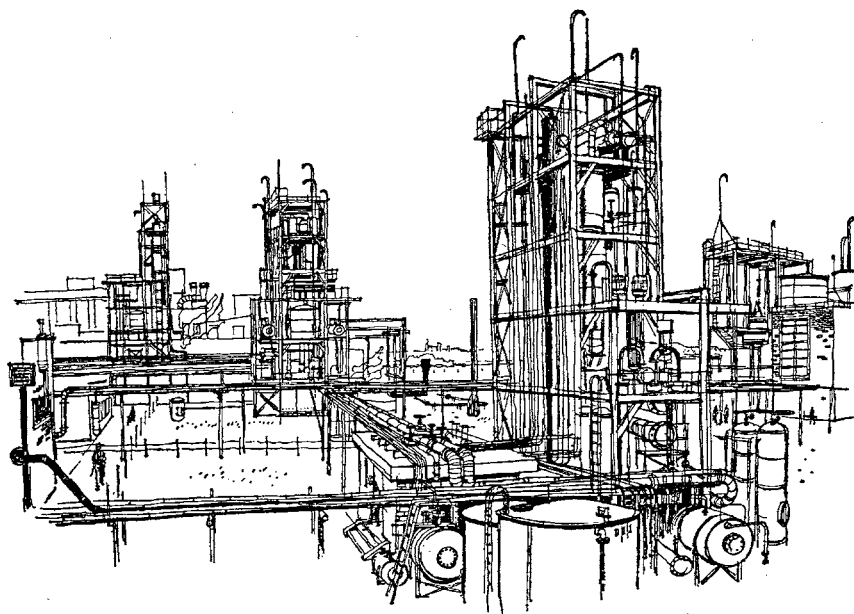




CHAPTER II

Widening the Field

CLIVE TURNBULL

The survey of C.S.R. activities in the production and marketing of sugar is now complete. But there is a major group of activities yet to be described in the chemical and building materials industries. These are relatively new fields of production for the company and their relation to the sugar industry is not obvious.

They have grown to an extent and with a speed which are striking and of significance for the future. This chapter examines the motives which guided the expansion into these wider fields, the organic connection of these developments with the sugar interests, the problems encountered (some of which still have to be overcome), and the magnitude of the achievements.

Mr Clive Turnbull was invited to report on these newer ventures. He is a well-known, independent writer from Melbourne, one of whose interests has been to study and describe the growth and operation of Australian industries.

September 1955

SUGAR today is not only a foodstuff. Sugar is the basis of a group of industries as yet so new that by most people their extent, in some cases even their existence, is scarcely realized. Thus it would surprise the average Australian at breakfast to realize that the company which provided the sugar that he has just put into his tea also produces enough building material to cover the inside and outside of a quarter of the 80,000 houses which Australia builds each year. He would be surprised, too, to realize that the same company provided part of the raw material of the aspirin in his medicine cupboard and of the paint (as he would call it) on his refrigerator. "What have these things to do with sugar?" he might ask, "Have building materials and chemicals any connection with the cane fields of Queensland and northern New South Wales?" The answer is "Yes. These are logical developments."

Businesses, if they are successful and efficient, follow a consistent pattern of development, aimed at the profitable use of the whole of the basic raw material. There are many instances, the simplest summed up in the old joke that the Chicago meatworks use all of the pig but the squeal.

It is apparent that a big business seeking ways of expansion will be interested in certain kinds of development adapted to its character and capacity. Thus it will not generally be interested in small-scale batch production suited to small enterprises but it will be interested in mass production by continuous processes. Such processes usually demand large capital expenditure and a high degree of "know-how", and therefore their development has generally to await the interest and attention of large companies. Because these ventures are costly, because they take a long time to start and an even longer time to become profitable, it is obvious that they must be of the kind which can take a natural place in an expanding national economy, neither too soon nor too late. When the time, the place and the raw material are perfectly matched is the moment to move. Traditionally, expansion of C.S.R. interests has been with solid, basic lines of permanent value to the community. Opportunistic or short-lived products and luxury lines have been avoided.

A look at the situation in the twenties and thirties shows how these forces acted in Australia. Megass, the fibre which remains after the sugar cane has been crushed, is used in firing the boilers of the sugar mills but sometimes its production outruns need. In mills in northern New South Wales there is normally a surplus of megass towards the end of the crushing season; but even when there is not a great surplus the megass is worth only the cost of enough coal to replace it. When both coal and transport were inexpensive megass from northern

New South Wales was available at low cost. A second by-product, molasses, had been used since last century as the raw material of industrial and potable alcohols in the company's distilleries.

In the late twenties and early thirties all these matters had long consideration. Large-scale expansion of sugar production, as such, in Australia or Fiji was not feasible because markets were then saturated. The company had even explored the possibility of entering the industry in other countries, such as India, but for various reasons it decided not to do so. Expansion by a diversification of interests through improved use of the by-products, megass and molasses, appeared to be the logical procedure. How these aims were eventually realized it is the purpose of this chapter to describe.

There is no theoretical difficulty in making use of megass as a raw material. Vegetable fibres have been used for centuries in making paper and, in more recent times, cardboard. Although it was apparent that it was possible to use megass for a variety of purposes, the immediate question which faced the company in the twenties was whether it was the basis of any product which would command a long-term market, justifying the high initial expenditure.

Developments in the United States pointed the way. Builders were demanding a wallboard of light weight at least 6 ft. to 8 ft. long and 3 ft. to 4 ft. wide. Such a board would facilitate building and meet the demand for more homes, factories and offices, a demand which increased with the lifting of the depression. Boards of this size could not be obtained from sawn timber but overseas manufacturers were making them in factories from fibres of softwoods by a process akin to that used in the manufacture of paper and cardboard. Australia lacks softwoods and twenty-five years ago no one had succeeded in using the short-fibred Australian eucalypts commercially for any such purpose. The company's officers, however, had noted that some overseas manufacturers were using sugar cane fibres to make their wall boards. Here, then, was a potential use for the Australian market; it remained to be determined whether it was also economically practicable.

A survey of the Australian market demand for wallboards (which had been imported from the United States in small quantities from 1930 onwards) showed that from 10,000 to 15,000 tons of cane fibre would be needed yearly as raw material if the industry attained the per capita consumption of the United States. The fibre was available and it was decided to proceed with the project. After further study of overseas development the company erected a small pilot plant at Macknade Mill in Queensland in 1936. This plant pulped megass

and made wallboard by a batch process which gave sufficient information for the company's technicians later to design a continuous process for a factory. The pilot plant operated for a couple of years on a semi-commercial scale. Both insulation board, similar to present-day "Cane-ite", and hardboard, similar to "Timbrock", were manufactured in 7 ft. by 4 ft. sheets and sold to the building trade in Queensland and New South Wales. At the same time intensive investigation took place in the central research and design departments in Sydney.

In 1937, having acquired a good background of laboratory research, practical operation of a pilot plant, and understanding of market requirements, C.S.R. sent two officers of the company to study the large-scale manufacture of wallboard in the United States, in England and on the continent of Europe. Information from all these sources was pooled and studied. Upon this basis a large factory was designed and erected at Pyrmont on the Sydney harbour-front, adjacent to the company's refinery, distillery and central workshops. The plant for this factory, with the exception of some very specialized equipment, was made in Australia. In 1939 it began production of the low-density wallboard known as "Cane-ite" at the rate of 10,000,000 square feet per annum. Today it can produce 40,000,000 square feet per annum.

All contingencies had been provided for—except the inevitable hazards of economic change. In the years since 1939 the Australian cost structure has altered radically. Coal is now four times its price in 1939. Transport costs between Sydney and the northern New South Wales sugar mills have risen even more steeply. Megass is therefore in great demand as mill fuel and consequently is no longer as attractive as it was as a raw material for building boards. Because of this much research has been done to find other raw materials and today, to keep costs to a minimum, "Cane-ite" is made from a mixture of megass, special grades of waste paper, and pulp made from inferior types of Australian eucalypt trees which have no other economic use. Because of these technical developments and despite the heavy increased cost of the raw material—megass—on which the industry was based, "Cane-ite" today, at double its price in 1939, has retained a favourable position in the building industry's cost structure. Plaster, asbestos cement, fibrous plaster and Portland cement are more than two and a half to three times their 1939 price; bricks and plywood are three to four times their 1939 price.

In all about £585,000 has been spent on the "Cane-ite" project and the venture has been successful. It has been successful because it was a logical development; the company had the "know-how"



C.S.R. BUILDING MATERIALS MADE IN AUSTRALIA.

"CANE-ITE" Wallboard.

Made largely from megass, which is the fibre left over when the juice has been crushed from sugar cane.

Used as an insulating interior wallboard. Sold in standard-size, white-ant proofed sheets, with a variety of finishes.

"TIMBROCK" Hardboard.

Made from Australian scrub eucalypts and other local hardwoods not normally suitable for the building trade.

Used for interior walls and fittings. It is flexible, grainless and splinterless, and is supplied in a variety of lengths of 4' 6" width.

"GYPROCK" Wallboard.

Made from a core of aerated gypsum plaster sandwiched between layers of special tough-fibred chipboard.

Used for interior walls and ceilings where its strength, smooth surface and ability to make a completely flush joint are an advantage.

"FIBROCK" Building Products.

Made from white and blue asbestos, the latter mined by Australian Blue Asbestos Ltd. in the Hamersley Ranges of Western Australia.

Used for corrugated roofing, guttering and down-pipes, flat exterior wall sheets, exterior wall sidings and accessories.

"CANE-ITE" ACOUSTI-TILES.

Made in 12-inch squares from "CANE-ITE". Each tile has 484 small holes in its surface to absorb sound.

Used on the walls and ceilings of offices, shops, factories and telephone booths to reduce noise. The tiles are easy to fit and attractive in appearance.

C.S.R. FLOOR TILES.

Made in 17 colours to allow an almost unlimited variety of combinations. A flexible floor tile *Vinylflex* made from vinyl plastic has recently been introduced in Australia.

Used where a fresh modern effect is required, or where traffic is especially heavy in shops, theatres, factories and offices.

C.S.R. BUILDING PLASTERS.

Made in N.S.W. by Concord Plaster Mills and in Victoria by Brunswick Plaster Mills from locally-mined gypsum.

Used for the making of fibrous plaster sheeting by many small manufacturing organizations. Also used by plasterers for special effects.

and the capital to carry it through; a market potentially existed and has been successfully established.

This was the beginning and thus the company entered the building materials business, perhaps the most highly competitive in Australia. When the "Cane-ite" factory was erected it had been decided to manufacture only insulation board and not to proceed further with the manufacture of the hardboard developed at Macknade because the Masonite Corporation of America was sponsoring the erection of a hardboard factory at Raymond Terrace, near Newcastle. C.S.R. undertook the sale and distribution of Australian Masonite and this arrangement continued for five years.

With a sales organization set up to sell "Cane-ite" and hardboard throughout Australia it was natural that the company should seek other types of basic building materials to make and sell. An Australia-wide sales organization is expensive and the more products that can be sold by the same sales force the cheaper the selling overhead becomes per unit. The more lines of the same type handled by the same sales organization the better pleased is the prospective customer who can perhaps order from one source much of the material he requires.

It was realized that the building trade, despite its basic nature, is liable to severe fluctuations in demand for various products. To guard against this American manufacturers commonly follow a policy of producing a number of complementary materials—internal and external linings, roofing materials and floor covering, for example—and the company kept this aspect firmly in mind. The wisdom of such a policy has become apparent in recent years when, despite a drop in demand for one or other of the Building Materials Division's products, the total sales volume has steadily increased, as shown in the accompanying graph of sales volume.

Among other materials investigated were a fireproof asbestos cement board and a plaster wallboard of the type very popular in the United States and known there as gypsum wallboard. The gypsum wallboard (now marketed as "Gyprock") had its immediate origins in the needs and shortages of World War II. Despite the priorities they enjoyed the Army and the Allied Works Council both suffered by reason of the acute shortage of building boards of all kinds. American army authorities, accustomed to the use of gypsum wallboard, proposed to Commonwealth officials that it be manufactured here. Officers of the company who had been overseas had observed that in the United States this board had superseded others and that it was the cheapest wallboard there obtainable. When the American suggestions were

supported by the Allied Works Council the company decided upon the construction of a plant at Concord, a suburb of Sydney.

The company had, in fact, decided some years earlier that when the time was ripe it would manufacture gypsum board in Australia and as a beginning had concentrated on obtaining the raw material, gypsum, needed to manufacture plaster. Leases were taken up throughout New South Wales. A plaster mill was erected in 1941 and the gypsum was processed for the manufacture of plaster of Paris for sale to the building trade and for other special purposes; thus plaster was already being manufactured and marketed while the wallboard factory was being designed and erected. Although plant and equipment for a gypsum wallboard factory could normally have been obtained from the United States it was Commonwealth policy during the war to import as little plant as possible. The company therefore designed and built the whole of the necessary equipment itself.

