 grade sugar of 99·8 pol which would be satisfactory for domestic consumption. If sulphur is to be used it is better to sulphite juice rather than syrup because of the bleaching effect; the sugar obtained is of ISS E-29 grade which is again good enough for domestic consumption and sulphur consumption is reduced by 50% if syrup sulphitation is obviated.

[1] *I.S.J.*, 1966, **68**, 340.

Beet sugar manufacture



Moral principle and material loss. E. KOZLOV. *Ekon. Gaz.*, 1966, **34**, (48), 36.—Beet payment according to sugar content is discussed with reference to the situation in the Soviet Union, where, despite extensive experiments with this form of payment (in Kirghiziya, the Ukraine and the Russian Federation), beet are still paid for by weight. It is pointed out that the tests have demonstrated the practical benefits that would accrue from the system, and it is particularly mentioned that under the present system there is no incentive to increase the sugar yield per ha, in which the Soviet Union occupies 17th place in the 18 major beet-producing countries of the world.

* * *

Storage of factory beet at high carbon dioxide concentration. N. P. KORZHENKO. *Sakhar. Svekla*, 1966, (11), 11–12.—In laboratory tests, the daily sugar losses in beet stored in 100-litre sealed chambers at 6–8°C fell from 0·2% during 10 days' storage to 0·08% during 40 days' storage. The CO_2 content of the atmosphere in which they were stored rose from 39·0% after 10 days' storage to 72·0% after 40 days. In beet stored at 6–8°C in open chambers, the daily sugar losses were nil during 10 days, 0·04% during 20 days and 0·05% during 40 days, while the CO_2 content of the atmosphere remained constant at 0·03%. During storage of beet for 50 days or more in sealed chambers, the CO_2 content of the atmosphere has been found to rise to 80–92% and all the roots are converted into a putrefied mass.

* * *

Research work on the influence of ionizing radiation on the keeping quality of sugar beet. P. STATICESCU *et al. Ind. Alimentara*, 1965, **16**, 575–578; through *Abs. Rom. Tech. Lit.*, 1966, **2**, 640.—In a series of experiments carried out at the Institute for Food Research, sugar beet roots are exposed to γ-irradiation in doses of 5,000, 8,000, 10,000 and 12,000 r. Irradiation did not inhibit the sprouting of roots during the storage period (125 days), but it did reduce the percentage of rotten roots. The weight losses were 15–100% lower than in the untreated controls, the best results being obtained with doses of 8,000 r. The invert sugar content of the beet increased with increased irradiation dose. The purity of the press juice from beets exposed to 5,000 and 8,000 r did not fall as much as in the case of the untreated controls, whereas the fall was greater in beets exposed to 10,000 and 12,000 roentgens than in the controls. The results indicate the possibility of using ionizing radiation to inhibit the respiration process in beet during storage.

Exergy in the sugar industry. T. BALOH. *Zucker*, 1966, **19**, 595–604.—In this examination of the exergy (amount by which heat is devalued) and enthalpy in sugar factory processes, much reference is made to the work of SCHIEBL[1]. Sankey diagrams are given for an older beet sugar factory and for a modern one, demonstrating how fuel consumption may be only half that before World War II. The possibility of effecting a 10% saving in steam by modifying the evaporator station in a sugar factory producing white sugar from a standard liquor is also indicated. It has been established that the exergy consumed in a process is proportional to the square of the process rate.

* * *

Discussion of "Exergy in the sugar industry". K. JÖRN. *Zucker*, 1966, **19**, 604–605.—The work of BALOH (see previous abstract) is discussed and certain points further elucidated. The sugar technological aspects of the recommendations regarding methods of saving heat are briefly stated. While a reduction in raw juice temperature would be favourable from the microbiological viewpoint, and lower temperatures in the evaporator station would facilitate juice processing with less colour formation, concentration of the thick juice to 75°Bx would increase viscosity and possibly lead to formation of fines before the syrup was fed to the vacuum pan. It is emphasized that mixing of thick juice and standard liquor and concentration of this mixture before the pan station is only possible when a standard white sugar is being produced, but that it is expedient to charge the pan with thick juice and liquor separately to be able to exert a fine control over boiling, sugar quality and massecuite purity.

* * *

Oil heating for shaft lime kilns in the sugar industry. H. SCHNEIDT. *Zucker*, 1966, **19**, 606–607.—Details are given of an oil-fired lime kiln which has a maximum capacity of 100 tons of burnt lime per day at a waste gas CO_2 content of 30–32%. The lime is claimed to be evenly burnt, and is of good slaking quality. The costs of lime production in oil-fired and coke-fired kilns are compared and the use of natural gas briefly mentioned.

* * *

Optimum length of a sugar campaign. Z. KOWALEWSKI. *Prace Inst. Lab. Badawczych Spozywczyego*, 1965, **15**, (4), 1–26; through *S.I.A.*, 1966, **28**, Abs. 753.—It is calculated that the optimum campaign length under

[1] Wärmewirtschaft in der Zuckerindustrie (Dresden, 1939).

present conditions in Poland is 105–110 days in Lublin department (in south-east Poland), 90 days in Warsaw department (east central Poland), 85 days in the west, and even shorter in the north. The campaign should begin during the last two weeks of September. Production costs at five factories over 10-day periods throughout three previous campaigns are tabulated. A formula for calculating the production costs per ton of sugar is given.

* * *

Mathematical description of the process of sugar extraction from a beet cossette by the diffusion method. G. A. GOTSADZE and YA. N. TAVARTKILADZE. *Trudy Tbilissk. Nauch-Issled. Inst. Priborostr. Avtomatiz.*, 1964, **4–5**, 119–127; through *S.I.A.*, 1966, **28**, Abs. 757.—The extraction of sucrose in a continuous tower diffuser is analysed by differential equations, assuming a uniformly cylindrical cossette of equivalent diameter d to travel upwards to a height h in the direction of its long axis. The sucrose concentration in the solid phase, C_s, at a height h is given by $C_s = C_{s0}\ (\alpha - 1)/(\alpha e^{kh} - 1)$, where C_{s0} = initial sucrose concentration, α = ratio of liquid phase to solid phase, $k = 4\beta\ (\alpha - 1)/d\upsilon\alpha$, β = mass change coefficient, and υ = speed of movement in the direction h. The liquid phase is assumed to be of zero concentration initially; otherwise, a more complex expression is valid. The liquid phase concentration is similarly given by $C_1 = C_{s0}\ (e^{kh} - 1)/(\alpha\ e^{kh} - 1)$. The equations are similar to those of SILIN, and may be used as control algorithms.

* * *

Solid-liquid extraction and its application in the sugar factory. P. L. DEVILLERS. *Zeitsch. Zuckerind.*, 1966, **91**, 629–635.—The nature of the beet and extraction of sugar by simple and counter-current diffusion are reviewed, with an account of the influence of a number of factors—time, temperature, apparatus, press-water recycling, beet sucrose content, water feed and pH—on the industrial process. The simultaneous diffusion of non-sugars is discussed, as is the effect of the same factors mentioned above. Other phenomena occurring during diffusion are briefly discussed; these include loss of sucrose by thermal inversion and by enzymic degradation, colour formation in juice and pulp, and fermentation. It is pointed out that industrially a compromise must be reached between conditions favouring sucrose extraction and those limiting non-sucrose extraction, and the currently adopted values for such conditions are briefly described.

* * *

A new 1000-kg flat-bottomed centrifugal. H. KOHL and W. D. KOPF. *Die Lebensmittelind.*, 1966, **13**, 418–420. Details are given of a fully-automatic centrifugal manufactured by VEB Maschinenfabrik Sangerhausen. Based on the 500-kg model, it has a basket of 1250 mm diameter which is 1100 mm high and is capable of a maximum speed of 1450 r.p.m. if required, although the standard speed is regulable between 1000 and 1300 r.p.m. The machine is designed for white sugar, middle product massecuite and affination. White sugar spun for 30 sec at 1000 r.p.m. and washed with steam at 145°C contained 0·016–0·025% ash and 0·15–0·40% moisture.

