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Development of Alcohol-based Industries

The present annual consumption of alcohol in India for industrial purposes amounts to about 4 million gal. out of the total production of 18 million gallons. With the prospects of increased production of alcohol in the near future (about 46.8 million gal. by 1960) consequent on the growth of the sugar industry now under way, there exists great scope for utilizing large quantities of alcohol as a raw material for plastics, solvents, D.D.T., synthetic rubber, pharmaceuticals, etc.

The problems and prospects of the alcohol industry and the development of industries based on it were examined by a Committee of Experts appointed by the Government of India. Some of the findings and recommendations of the Committee are briefly reported here.

THE development of alcohol industry in India has been closely connected with the problem of utilizing the by-product molasses of sugar factories. With the growth of the sugar industry envisaged during the Second and Third Plan periods, increasing amounts of molasses would become available for manufacture of alcohol in the country. On the basis of the programme for expansion of sugar industry during the Second Plan period it is estimated that about 900,000 tons of molasses will become available by 1960 for alcohol manufacture. The total yield of alcohol from this source plus about one million gal. from *mahua* flowers, will be 45—50 million gal. compared to the present production of about 18 million gal. a year.

The bulk of the present production of alcohol about 10 million gal., is used as motor fuel and the rest for industrial purposes (4 million gal.) and as potable spirits (4 million gal.). There are various difficulties at present in increasing the demand for alcohol for use in motor spirit. With increased production of alcohol, therefore, substantial quantities will have to be diverted to other uses and the present pattern of utilization will have to be changed. As alcohol is available at a low cost, it could be used as a basic raw material for plastics like polyethylene, polysterne, cellulose acetate and polyvinyl chloride; solvents like butanol, ether and acetone; and for D.D.T., synthetic rubber and pharmaceuticals.

A rational development of industries based on alcohol would require a detailed examination of the conditions governing the production and use of alcohol. The Government of India, therefore, appointed in October, 1955 a Committee on Alcohol to go into various aspects of the question and to recommend measures for increasing the production of alcohol in the country and for its utilization for different purposes. The Report of the Committee, which has been under Government's consideration, was released recently. The Committee has assessed the production of alcohol having regard to the present and potential availability of raw materials and has dealt with the manner of utilization of the material as power alcohol and for industrial purposes. The system of control exercised by different States over production, distribution and transport of alcohol has also been examined by the Committee. The findings and recommendations of the Committee are reported here.

Present Position

There are at present 45 distilleries in India producing power and or industrial alcohol (95 per cent by vol.). Of these, only 19 factories have the necessary dehydrating equipment; most of these use benzene as the entrainer for dehydration; one factory uses glycerine while another employs acetates.

Production — Data on capacity and production of alcohol in relation to availability of molasses are given in Table 1. It is seen that there is considerable scope for utilizing more of the available molasses. The gap between molasses available and actually utilized is becoming larger year by year.

Consumption — Table 2 gives data on the pattern of consumption of alcohol as obtaining in 1955. It is seen that of the 5 million gal. of rectified spirit produced, about half the quantity is used as denatured spirit. This includes its use in shellac varnish, lacquer, French polish and a few miscellaneous industries. The production and use of rectified spirit for industrial purposes has not increased beyond one million gal. per year during 1950–55. The quantity used in the pharmaceutical industry is estimated at half a million gallons. About 3 million gal. of rectified and lower strength spirits are also used in the manufacture of potable spirits.

TABLE 2 — PATTERN OF ALCOHOL CONSUMPTION — 1955

(100% by vol.)

CONSUMPTION	*Gal.*
Power alcohol	9,300,000
Rectified spirits	2,011,000
Denatured spirits	2,168,000
Potable spirits	4,161,000
TOTAL	17,640,000
Additional anticipated demand on the basis of schemes under implementation*.	44,800,000
TOTAL	22,400,000

* D.D.T., 280,000 gal.; Sirsilk expansion, 800,000 gal.; Polythene, butanol esters and ethylene dichloride, 3,720,000 gal.

Development Prospects

The prospects for the development of the alcohol industry have to be examined mainly with respect to the availability of raw-materials for alcohol manufacture and the demand which can be built up for the product.

Raw Materials — As the cost of production of alcohol will have to be maintained at the lowest possible level to stimulate new demands, the Committee considers that molasses will continue to be the main raw material for the manufacture of power or industrial alcohol. Besides, the quantity of alcohol that could be produced from molasses, expected to be available during 1955-60, will be much greater than the possible demands for industrial purposes and would leave a considerable surplus to be absorbed as power alcohol. The only other material which is in use to a small extent as a source of alcohol is *mahua* flowers ; this material could continue to be used at certain locations where it is available at a low cost and where the alcohol is intended for use mostly for potable spirits. In the event of pulping plants being established in the country in the near future employing the sulphite process, the manufacture of alcohol as a by-product from the waste liquors would require consideration.

TABLE 1—PRODUCTION OF MOLASSES AND ALCOHOL IN VARIOUS STATES

STATE	MOLASSES (1954-55) *(in thousand tons)*		TOTAL ALCOHOL (1955) *(in million gal.)*		POWER ALCOHOL (1955) *(in million gal.)*	
	Produced	Utilized	Capacity	Production	Capacity	Production
U.P.	350	210	12·7	10·5	10·2	8·1
Bihar	80	40	2·6	2·0	1·3	0·97
Bombay	57	24	3·1	1·2	1·1	0·25
Punjab	11·7	12	1·8	0·6	0·8	...
Southern States	97	50	5·5	2·8	1·5	1·1
Other States	17	20	3·7*	1·5	...	...