By making "Gyprock" the company has helped to develop Australian raw materials—gypsum for the inside of the board, wood pulp for the paper surfaces. To date, however, "Gyprock" has not been in such keen demand as have some other building boards—a contrast to experience overseas where similar gypsum wallboards are the most popular of all, partly because of their strength, rigidity and flame-proof qualities and particularly because of their low cost. The cost in Australia will decrease with the increased production which will follow demand as the building trade becomes more accustomed to the use of the product. Meantime the plaster side of the business has been successful and sales have steadily increased. A successful plaster business has also been built up in Victoria.

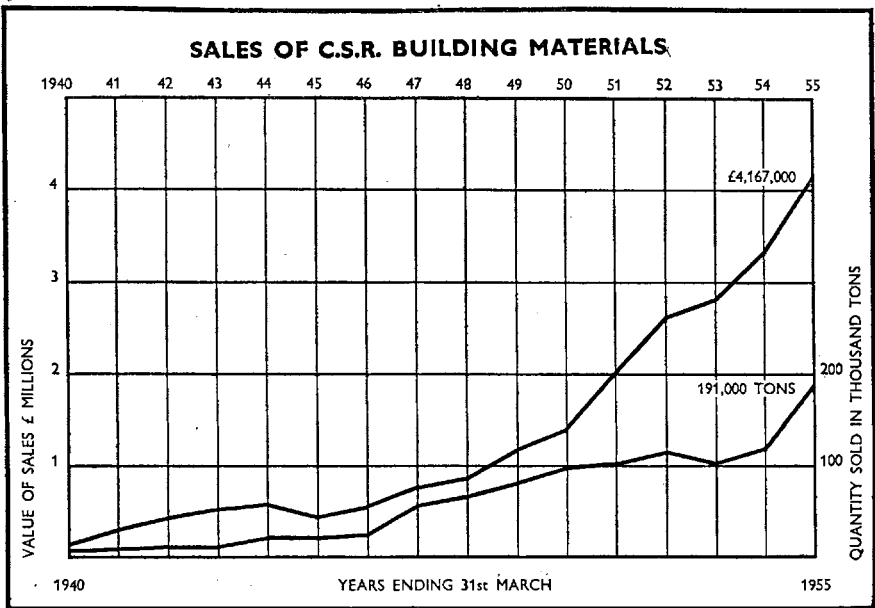
About the time that the company began to take an active interest in gypsum wallboard it also became interested in other types of fire-proof board and so turned its attention to asbestos cement products. On this occasion a small asbestos cement plant was bought as a going concern and developed by the company's engineers.

The heart of the manufacturing problem in this case is the supply of asbestos, for the other materials are readily available in Australia. When the company first became interested in the project Australia imported all her requirements of asbestos, 15,000 tons per annum, from Canada and South Africa. Concerned that such an essential raw material had to be imported, the company set out to see whether a suitable fibre could be obtained locally. In making asbestos cement, the asbestos fibre is mixed with Portland cement and water and later the water must be drained and pressed from the mixture. The fibre used must, therefore, drain easily. Three main kinds of asbestos are

SOUTH PACIFIC ENTERPRISE

used in Australia: blue crocidolite asbestos, which is long-fibred, drains readily in the manufacturing process, and is very strong; white asbestos, which is short-fibred, drains poorly and is slightly weaker; and amosite asbestos, which is short-fibred, drains well but is weak and is the cheapest of all asbestos fibres.

The company's inquiries led first to Tasmania and there it took leases of asbestos deposits. In these leases it mined a short-fibred white asbestos. But production ceased after the war as the deposits were not extensive—indeed, there are no known large deposits of white asbestos in Australia (though there are a considerable number of quite small deposits) and there are no known amosite deposits at all. There remains blue asbestos or crocidolite which occurs in the Hamersley Ranges in Western Australia and, in particular, at Wittenoom Gorge, 700 miles north-east of Perth and 100 miles south-west of Marble Bar, a place legendary in Australia for its extreme heat and its isolation from the rest of the continent. It was to this forbidding area, with mere tracks leading to it, that the company turned. The



Sales of the company's building materials have steadily risen since the company entered this field. The increase in value of sales has been substantially influenced by monetary inflation. But total sales expressed in tons (arrived at by adding together tonnages of the several kinds of building materials) show a steady overall increase in physical quantity of products sold.

development of the area is one of the romantic stories of industrial enterprise and, incidentally, a very considerable contribution to national wealth in strategic minerals.

The story of Wittenoom asbestos deposits begins with early prospectors, the lone and hardy pioneers of many mineral fields, picking at outcrops of asbestos. The method of occurrence itself is odd. The asbestos occurs in horizontal veins averaging half an inch in width, though sometimes measuring as much as two inches. Several of these veins occur over a total seam height of two feet. The economic mining of such a narrow horizontal seam in extremely hard rock was a new problem for Australia.

Here, then, was the first problem to be solved. Company officers in a world-wide search for a suitable mining technique visited iron mines in Alabama, silver-lead mines in Canada, asbestos mines in Rhodesia and diamond mines in South Africa. They adapted to Wittenoom conditions the various techniques examined. The company brought mining consultants from America. It brought Canadian and American shift bosses on a short-term basis to instruct the miners in the details of the methods to be used. The company could not get sufficient Australian miners to go to this isolated spot and, when the war was over, miners were brought from Italy, Holland, Austria and other countries to make up the numbers needed.

In the beginning there was no town. Transport and communication facilities were poor. Much of the early equipment had to be flown from Perth, 700 miles away. Even today transport is not easy. Stores normally come from Perth by sea to Point Samson, the port of Roebourne. Thence trucks take the stores 200 miles south-east to Wittenoom. Dry weather roads connect to Roebourne, Port Hedland, 150 miles north, Marble Bar, 100 miles north-east and Meekatharra, a railhead 300 miles south. There is an airmail to Perth three times a week and urgent messages may be radioed to Port Hedland for relay by telegraph to Perth.

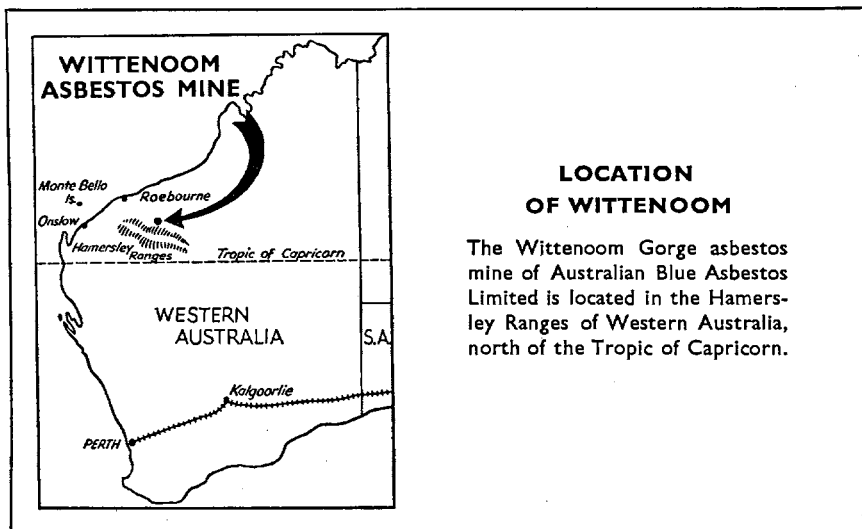
The original settlement was in a narrow gorge near the mine and the mill. Later it was replaced by a second settlement, seven miles away on the tableland outside the mouth of the gorge. Today this is the town of Wittenoom, largest inland town in the north-west and completely dependent on the blue asbestos industry. Largely built by the Commonwealth and Western Australian Governments, which recognized the importance of the industry and sponsored its early development, its present population is about 750, of whom about 200 are children. The people of Wittenoom have all the facilities of civilization—electric light, running water and septic installations for their homes, a large

general store, a cinema, cafe, hotel and school. There are tennis courts equipped for night tennis, a recreation room, a racecourse and sports ground, a modern hospital, a bus service to the mine and a regular air service to Perth. Such is life in the outback today when large national development makes necessary the provision of such naturally expensive amenities.

The Wittenoom ore is processed in a mill near the mine and blue asbestos is separated by blowing processes. The product is a strong, free-filtering fibre used by asbestos cement manufacturers to mix with white asbestos fibre. Certain industries use it for its chemical resistance. Thus the battery case in a car may be made from short blue asbestos fibres held together with plastic resin.

The operating company, Australian Blue Asbestos Limited, in which C.S.R. has a 97 per cent shareholding, is increasing the output of the mine and developing a market in competition with such countries as South Africa, which produces 30,000 tons of blue asbestos per annum largely with coloured labour, and Canada, which produces 1,000,000 tons of white asbestos. With steady progress at Wittenoom the cost per ton of the Australian fibre has been halved and additional increase in production will reduce the cost still further. The present aim is an output of 8,000 tons per annum but the deposits are of such extent that, once the industry is firmly established, output could be increased to 30,000 tons per annum or more if necessary.

The situation is not without difficulty, however. The use of Australian



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blue fibre has not yet been accepted by the older-established asbestos cement manufacturers in Australia and the industry has had to depend largely on sales to overseas markets developed during the visits of company officers abroad. The local blue fibre is at present dearer than the particular grades of imported fibre used in Australia and the asbestos cement industry generally does not consider that it should use the Wittenoom product at higher cost although, with the increased production made possible by such use, the price could be reduced to that of comparable imported fibre. After all other means of encouraging local use of Australian blue fibre had been tried, application was made to the Tariff Board in June 1954 for protection by a duty on imported fibre. The company proposed that as long as consumers in Australia used local blue fibre to the extent of 15 per cent of their total usage of asbestos no duty be applied on any asbestos fibre imported, but that, failing this, a protective duty of 40 per cent should be applied. As Australia now obtains from abroad slightly more than 30,000 tons of fibre per annum this proposal would mean that Australia would use about 4,000 tons of blue fibre per annum. It is estimated that the protection requested would increase the cost of asbestos cement products by about 3 per cent only.

The Tariff Board Report tabled in Parliament in September 1955 recommended, however, that no assistance be granted to the industry as it considered the extra cost to Australian industry unjustified and considered protection by the method suggested to be "coercive". It appeared that the Tariff Board made its recommendation without taking account of such matters as the development of a remote area of Australia, the strategic and defence value of the industry, and the benefit to the overseas trade balance given by export of blue fibre and by the saving in imports if local blue asbestos fibre is used in Australia. During the calendar year 1955 sales of blue asbestos fibre to Europe and the United States will amount to 8,000 tons and the credit to the overseas trade balance will be £800,000, almost half of this being in dollar currency.

Irrespective of dollar-earning and contributions to the national stocks of raw materials, all industry, of whatever size, in Australia's north is strategically important. Thus the portion of Western Australia north of the 26th parallel, usually referred to as the North-West, has an area of 527,000 square miles and a total white population of only 8,400. Of this total 2,700 are in the coastal town of Carnarvon on the 25th parallel, leaving only 5,700 in the main north-west area. Wittenoom has become the largest inland town in this area with a population of 750. The asbestos fibre industry has also re-established

the important but lately moribund centre of Roebourne with its port at Point Samson. Shipping services and air services have derived increased revenue. Asbestos production—even at its present stage of development—is directly responsible for 900 additional residents, an increase of about 17 per cent in the population of the main north-west area. Though the figures are small in themselves, these are significant contributions towards solving a national problem. Perhaps it is appropriate that the sugar industry, on which the integrity of north-eastern Australia depends, should have done its share towards the development of the north-west area. By the decision of the Tariff Board, however, continuation of this industry in the North-West will be dependent on finding adequate export markets for the blue fibre produced, while Australia continues to import fibre from abroad to a total value of £3 million per annum.