* * *

The use of sodium triphosphate for beet juice purification. A. I. KATANA. *Sakhar. Prom.*, 1966, **40**, (12), 12–13.—With reference to the statements made by ONANCHENKO[1] that sodium triphosphate added to 2nd carbonatation juice can cause pitting of evaporator tubes, it is pointed out that addition of this compound has been the practice at a number of Soviet sugar factories for some years, and there has been no occurrence of evaporator tube corrosion as a result of its use at several sugar factories asked to submit information on the subject. The present author advocates adding 2–3 kg of sodium triphosphate per 100 tons of beet at the start of a campaign and 15–20 kg/100 tons towards the end of the campaign. It is claimed that this improves juice evaporation and massecuite crystallization and curing, while also reducing lime salts contents.

* * *

Results from the use of sodium triphosphate for beet juice purification. N. V. KHEIZE, A. K. KARTASHOV and A. D. GOLUBEVA. *Sakhar. Prom.*, 1966, **40**, (12), 13–17.—The phosphate content in a filtered 2nd carbonatation juice sample to which no sodium triphosphate had been added was only slightly lower than that of a sample (0·0050% P_2O_5) from the same juice which was heated to 95°C before sodium triphosphate was added (22 kg/100 tons of beet) with vigorous mixing for 3 min. Part of the phosphate-treated juice was evaporated for 90 min, after which the resultant syrup was of excellent transparency without any traces of PO_4^{---} ions. On the other hand, addition of a very small quantity of PO_4^{---} to the syrup caused precipitation of calcium phosphate. These results do not bear out the criticism made by ONANCHENKO (see previous abstract). It is also pointed out that the solubility of calcium phosphate is so low that any PO_4^{---} ions occurring in the evaporator will precipitate as calcium phosphate and will not form compounds with iron or other metals. Since phosphate treatment of condensate used as boiler feed water is widely practised to prevent corrosion where the ammonia content is high, it is mentioned that ONANCHENKO's views regarding pitting would apply to boilers, but this has not been reported. The origins of the views linking corrosion with sodium triphosphate are to be found, it is stated, in the processing of sub-standard beet and their refractory juices. It is recommended that the pH of sulphitation juice going to the evaporators should not be lower than 8·8–9·2, and 2–5 kg of sodium triphosphate/100 tons of beet is recommended for normal purposes, except where the natural alkalinity of the juice is low (0·01% CaO), when 10–20 kg/100 tons of beet should be added. If the juice alkalinity is lower than

[1] *I.S.J.*, 1966, **68**, 309.

0·01% CaO or if it is acid, sodium carbonate should also be added.

* * *

BMA settlers for 2nd carbonatation juice. V. A. ZAMBROVSKII and O. V. STRATIENKO. *Sakhar. Prom.*, 1966, **40**, (12), 17–19.—Tests at Timashevskii sugar factory showed that while the two four-tray 95 sq.m. BMA settlers removed 35% of the mud (on weight of juice) from 2nd carbonatation juice, and the alkalinity and reducing matter content were the same as before settling, the juice colour rose from 36·3°St to 43·8°St. The normal practice at the factory is to return some of the mud to carbonatation and some to the vacuum filters; 0·5–0·6% lime is added to 2nd carbonatation. Omitting one settler and using 3 trays in the other caused the effective cycle in each of six 15 sq.m. Stellar candle filters treating the supernatant juice to be reduced from approx. 48 min to 9–10 min. While settlers are considered necessary where 2nd carbonatation juice is limed, it is also felt that the retention time should be reduced and that one settler at Timashevskii would be sufficient for the 2nd carbonatation juice. While BMA settlers operate well with 1st carbonatation juice, they are not optimum for 2nd carbonatation juice, which flows at a much faster rate, and should be lower in height to reduce retention and hence inhibit colour increase. The use of flocculation aids in 2nd carbonatation juice settlers to replace filters is briefly discussed.

* * *

Technical and chemical control of (sugar) manufacture. A. I. SHAPIRO. *Sakhar. Prom.*, 1966, **40**, (12), 20–22.—The need for efficient organization of factory tarehouses and laboratories in the Soviet Union is emphasized, and in this connexion the lack of suitable instruments deplored. Sugar losses occurring in beet between reception at the factory yard and sampling in the tarehouse often exceed those in the factory, and should be reduced. The question of the skill and organization of staff is discussed and the employment of microbiologists considered necessary.

* * *

Storage and processing of beet harvested by combine and not manually cleaned. G. V. EREshchenko and I. K. STOYANOVSKAYA. *Sakhar. Prom.*, 1966, **40**, (12), 40–43.—Mechanically-harvested beet containing an average of 8·03% dirt, were stored for 46–63 days in periodically force-ventilated piles measuring 3·4 m high × 70 m long × 20 m wide. During storage the daily sugar losses were 0·025% on weight (compared with 0·23% in the controls which were stored for 58 days) and 35·7% of the beet had sprouts about 15 cm long. The dirt content after storage was 4·75%. Of three different types of beet cleaners, the BUM-U-3 piler with cleaning plant attached proved the most effective. The amount of dirt and other impurities, as well as beet pieces, found in flume-wash water was much greater in the case of the mechanically-harvested beet. While the slicing capacity of the factory handling the mechanically-harvested beet was not impaired, difficulties were experienced in 2nd massecuite boiling and crystallization. Molasses purity and yield rose by 0·8 units and 0·07% on weight of beet, respectively, while total sugar losses rose by 0·05%. White sugar yield fell by 0·51% on weight of beet.

* * *

Mechanical and manual harvesting of sugar beet in 1965. L. SCHMIDT, A. HAVRÁNEK, J. ZAHRADNÍČEK and J. NOVOTNÝ. *Listy Cukr.*, 1966, **82**, 265–270. Tabulated data are given on beet harvesting and storage trials at a number of Czechoslovak sugar factories over the period 1958–1965. In the first 4-year period (1958–1961) the daily weight and sugar losses over a relatively short storage period in conventional piles averaged 0·155% and 0·058%, respectively, in mechanically-harvested beet compared with 0·083% and 0·030%, respectively, in manually-harvested beet. In the second 4-year period (1962–1965) the beet were harvested (manually and mechanically, respectively) after removal of the leaves. The average daily losses in weight and sugar during storage were lower than the 1958–1961 averages for both mechanically-harvested beets (0·066% and 0·029% weight and sugar loss, respectively) and for manually-harvested beet (0·055% and 0·025%). Mechanical harvesting had greater effect on the condition of the beet than did mechanical unloading or piling.

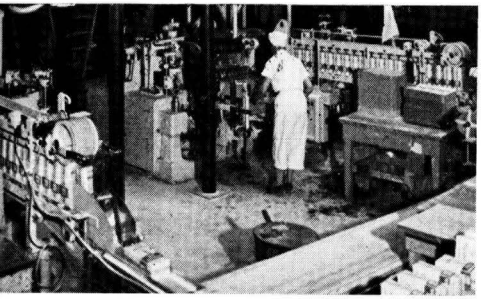
* * *

Recirculation of pulp press waters. II. E. SLAVÍČEK. *Listy Cukr.*, 1966, 82, 270–279.—Five models of press water recirculation schemes for use with battery diffusers are described, and for each the quantity of pulp and juice and sugar losses are calculated using the equations developed previously[1]. The results are given in graph form. In all cases the sugar losses were lower than or at most the same as those sustained in diffusion without press water return.

* * *

Vacuum regulation in a vacuum pan and the quantity of barometric water. S. BOUČEK and P. MOTEJL. *Listy Cukr.*, 1966, **82**, 280–282.—The vacuum regulator comprises a pneumatic transmitter before the shut-off valve in the vapour line of the vacuum pan. The transmitter is connected to a vacuum sampler which compares the vacuum with the atmospheric pressure on the other side of its diaphragm. A signal is then sent to a PI recording regulator which adjusts the vacuum through a servo-motor controlling the globe valve in the vacuum line. Tests showed less vacuum fluctuation with the use of this unit than in other pans not equipped with it. The amount of cold water fed to a condenser is regulated according to the temperature of the water discharged from the condenser through a temperature transmitter, the sensing element of which is constantly immersed in the water discharge line from the condenser. The temperature signal is transmitted to a PI regulator with micro-recorder which in turn controls the valve in the cold water feed line to the condenser.

[1] *I.S.J.*, 1967, **69**, 146.