* Includes low strength spirit.

The production of molasses is expected to be of the order of 1,020,000 tons per year from 1959–60 onwards ; of this 911,000 tons may be taken as the quantity that will be readily available for the manufacture of alcohol. This should yield over 45·8 million gal. of alcohol (100 per cent by vol.). In addition to this, production of another one million gal. per year may also be expected from *mahua* flowers. The installed capacity necessary to ensure the production of 46–47 million gal. of alcohol may have to be of the order of 51–52 million gal. per year.

Location of New Distilleries — The Committee has examined the question of regional availability of molasses, and the possible location of new distilleries and expansion of existing units. The present distillery capacity is of the order of 29·4 million gal. per annum. Licenses granted for setting up new capacity or expansion of existing units amount to 7·3 million gal., thus raising the capacity by 1958 to 36·7 million gallons. The Committee has suggested that an additional capacity of 17 million gal. should be created thus raising the total capacity from 1958 onwards to 53·7 million gallons. In fact, a further quantity of 4–5 million gal. has been licensed since the Committee submitted its report. As the increased supplies of molasses become available by the end of 1959, consequent upon increased production of sugar, the additional capacity for alcohol production should also be ready by 1959–60.

In view of the stringency of foreign exchange, the Committee has suggested that plant and equipment for new distilleries should be fabricated locally as far as possible. Designs of the proved distillation equipment and know-how developed abroad in recent years should be adopted.

Economic Unit Size — A unit manufacturing one million gal. of alcohol per year is considered to be the economic size for a distillery under the conditions obtaining in India. The cost of production of alcohol in such a unit is estimated at 80 nP. per gal. (99.5 per cent by vol.) assuming that 54·5 gal. of alcohol are obtained from one ton of molasses costing Rs. 6·8 (25 nP. per md.). Establishment of units of this size has been recommended wherever adequate quantities of molasses can be economically pooled at suitable central locations. Where such pooling of at least 201,000 tons of molasses is not feasible, distilleries of smaller capacity may be located as adjuncts to sugar factories and the distillery operated only during the sugar season. Under these conditions such units may not be uneconomic.

Demand Prospects — The demand for alcohol falls into three well-defined categories : (1) blend for motor fuel ; (2) industrial raw material ; and (3) liquor for human consumption.

In regard to the demand for use as motor spirit, it would appear at first sight that there exists good scope for extending it. Consumption of petrol in India at present is of the order of 300 million gal. per year and on the basis of a 20 per cent blend being enforced all over India, the consumption as power alcohol could increase to 60 million gallons. But there are several practical issues, principally the one relating to financial losses that may be entailed in the adoption of such a measure, which prevent this demand from materialising except under conditions of emergency. It is now generally considered that the use of alcohol in motor fuels is the least profitable way of utilizing it, although it may be justified at times from a strategic point of view. Taking into consideration the establishment of petroleum refineries in India and exploration for crude oil in the country, it is felt that there may be no need to promote the manufacture of alcohol, primarily for use as a motor spirit. The future alcohol industry would have, therefore, to be planned on the basis of meeting the possible demands from industry and of producing the alcohol as far as possible from low-cost raw materials only. The use of alcohol as a motor fuel may be kept in mind to cover any imbalance between anticipated production and the gradual development of demand for various industrial purposes.

The present consumption of alcohol for industrial purposes is estimated at 4–4·5 million gal. per annum. A number of new projects based on alcohol are now under way. These include manufacture of polyethylene, ethylene dichloride, acetic acid and various solvents, D.D.T., etc. The projects for synthetic rubber, and organic intermediates for dyes and pharmaceuticals, now under consideration, would absorb annually 10–12 million and 0·8 million gal. of alcohol respectively. The

latter scheme would require, in addition, the following chemicals which can be economically produced from alcohol utilizing a further 2 to 2·5 million gal. a year : acetic anhydride, acetone, butyl acetate, diethyl acetal, diethylamine, acetic acid, butyl alcohol, ethyl acetate, and ethylene oxide. There exists, besides, considerable scope for increasing the production of acetate rayon by establishing new factories. The manufacture of chloroform and ether in the country has still to be developed. It may be possible to establish the manufacture of cellulose acetate for use as a raw film and as a moulding powder.

The use of industrial alcohol for shellac varnishes and lacquers may also increase during the next few years, but the additional demand may not be appreciable. Alcohol used in the manufacture of spirituous medicinal preparations, toilet requisites and perfumery has been estimated at about 500,000 gal. per year. No large increase in this demand is anticipated. It may, however, be possible to increase the consumption of denatured spirit for domestic and other miscellaneous purposes provided it is made available at a low cost, without serious restrictions on its possession and use.

Alcohol-based Industries

The Committee has formulated some specific proposals for the establishment and development of alcohol-based industrial units in the country. These include the following :

Ether — The three plants already in operation in Hyderabad, Baroda and Calcutta should be assisted in improving their efficiency and reducing the cost of production. Alcohol may be supplied to these plants at a low rate, free of duty.

Ethyl Chloride — A new unit may be considered if it is linked up with proposals for manufacturing chemicals like ethyl cellulose, tetraethyl lead, ethyl amines, etc. The existing unit at Baroda, which mainly manufactures B.P. grade, may be assisted in the supply of alcohol.

Acetone — A new unit based on isopropyl alcohol may be established in or near a port town. Normally the manufacture of acetone from alcohol should not be encouraged as it may be relatively less economical. It should be cheaper to produce acetone from imported isopropyl alcohol. Such a unit may be encouraged if it is linked up with the manufacture of solvents based upon acetone like diacetone alcohol, isophorone, etc.