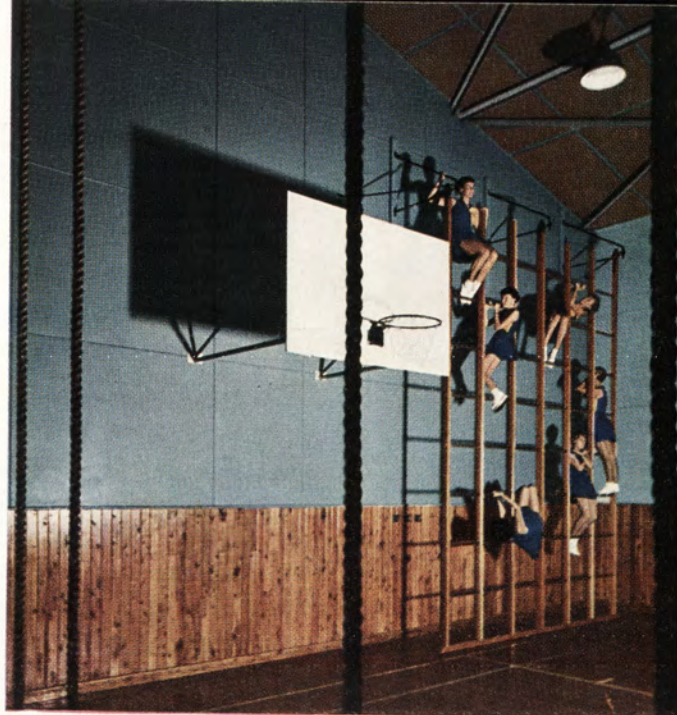
The company's own present use of asbestos is in a wide range of asbestos cement products ("Fibro" sheeting, sidings and roofing) and in various types of floor tiles including "Vinylflex", a vinyl floor covering previously almost unknown in Australia though popular in the United States and England for a number of years. These tiles, manufactured at Concord, Sydney, are used in shops, offices, factories, hallways, vestibules, theatre entrances, restaurants and homes. In developing their manufacture, C.S.R. leaned heavily for "know-how" on one of the largest manufacturers of building materials in the United States, the Johns-Manville Corporation, with which the company has long had friendly associations.

While the asbestos mining venture makes a colourful story and has interesting and important national implications, it forms only a small part of the company's overall operations in the building materials field. The hardboard manufacturing venture, for instance, has grown to be a big business in itself and has proved an outstanding commercial success. The product, "Timbrock", is a strong high-density hardboard, the natural accompaniment of "Cane-ite", a light low-density board.

As "Cane-ite" is made largely from megass, so "Timbrock" is made from low-grade eucalypt timber, useless for other purposes. Peculiarly suited to the needs and to the resources of the building industry, hardboard has already achieved in Australia a per capita consumption three times that in the United States. It is in itself a lesson in the results of mass production. When hardboard was introduced to the Australian market after the depression plywood was cheap and hardboard comparatively dear. But with the mass production of hardboard in the war years its price fell, in contrast to the rising prices of the vast majority of products, including its old rival, plywood.

Uses of some C.S.R. Building Materials

Timbrock upper walls and a *Cane-ite* ceiling in the gymnasium of the Burwood Domestic Science School, Sydney.

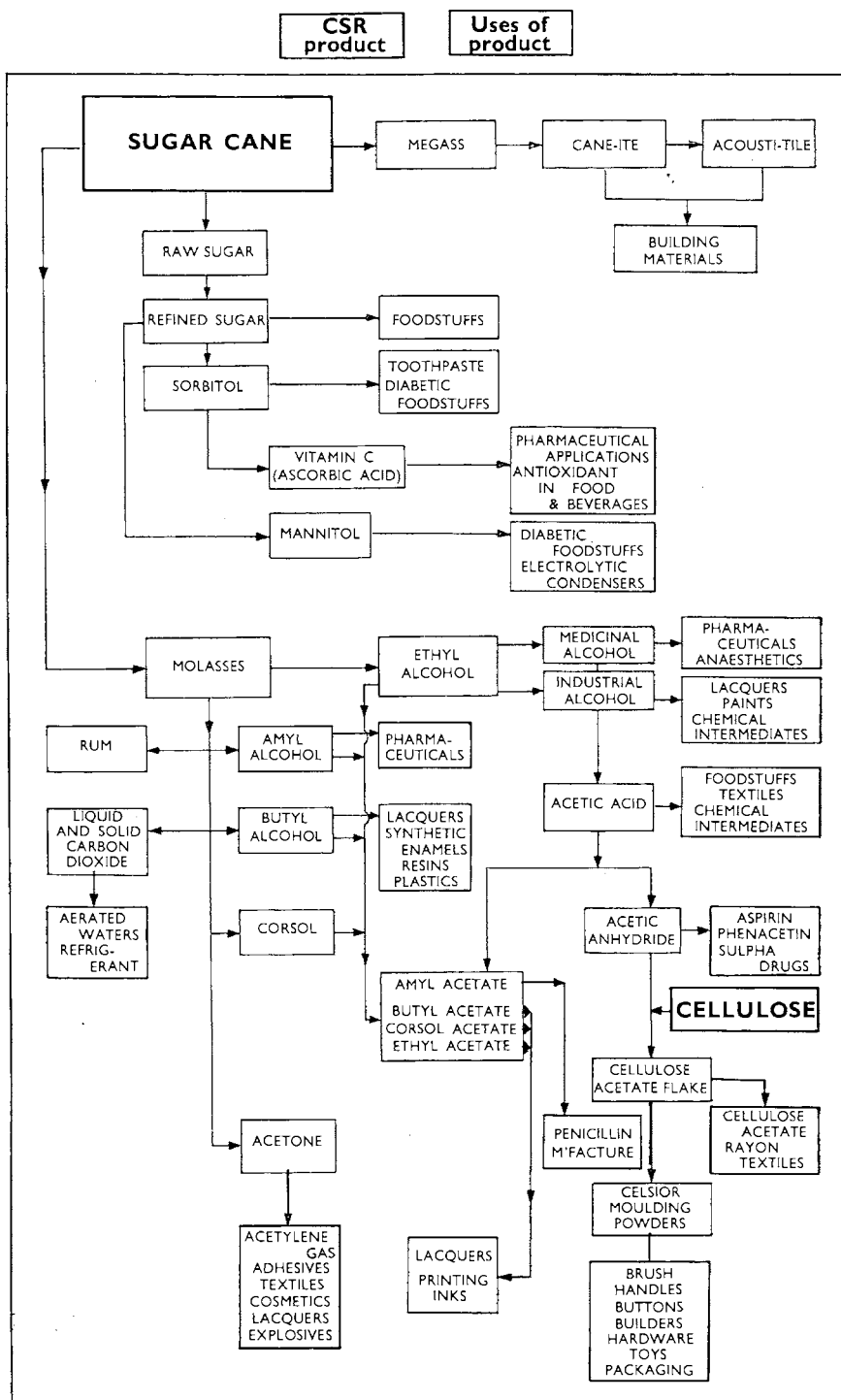


A wall of *Gyprock*, painted blue, and a *Cane-ite* Acousti-tile ceiling in a Sydney suburban home.

The foyer of the Australian Mutual Provident Society's building at North Sydney is paved with *Vinylflex* tiles.



C.S.R. PRODUCTS DERIVED FROM SUGAR CANE AND THEIR USES



WIDENING THE FIELD

The story of the manufacture of hardboard by the company goes back to the twenties for its making always appeared to be a natural accompaniment to the manufacture of an insulating board and hardboard was made in the pilot plant at Macknade Mill. For several reasons, however, including the company's term as a distributor of the hardboard made by the Masonite Corporation, manufacture did not proceed until the end of the World War II when the company, now with a wide experience in the making of building boards, was able to design most of the plant itself. Some of the machinery was bought from Sweden but the rest, notably the presses, was designed and built in Australia. Production on a factory scale began in 1947.

With hardboard manufacture it may be said that a further success has been attained in the long struggle to make full use of the native timber resources of Australia. The eucalypt hardwoods, for many years used only as fuel or as a building material in their natural state, were thought by some experts to defy the uses to which softwoods in other countries can be put. Trees elsewhere are the raw material of wrapping paper, cardboard, writing paper, newsprint and building board, all made by separating and reconstituting the natural fibres. Today, following research and development by the paper-making companies and the manufacturers of hardboard, all these are made in Australia with Australian woods, a triumph for Australian research and technology. Less than a generation ago all that could be done with trees in Australia was to saw them up or burn them. Today an enormous range of manufactured products stems from the forest.

Such is the story of the building materials division of the company today. All this has come about in a comparatively short time. It is not to be expected that development will stop at this stage, although about £4 million has already been invested in the division. New vistas continually open.

* * *

A company which produces a perishable product in outlying areas is deeply concerned with the problems of transport. If facilities are not already provided by other organizations it must take steps to move its raw materials and its intermediate and finished products. It must also supply its outposts with all those things necessary to establish and maintain them. The extent of direct operations of C.S.R., covering eastern Australia, New Zealand and Fiji, has made shipping a necessary and important part of its activity.

The story of the company's ships goes back to 1873 when the little collier *Keera*, of 158 tons, was bought for £6,500 and employed between

Sydney and the company's mills on the north coast of New South Wales. She was followed in due course by other small vessels, *Fiona* (lost near the Seal Rocks in 1882), *Terranova*, a paddle steamer (afterwards used as a cable-laying vessel in New Zealand), and *Fiona II*. With *Fiona III*, built at Middlesbrough in 1908, a new and significant stage was begun for, compared with her predecessors, she was a large vessel of 4,471 tons gross register with a deadweight capacity of 7,300 tons. Especially adapted to the company's work, she was fitted with tanks to carry about 1,400 tons of molasses.

Though, initially, the company bought ships to serve its mills without recourse to other companies' vessels—and the serving of the Queensland and Fiji mills remains a most important part of their work—the growing importance of molasses as a by-product exercised a large influence upon the design of later ships. In 1916 *Rona* was laid down—6,205 tons gross with a deadweight capacity of 9,300 tons; her molasses-carrying capacity is 5,600 tons. In 1933, after disposing of *Fiona III*, the company built *Fiona IV* (3,484 tons); in 1938 *Tambua* was added to the fleet and for a time a fourth vessel, *Moa Moa*, was in use. In addition to a large number of lighters, small tugs and launches engaged in hauling the sugar cane from the farms to the mills in New South Wales and Fiji and in the transshipment of sugar to oceangoing vessels in Fiji waters, the company also operated two small vessels, *Marama* and *Rani*, in the Fiji inter-island trade.

Tonnages of molasses carried by the company's vessels increased from 31,240 in 1945 to 71,021 in 1954. Molasses has become the basis of one of the company's most significant new ventures. It has long been one of the important raw materials used in the production of alcohol, both industrial alcohol and potable spirit (rum). Overseas mills began fermentation of molasses for the production of spirit about three hundred years ago, thus putting a previously discarded by-product of the sugar industry to profitable use. In this way the great industries of Jamaica and the general Caribbean area became established.

The founders of C.S.R. naturally did not neglect the possibilities of molasses and in 1873 set up a distillery at Harwood Mill on the Clarence River in New South Wales. This plant, producing both industrial spirit and rum, operated until 1896 when it was closed down. Several years previously the company had started another distillery at Nausori in Fiji. In 1901, however, when the possibility arose that under Federation spirit produced in Fiji would be excluded from Australia, the Nausori distillery was closed, and arrangements were made for the erection of a large plant in Sydney; thus began the

Pymont distillery, now the largest in Australia. In 1940 another distillery was set up at Yarraville, Melbourne, to meet the needs of the southern market.

These plants are part of the logical integration of the sugar industry. They use molasses as their raw material and convert it to alcohol by fermentation with yeast. They are established alongside the company's refineries because, first, it is economic to obtain the steam and electric power required in distilling and processing from the plant already installed for refinery use; secondly, they are able to share the deep water berths established for the refineries; and, thirdly, these locations are convenient to the market. Establishment of the Yarraville distillery at the beginning of the war was particularly opportune, for absolute alcohol (spirit from which all water has been eliminated) is a very useful additive to petrol. The acute shortage of motor spirit from 1940 onwards brought a request from the Commonwealth Government for the maximum output of absolute alcohol and both distilleries operated seven days a week, day and night, from December 1940 to October 1943. So necessary was this extra fuel that raw sugar was used to supplement molasses as a raw material.

Alcohol, then, for a number of years was an end-product so far as C.S.R. was concerned. But alcohol is, itself, one of the bases of the organic chemicals industry. In one of the major decisions of its history the company decided to enlarge the horizons still further by becoming a large-scale manufacturer of organic chemicals.

Today the company is "in" chemicals to the extent of a 60 per cent holding in the £6,000,000 C.S.R. Chemicals Proprietary Limited (the remaining 40 per cent being held by the Distillers Company Limited of Great Britain). This offshoot—the word seems rather an understatement for a concern of such magnitude—dates its formal existence only from 1952, but C.S.R. has always been "in" chemicals. Sugar is a chemical and the story of the company's long-term emphasis on chemical control in mills and refineries has been told already. The fermentation of molasses and the distillation of alcohol alike are industrial chemistry. Chemicals were a logical avenue of expansion.

In the late twenties and thirties a policy of developing the use of both megass and industrial alcohol had been decided upon. A start on the megass side was made with "Cane-ite" just before the war, and an initial entry into chemicals was made in 1939 by joining with the Distillers Company of Great Britain and the Sydney chemical firm of Robert Corbett Proprietary Limited to expand an existing factory at Lane Cove, Sydney.