Sugar refining

Free moisture changes in granulated sugar. J. F. DOWLING. *Proc. 25th Meeting Sugar Ind. Tech.*, 1966, 34–59.—Determination of the moisture content of 1st, 2nd, 3rd and 4th sugars showed that during the first 24 hr of storage all showed a marked increase in free moisture, after which it decreased sharply over a number of days. It is considered preferable to measure the moisture content every 8 hr in order to obtain an accurate picture of the major change occurring during the first day, particularly since, in the case of feed liquors having low colour contents, the major release of bound moisture may occur as early as 8 hr after the sugar sample is taken. The largest amount of bound moisture was found in conglomerated sugar crystals and in unscreened sugars (the sugars were passed through 20, 40 and 60 U.S. mesh screens). Higher purity sugars lost free moisture at a greater rate, and there appeared to be a direct relationship between pan feed liquor colour and the so-called "% drop" (the difference between the 2nd day's meter reading and the 5th day's reading, divided by the 2nd day's reading). Conditioning sugar with dry air did not accelerate conversion of bound moisture to free moisture but merely helped to remove the excess free moisture already present. Laboratory tests in which sugar was dried under different conditions verified that bound moisture is formed during drying, and is attributed to excessively rapid drying. The bound moisture content of sugar samples conditioned before drying and then stored in sealed jars was not excessive.

* * *

Theory and practice of sugar curing at Canada & Dominion Sugar Co. S. STACHENKO, W. A. R. ALLEN and J. A. SWAN. *Proc. 25th Meeting Sugar Ind. Tech.*, 1966, 75–122.—Because refined sugar had a higher moisture content after storage in silos than before storage, with the possibility of caking, a new system was intoduced at Montreal refinery in which the sugar is stored for a short period (40–48 hr) in curing silos before being stored in the "permanent" silos. Tests had shown that 120–130°F was an ideal conditioning temperature. Two concrete silos were built to be operated in parallel, each having a maximum capacity of 2,072,000 lb of sugar at 56 lb/cu.ft. Sugar is fed on a screw conveyor and is distributed by a rotary chute operating at 2 r.p.m. The sugar discharge system consists of 12 inverted stainless steel cones arranged in a circle of 17 ft 10 in diameter (compared with an internal silo diameter of 20 ft 4 in between wall linings). The sugar falls into a hopper whence it is carried by screw conveyor to an elevator for screening before passing into one of two silos in parallel, each having a capacity of 7½ million lb. The inner walls of the curing silos were lined with wood strip. Because the lining in one silo collapsed and had to receive extra vertical support, only one silo could be operated initially. Retention of the sugar was limited to less than 24 hr. During an average of 20 hr 20 min the moisture was reduced from 0·038% to 0·018% at 125°F. Later operation of both silos gave a moisture reduction from 0·036% to 0·013% during 40 hr at an average temperature of 115°F, although a temperature of 125°F gives a final moisture content of 0·01% on average. Details are given of the air requirements and of the week-end procedure. The standard moisture determination method used consisted in introducing the sugar sample into anhydrous methanol and determining the rate of water release by Karl Fischer titration during 60 min.

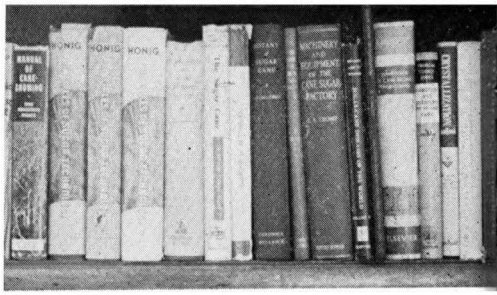
* * *

Dust prevention, protection, collection, and removal in sugar refining. B. A. STEPHANS. *Proc. 25th Meeting Sugar Ind. Tech.*, 1966, 139–151.—Among methods of dust prevention and isolation is that of enclosure, in which systems liable to dust formation are sealed off from other areas in a factory or refinery by enclosing inside separate buildings within the overall factory building. The is exemplified by the raw sugar weighing station at Savannah refinery, in which the raw sugar conveyor is sprayed continuously with water. Equipment intended to prevent dust formation is discussed, as are methods of collection.

* * *

Scum processing procedures. D. TONNER and R. J. CURRIE. *Proc. 25th Meeting Sugar Ind. Tech.*, 1966, 152–161.—At Atlantic Sugar Refinery the clarifier mud is diluted to 20°Bx and settled, then diluted to 2·3°Bx with further settling and subsequently treated in a circuit incorporating two hydrocyclones ("Dorr-Clones"), one as standby. These receive the muds from a tank in which the mud from the dilution tanks is settled together with solids from Sweco screens and the overflow from a head tank receiving the liquid portion from the "DorrClones". Mud from the head tank is treated in a centrifugal separator, the sugar from which is recycled to the melters together with the sugar recovered from the dilution tanks. The system permits recovery of 2340 lb of sugar solids from 2350 lb of sugar solids in the muds, producing only 35,000 lb of sweet water per hr.

New books



Estación de carga mecanizada para la exportación de azúcar a granel por el puerto de Veracruz, Ver. (Mechanized loading station at the port of Veracruz, Ver., for the exporting of bulk sugar). ANON. 12 pp; $6\frac{3}{4} \times 8\frac{1}{2}$ in. (Unión Nacional de Productores de Azúcar S.A. de C.V., Balderas No. 36, México 1, D.F.). 1967.

This well-produced booklet presents a number of coloured photographs showing the bulk terminal built at Veracruz in Mexico for the loading of bulk raw sugar into ships. It includes a parabolic silo of 40,000 tons capacity and the equipment was supplied by Bühler Brothers of Switzerland. The sugar is unloaded into the warehouse from road and rail trucks and is fed to storage on an inclined belt conveyor at a rate of 400 tons/hr. The sugar is reclaimed by means of an underfloor conveyor system, aided by Hough "Payloaders", and is loaded into the holds of the ships by sugar throwers. The warehouse measures 23·2 metres high by 96 metres long by 50 metres wide.

* * *

Le sucre. ANON. 165 pp; $8\frac{1}{4} \times 10\frac{3}{4}$ in. (Centre d'Etudes du Sucre, 30 rue de Lübeck, Paris 16e, France.) 1967. Price: 15F; 21s 0d.

This book is obviously intended to teach people outside the industry something about sugar. With this in mind the sugar technologist should not expect to find a great deal to interest him. The contents are arranged under ten main headings: history; physical and chemical properties of sucrose; cane and beet agriculture (with information on photosynthesis); sugar manufacture; the sugar economies of France, the E.E.C. and the world; sugar quality regulations in France; sugar and sugar by-product uses; the rôle of sugar as a foodstuff; sugar uses in the kitchen; and addresses of beet, cane and sugar organizations in France; while a bibliography containing 88 titles is included. The material is well arranged and presented in a concise manner, in a type that is easily readable. Although, naturally, some emphasis is laid on French data and information, the book contains much that is of international significance.

* * *

The story of sugar. 25 pp.; 6 × 9 in. (Canadian Sugar Institute, 408 Canada Cement Building, Phillips Square, Montreal, Quebec, Canada.) 1967.

This booklet presents a simple picture of beet and cane sugar manufacturing processes and of various aspects of the world's sugar industry plus a brief history of sugar processing. Cane and beet agriculture, sugar refining and by-products are also dealt with, and a brief mention made of Canadian sugar production.

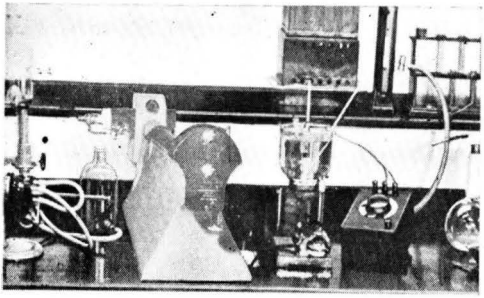
* * *

La industria azucarera boliviana, 1964-1965. (The Bolivian sugar industry, 1964-1965.) 139 pp.; $7\frac{1}{4} \times 10\frac{1}{2}$ in. (Comisión Nacional de Estudio de la Caña y del Azúcar "C.N.E.C.A.", La Paz, Bolivia.) 1967.

During the period up to 1964 the Bolivian sugar industry was developing to the point where it could supply the whole of the domestic requirements. Further increase in production the following year was subjected to the low world market prices engendered by the overproduction of 1964 and 1965, and planning is now on a basis of a steady but slow expansion from 1966 with more efficient production and a solidly based economy.