Ethylene Dichloride — Two units have already been licensed and they may be assisted in the supply of low cost, duty-free alcohol. A third unit may be set up if it is linked up with a scheme for manufacture of vinyl chloride.

Ethylene Oxide Glycol and Derivatives — It may be feasible to set up one unit in Delhi in conjunction with the ethylene dichloride plant with a capacity of 900 tons of ethylene oxide, using 300,000 gal. of alcohol. Alternatively, a site in West Bengal may be considered. Some quantity is also expected to be made by the solvents plant being set up in Bombay.

Acetaldehyde-based Chemicals — The requirements of these chemicals (excluding those of acetate rayon and cellulose acetate) are estimated as under:—*Acetaldehyde*, 1,200 tons for direct condensation products like acetal, paraldehyde, aldehyde ammonia, picoline, penta-erythritol, etc. *Acetic acid* 6,000 tons ; *Acetic anhydride*, 1,000 tons ; *Esters* (ethyl and butyl), 3,000 tons; *Crotonaldehyde*, 1,400 tons for conversion to butanol, butyraldehyde, octanol, etc. and for direct use.

The new solvents project under way in Bombay is expected to make some of these items ; nevertheless there is scope for additional capacity to be established. One unit in U.P. and another in Madras, each using about two million gal. of alcohol per year could be set up.

Acetate Rayon & Cellulose Acetate — The unit in Hyderabad may expand production to 3,000 tons a year. A new unit with a capacity of 3,000 tons per annum may be set up for cellulose tri-acetate at Mandya, Mysore State. One or more units for acetate rayon, each of 3,000 tons capacity may be set up in Bombay and Andhra.

Synthetic Rubber — This should be a priority scheme both from the point of view of alcohol utilization as well as essentiality of the product. Manufacture of butadiene, one of the components required, may be established in U.P. Over 11 million gal. of alcohol would

TABLE 3 — ESTIMATED PRODUCTION AND UTILIZATION OF ALCOHOL—1959

STATE	ADDITIONAL LICENSING *gal.*	ESTIMATED OUTPUT *gal.*	ANTICIPATED DEMAND* *gal.*	REQUIREMENTS OF NEW PROJECTS *gal.*	SURPLUS POWER ALCOHOL AS MOTOR SPIRIT *gal.*
Travancore-Cochin	nil	300,000	300,000	...	...
Madras	1,700,000	2,600,000	471,000	1,500,000 (Acetic acid, etc.)	1,000,000
Mysore	1,300,000	2,500,000	370,000	1,200,000 (Cellulose acetate)	700,000
				200,000 (Pharmaceuticals)	
Andhra & Telengana	1,600,000	4,450,000	2,200,000	500,000 (Export)	1,500,000
Bombay	4,500,000	6,340,000	2,200,000+ 200,000 as P.A.	1,500,000 (Acetate rayon) 500,000 (Chemicals)	2,000,000
Rajasthan	...	300,000	550,000	...	...
Madhya Pradesh	400,000	1,230,000	750,000	...	...
Punjab & Delhi	800,000	2,300,000	1,000,000 + 4,200,000 as P.A.	500,000 (Ethylene derivatives)	
U.P.	4,350,000	2,000,000	1,000,000 + 4,200,000 as P.A.	12,000,000 (Butadiene)	
				2,000,000 (Acetic acid & other chemicals)	7,000,000
Bihar	1,500,000	4,930,000	1,000,000 + 900,000 as P.A.	800,000 (Organic intermediates)	
Orissa	500,000	400,000	200,000	...	...
Bengal	nil	1,125,000	3,000,000	2,000,000 (to be secured from U.P. & Bihar)	...
Assam & other areas	400,000	350,000	300,000	...	...
Total ...	17,100,000	46,800,000	13,200,000 + 9,300,000 as P.A.	21,700,000	12,200,000

* Including demand for schemes under implementation

P. A., Power alcohol

be required for 15,000 tons of butadiene which is necessary for producing 23,000 tons of synthetic rubber (GRS).

The overall position with reference to anticipated production of alcohol and its utilization for different purposes is given in Table 3. The future of consumption of 46·8 million gal. of alcohol may be as follows : industrial uses, 30–32 million gal.; alcoholic liquors, 4 million gal.; and motor fuel, 11–12 million gallons.

Government Decisions

Government have accepted the suggested targets of production of alcohol and alcohol-based industries. Government also agree with the Committee's view that power alcohol should continue to be used as a motor fuel to the extent necessary during the developmental period. The suggestion for the setting up of a Development Council for fermentation industry, including alcohol and products based on it, has been accepted by Government.

Other recommendations of the Committee relating to price control on alcohol and molasses and excise and taxation measures are being examined further by Government of India in consultation with State Governments.

Chelating Agents in Industry

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Chelating agents are finding increasing use in analytical procedures in a number of industries. The article presents a survey of the applications of chelating agents in food, textile, paper, rubber, soap, leather and sugar industries. In the sugar industry, in particular, chelating agents have a promising field of application: e.g. estimation of calcium in sugar-house products; cleaning evaporator tubes; and improving sugar recovery from cane juice.

SINCE the discovery by Schwarzenbach and his co-workers of the property of aminocarboxylic acids to combine with metallic ions forming stable chelated complexes, exhaustive studies on the use of these acids, known as chelating agents, in analytical procedures have been undertaken. The more commonly used chelating agents are ethylenediaminetetracetic acid (EDTA), nitrilotriacetic acid (NTA) and N, N-di-β-hydroxyethyl glycine.