Both C.S.R. and the Distillers Company had interests in the

industrial alcohol field. C.S.R. had met virtually the whole of Australia's industrial alcohol requirements for many years and the Distillers Company had an interest in Queensland where, with a number of sugar milling companies, it had formed Australian National Power Alcohol Company Proprietary Limited and established a distillery at Sarina in the Mackay district. This distillery has been operating since about 1927, producing mainly power alcohol for use as motor fuel.

Though some expansion in building materials took place during the war, further advances in chemicals had to wait. The research department of C.S.R. was fully engaged on wartime problems referred to it by the Federal Government and neither time nor trained staff was available for the company's own affairs. Nevertheless, much valuable work was done at Lane Cove, notably in the production for munitions of acetone direct from alcohol; the acetone plant, which had been constructed from design and "know-how" supplied by the Distillers Company, was operated by C.S.R. as agents for the separate company formed for the purpose. The plant was subsequently bought by Robert Corbett, a company which was itself eventually absorbed by the later-formed C.S.R. Chemicals.

At the time when C.S.R. and the Distillers Company acquired their interest in Robert Corbett that company was engaged in the manufacture of acetic acid (from imported calcium acetate), ethyl acetate and metallic soaps. The plant was extended for the production of acetone and butanol from molasses, and acetic acid directly from alcohol.

Many things can be done with alcohol. With oxygen from the air it can be converted into acetic acid and acetic acid is one of the most important bases of the organic chemicals industry. With acetic acid as a starting point the changes can be rung through a whole range of modern synthetics—from plastic steering wheels to chemicals used in the preparation of penicillin. The world we live in today is becoming more and more dependent upon chemicals in peace as in war. By the degree of its use of chemicals we may roughly gauge the stage of economic progress of a community. Australia is becoming big enough, rich enough and technologically sufficiently equipped to develop in some directions, at least, the organic chemicals industry and to consume the products which it makes.

It may be explained here that few, if any, of the bulk products of this industry find their way direct to the general public, hence the comparative unfamiliarity of their names. These products of a series of manufacturing operations by their makers are themselves the raw



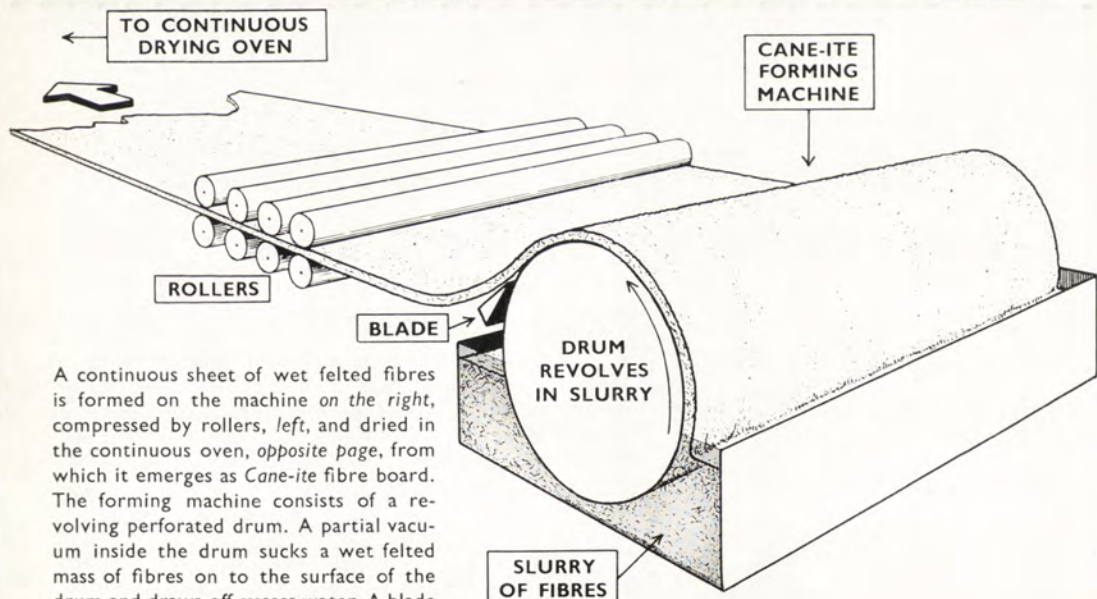
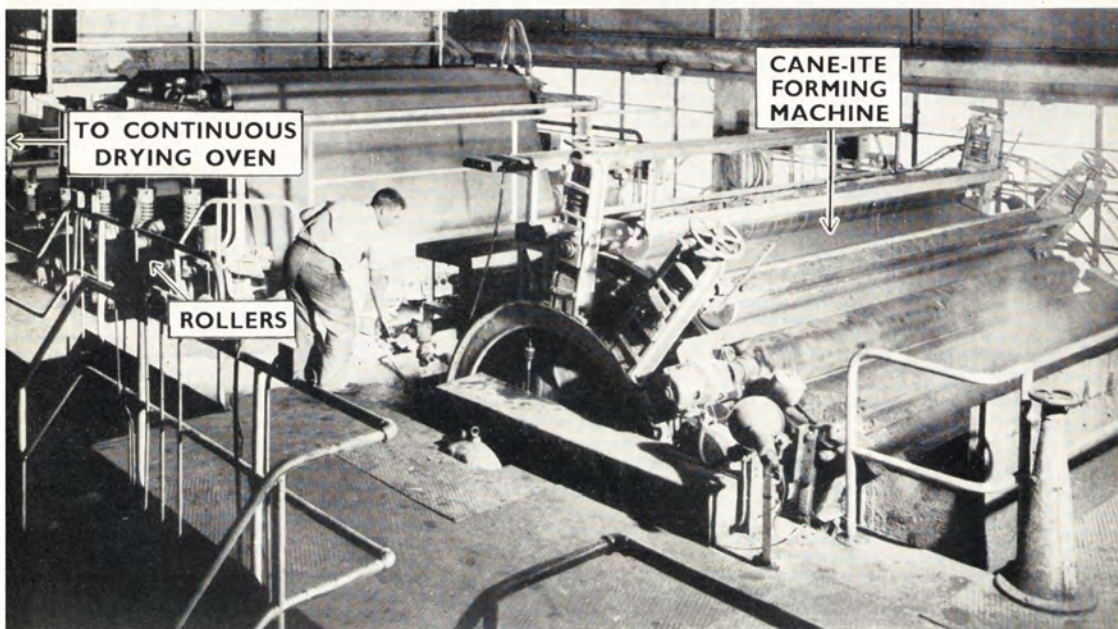
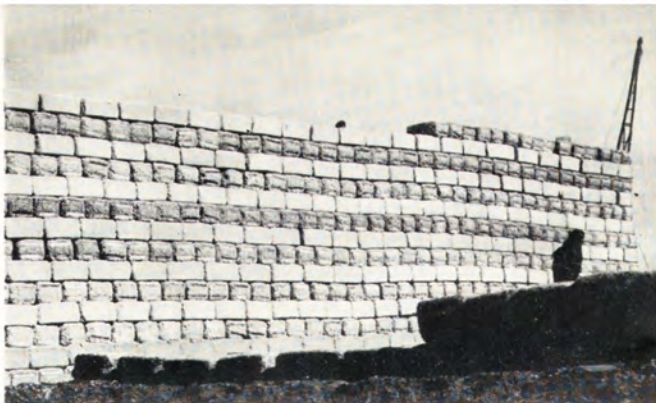
Showroom of building materials sales office in Sydney.

Cane-ite and Timbrock factory at Pyrmont, Sydney. Part of sugar refinery on the left.

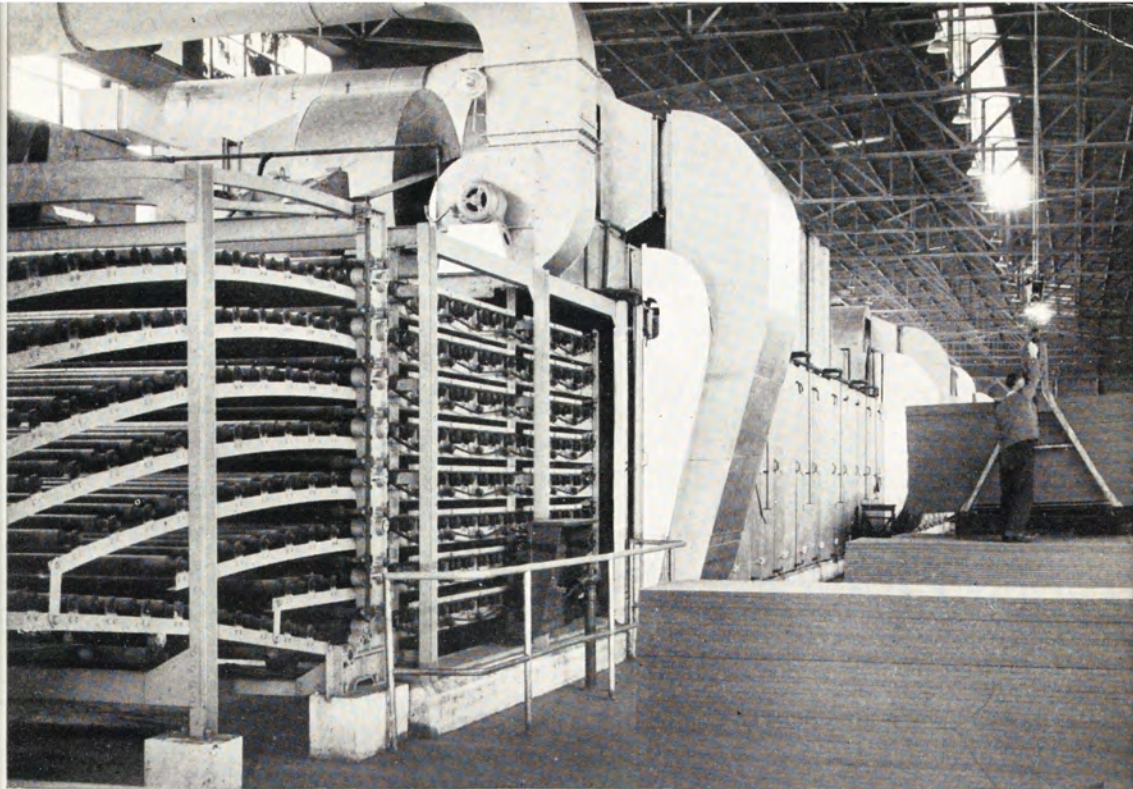


Cane-ite Manufacture

At right: Baled cane fibre (megass or bagasse) used for making Cane-ite. Cane fibre and wood fibre are softened by treatment with steam and chemicals and mixed with water to form a slurry, from which a continuous mat of felted fibres is drawn off by a forming machine, illustrated below.

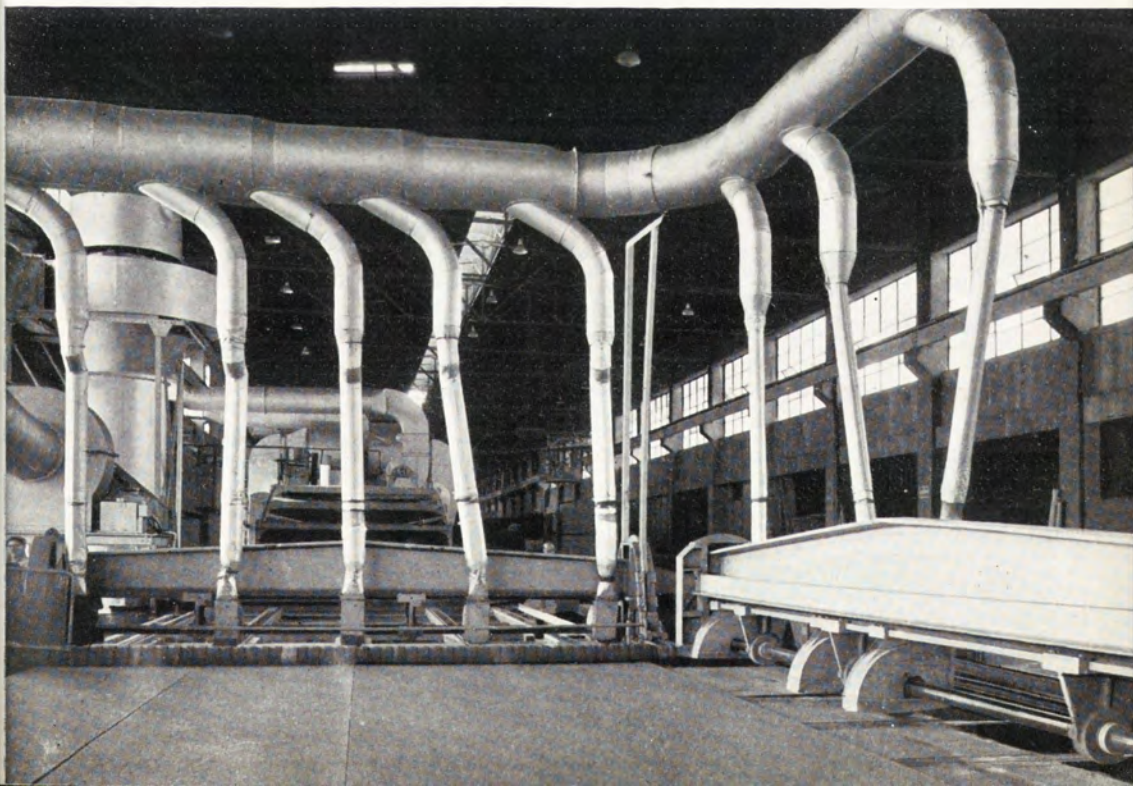


A continuous sheet of wet felted fibres is formed on the machine on the right, compressed by rollers, left, and dried in the continuous oven, opposite page, from which it emerges as Cane-ite fibre board. The forming machine consists of a revolving perforated drum. A partial vacuum inside the drum sucks a wet felted mass of fibres on to the surface of the drum and draws off excess water. A blade skins the wet mat off the drum, and heavy rollers squeeze out more water and compress the mat.