To provide a groundwork for such planning, the sugar crops of 1964 and 1965 have been examined by C.N.E.C.A., a supervising body which includes representatives of the Government, banks, the sugar industries and cane farmers. The result of this survey is presented in the form of a bulletin which first assesses the world sugar situation during the period, with special reference to the sugar producers of South America.

The sugar area of Bolivia—the Department of Santa Cruz—is described and its climate and the growing of cane discussed, as are the cane growers' organizations. The sugar factories and their equipment are detailed, except for the older "La Esperanza", which closed after the 1964 season. Some information is provided on the "Stephen Leigh" project which is expected to have a trial run this year and operate fully in 1968. The results from the two seasons are discussed and statistical data from 1960 to 1965 are tabulated and presented in graph form. Further details of production, imports, exports, consumption, etc., are detailed and various aspects of the "multiplier effect" on the Bolivian sugar industry are discussed. Various laws ("supreme decrees") relating to the industry are reproduced, and two appendices describe the "DorrClone" system for sand removal from juice, and the BMA-Egyptian cane diffusion system.



Laboratory methods & Chemical reports

A modified method for determining filtrability. R. P. JENNINGS. *Proc. 40th Congr. S. African Sugar Tech. Assoc.*, 1966, 199–205.—A modification of the C.S.R. filtrability test which is carried out at 80°C and which can be applied to refinery liquors is described in detail. It was examined and found to be suitable for determining the filtration rate of carbonatated liquors. Correlation of data between laboratory filtrability and factory filter performance is closest when sugars of one origin are being refined, although this may be due to changes in the carbonatation process in the refinery.

* * *

Application of sound generators for initiation of sugar crystals. S. ZAGRODZKI and Z. NIEDZIELSKI. *Roczn. Technol. Chem. Zywn.*, 1966, **12,** (1), 93–112; through *J. Sci. Food Agric. Abs.*, 1966, **17,** ii–239.—Methods of accelerating crystal formation in the sugar industry are examined, including the behaviour of supersaturated sucrose solution subjected to sonic vibration. Sonic vibrations of 7·1 kc/s frequency at 60°C substantially reduce the time of sugar nuclei formation. For syrup of 1·025, 1·05 and 1·1 supersaturation coefficient this time can be reduced to approx. 8·3%, 4·8% and 2·8%, respectively, of that needed without sonic vibration. Well-formed sugar crystals may be produced from not too highly supersaturated solutions, permitting complete automation of the process, with the sonic generator installed at the syrup inlet of a continuous crystallizer.

* * *

The mechanism of crystal growth. A. VANHOOK. *Ind. Sacc. Ital.*, 1966, **59,** 201–207.—This paper is the text of a lecture presented at the Serafino Cevasco sugar school in the University of Ferrara. After describing the steps of crystal growth, the author summarizes the principles of nucleation and growth, emphasizing the rôle of dislocations. Factors affecting crystal habit are discussed.

* * *

Thin-layer chromatography of the commonly occurring commercial sugars. C. BRACHER and L. E. BAULY. *Food Manufacture*, 1965, **40,** (8), 38–39; through *Anal. Abs.*, 1966, **13** Abs. 7108.—A rapid method for the routine separation of fructose, glucose, sucrose, maltose and higher sugars is described. Separation of sugars of closely similar R_f values is improved by V-marking the initial 5 cm of the plate (coated with a 0·75-mm thick layer of Kieselguhr G made into a slurry with 0·02M Na acetate buffer and dried at 110°C for 20 min). Spots on a 5% solution of the sugars in pyridine (containing 10% of water if necessary to ensure complete dissolution) are applied, and development carried out with 65:23:12 ethyl acetate:*iso*-propyl alcohol:water. The developed plate is dried for 3 min at 110°C, sprayed with 5 ml of a freshly-prepared locating reagent (1% each of aniline and diphenylamine in acetone, to which is added sufficient H_3PO_4 just to dissolve the precipitate initially formed) and then heated for 15 min at 110°C.

* * *

Direct sampling and analysis of individual cane consignments. I. Rapid cane and bagasse analysis using the S.M.R.I. cold extractor. E. J. BUCHANAN. *S. African Sugar J.*, 1966, **50,** 1049–1059.—A cold extractor has been developed, on the basis of much experience, for the purpose of rapid cane and bagasse analysis. Comprehensive tests have provided sufficient evidence on which to base a recommendation to the South African sugar industry that the cold extraction method using the S.M.R.I. extractor should be adopted without delay as a standard or alternative standard method for the analysis of cane, mill bagasse and final bagasse. Results of tests on these products during 1964–1966 are summarized. The proposed method streamlines laboratory routine. During a period of three years the extractor has required no maintenance, and it has the advantage of being manufactured locally to S.M.R.I. design.

* * *

Clarification factor. A. C. CHATTERJEE. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 113–114. Proposals by MITTAL[1] for calculation of clarification factor are criticized and the formula used by the Sugar Technologists' Association of India[2] recommended as serving the desired purpose.

* * *

Studies on specific conductance of Indian sugars. S. C. GUPTA, N. A. RAMAIAH, A. P. GUPTA, S. S. KATIYAR and I. S. JUNEJA. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 115–118.—Improved techniques have made it possible to produce plantation white and khandsari sugars of such good quality that it is difficult to distinguish them from refined sugars. Measurements were made on a number of types of sugar and are recorded. They permit a

[1] *I.S.J.*, 1966, **68,** 314.
[2] HONIG: Principles of sugar technology, Vol. I (Elsevier, Amsterdam) 1953, p. 614.

distinction to be made between refined sugars (2–15 $\times 10^{-6}$ mho), sugars produced by the D.M.C. process or plantation white sugars (30–100 $\times 10^{-6}$ mho), khandsari sugars produced using a sulphitation process (100–300 $\times 10^{-6}$ mho) and raw sugars (300–700 $\times 10^{-6}$ mho).

* * *

Studies on the composition of molasses of khandsari and vacuum pan sugar factories. S. L. PHANSALKAR and H. S. SRIVASTAVA. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 193–197.—Comparative analyses were made on 8 samples each of molasses from double-carbonatation, double-sulphitation and khandsari factories, and are tabulated. The principal differences lie in calcium content, colour, sucrose content and amount of grain present, all of which were much higher in the khandsari molasses.

* * *

Determination of ash by ion exchange. V. A rapid method of estimation of ash in raw sugar. S. BOSE, K. C. GUPTA and S. MUKHERJEE. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 199–201.—The technique described earlier for other sugar products has been extended to raw sugar; 10 g of the sugar is dissolved in 90 ml of distilled water and allowed to flow at 0·2 ml/min/ml of resin through a bed of 30 g of "Duolite C-25" cation exchange resin (previously treated with hydrochloric acid and then washed with distilled water until the effluent is neutral). The column is then washed with distilled water until free of acidity and the combined effluents titrated with N/10 NaOH using phenolphthalein as indicator. The results, together with corresponding ash values found by the classic method, are represented by an equation relating the ash value (Y) to titre/100 g of sugar (X), viz. $Y = 0{\cdot}0724\,X - 0{\cdot}0441$.

* * *

A scientific method of assessment of (the) colour of Indian plantation white sugars: Physical basis for reproduction of Indian sugar standards. S. C. GUPTA, N. A. RAMAIAH and B. I. NEMADE. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 213–224.—The plantation white sugars are graded into five grain sizes and the graded sugars filled into the standard bottles used for colour assessment. The reflectance values were measured using a photoelectric meter employing red, blue and green filters, and the resultant colour values recorded on a chart, the slope of the linear plot being a measure of the whiteness.

* * *

Studies on the orientation of impurities in raw sugar crystals: Principle of the manufacture of white sugar by (the) defeco melt crystallization (DMC II) process. S. C. GUPTA, S. K. D. AGARWAL, A. P. GUPTA, I. S. JUNEJA and V. M. BHALWAR. *Proc. 34th Conv. Sugar Tech. Assoc. India*, 1966, 265–271.—Examination of raw sugars by washing them with sucrose solution as well as with a methanol/*iso*-propanol mixture demonstrated that most of the impurities were on the outside of the crystal and that the core was free of colour (except in one case) and of a purity comparable with sulphitation sugar. The washed raw sugar could therefore be used as seed for development in the D.M.C. process to crystals which were comparable with sulphitation sugar.