Ethylenediaminetetracetic acid (EDTA) is finding increasing use as a complexing agent in analytical procedures and in industry. It is the object of the present communication to survey the applications of chelating agents in different industries.

Food Industry

Chelating agents are used in the preservation of canned food. Addition of EDTA (0·125-0·5%) suppresses the formation of glass-like struvite ($MgNH_4PO_4 . 6H_2O$) crystals in canned fish or shell fish. EDTA has also been used to prevent after-cooking darkening of pre-pealed potatoes. Dipping the potatoes for 60 sec. in a mixture of sodium sulphite (1%) and disodium salt of EDTA (1%) delays the darkening ; the chelating agent inactivates the iron by forming water soluble complexes.

Mineral Separation and Electroplating

Chelating agents have been extensively used in mineral separation, metal finishing and electroplating. EDTA plays a significant role in the separation of rare earth metals ; sodium-rare earth salts of EDTA can be separated by fractional crystallisation. Separation of ceria earths with EDTA is effected by : (i) fractional precipitation of free complexes, (ii) fractional crystallisation of sodium salts in the presence of the complexed lanthanon ions, and (iii) fractional crystallisation of their ammonium salts. Fractional precipitation of erbium from a mixture of erbium and yttrium could be achieved by acidification of solutions of their oxalates in diammonium dihydrogen ethylenediamine tetracetate. Ion exchange resins have also been used to separate the alkali and rare earth complexes of EDTA. When an EDTA solution of cesium, sodium and lithium is passed through a bed of Dowex-1 (4% cross linked), cesium appears first in the effluent, followed by sodium and lithium. Complete separation of scandium from rare earths could be achieved by passing the complexed solutions with NTA and EDTA through a resin bed, scandium being eluted first. When EDTA is added to the ore containing rare earths, it forms complexes more strongly with the rare earths having higher stability constants. The heavier rare earths which are more strongly complexed, pass through the column while the uncomplexed ions are held by the resin. A single operation causes the separation of a complex rare earth mixture into fractions which contain only a few adjacent rare earths.

In electroplating, the chelating agents are preferable to cyanides in electrolytic baths. EDTA complexes are non-poisonous and their application eliminates the use of distilled water required for making the solution.

EDTA has also been used in inhibiting the corrosive action of acids on metals like iron, zinc and cadmium.

Textile Industry

Chelating agents can be used to soften water and remove insoluble soaps. A significant use of EDTA in the textile industry is in the dye-

ing of fabrics. The presence of iron in chrome baths causes the fabric to be spotted, streaky or to acquire off-colour. These difficulties could be overcome by addition of EDTA to the dye-bath ; ferric iron chelates with EDTA instantly while chromium is chelated only slowly.

EDTA has been successfully employed for the removal of iron from cotton and linen fabrics and for decontaminating cotton clothing exposed to radioactive dust.

Paper Industry

Paper pulp after sulphitation acquires a reddish colour on storage. The colour-forming substance in the fresh pulp is in the reduced (*leuco*) form and, therefore, colourless. When the reducing agents in the pulp (sulphur dioxide or sulphite) get oxidised by air during storage, the colour producing substance also gets oxidised producing the red colour ; this oxidation occurs in the presence of heavy metal ions which act as catalysts. Inactivation of these metal ions with chelating agents like EDTA prevents the reddening of the pulp. The trisodium salt of EDTA (0·1% on the weight of pulp) has been used as a substitute for polyphosphate in the mixture employed for bleaching the greenwood pulp.

Rubber Industry

Chelating agents are used in rubber industry for preserving latex and for stabilising rubber. De-sludged Hevea latex preserved by adding EDTA, is used in processes where larger amounts of ammonia would interfere.

The presence of metallic ions such as copper, manganese, cobalt, iron and their compounds accelerates the oxidation of rubber and thus decreases the life of the product. EDTA and *n*-butylamino salt of EDTA have been found to be useful in rendering metals and their compounds inactive by complex formation and therefore inhibit oxidation. They are more effective in prolonging the life of rubber than the conventional antioxidants in use ; 0·2 to 2 per cent of the chelating agent by weight of the compound gives satisfactory results.

Soaps and Oils

As constituents of soaps chelating agents, such as tetrasodium salt of EDTA, not only aid stabilization of the soap against oxidation but also render the soap suitable for use with hard water irrespective of the type and degree of hardness of water.

During refining of oils, the presence of trace elements causes oxidation of the oil. This has been substantially reduced by the use of chelating agents ; addition of chelating agent (~0·1% by weight) in alkali refining of soya-bean oil diminishes considerably the loss of oil on account of occlusion or emulsification.

Leather Industry

EDTA has been used in reducing the bacterial count in the soak water and discolouration of leather goods. When EDTA is added to soak water, the minerals present form complexes with it and thus become unavailable to the bacteria. Addition of 0·25% (on the weight of the salted skins) of ' Versene Fe 3 ', a commercial iron salt of EDTA, reduces the water soluble protein and the coagulate in the soak liquor. Use of 0·01–0·03% EDTA eliminates discolouration in vegetable tanning.

Sugar Industry

Chelating agents have a promising field of application in sugar industry for (i) estimation of calcium in sugar-house products, (ii) cleaning the evaporator tubes, (iii) elimination of lead error and (iv) increasing sugar recovery.