The wet sheets are continuously fed into an 8-deck drying oven, 280 feet long.

As the sheets emerge from the drier they are cut to various sizes. The "spider-leg" tubes suck away dust made by the saws.

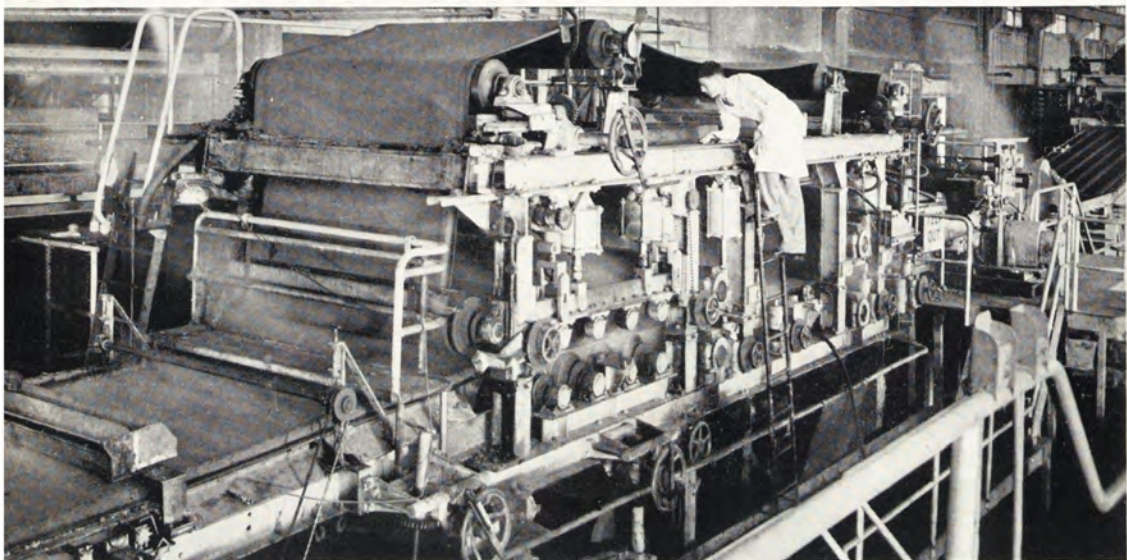




Timbrock Manufacture

Australia's hardwoods are used as the raw material of *Timbrock*. At the factory they are chipped into small pieces and ground to fibres.

Wood-fibre is mixed with water and chemicals and formed into a continuous strip of wet pulp mat which is then squeezed between rollers.



Sheets of wet pulp are placed in a press between metal plates, heated with steam and subjected to pressure. They come out of the press as finished *Timbrock*. At left below: The press. At right: *Timbrock* emerging from press.





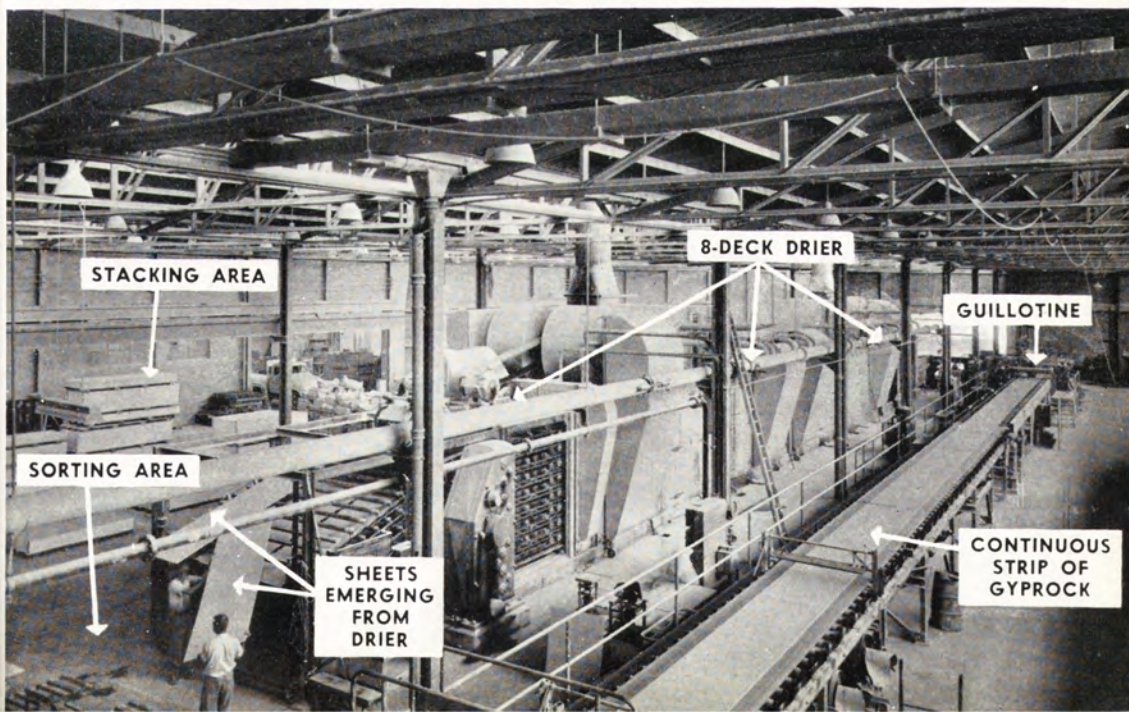
Gyprock Manufacture

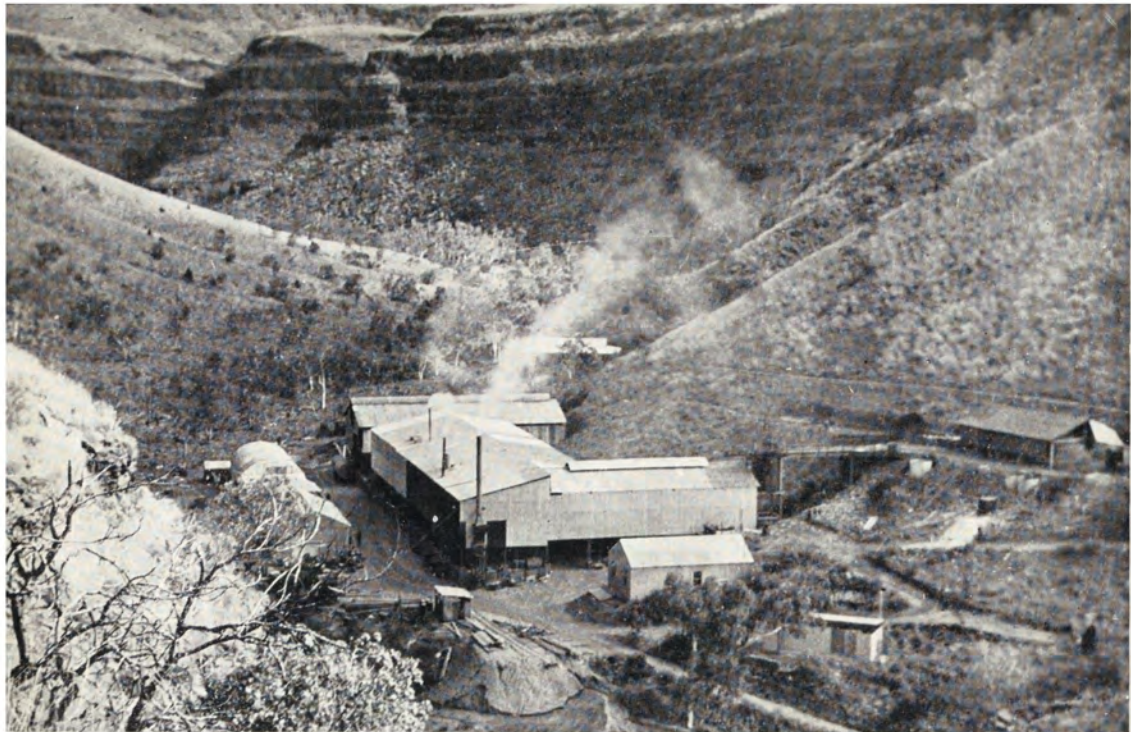
Raw gypsum comes from open-cut mines in N.S.W. and Victoria. It is ground and converted to plaster by calcining.



A foamed mixture of plaster and water is fed evenly between two sheets of tough water-resistant paper.

Gyprock is made in a continuous strip, cut into lengths and then dried. The finished product is light but strong, with a surface which can be painted or wall-papered.





Asbestos Mining

The mine buildings of Australian Blue Asbestos Ltd. at Wittenoom Gorge, Western Australia. The mine produces high-grade blue asbestos.

Blue asbestos is a long-fibred mineral. This sample of asbestos ore from Wittenoom shows the length of the fibres.

A factory building constructed from C.S.R. *Fibro*ck corrugated asbestos cement wall and roof sheets. Down pipes, corner strips and curved roof ridges are also made of asbestos cement.





**C.S.R. Building Products
in use**

Left: C.S.R. floor tiles in a mercery store.

Below: A modern plaster ceiling



Below: Acousti-tiles in an office.



Below: C.S.R. branch office, Adelaide, with Gyprock walls, C.S.R. floor tiles, Cane-ite Acousti-tiles on ceiling, and a Timbrock counter.

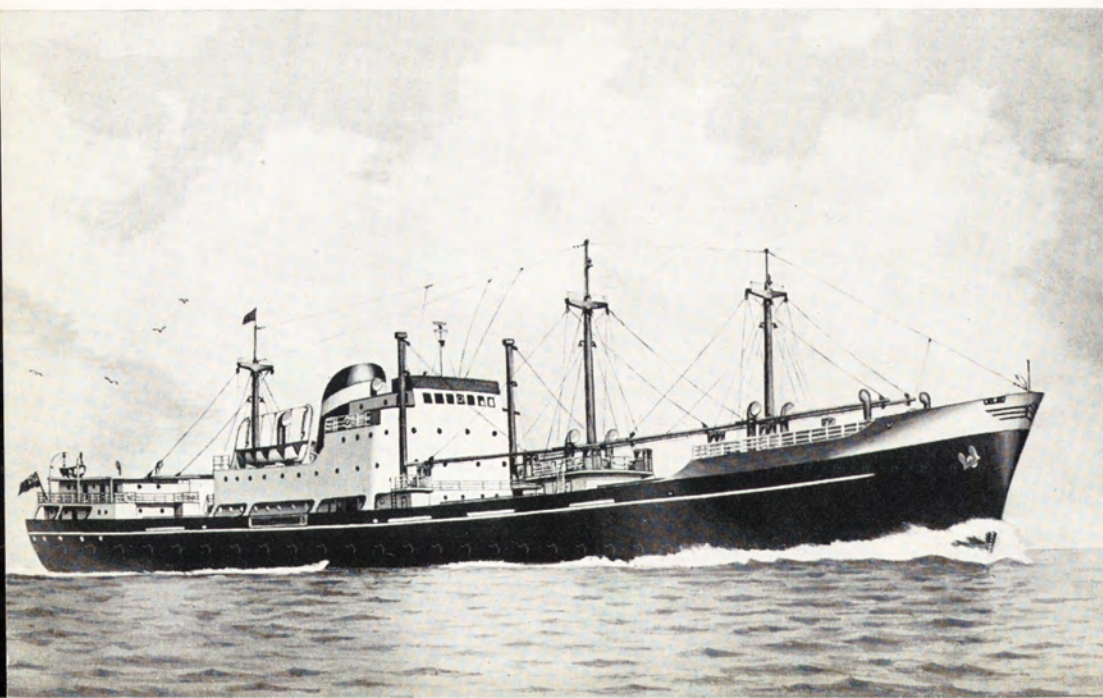




Shipping

S.S. *Fiona*, one of the company's three ships. C.S.R. owns also the S.S. *Rona* and the S.S. *Tambua*. These ships carry general cargo, molasses and sugar between Australia, Fiji and New Zealand.