* * *

L(+)-lactic acid as criterion for the degree of infection in sugar beet extracts. W. MAUCH, J. TSCHERSICH and S. SCHMIDT-BERG. *Zeitsch. Zuckerind.*, 1966, **91**, 688–691.—Tests showed that lactic acid-forming bacteria viable in extracts from sugar beet at 65°C form only L(+)-lactic acid, which is therefore of value as a criterion for the degree of infection in continuous diffusion. The relationship between bacterial counts and the quantity of lactic acid formed is not the same for all temperature ranges, the lactic acid content increasing at a greater rate with rise in temperature. The "lactic acid-forming capacity" is suggested as a measure of infection, being defined as the total lactic acid quantity (ml) formed by 10^9 bacteria per ml of liquid per hr. Extracts disinfected with formalin before incubation showed a much lower lactic-acid forming capacity than did those not treated with formalin. On the basis of these results, an alteration has been made to the method of calculating the results obtained in enzymatic determination of lactic acid in sugar solutions[1].

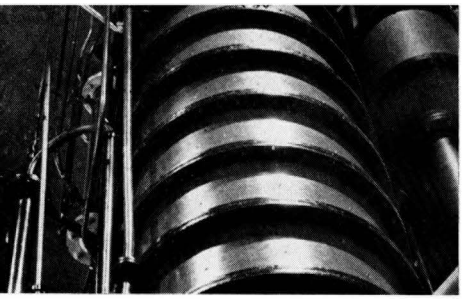
* * *

Sources of error in hydrometer and pycnometer determination of density. W. KÄMPF. *Zeitsch. Zuckerind.*, 1966, **91**, 691–699.—While measurement of sucrose solution density with a hydrometer is quicker and simpler than with a pycnometer, both must be corrected for air temperature and pressure. The Brix, Balling and Baumé values are not recommended, since they can lead to error, and the only correct and unequivocal value is considered to be the weight % of sucrose or dry solids. The most important values for sucrose % weight in pure sucrose solutions are tabulated together with density, density ratio and immersed weight ratio and are related to Brix, Balling and Baumé values. Values are also given of air density at heights of 1000 m above sea level and for temperatures up to 30°C.

* * *

A rapid electrochemical method of determining invert sugar. F. TÖDT. *Zeitsch. Zuckerind.*, 1966, **91**, 700. The method is based on the measurement of the fall in quantity of periodic acid as this is consumed in the oxidation of the invert sugar. This occurs in neutral solution at room temperature, but the periodic acid must be present in a quantity at least 2½ times greater than that of the invert sugar. The reduction in the periodic acid content can be measured as the current feed-back of a micro-ammeter connected to an element formed by a gold amalgam and a zinc electrode. Some tests with the method are reported.

[1] *I.S.J.*, 1966, **68**, 246.



By-products

Biological control of cultures used in the inoculation of beet pulp. L. VOKOUNOVÁ, B. HYLMAR and M. TEPLÝ. *Listy Cukr.*, 1966, **82,** 256–258.—In a discussion of the techniques used in Czechoslovak sugar factories in the propagation of lactic bacteria for beet pulp inoculation, emphasis is laid on the need for extreme care. Apart from the provision of suitable equipment, systematic biological control of the laboratory is called for as well as special instructions to be given to personnel involved in this work.

* * *

Industrial alcohol: a brief study on fractional distillation. T. S. RAO. *Indian Sugar*, 1966, **16,** 431–433. Details are given of the equipment and process stages in the production of industrial alcohol from cane molasses by fractional distillation.

* * *

Research on beet pulp ammoniation. II. Some forms of fixed nitrogen. T. STOBIECKI, K. GLOGOWSKI and E. CZAPLICKI. *Gaz. Cukr.*, 1966, **74,** 239–243.—Tests carried out on beet pulp obtained in 1963/64 and 1964/65 at Strzelin beet factory (Poland) involved fractionation of ammoniated samples. It was found that while ammoniation at atmospheric pressure increased the bound N content in the pulp by 100%, ammoniation under pressure (5 atm) increased it by 200%. In the former case, 60% of the bound N was easily soluble in water, one-third comprising N compounds with water-soluble pectin. A further 25–30% of the N formed compounds with substances soluble in 3% HCl (water-insoluble pectins and cellulose to which the N was weakly bound). The remaining insoluble 10–15% N was strongly bound to cellulose and other polysaccharides found in vegetable tissue. In pulp ammoniated under pressure 70% of the N was easily soluble in water, 10% was acid-soluble, and about 20% was strongly bound to the residue from extraction.

* * *

Condition for spontaneous combustion of (dried beet) pulp during storage. K. PIETRONIUK. *Gaz. Cukr.*, 1966, **74,** 243–245.—Causes of spontaneous combustion given include: inadequate and irregular drying; secondary moistening of the pulp through open roofs, windows, etc.; insufficient cooling before storage; and electrical charging of dry particles. For prolonged storage, a moisture content of 12% is recommended. If the moisture content exceeds this level, there is risk of fermentation with generation of considerable heat and hence danger of combustion. It is preferable to store in a completely dry building, but in any case the atmosphere should not exceed 40–50 R.H.

* * *

Fibre boards from bagasse. S. R. D. GUHA, M. M. SINGH, V. V. MUKHERJEA and V. B. SAXENA. *Indian Pulp & Paper*, 1965, **20,** 255–256; through *S.I.A.*, 1966, **28,** Abs. 782.—Experimental insulation boards and hardboards were made from undepithed bagasse by soaking in water for 16 hr, steaming at 8 kg/sq.cm. for 5–15 min, defibrating at the same pressure in a laboratory Asplund defibrator for 10 min, diluting with water, moulding, pressing at 35 kg/sq.cm. for 5 min, and drying in the press at 190°C for ½ hr. For insulation boards no pressure was applied during drying, and for hardboards 32 kg/sq.cm. was applied. Mechanical properties of the resulting boards are tabulated. Those of the insulation boards were best after 5 min steaming (tensile strength 14·0 kg/sq.cm., modulus of rupture 26·3 kg/sq.cm.) and those of the hardboards were best after 15 min steaming (tensile strength 192 kg/sq.cm., modulus of rupture 293 kg/sq.cm.).

* * *

Beating properties of fibrous raw materials not prepared from wood. J. GRANT. *Papier*, 1965, **19,** 765–770; through *S.I.A.*, 1966, **28,** Abs. 783.—The properties (fibre dimensions and strengths) of eight such materials, including bagasse, are described in some detail. Bagasse is particularly suitable for making the middle layer in corrugated cardboard. It may also be used as a constituent of the pulp for making newsprint and high-quality writing paper. The importance of depithing bagasse is stressed. Removal of 50% of the pith increase the bursting factor of the paper by approx. 20% and the breaking length and tear strength by approx. 10% each.

* * *

Pulp for Indian paper industry. H. K. MUTHOO. *Indian Pulp & Paper*, 1965, **20,** 207–222; through *S.I.A.*, 1966, **28,** Abs. 784.—The availabilities in India and the proportions of some fibrous materials (including bagasse) are discussed, and their treatments for pulp production are outlined.

* * *

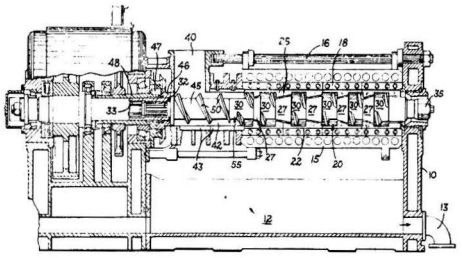
Production of lactic acid by accelerated fermentation. B. GOVORCIN. *Kemija Ind.*, 1965, **14,** 977–990.—A study is made of two selected *Lactobacillus* spp. for deriving the optimum conditions for production of lactic acid from molasses with avoidance of the action of other bacteria.

Patents

UNITED STATES

Screw press. A. H. BURNER, *assr.* THE FRENCH OIL MILL MACHINERY CO., of Piqua, Ohio, U.S.A. **3,246,597.** 27th May 1963; 19th April 1966.

It has been found that with fibrous material such as bagasse, delivered into a screw press, the fibres tended to pack between the periphery of the feed screw flights 50 and the inner surface of the cage 43. This caused resistance to rotation of the shaft 45 carrying the flights, so increasing current consumption by the driving motor. The fibres would eventually break and the resistance would be suddenly lowered, and the current consumption would drop accordingly. The result of this would be a considerable variation in the current used, e.g. between 100 and 300 amp for a 200 h.p. motor operating with a 440 V supply.