Estimation of Calcium — Estimation of calcium in cane juice and other sugar-house products is important in determining the juice clarification efficiency and the formation of the evaporator scales. The oxalate method and soap-solution method, which are usually employed, are inaccurate and/or time-consuming. Methods have been developed for estimation of calcium using EDTA as the volumetric titrating agent and alkaline murexide (ammonium purpurate) solution as the indicator. The method enables accurate and easy estimation of calcium content in non-coloured sugar solutions. The authors have developed a simple method using EDTA which can be applied even to coloured products like molasses. A known quantity of the solution of molasses is clarified in the usual manner by addition of lead subacetate solution and filtered. The excess of lead in the clear filtrate is precipitated by potassium ferrocyanide and filtered. An aliquot of the filtrate is titrated

against standard EDTA either using ammoniacal murexide or by spectrophotometric method. The use of potassium ferrocyanide not only eliminates lead but also other interfering ions like Fe, etc. excepting calcium and magnesium ; the latter occurs only in relatively negligible amount in sugar-house products.

Cleaning of Evaporator Tubes — During concentration of cane juice after carbonation or sulphitation processes from 14 to 60 Bx in evaporators, calcium and other inorganic constituents along with certain organic substances present in the juice get deposited on the evaporator tubes. This causes an appreciable decrease in the heat transfer capacity of the tubes. A recent method worked out for controlling the formation of scales involves the use of EDTA ; addition of EDTA (10 p.p.m.) at *p*H 7 to the juice has been found to reduce scale formation by 13 per cent.

Subjecting the tubes to the action of a boiling solution (0·5%) of EDTA results in the efficient cleaning of evaporator tubes. Similarly, EDTA can be used for cleaning filter cloth rendered useless in sugar factories due to clogging of the pores by the mud which contains appreciable amounts of calcium salts, and for cleaning beer columns in distillaries.

Elimination of Lead Error — The usual method employed for the estimation of sugars in cane juice and molasses is by polarimetry. Lead subacetate or basic lead nitrate commonly used for precipitation of the colouring and other extraneous matter from the sugar solutions introduces considerable error in the pol readings. A method developed recently to eliminate the lead error in pol determinations involves the addition of a known volume of EDTA solution to the solution under examination. Results obtained show that the method is more accurate than other methods currently employed.

Increasing Sugar Recovery — The use of EDTA in improving the recovery of sugar from the cane juice has been explored by the authors. During evaporation of juice and the boiling of the syrup for crystallisation, appreciable amount of sugar combines with inorganic constituents such as lime, Ca++, etc. to form sugar complexes. The sugar present in the form of complexes is not available for crystallisation and is lost in the molasses. An appreciable amount of sucrose present in molasses exists in the complexed form. When diluted to 5 Bx and treated with disodium salt of EDTA, 6–7 per cent of sucrose is found in complexed form is released. Thus a sugar factory producing 100 tons of sugar per day can recover from the same amount of cane juice, 1–2 tons more of sugar.

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Vegetable Milk Curd from Groundnuts

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The article describes a method for processing of groundnut for preparing vegetable milk curds. The product offers a practical possibility of supplementing the inadequate supply of animal milk in certain regions in the country and of fortifying diets with calcium, vitamins and other nutrients. The cost of production of vegetable milk curd works out to about 13 nP. per pound.

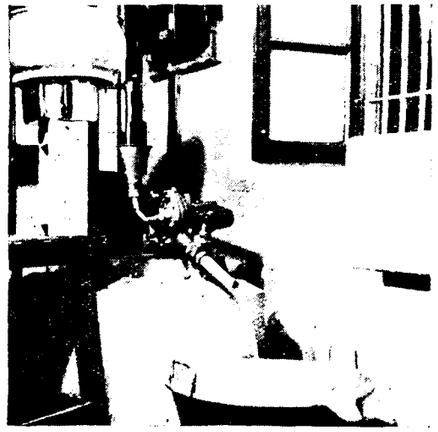
VEGETABLE milk and milk products processed from soyabean are commonly consumed in China and other far-eastern countries. A plant for the production of spray-dried vegetable milk powder known as 'Saridele' has recently been erected, at Djakarta under the auspices of the FAO, UNICEF and the Indonesian Government ; the estimated capacity of the plant is 300 tons per year [1]. These and other similar products described in literature are meant to supplement the inadequate supply of animal milk in those regions. A similar approach for the processing of groundnut has been made in the Central Food Technological Research Institute and the practical possibilities of preparing vegetable milk have been established [2]. The lactic fermented curd prepared from the vegetable milk has been found to be an acceptable product. Vegetable milk is produced daily in the pilot plant installed at the Institute and the curd prepared from it is sold to local catering establishments.

The Process — Shelled groundnut of good quality is mildly roasted, cooled and scrubbed to remove the testa and germ. The clean split cotyledons are made into a paste in a pulveriser (triple roller mill, 'mikro' pulveriser or 'kek' mill) and the paste is mixed with six parts of water and filtered to yield a milky emulsion. While mixing with water, saturated lime water is added slowly with stirring to neutralize the acidity ; about 0·5 litre of lime water is required per lb. of paste. The emulsion so obtained acquires a faint yellow tinge. The *p*H of the emulsion is adjusted to 6·8–7·0 and the milk is heated to boiling in a steam-jacketed kettle. Steam is bubbled through for 30–45 min. to deodorise the milk. After cooling the milk is fortified with minerals and vitamins, by adding to per litre (2·2 lb.) of deodorised milk tricalcium phosphate (2·2 g.), sodium citrate (1·1 g.), riboflavin (2·0 mg.), ascorbic acid (17·7 mg.), vitamin A (1400 I.U.) and vitamin D (200 I.U.).