The keel of this new C.S.R. ship has been laid for completion in 1957. *From a watercolour impression by Mr David Hogan.*



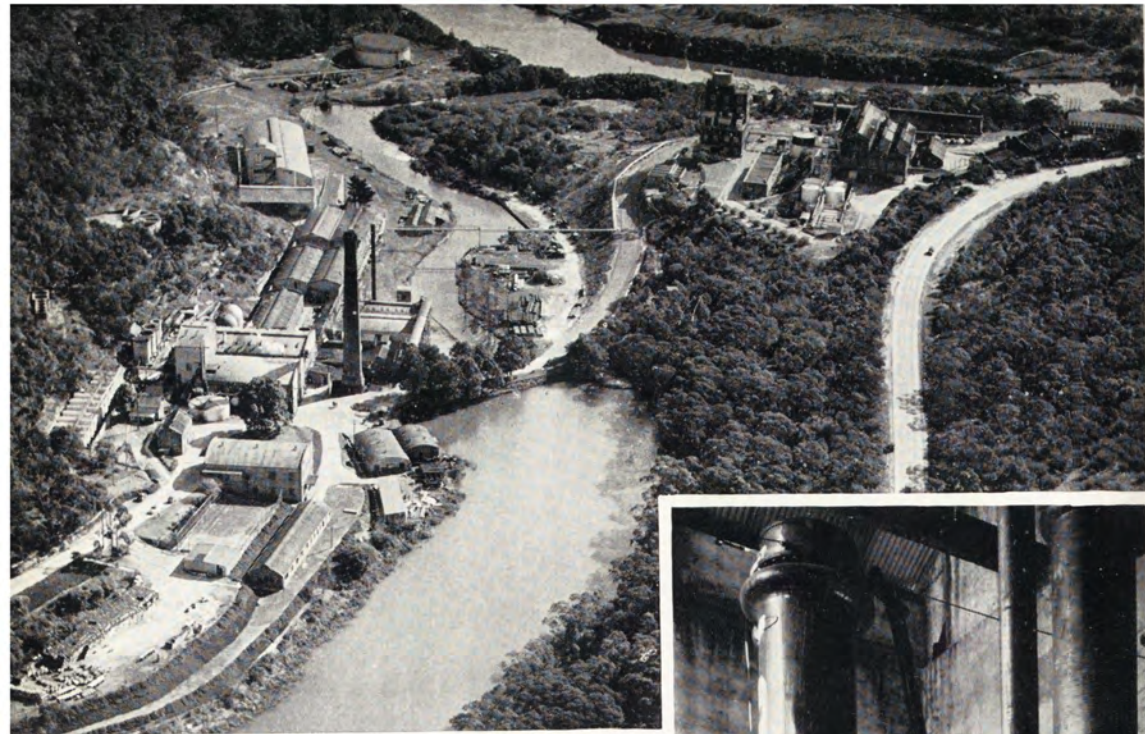


Distilling

An operator checks the spirit gauges in the Pymont distillery. At the company's distilleries in Sydney and Melbourne, molasses is converted to ethyl alcohol, white spirit, absolute alcohol, methylated spirit and fusel oil.



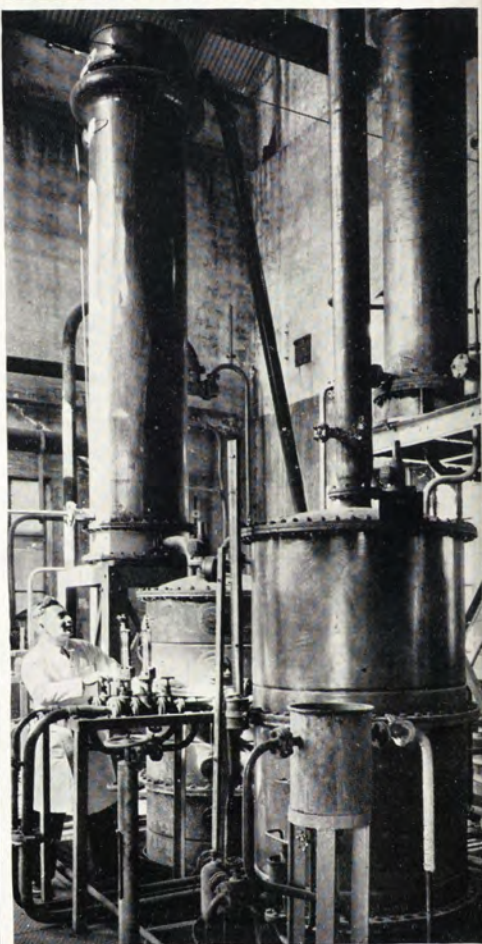
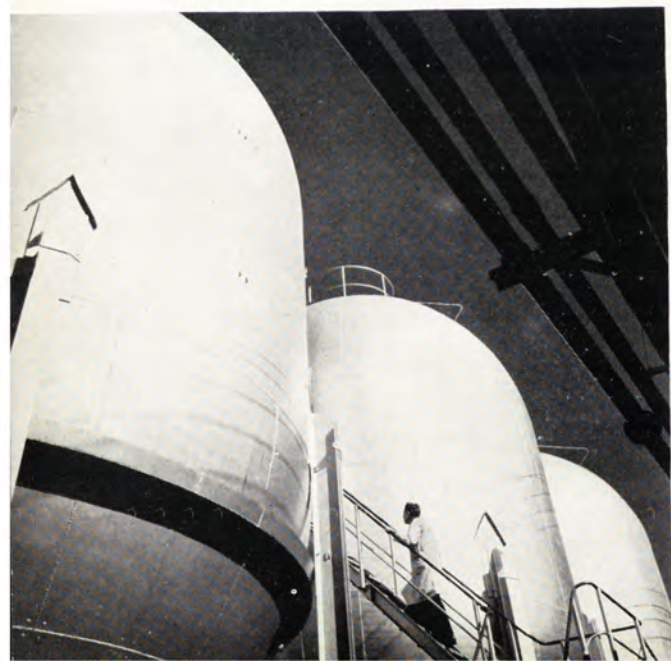
Large wooden spirit storage vessels at Pymont distillery. The barrels in the foreground contain rum.



C.S.R. Chemicals' factory at Lane Cove, Sydney. Boiler station, fermentation acetone butanol plant, stores and workshops on left. Acetic acid plant, synthetic acetone plant, esters plant and main office at top right. Cooling water reservoir in foreground.

Acetone and Butanol Manufacture

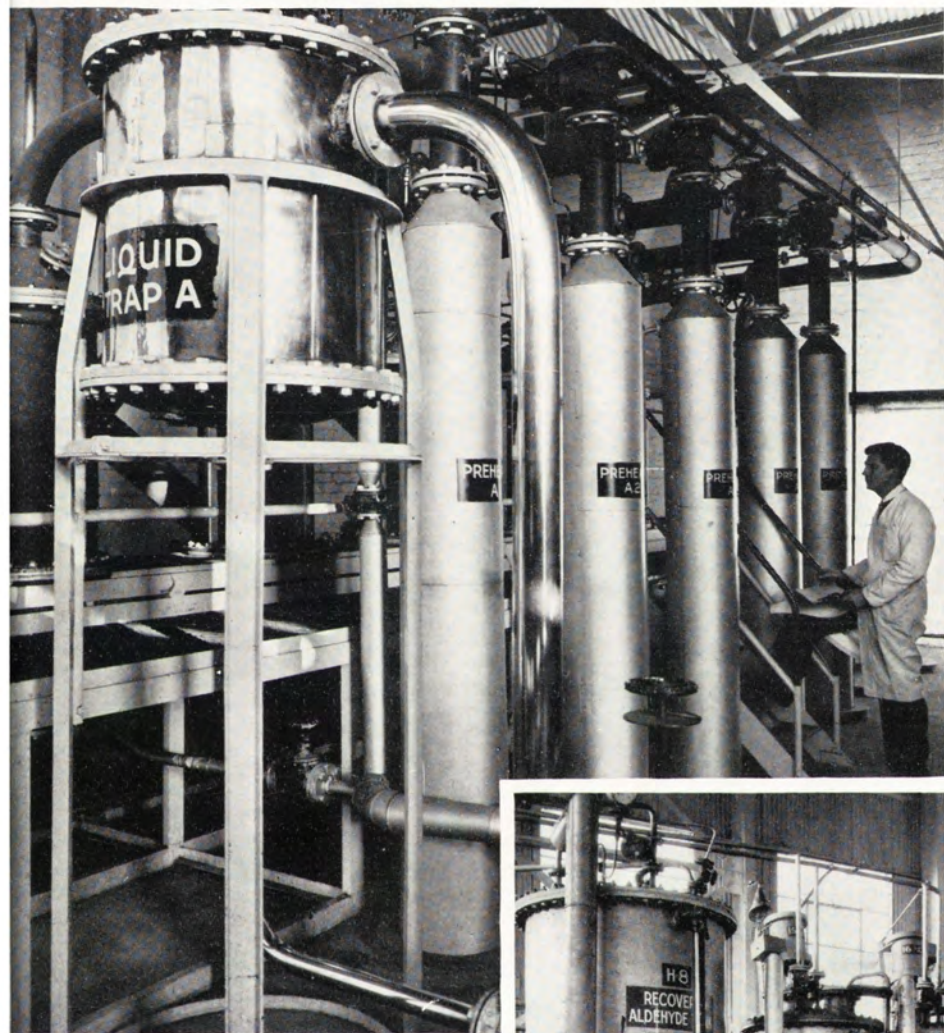
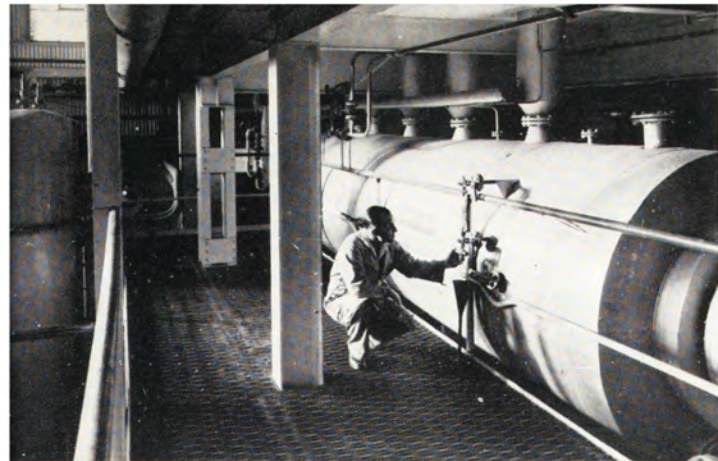
Below: Pressure vessels in which molasses is fermented.



Above: Condensers and tops of twenty-foot high still columns, in which acetone and butanol are distilled from fermented molasses.

Manufacture of Acetic Acid

Ethyl alcohol and air are the raw materials from which acetic acid is made. Alcohol is vaporized and mixed with air in this vessel.



Above: Alcohol vapour is preheated and oxidized to acetaldehyde in furnaces.

Right: Acetaldehyde is reacted with oxygen to form acetic acid.



Ester Manufacture

The building (right) houses plant for the manufacture of ester solvents (butyl, amyl and ethyl acetates) and for phthalate and sebacate plasticizer production.



Left: Control panel and flow gauges, continuous esterification plant.

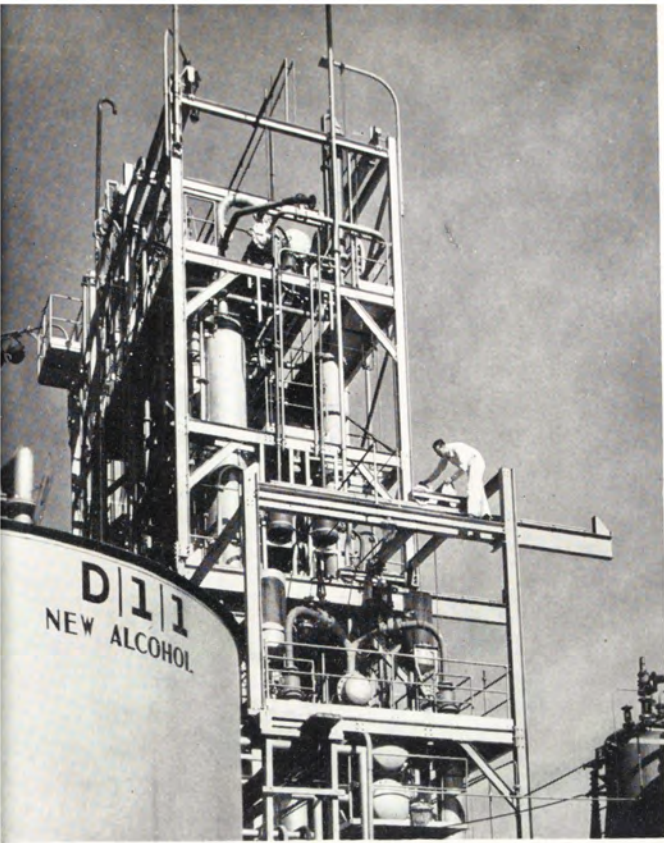
Right: A stainless steel road tanker being examined for internal cleanliness at the loading point, Lane Cove.