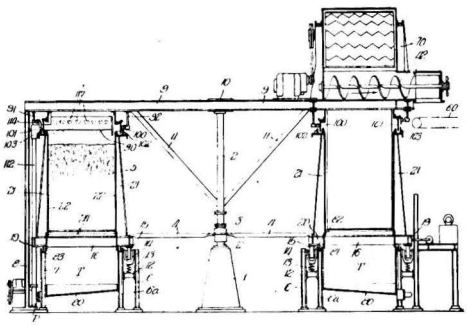


By increasing the gap between the periphery of the flights 50 and cage 43 to at least $\frac{1}{2}$ inch, the clogging with fibres is obviated while, contrary to expectations, feeding efficiency is not impaired—in fact, feeding is satisfactory even with a gap of more than $\frac{7}{8}$ inch.

* * *

Cane diffuser. H. F. SILVER, C. R. STEELE and F. B. PRICE, *assrs.* AMERICAN FACTORS ASSOCIATES LTD., of Honolulu, Hawaii, U.S.A. **3,248,263.** 14th November 1962; 26th April 1966.

The diffuser (the Silver ring diffuser) comprises a pedestal 1 carrying a vertical post 2 provided with a rotary bearing member 3 from which extend a series of radial struts 4 to the rotary annular chamber 5. Around the pedestal 1 and on the arcs of circles are concentric pairs of supports 6, 6a and 7, 8, the outer support 8 extending upwards and connecting with cross beams 9 extending inwards to the centre attachment 10 mounted on post 2. Diagonal braces 11 connect beams 9 and post 2. Between supports 6 and 6a is a cross support 12 mounting a suitable spring 13 which supports a guided yoke 14 carrying the supporting rollers 15. Similar rollers are mounted between each set of supports 6 and 6a and between each set of supports 7, 8. Above the rollers are radial beams 16 attached at their inner ends to struts 4 and equipped with horizontal circular track-like surfaces 19, 20 near their ends to contact the rollers 15 so that the latter support the beams 16. The beams carry upright supports 21 to which are mounted side walls 22, and between the beams are sections forming a perforated annular floor 24. The walls and floor form a continuous annular chamber, supported on rollers 15 and able to rotate about the axis of post 2, under the action of a suitable drive which can be set for any desired speed.



Beneath the floor 24 is a series of stationary tanks T each having sloping bottom 80 which directs liquid toward the pump P by which it is raised and distributed over the section of the annular chamber above the next tank T. Fresh prepared cane is fed to the apparatus by a suitable belt or other conveyor feeding the stationary scroll 42, which distributes it into the annular chamber in such a way that a bed with an even horizontal top surface is formed. The cane is carried round as the chamber rotates, and near the feed scroll encounters an elevator device which lifts it all out of the chamber. Water supplied near this discharge part of the diffuser is distributed by a suitable device and percolates through the bed

Copies of Specifications of United Kingdom Patents can be obtained on application to The Patent Office, Sale Branch, Block C, Station Square House, St. Mary Cray, Orpington, Kent (price 4s 6d each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C., 20231 U.S.A. (price 50 cents each).

and through the perforated floor 24 into the tank T from which it is collected and pumped to the distributor above the tank T next towards the fresh cane distributing scroll. The countercurrent percolation of gradually enriched juice through the bed and from tank to tank ends with the tank nearest the feed point from which it is withdrawn to process.

* * *

Beet harvester. M. C. WIELAARD, W. A. WIELAARD and M. OSSEVOORT. **3,250,332.** 15th October 1962; 10th May 1966.

* * *

Production of sugar esters. H. SCHNELL, H. DOHM and J. NENTWIG, *assrs.* FARBENFABRIKEN BAYER A.G., of Leverkusen, Germany. **3,251,827.** 4th October 1960; 17th May 1966.—The sugar (sucrose) is heated at 40–190°C (160°C) with 1–7 moles/mole (1, 2 moles/mole) of an aryl (phenyl, methyphenyl, chlorophenyl, methoxyphenyl or naphthyl) monoester of a (fatty) carboxylic acid (phenyl stearate alone or mixed with diphenyl adipate) in the presence of 0·05–0·30% of) a catalyst (K_2CO_3, NaOH or KOH) (or in dimethyl formamide solution at 105–110°C, removing the solvent and) thereafter recovering the sucrose ester. The reaction may be carried out in an inert dispersing agent, e.g. toluene or xylene.

* * *

Separation of unreacted sugars from fatty acid ester reaction mixtures. W. HAGGE, U. W. HENDRICKS and M. QUADVLIEG, *assrs.* FARBENFABRIKEN BAYER A.G., of Leverkusen, Germany. **3,251,829.** 2nd March 1964; 17th May 1966.—A mixture containing the products of an inter-esterification reaction between excess sugar (sucrose) and fatty acid alkyl esters in dimethyl formamide, dimethyl acetamide, dialkyl sulphoxide or butyrolactone, is treated with a halogenated aliphatic or aromatic hydrocarbon or a halogen-free hydrocarbon (1,2-dichloropropane) which is miscible with the reaction medium, whereby the unreacted sugar is precipitated and can be recovered.

* * *

Beet thinner. R. L. PROPST, *assr.* HERMAN MILLER INC., of Zeeland, Mich., U.S.A. **3,252,249.** 28th April 1964; 24th May 1966.

* * *

Producing glutamic acid. J. C. MEGNA and R. D. BOUCHER, *assrs.* INTERNATIONAL MINERALS & CHEMICAL CORP. **3,254,002.** 7th January 1963; 31st May 1966.—*Corynebacterium lilium* or *C. callunae* is grown on an aqueous carbohydrate (sucrose) medium incorporating a nitrogen source, the initial medium containing less than about 3% carbohydrate by weight and less than about 10 γ biotin per litre. After 1–8 hours' initial growth, increments are added of a carbohydrate containing 0·02–0·30 γ (0·03–0·17 γ) biotin per gram (beet molasses) to maintain the carbohydrate level in the medium at not more than 1% (0·5%) by weight (until a total of 7·5% by weight has been added).

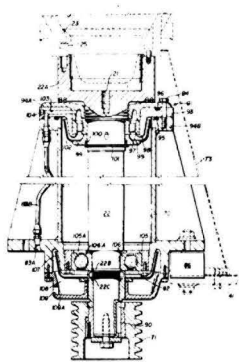
* * *

Preparation of pressed sugar tablets. E. J. CULP and R. M. GERSTENKORN, *assrs.* AMERICAN SUGAR CO., of New York, N.Y., U.S.A. **3,255,041.** 22nd May 1964; 7th June 1966.—The tablets are prepared by pressing into shape moist sugar containing 1·6–2·8% water by weight and bringing these rapidly to 200°–230°F (215°–230°F) by means of infra-red radiant energy under such conditions of energy intensity and time [4–1 (2–1) minutes, respectively] that no significant caramelization occurs. The temperature is then reduced to 150°–180°F and the tablets maintained at this for sufficient time for the water content to drop to less than 1%, after which it is cooled [by means of forced cool (40°–90°F) dry gas (air)] to below 130°F (90°–110°F) at a rate such that a hard tablet is produced. The process may be carried out continuously, the total time of heating and cooling being 5–10 min (6–8 min).

* * *

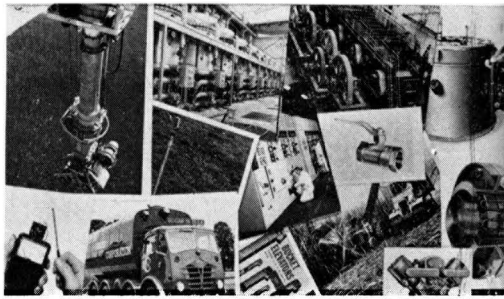
Shaft lubrication system for a continuous centrifugal. C. R. STEELE and F. B. PRICE, *assrs.* AMERICAN FACTORS ASSOCIATES LTD., of Honolulu, Hawaii, U.S.A. **3,257,235.** 17th May 1965; 21st June 1966.