To the fortified and homogenised milk is added invert sugar (1 per cent) of 55°Bx and the milk seeded with cow milk curd or vegetable curd at 37–38°C. ; about 1 lb. of curd is required per 100 lb. of milk ; the quantity of invert sugar and seed curd can be varied according to the acidity required in the final product. The milk is left at room temperature for 12 hr. when it sets to a thick white curd.

The chemical composition of the curd is as follows : total solids, 12·07 ; protein, 3·00 ; fat, 5·20 ; carbohydrates 3·07 ; ash, 0·80 ; calcium, 0·11 ; and phosphorus, 0·10 g./100 ml. Vitamins (per litre) : thiamine, 0·65 mg.;

PULVERISATION OF GROUNDNUTS IN A TRIPLE ROLLER MILL



HOMOGENIZATION OF FORTIFIED MILK

riboflavin, 2·00 mg ; nicotinic acid, 11·10 mg. ; ascorbic acid, 17·70 mg. ; vitamin A, 1400 I.U. ; and vitamin D, 200 I.U.

The fat content of the curd could be reduced from 5·2 to 3·0 per cent by adopting a simple oil displacement technique, the Skipin process [3]. The moisture content of the fine paste is adjusted to about 18 per cent by adding the calculated quantity of warm water and the paste is kneaded for about 10 minutes. The oil liberated is drained off.

Vegetable curd offers a practical possibility of fortifying diets with calcium, vitamins and other nutrients. Though the biological value of the vegetable curd protein is inferior to that of animal milk protein (deficient in methionine), the product is a good supplement to rice diet [4,5].

Economics of Production

Pilot plant trials at the Institute have shown that 1 lb. of decuticled groundnut yields 8 lb. of curd. The cost of production is estimated at 13 nP. per lb. (Table 1).

TABLE 1—VEGETABLE MILK CURD—PRODUCTION COST

(Basis: 1000 lb. of curd per day (8hr.); 363,000 lb. per year)

	Rs.
Capital	
Plant and equipment	42,500
Installation cost	2,500
Building, about 1000 sq. ft.	15,000
TOTAL	60,000
Direct Cost	
Raw materials including chemicals, vitamins, etc.	23,231
Production and supervisory labour	9,000
Services — Water, electricity, steam etc.	5,490
TOTAL	37,721
Indirect Cost	
Depreciation on equipment (10%) and building (5%)	4,700
Interest on working capital (Rs. 20,000) at 5%	1,000
Miscellaneous (transport, laboratory expenses etc.)	5,000
TOTAL	48,421

Cost per lb. of curd, 13 nP.

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Leather Auxiliaries—A Symposium

The requirements of auxiliaries for the Indian Leather industry have, until recently, been met largely from imports. With the development of the industry and the restricted availability of imported auxiliaries, the utilization of the country's resources of these materials has assumed importance. The symposium was organized to discuss the problems relating to the manufacture of leather auxiliaries, such as curing, soaking and deliming agents, bating and pickling materials, depilants, tanning agents—natural, mineral and synthetic—surface-active agents, finishing materials, etc.

A SYMPOSIUM on Leather Auxiliaries was held at the Central Leather Research Institute, Madras during 14-17 March 1958. The symposium was inaugurated by Prof. M. S. Thacker, Director-General, Scientific & Industrial Research ; Shri Bishnuram Mehdi, Governor of Madras presided over the inaugural session. Over 180 delegates from all over India representing technologists, traders, tanners, and manufacturers took part in the deliberations of the symposium. Distinguished delegates from U.S.S.R. and the Philippines also attended the symposium.

Sixty-two papers were presented and discussed in the course of five technical sessions : (1) Auxiliaries for pre-tanning, (2) Tanning agents, (3) Tannin extracts, (4) Post-tanning auxiliaries, and (5) Leather finishes.

Auxiliaries for Pre-tanning

The papers discussed at the session dealt with pre-tanning operations and auxiliaries used therein. Dr. Y. Nayudamma, Director, CLRI discussed the problems facing the leather auxiliary industry in India. The leather industry requires small quantities of a large number of auxiliaries. Their manufacture on a large scale will not, therefore, be economical. Steps have, therefore, to be taken to start their production on a small scale.

The possibility of using barium sulphide as a substitute for sodium sulphide in tanning was discussed in one of the papers read by Shri S.C. Datta. The problem has assumed importance on account of the depletion of the country's natural deposits of sodium sulphate required for production of sodium sulphide.

A review of researches carried out at CLRI on the production and use of enzyme bates and depilants for leather manufacture was presented by Shri S. M. Bose. The factors influencing the production of enzyme bates from different sources were discussed and practical aspects of the bating process for the manufacture of different types of leather were considered.

The influence of some tanning auxiliaries like surface-active agents on the swelling of hide at different stages of leather manufacture was discussed by Shri S. Ghosh (CLRI) and Shri P. K. De (Calcutta University). The extent of the swelling produced is an important factor which determines the quality of the resultant leather.

Tanning Agents

Twelve papers dealing with chrome tanning agents, chrome re-tannage and synthetic tanning agents were presented at the session. Studies on the optimum conditions for the preparation of basic chrome liquors by reducing acid dichromate with sugarcane bagasse, and practical tanning trials with the liquor so prepared were reported by Shri T. J. Devassy and Dr. Y. Nayudamma (CLRI). Work done at CLRI on alum tanning was reviewed in another paper which describes the preparation of different basic aluminium salts and their use in combination with mineral tanning agents. The aluminium salt can be used with advantage in the production of leather intended for grain and flesh finish, for sports goods and for industrial purposes. The salt could also be used in the manufacture of uppers, sole leather, upholstery and fancy leathers, and as a mordant in dyeing.