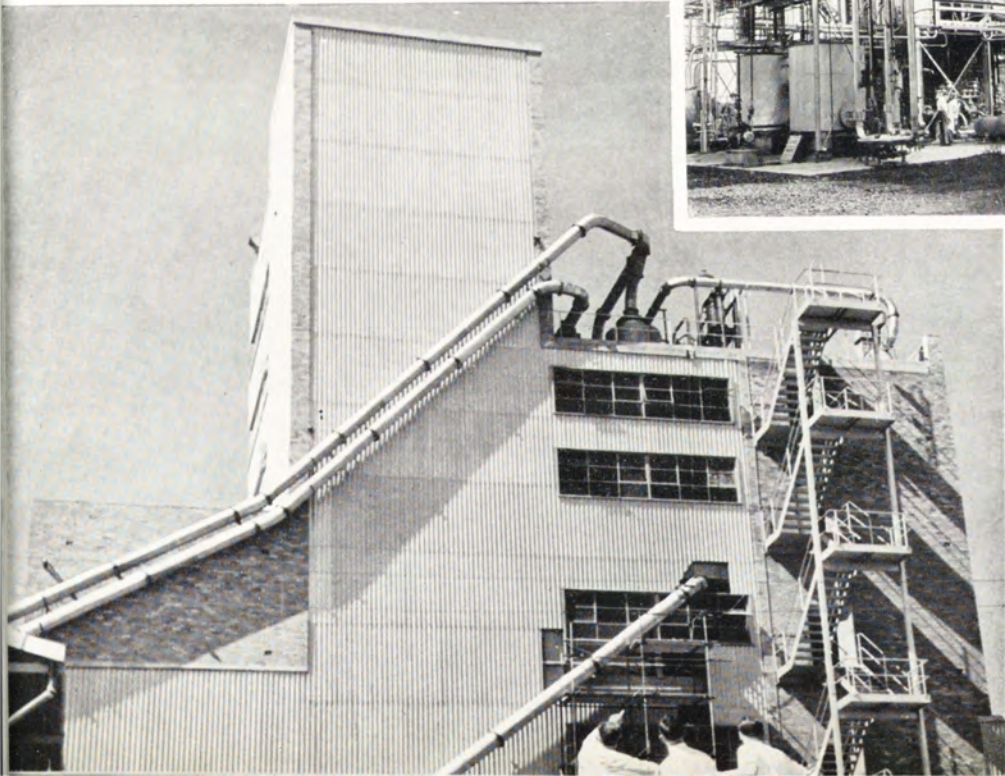
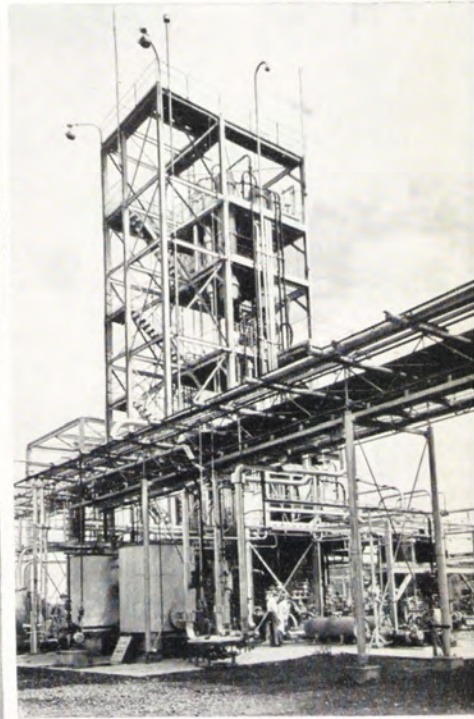
Cellulose Acetate Manufacture

Left: The first step in the manufacture of cellulose acetate at Rhodes, Sydney. Ethyl alcohol, made from molasses, is converted to acetic acid.

Below: Acetic acid is converted to acetic anhydride by a high-temperature catalytic cracking process.

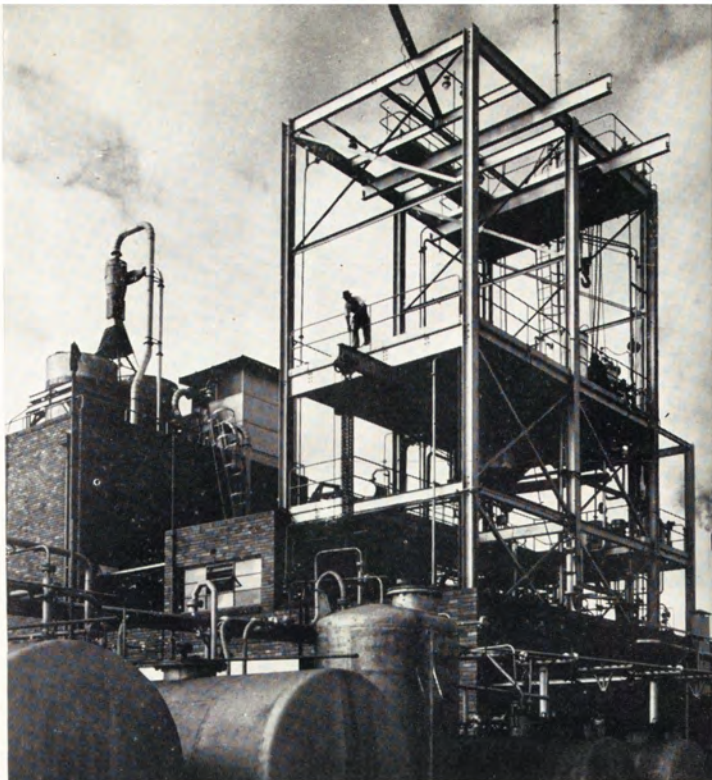


Below: Cellulose and acetic anhydride are combined in this building to form cellulose acetate.

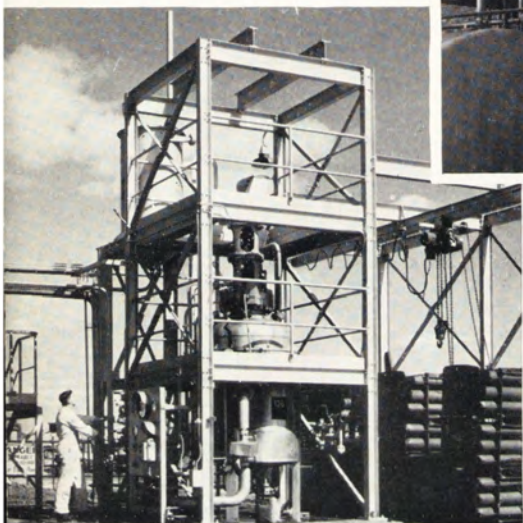


Manufacture of Plastics and Fine Chemicals

Right: The Starex polystyrene plastics moulding powder plant.

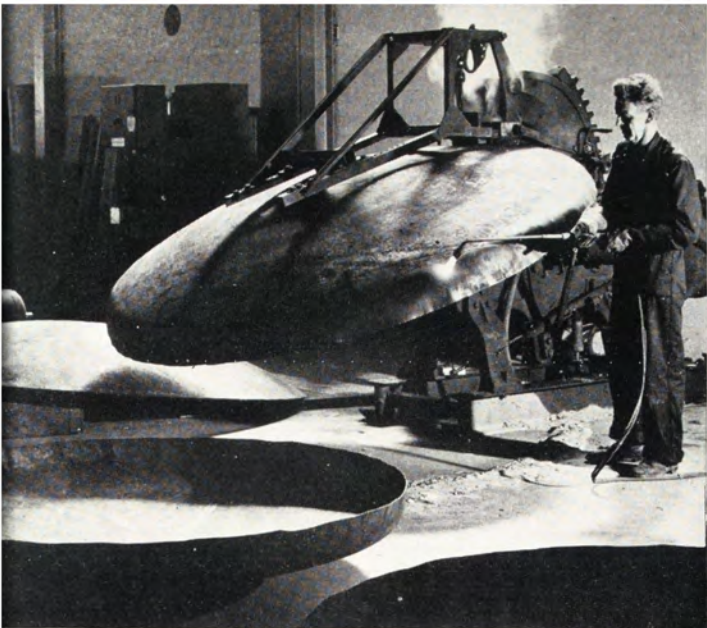


Various fine chemicals are made at Rhodes. The apparatus (*left*) hydrogenates sugars to produce sorbitol and mannitol. Vitamin C is then made from sorbitol.



Celsior plastics moulding powder (*right*) is made at Rhodes from cellulose acetate, plasticizers and colours. It is used by moulders to make many articles of everyday use.

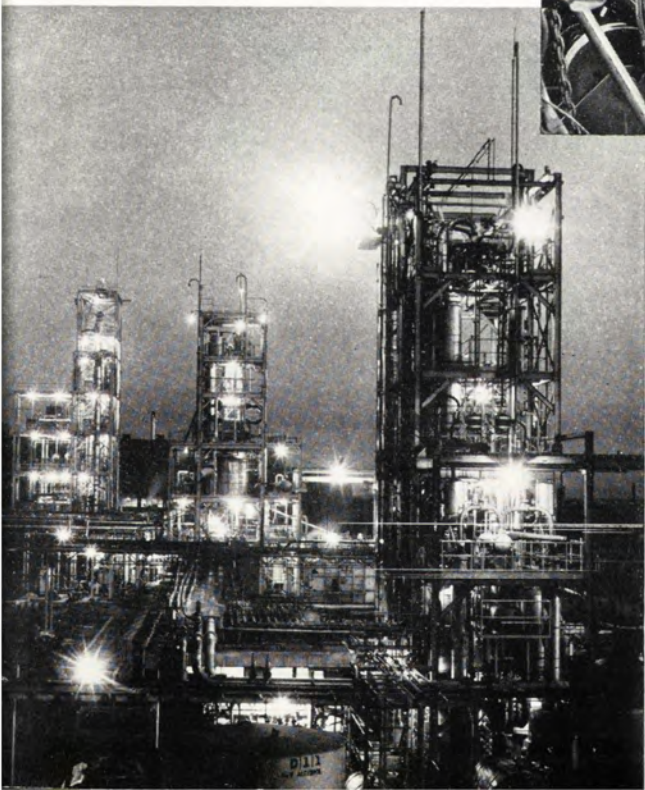




Plant Fabrication

Most of the fabrication work for C.S.R. Chemicals factories at Rhodes, Sydney, was carried out by the C.S.R. Company. Here the dished ends of vessels are being shaped.

Fabrication of special alloys used in the Rhodes plant posed additional problems for C.S.R. engineers. Argon arc welding was one of the many techniques employed.



C.S.R. Chemicals' factories at Rhodes.

materials of other industries and may pass through several processing organizations before they find their final marketable form, emerging as constituents of familiar household goods. Take the case of butanol. As a volatile inflammable liquid it is sold by the makers, C.S.R. Chemicals, whom we may call Manufacturer One, to Manufacturer Two. Manufacturer Two adds urea, a white powder which he has bought from another source, and formaldehyde, a noxious gas in solution, and "cooks up" what is known as a synthetic resin called butylated ureaformaldehyde. This substance Manufacturer Two sells to Manufacturer Three who, using more butanol, converts it into a surface finishing paint for the refrigerators of Manufacturer Four. Obviously butanol, butylated ureaformaldehyde or even the eventual surface finishing, which has to be baked on, are of no use to the individual buyer—each is a stage in an elaborate technological sequence, the complexity of which puts it outside the personal sphere of the ultimate consumer.

The association of C.S.R. and the Distillers Company in Robert Corbett was fruitful. We may see it as a stepping stone to a greater venture which was to result in the formation of C.S.R. Chemicals itself. With the ending of the war the industrial situation began to change—development was once more possible. Fears of motor fuel shortage during the war had led the Commonwealth Government to establish grain distilleries for the production of pure alcohol to supplement the nation's fuel supply, and the construction and operation of these distilleries in various States and all the research involved had been carried out by C.S.R. as a top-priority project requiring the full services of a considerable research and technical team. With the end of the war these men, released from this and other important undertakings, were able to turn their attention to the investigation of the manufacture of new chemicals starting from ethyl alcohol as a base.