The upper bearing assembly 97 separates the stationary flange 93 from the rotating shaft 22. Mounted on the latter is a flanged cup 102 which extends up above the level of the bearing. Similarly cup 107 extends above the level of the bearing 106 which separates the shaft from the stationary support bracket 105. The bracket 94A is drilled so that lubricant supplied through port 83A to pipe 83B is fed



through port 103 to the annular space above the bearing 97, and through the bearing into the cup 102. It overflows inside the hollow casing 70 and so over the bearing 106, into cup 107. Here it overflows into chamber 108 which it leaves via port 109 which is connected to the return circuit of the lubricant system. When the centrifugal is not in operation the bearings are immersed in lubricant so that no corrosion can take place.

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.

"Endoscopes". Deutsche Endoskopbau Gesellschaft Sass, Wolf & Co. m.b.H., 1 Berlin 61, Ritterstr. 12, Germany; W. Wykeham & Co. Ltd., Old Queen Street House, Storey's Gate, London S.W.1, England.

"Endoscopes" comprise an objective tube, a rigid or flexible intermediate tube containing the light source, an extension tube if required, and an eyepiece with a wide field of vision. The tubes are of glass and are housed in outer chromium plated tubes. "Endoscopes" can be used for inspection of any hollow body such as tubes, boilers, tanks, valves, etc., and they have been used for tube inspection in an Austrian sugar factory. The eyepiece tubes can be provided with binocular or monocular lens attachments or a quick-change attachment having three oculars.

* * *

Process water reclamation from washing plants. Allied Colloids Manufacturing Co. Ltd., Low Moor, Bradford, Yorkshire, Enghalnd.

The introduction of "Magnafloc" synthetic flocculants for rapid separation of suspended solids from process streams, effluents and turbid raw waters is announced. These chemicals have been successful in the clarification of flume water in the case of beet washing stations and are claimed to produce high-clarity waters suitable for re-use in process.

PUBLICATIONS RECEIVED

CROWN PUMPS. Crown Pump Manufacturing Co. Ltd., Hanworth Trading Estate, Hampton Road West, Hanworth, Middlesex, England.

Leaflet No. 12 gives information on the Crown-Hardi range of low-speed diaphragm positive-displacement pumps, which are self-priming and will handle a wide range of liquids at a speed of 500-600 r.p.m. They may be run in either direction without output or pressure variations, and may also be run dry without risk of damage. Pulsation is minimized by a damper device which is supplied with the pump. The complete unit can be supplied fully piped and mounted ready for installation with driving power supplied to customers' requirements (electric, diesel or petrol motors). The Company also manufactures other types of pumps, including gear-type pumps and special purpose pumps manufactured to individual requirements.

* * *

"AJAX" FLOW INSTRUMENTS. F. Bamford & Co. Ltd., Ajax Works, Whitehill, Stockport, Cheshire, England.

Brochure A1/B illustrates the various types of "Ajax" flow instruments, including liquid level alarms, flow indicators and switches, indicator panels, and temperature and pressure switches.

Brevities

Silver continuous centrifugals.—Dorr-Oliver Inc. are to market Silver continuous centrifugals under the terms of a recently signed agreement, which gives them exclusive worldwide licence. The machines sold in most parts of the Western Hemisphere will be manufactured by Silver Engineering Works Inc., while Dorr-Oliver or their authorized manufacturing representative will manufacture the centrifugals for use in the rest of the world.

* * *

Refinery intrumentation.—Taylor Instrument Companies (Europe) Ltd. have recently received an order for the complete instrumentation of the Hammersmith refinery of Manbré Sugars. The order includes five panels, instruments, installation and commissioning. The instrumentation will include units from the Taylor "Transcope" range plus a new range of pneumatic and electronic "Quick-Scan" instruments. This sophisticated control system, designed by Manbré and Taylor engineers, is intended to minimize operator calculation and to eliminate delays in operation by regulating and co-ordinating levels, densities, pH, heating and output capacities. It is described as an excellent example of a system in which conventional pneumatic and electronic analogue computing techniques are used to control, with high accuracy, an involved process operation to obtain maximum efficiency from available plant.

* * *

Manbré Group advisory service.—Manbré Technical Services has been expanded into a new national service for the U.K. food industry following consolidation of the Group's national production and delivery facilities. As a major producer of liquid sucrose and glucose and mixtures of these, Manbré will advise manufacturers on the most economical and effective use of these products and will recommend the most suitable plant, advise on erection and supervise initial deliveries from the Group's sugar refineries. Already the Group's engineers have developed fully automatic systems for handling bulk liquid sugars, and these systems have been installed in breweries and in many food and soft drink factories.

* * *

Molasses terminals contract.—Applied Research and Engineering Ltd., the design and project engineering subsidiary of Capper-Neill Ltd., has received a contract from International Molasses Ltd. for the construction of two molasses terminals at Liverpool and Hull. The terminals are designed for unloading molasses from dockside tankers and for bulk storage, blending and mixing before the product is distributed by road or rail. Each terminal will comprise two 2,000,000-gal molasses blending tanks and two mixing tanks each of more than 800,000 gal capacity. International Molasses Ltd., formed earlier this year to import, sell and distribute industrial molasses, plans to erect other terminals in the near future to serve the whole of the U.K. The company is jointly owned by the National Molasses Co., of Pennsylvania, Louis Dreyfus & Co. Ltd., of London, and Sucres et Denrées S.A., of Paris.

* * *

Corrigendum.—On p.190 of the August issue, the brevity on "Funda" filters at the Plaistow Wharf refinery of Tate & Lyle Refineries Ltd. stated that these had been manufactured by Alfa-Laval Co. Ltd. The filters were, however, manufactured by Chemap A.G., of Männedorf, Switzerland, and were *supplied* by Alfa-Laval Co. Ltd.

Cuban Sugar Exports[1]

	1966	1965
	(*metric tons, raw value*)	
Albania	10,490	11,297
Algeria	618	18,291
Bahrein	—	4,780
Belgium/Luxembourg	6,704	—
Bulgaria	158,051	157,692
Canada	69,378	68,614
Ceylon	—	43,443
Chile	—	10,210
China	619,731	398,216
Czechoslovakia	262,098	244,618
Finland	10,789	—
Germany, East	207,192	169,878
Iran	10,336	73,466
Iraq	—	126,313
Israel	—	9,138
Italy	45,399	52,533
Japan	359,961	415,215
Jordan	69	33,940
Korea, North	21,335	21,458
Lebanon	329	10,459
Mali	—	10,546
Morocco	181,327	182,209
Netherlands	18,862	5,487
Norway	22,294	31,005
Poland	52,843	—
Portugal	—	41,520
Spain	145,343	173,771
Sudan	—	31,556
Sweden	44,741	42,399
Switzerland	48,437	18,818
Syria	53,309	62,167
U.S.S.R.	1,814,930	2,456,144
U.A.R.	97,038	126,168
U.K.	61,646	113,237
Vietnam, North	13,077	65,997
Yugoslavia	97,912	85,045
Others	400	—
	4,434,639	5,315,630

* * *

Brazil sugar exports[2]

	1966	1965	1964
	(*metric tons, tel quel*)		
Canada	—	8,627	—
Chile	89,191	88,551	—
Finland	—	—	10,590
France	62,404	31,561	5,250
Hong Kong	—	20,739	—
Iraq	20,000	41,567	—
Italy	—	9,707	10,005
Japan	—	23,185	—
Kenya	—	7,907	—
Korea, South	—	10,482	—
Lebanon	19,815	45,474	—
Morocco	—	6,500	—
Portugal	10,909	10,296	10,513
South Africa	—	31,542	—
Sweden	—	10,704	—
Syria	9,575	10,578	—
Tunisia	58,421	47,464	20,736
U.K.	166,548	54,910	20,805
U.S.A.	495,867	322,934	161,993
Uruguay	67,132	34,761	25,590
Zambia	10,412	—	—
Other countries	—	999	77
TOTAL	1,010,274	818,488	265,559

Brevities

Flood damage in Cuba[3].—According to reports from Cuba, persistent heavy rainfall has led to flooding in the western part of the island. The cane is said to have suffered from the flooding but no estimates of the damage are yet available.

* * *

Rumanian sugar crop, 1966/67[4].—Sugar production from the 1966/67 crop in Rumania amounted to 466,921 metric tons, white value. Output during the 1965/66 and 1964/65 campaigns totalled 384,913 tons and 421,399 tons, respectively.