Recent development in syntans and their technical uses formed the subject of a paper presented by Mr. R. Bosse, Leverkusen (Germany). The possibilities of effecting economies in vegetable tanning processes employed in India by using combinations of

LEATHER FAIR—A VIEW OF THE EXHIBITS DISPLAYED

syntans and vegetable tanstuff were brought out in the paper. Investigations carried out at CLRI on the preparation of syntans—Nerodal and Novolac — were described by Shri D. Mukherjee.

Other papers presented at the session dealt with the use of hexamethylene tetramine phenol complexes in tanning and use of indigenous tanstuffs for chrome re-tan leathers.

Tannin Extracts

Developments reported at the session related to preparation of tannin extracts from indigenous materials and utilization of waste products like sulphite liquors in tanning processes to meet shortage of tanning materials in the country.

Commercial waste sulphite liquors from the paper industry provide an abundant source of lignin sulphonic acids and their salts, which may be suitably utilised as a source for tanning agents. The possibilities of suitably modifying these materials by chemical treatments were discussed by Messrs K. B. Mathur and S. K. Barat (CLRI).

The utility of *babul* bark extract in conjunction with myrobalan for tanning sole leather was brought out in a paper from *Kapurthala Northern India Tanneries Ltd.* The leather so obtained is reported to be as good as English sole leather.

Kahua (*Terminalia arjuna*) bark when used alone for E.I. tanning of hides imparts a red colour to the leather. This drawback can be overcome by suitably blending the bark extract with *konnam* (*Cassia marginata*) ; the leather obtained has a better appearance, feel and improved physical and chemical characteristics comparable to those of wattle tanned leathers. Attempts are being made at CLRI to utilise the blend in sole leather tannage.

Among the causes of deterioration of conventional insole leather are perspiration and iron grindery. A new tannage developed in South Africa — chrome-syntan combination tannage—has proved effective in checking the deterioration of leather. The leathers obtained are very absorbent and do not crack. The cost of insole leather so prepared is a little higher than that of the conventional type but this is offset by the resulting improvement in its serviceability.

Post-tanning Auxiliaries

Auxiliaries of the post-tanning operations such as fatliquors, surface-active materials and emulsifiers were the subject of papers presented at the fourth technical session.

Shri T. V. Jagadeesan of *Standard Vacuum Oil Co.*, Madras dealt with the scope of using petroleum products in the treatment of leather. Blends of petroleum products with fatty oil eliminate burning of leather, spew formation and loose grain, and impart greater firmness and water-resistance to the leather.

Different types of emulsifiers, and their preparation and uses in leather manufacture were outlined and the mechanism of emulsification was explained in a paper from CLRI. Results of trial carried out with a number of emulsifiers of the anionic, cationic, and non-ionic types prepared at the Institute for fatliquoring of leather were described.

Fish oil is an important constituent of a good currying oil, especially for treating industrial leathers. The characteristics of fish oils suitable for different treatments were dealt with by Shri G. P. Madhavan of *Gordon Woodroffe Leather Manufacturing Co. Ltd.* The need for investigating suitable blends of fish oils of high iodine value with vegetable oils was emphasised.

Shri V. V. Mhasker of the National Chemical Laboratory, Poona described a process developed at the Laboratory for modification of sugarcane wax so as to render it suitable for manufacture of leather polishes. India imports waxes like carnauba and montan worth about 10–12 lakhs of rupees, for the manufacture of leather polishes, etc. In addition, wax polishing compositions valued at Rs. 10 lakhs are also imported.

Sugarcane wax is the only indigenous wax which can be abundantly made available. The crude cane wax gives good gloss on application, but it has some drawbacks like dark colour, stickiness and poor solvent take-up property and therefore, has not much industrial use. The process developed at the National Chemical Laboratory, involves oxidation of the crude cane wax and its subsequent chemical modification. It is possible to prepare in this way a modified sugarcane wax which can be utilized for manufacture of leather polishes in place of carnauba or montan wax. The only drawback is that the creams prepared from sugarcane wax are somewhat soft above 40°C.

Leather Finishes

The concluding session was concerned with finishing materials, such as pigment finishes, resin emulsions, binders, solvents and diluents, etc.

The use of resin emulsions in finishing leather has become a standard practice in recent years. Work has been initiated at CLRI to develop suitable resin emulsions using monomers of methyl acrylates and methacrylates as raw materials. The emulsions have been found to be satisfactory and economical substitutes for imported resin emulsions. Attempts are being made to modify the naturally occurring shellac resin, which is abundantly available in the country, for preparing suitable emulsions.

Other papers presented at the session dealt with alkyd resin finishes, natural and synthetic binders and nitrocellulose solvents and diluents.

Leather Fair

More than 40 exhibitors participated in the ' Leather Fair ' organised concurrently with the symposium. The fair was inaugurated by Shri Morarji Desai, the then Union Minister for Commerce and Industry and was visited by over 4,000 people. Various types of auxiliaries for the leather industry and finished leather goods from India, Germany, U.S.A., U.K., Japan, Burma and Indonesia were among the exhibits displayed at the fair.

Patents & Processes

Chlorinated Turpentine

Patent No. 52338

Regional Research Laboratory, Hyderabad

CHLORINATED turpentine is a new insecticide developed at the Laboratory from chlorine and turpentine, which are abundantly available in India.

The process consists in chlorinating turpentine oil in a reaction vessel at low temperature by bubbling chlorine gas through the oil. The absorption of gas is rapid and a viscous product containing about 68 per cent chlorine is obtained. A pilot unit set up at the Laboratory is working satisfactorily.