The research team began work at the C.S.R. laboratories at Pymont late in 1944. Various possibilities were examined. Some were dropped in the early stages—costs were too high or markets were too restricted. Other projects, such as the manufacture of ethyl cellulose, an attractive and tough plastic, were taken through to pilot-scale work before a decision not to proceed further was reached. One project still showing promise that emerged from this investigation was the manufacture of cellulose acetate, a constituent of many kinds of moulding powders used in the plastic industry and of rayon yarn and fabric. The company decided to explore thoroughly the industrial manufacture of this product and its related chemicals.

The laboratory stage of research was then supplemented by the building of pilot plants for the making of acetic acid, acetic anhydride, cellulose acetate and cellulose acetate moulding powder. Much progress was made in this way but it became obvious that all the information needed could not be obtained by unassisted effort in Australia. It would be necessary to see overseas plants in operation. Personal investigations, therefore, were made by officers of the company in Canada and the United States, in the United Kingdom and in Germany. The German visit was a difficult undertaking as in the immediate postwar period only persons on official duty were allowed entry. Two of the company's officers solved the problem—they entered Germany as honorary colonels attached to the British Army's T-force, part of the task of which was the study of German industry. They were thus able to make careful examination of the I. G. Farben plants, where much that had been learned in the C.S.R. laboratories was confirmed and valuable additional technical data were gathered.

After further investigation a contract was made with the Hercules Powder Company of the United States for the purchase of working knowledge relating to its improvements on a German process for the manufacture of cellulose acetate and it was then decided to build a factory for making this material. In 1943 the company had bought about eighteen acres of land at Rhodes, Sydney, as a provision for possible expansion, recognizing that suitable factory areas close to Sydney were becoming increasingly valuable and very difficult to obtain. It was on this site that it was decided to start the new undertaking and in the preparation of the site a further twelve acres were reclaimed from the adjacent Homebush Bay.

As constructional work proceeded on the Rhodes site—more than 90 per cent of it by local engineering firms—still further research was carried on, with additional journeys to overseas countries, including Japan, to study methods of manufacture. During all this time the project was being developed and financed directly by the company itself through what was known as the C.S.R. Industrial Chemicals Division. In 1950, however, discussions with the Distillers Company, already an associate in Robert Corbett, led to a further pooling of interests. A new company, C.S.R. Chemicals, was set up to conduct the venture, with C.S.R. holding 60 per cent of the shares and the Distillers Company 40 per cent. It was this company, C.S.R. Chemicals, which subsequently took over the shares in Robert Corbett.

In the Distillers Company C.S.R. has a great and powerful ally in the field of chemical manufacture. Possibly this large British company (its assets total £118,000,000) is best known to the public for the many

brands of excellent Scotch whisky which it makes, and it may come as a surprise to some, therefore, to find that it ranks second only to Imperial Chemical Industries in the chemical industry of Great Britain. The link with the Distillers Company brings to C.S.R. Chemicals a wealth of world-wide experience in the making, buying, and selling of chemicals and, what may be even more important, gives access to a great amount of research work.

In the assessment of the market potential for cellulose acetate flake, C.S.R. Chemicals had the benefit of the experience of Courtaulds Ltd., the British textile firm. The great new factory of Courtaulds (Australia) Ltd. was being built at Tomago, near Newcastle, and C.S.R. took up a considerable shareholding in it. This was to be the start of the Australian rayon yarn spinning industry. Two types of rayon are in world supply; acetate rayon and viscose rayon. After much preliminary investigation Courtaulds decided that the economics of manufacture in Australia and the structure of its textile industry favoured acetate rayon as the first step, and the formation of Courtaulds (Australia) Ltd. was planned on that basis. Their production of viscose rayon was limited to viscose tyre cord, a much coarser product than the yarn used for weaving and knitting. The economics of production of cellulose acetate flake looked satisfactory, and its manufacture had the important national advantage of making the Australian rayon textile industry less dependent than hitherto on imported yarn.

On 24 July 1953 the £4,500,000 factory at Rhodes was officially opened by the Governor-General of Australia. To the layman this great plant is interesting as much for what is invisible as for what can be seen. Like all modern chemical plants (and many other plants also) it is very largely controlled automatically by instruments. Machines now make all the calculations and adjustments necessary for the control of complex processes and do it far more skilfully than any human being can, anticipating and countering deviations from normal with a speed and accuracy beyond human reflexes. Also like many other chemical plants, most of the Rhodes plant is out-of-doors—not roofed in or walled in. The various units of stainless steel and aluminium sit out by themselves in the open air. If the layman wants to know what goes on in them he must ask the chemical engineers unless—which is highly unlikely—he can read the processes in the instrument charts and flickering dials. The plant is one of the outstanding examples in Australia of automatic control and operation.

The story of cellulose acetate is a success story—a technical success story. Thousands of plans were drawn, obstacles to the fabrication of

chemical equipment in Australia were tackled and overcome, a first-class series of plants was constructed and, finally, the chemicals produced proved on the evidence of overseas experts to be of quality equal to any in the world. But the period of building at Rhodes coincided with the steepest inflationary period Australia has ever experienced—wages rose 100 per cent from 1949 to mid-1953, and labour and materials were in short supply. The costs of electricity, gas, and coal skyrocketed. All this meant a great increase in capital cost necessary to complete the project and higher operating costs when the plants began production. This rise in the cost of the Australian product unfortunately coincided with a drop in the price of the overseas material. It became necessary, therefore, to ask the Federal Government for assistance on the cellulose acetate project. After a hearing by the Tariff Board the Government decided against granting assistance, but on further representations the matter has been reopened and the verdict is now awaited. This verdict will determine whether the technical success, which after all is really only the prologue of this section of the C.S.R. Chemicals story, will be followed by the financial success which is essential to complete it.

But cellulose acetate is only one of a number of products, all previously imported, now manufactured at the Rhodes and Lane Cove factories. The solvents industry at Lane Cove, which has proved a flourishing business, has been considerably expanded since C.S.R. acquired an interest. A plant for the continuous production of butyl acetate supplies the full requirements of the Australian lacquer industry for that solvent, and the rapidly expanding plastics industry now looks to that factory for its phthalate plasticizers for compounding the resins used in making such things as covering for electric cables, garden hose and raincoats. Furthermore, a plant has recently been erected at Rhodes for making that popular plastics material, polystyrene, which is moulded into so many articles in everyday use.

Apart from its industrial chemicals, C.S.R. Chemicals also produces certain "fine" chemicals such as Vitamin C. Fine chemicals generally comprise the newer, higher-priced chemicals not used in anything like the tonnages of such old stalwarts as acetic acid and the solvents. Their market is not firmly established and consequently they often present some commercial hazard as they may be replaced by some better chemical; or the market price may fall drastically as more manufacturers enter the field. In Australia, where the local market is small, there are especial difficulties. If, however, the raw material is readily and cheaply available—preferably a chemical of agricultural origin—it is possible for Australia to compete in the world fine chemical

markets as she is now doing. Ascorbic acid (Vitamin C) is a chemical which fulfils these requirements, as sugar is its starting point, and today it is being exported in substantial quantities.

Although "vitamin" has become a popular term only in comparatively recent times the fact that certain fruits, notably limes and other citrus fruits, contained an ingredient preventing scurvy (that is, anti-scorbutic or ascorbic) has been known for many years; it was recognized, for instance, by Captain Cook. This substance, Vitamin C, was isolated in the laboratory in the late twenties and synthesized a few years later. In 1937 it was produced in commercial quantities in both America and Europe and it has since become generally known and widely used. There is an interesting background to its production in Australia.

In 1940 the Drug Sub-Committee of the University of Sydney, following reports of scurvy among members of the Australian Imperial Force in the Middle East, decided to attempt the synthesis of ascorbic acid in Australia and succeeded in producing it on the laboratory scale. Meanwhile the facilities of the research department of C.S.R. had been offered to the Commonwealth and the department was given a variety of tasks including the production of ascorbic acid on a commercial scale. With improvised equipment a pilot plant was erected by the end of 1942 and production began at the rate of 80 lbs. a month. By the end of the war the production rate had been increased to more than 400 lbs. a month and altogether more than 8,000 lbs. was produced and sent to the armed forces in the form of fortified food and tablets. Demand did not cease with the war, however, and it was decided to design and erect a new factory at Rhodes. Now, instead of rating in pounds, production is rated in terms of tons per month. The production of ascorbic acid from sugar in a six-stage synthesis on a factory scale is the most complex in a long history of processes which began many years ago with the production of rum at a colonial distillery on the Clarence River.

The hazards mentioned earlier are not technical but economic. Thus another fine chemical, para-amino-salicylic acid—known as P.A.S., made by C.S.R. Chemicals proved commercially unprofitable and its production had to be abandoned. This material is most useful in the treatment of tuberculosis. World production was insignificant and none was available for clinical trials in Australia. The research department of C.S.R. worked out its synthesis and C.S.R. Chemicals began making it. Technically the manufacture was successful and an excellent product was made which was gladly accepted by the T.B. clinics and the medical profession. The basic raw material was not

made in Australia, however, and as supplies of P.A.S. became freely available from overseas at lower prices the local material was priced out of the market.

Other sugar-derived chemicals, such as sorbitol and mannitol, are exported, as well as ascorbic acid. They not only provide new uses for Australian raw materials and new services for the Australian people but they prove that, given the right economic background, the most complex processes can be exploited as successfully in Australia as in countries with a long experience in organic chemicals.

The benefits are both specific to the company and general to the nation. Expansion into the new fields has created many opportunities for staff advancement. The new sections, of necessity, have had to lean heavily on the parent body for key staff and with notable exceptions the managers, accountants, chief chemists and chief engineers of the new factories are people who were trained from an early age in the sugar operations of the company. In recent years there has been a slight reversal of the flow of staff and some senior officers have been brought back into the sugar side; so the varied techniques and skills of sundry industries are finding their way back into the general stream of knowledge in the company.

The new ventures of C.S.R. are economically and strategically important to Australia. An Australian driving past the green fields of cane in the warm, lush Queensland littoral may well take pride in realizing that upon the foundation of this primary product has been raised a whole series of industries, some of them among the most technologically complex in the world. This is the full exploitation of national resources, and if it be the duty and the need of a nation so to exploit its resources then here, it may be claimed, the job is being well done. This is not to imply that all the possible uses of sugar have been found and developed. It is reasonable to assume that in years to come there will be many more. The potentialities of organic chemistry in juggling the atoms of hydrogen, carbon and oxygen to produce a new world of synthetic products are almost limitless.

EDITOR'S NOTE

Since Mr Clive Turnbull completed this chapter in September 1955 several developments have taken place in C.S.R.'s newer activities. Greatly increased market outlets have been secured overseas for blue asbestos from the Wittenoom mine, and governmental approval for the industry has been forthcoming in the form of a small and temporary subsidy from the Western Australian and Commonwealth Governments. In the chemical field, cellulose acetate manufacture has

WIDENING THE FIELD

also been granted temporary assistance in the form of a bounty on local production.

The greatly improved prospects for the Wittenoom blue asbestos project are mainly the result of steadily increasing efficiency and lower costs and, above all, active and persistent efforts to find and enlarge markets. 8,000 tons of blue asbestos were sold overseas in 1955 at about £100 per ton. Sales negotiated in the United States, together with other markets which have been established in Europe, are expected to lead to total export sales of 12,000 tons, worth £1,200,000, in 1957 with exports rising further in subsequent years. The industry's value as an earner of overseas funds has been recognized by the Commonwealth Government which has granted a subsidy of £5 per ton up to 6,000 tons for the year ending September 1956. This matches a similar subsidy granted by the Western Australian Government. While the assistance of the two governments is temporary it is especially valuable as a definite indication of both Federal and State approval for the venture.

The importance of local production of cellulose acetate rayon yarn has also been recognized by the Commonwealth Government which, acting on the recommendations of the Tariff Board, has decided to pay a bounty of 10d per lb. on cellulose acetate flake sold for the purpose of manufacture into cellulose acetate rayon yarn. This assistance is limited to a three-year period and to a total of £142,000 in any one year and was recommended by the Tariff Board as preferable to the imposition of a tariff on the imported product. The Tariff Board, in recommending this assistance to the industry, took into consideration C.S.R. Chemicals' "strenuous and rewarding efforts to reduce the cost of this product" and noted that "on the basis of production by C.S.R. Chemicals Pty Ltd of 3,400,000 lb. of rayon grade cellulose acetate flake per annum, the saving to Australia of overseas funds would be of the order of £340,000 per annum". The future of cellulose acetate manufacture is still dependent on efficient production and also on the possibility of reducing costs still further through an increased market for fabrics made from acetate rayon yarn.