* * *

Frost damage in Argentina[5].—In Argentina frosts occurred in June and consequently it is expected that sugar production will decrease. Early this year the Government had limited production to 750,000 metric tons in order to reduce excessive stocks.

* * *

Ryukyu Islands sugar production, 1966/67[6].—The 1966/67 campaign in the Ryukyu Islands ended on the 19th May and final figures relating to this crop are given below. The recent decrease in production has been attributed largely to both typhoon and insect damage.

	Cane crushed (*metric tons*)	*Sugar yield* % *cane*	*Sugar production* (*metric tons*)
1966/67	1,660,505	11·74	194,879
1965/66	1,733,763	11·86	210,454
1964/65	2,435,218	11·26	274,103
1963/64	1,173,441	10·90	128,365
1962/63	1,433,720	10·50	150,494

* * *

Portuguese East Africa sugar refinery[7].—Establishment of a sugar refinery at Marromeu has been authorized by the Government and sanction has been given for the installation of a factory for the manufacture of sweets and by-products.

* * *

Colombian sugar exports, 1966[8].—Exports of sugar in 1966 from Colombia totalled 113,930 metric tons, tel quel, of which the bulk (94,727 tons) went to the U.S. and the remainder (19,203 tons) to the U.K.

* * *

Sena Sugar Estates Ltd., 1966 results.—Sugar production at the Sena sugar factories in Portuguese East Africa in 1966 totalled 107,303 tons, as compared with 113,868 tons in 1965 and 96,794 tons in 1964.

* * *

A. & W. Smith & Co. Ltd.—Mirrlees Watson Co. Ltd. move. A. & W. Smith & Co. Ltd. and The Mirrlees Watson Co. Ltd., the two sugar machinery manufacturing companies associated with the Tate & Lyle Group, have moved from their former offices in London to a new Head Office at Cosmos House, 1 Bromley Common, Bromley, Kent. Mr. BASIL SWAIN has been appointed a Director of both Companies and will succeed Mr. P. A. LONGLEY when he retires in the near future, becoming responsible for the sales activities of the two Companies. He will have the assistance of Mr. IAN CARMICHAEL as Sales Manager of The Mirrlees Watson Co. Ltd.

---

[1] *I.S.C. Stat. Bull.*, 1967, **26**, (6), 33.
[2] *Lamborn*, 1967, **45**, 103.
[3] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (17), 11.
[4] C. Czarnikow Ltd., *Sugar Review*, 1967, (820), 119.
[5] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (17), 14.
[6] C. Czarnikow Ltd., *Sugar Review*, 1967, (820), 118.
[7] *Overseas Review* (Barclays D.C.O.), July 1967, p. 28.
[8] C. Czarnikow Ltd., *Sugar Review*, 1967, (822), 128.

Brevities

Record crop prospects in Guyana[1].—A record crop of 345,000 tons is expected in Guyana this year, as against 288,869 tons produced in 1966. The spring crop produced 118,287 tons, the highest figure attained since 1961, compared with 105,681 tons in 1966. If conditions remain favourable, production over the whole year should exceed the 1960 record figure of 334,441 tons.

* * *

Chad sugar industry[2].—In Chad, a sugar refinery with a production capacity of 10,000 tons of sugar loaves, is in operation at Fort Lamy. Its capacity is to be increased to 14,000 tons by 1970. A new sugar factory with an initial capacity of 15,000 tons (later to be increased to 30,000 tons) is to be built at Banda, near Fort Archambault.

* * *

U.S. beet sugar crop reduction forecast[3].—Based on the condition of the sugar beet crop on 1st July, the Crop Reporting Board of the U.S. Department of Agriculture indicates that the output of sugar beets this year is expected to be 8·9% less than last year. The acreage planted is reported to be 3% less than in 1966, viz. 1,205,000 acres compared with 1,240,000 acres, and it is expected that 1,153,000 acres will be harvested, about 1% less than in 1966. The Board places the expected beet tonnage for 1967 at 18,569,000 short tons as against 20,383,000 tons in 1966.

* * *

New Czechoslovakian sugar factory[4].—Construction has started on a new sugar factory at Hrochova Tynec in Czechoslovakia which will be the most modern in the country, and will replace 4 or 5 old factories in East Bohemia. It will have a capacity of 4000 metric tons of beet per day and should come into operation in 1969. Machinery is to be supplied by a Polish organization "Energoexport".

* * *

Australian cane harvester and loader for Venezuela[5].—Master-Built Pty. Ltd., of Bundaberg, Queensland, has won a contract to manufacture a sugar cane harvester and a cane loader for Venezuela. The two machines are worth a total of Aus.$30,000 (£12,000).

* * *

Ghana sugar exporting plans[6].—According to an announcement by a spokesman of the Ghana Sugar Products Corporation, Ghana is to become an exporter of sugar. It is planned to construct a further three factories. The two existing factories in Komenda and Asutsuare (East Ghana) have an annual capacity of 54,000 tons. Japanese experts are presently carrying out a test programme for the cultivation of sugar cane near Aveme. In this region large areas which are suitable for cultivation of sugar cane are available.

* * *

North Vietnam sugar factory[7].—A sugar factory, supplied by Poland, has been built and put into operation at Van Dien in the vicinity of Hanoi. The capacity of the factory is 1000 tons per day.

* * *

Record British Honduras sugar production[8].—The Sugar Board of British Honduras has announced that a record 58,320 tons of sugar were manufactured by the two factories of Belize Sugar Industries Ltd. this season. In addition, 3,267,785 gallons of molasses were produced, most of which is being exported. It has already been announced that next year's production target will be 75,000 tons of sugar.

Canadian Sugar Imports

	1966	1965	1964
	(*long tons, tel quel*)		
Raw Sugar			
Australia	103,743	131,682	115,460
Barbados	10,975	18,176	9,952
Brazil	2,700	5,800	—
British Honduras	7,370	5,000	1,673
Colombia	—	5 203	—
Cuba	64,338	64,541	250
Dominican Republic	5,000	6,007	18,809
Fiji	41,506	72,691	42,922
French West Indies	—	3,4 4	—
Guyana	101,132	90,239	112,656
Haiti	—	—	6,744
India	50,213	51,980	—
Jamaica	96,735	79,364	91,130
Leeward Islands	7,332	2,832	4,980
Mauritius	84,881	93,346	123,987
Mexico	9,109	—	4,543
Rhodesia	14,685	28,630	20,965
South Africa	130,115	108,781	85,370
Trinidad	29,666	49,796	42,656
Others	—	54	9
	759,500	817,876	682,106
Refined sugar			
Panama	—	—	759
U.K.	1,524	1,080	1,249
U.S.A.	7,747	5,540	7,005
Venezuela	—	—	2,376
Others	107	375	746
	9,378	6,995	12,135

* * *

Thailand sugar exports[10]

	1966*	1965†	1964†	1963†
	(*metric tons, tel quel*)			
Ceylon	—	10,255	10,000	—
Hong Kong	305	3,625	8,312	5,922
Japan	972	3,082	2,962	35,051
Korea, South	1,495	6,450	—	—
Malaysia	480	11,472	1,587	4,862
Singapore	99	12,560	5,090	6,288
South Africa	—	15,100	—	—
U.K.	1	2	10,240	—
U.S.A.	18,008	—	—	—
Vietnam, South	30,012	20,320	10,165	—
Others	8	738	2	206
TOTALS	51,380	83,604	48,358	52,329

* Source: Thailand authorities.
† Source: International Sugar Council.

Barbados sugar production, 1967[11].—Harvesting of the 1967 crop has been completed and total sugar production is estimated at 202,610 long tons, including fancy molasses. This compares with 171,910 tons in 1966 and 195,973 tons in 1965.

[1] *Reuters Sugar Rpt.*, 31st May 1967.
[2] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (19), 2.
[3] *Lamborn*, 1967, **45**, 111.
[4] *Zeitsch. Zuckerind.*, 1967, **92**, 380.
[5] *Australian News*, 20th July 1967.
[6] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (19), 16.
[7] *Zeitsch. Zuckerind.*, 1967, **92**, 380.
[8] *Public Ledger*, 29th July 1967.
[9] C. Czarnikow Ltd., *Sugar Review*, 1967, (814), 95.
[10] C. Czarnikow Ltd., *Sugar Review*, 1967, (819), 115.
[11] F. O. Licht, *International Sugar Rpt.*, 1967, **99**, (21), 13, 14.