Chlorinated turpentine is a viscous product, insoluble in water but soluble in common, organic solvents, including kerosene. It can be easily emulsified with water. Insecticidal formulations can be prepared in the form of solution in kerosene oil or water dispersible pastes and powders.

Chlorinated turpentine tested against houseflies and mosquitoes at 50 mg./sq. ft. level showed 80 per cent mortality during the first two weeks and 75 per cent during next two weeks. Tests against mosquito larvae (25 mg./sq. ft. of water surface) produced 100 per cent mortality after 24 hours. Chlorinated turpentine (6 per cent) in white oil injected into the body cavity of a cockroach (at 1 ml./40 g. of body weight) produced knock-down effect in 5–7 min. and cent per cent mortality in 24 hours.

Chlorinated turpentine has also been tested as a contact poison against stored grain pests ; a mortality of 76–100 per cent has been recorded after 24 hours.

A composition containing 5 per cent chlorinated turpentine, 3 per cent pine oil and 0.001 per cent pyrethrum in kerosene oil has been tested against houseflies, mosquitoes, cockroaches, bugs, fleas, beetles, lice, cattle ticks and termite. High knock-down and mortality was produced in all cases.

According to the Director, Malaria Institute of India, Delhi the insecticidal properties of chlorinated turpentine compare favourable with those of the DDT when tested under similar conditions.

The process of manufacture can be adopted by the existing insecticide manufacturing units ; independent production units can also be set up.

Parties desirous of undertaking commercial development of the process may contact the Secretary, National Research Development Corporation, Mandi House, New Delhi.

Carbon-bonded Graphite Crucibles

Patent No. 58869

National Metallurgical Laboratory, Jamshedpur

GRAPHITE crucibles are widely used for melting brass and other non-ferrous alloys, in iron and steel foundries and, to a limited extent, for melting precious metals. Their application in high-frequency melting furnaces is well-known and is growing.

Graphite crucibles are being produced in India mostly at Rajahmundry on a small scale, but the total annual output does not exceed 90 tons. Crucibles made at these centres are only of the clay-bonded variety and have much shorter life than carbon-bonded crucibles which are wholly imported.

The demand for graphite crucibles in India, estimated at about 700 tons per annum, is mostly met from imports. During the first eight months of 1957, 74,467 crucibles costing about Rs. 11 lakh were imported into the country.

(*Continued on page 129*)

Technical Digest

Concentrated Malt Food

NUTRITIONAL foods based on milk powder and malt foods under various proprietary brands are used as supplements to the diet of children, convalescents etc. Bulk of the Indian requirements of such foods are met from imports. During 1955–56, 60,341 cwt. of malt foods valued at Rs. 1·64 crores were imported.

A process for the production of a concentrated and nutritionally balanced food has been developed at the Central Food Technological Research Institute, Mysore. The food provides all the nutrients in a concentrated and palatable form and can be used as a substitute for milk in the diet of grown-up children and adults.

The Process

Malted grains (*cholam*, *ragi*, wheat, etc.) are dehusked and ground to a fine powder (<100 mesh). The powder is mixed with groundnut cake flour prepared by pressing selected decuticled groundnut kernels in an expeller and grinding the cake. Roasted pulse flours, skimmed powder and sugar in suitable proportions are added. The blend is fortified with vitamins of groups B & C ; vitamins A, D & E are added in a vehicle of hydrogenated oil, which provides a base for the vitamins and also raises the fat content of the product to the required level. The mixture is further fortified with essential minerals and buffer salts such as disodium phosphate, acid potassium phosphate, sodium citrate and sodium chloride to ensure even suspension and dispersibility of the product in water. A flowsheet of the process is given in Fig. 1.

The yield of malt flour varies from 65 to 75 per cent, depending on the cereal used. The high nutritive value of the product has been confirmed by feeding experiments.

TABLE I — PRODUCTION OF MALT FOOD — PROJECT COST

(*400 lb. per day, 300 days per year*)

Capital	*Rs.*
Buildings (2,250 sq. ft.) @ Rs. 10 sq. ft.	22,500
Plant & Machinery	30,500
Laboratory equipment, accessories, essential spares, etc.	1,500
Furniture and office equipment	2,000
Installation and erection @ 10% of plant and equipment	3,000
TOTAL	59,500
Direct Cost	
	Cost per day
Raw Materials	*Rs.*
Cholam, 144 lb. @ Re. 1 per 6 lb.	24·00
White groundnut cake, 104 lb. @ Re. 0·25 per lb.	26·00
Skimmed milk powder, 100 lb. @ Re. 1 per lb.	100·00
Hydrogenated fat, 20 lb. @ Re. 1·25 per lb.	25·00
Sugar, 64 lb. @ Re. 0·44 per lb.	28·16
Roasted Bengalgram powder, 20 lb. @ Re. 0·50 per lb.	10·00
Vitamins	36·00
TOTAL	249·16
Utilities	
Electric power, 200 kWh @ Re. 0·06 per kWh	12·00
Electricity for lighting	1·67
Engineering @ 5% on plant	5·83
Service @ 3% on building	2·25
TOTAL	21·75
Supervision and labour	43·20
Packing @ Re. 0.50 per lb.	200·00
TOTAL DIRECT COST	514·11
Indirect Cost	
Depreciation on plant @ 10%	11·67
Depreciation on building @ 5%	3·75
Indirect labour and administration, insurance, taxes, etc. @ 100% on labour and supervision	43·20
Interest on working capital @ 6%	7·70
TOTAL INDIRECT COST	66·32
TOTAL DIRECT AND INDIRECT COSTS	580·43
Cost per lb.	1·46

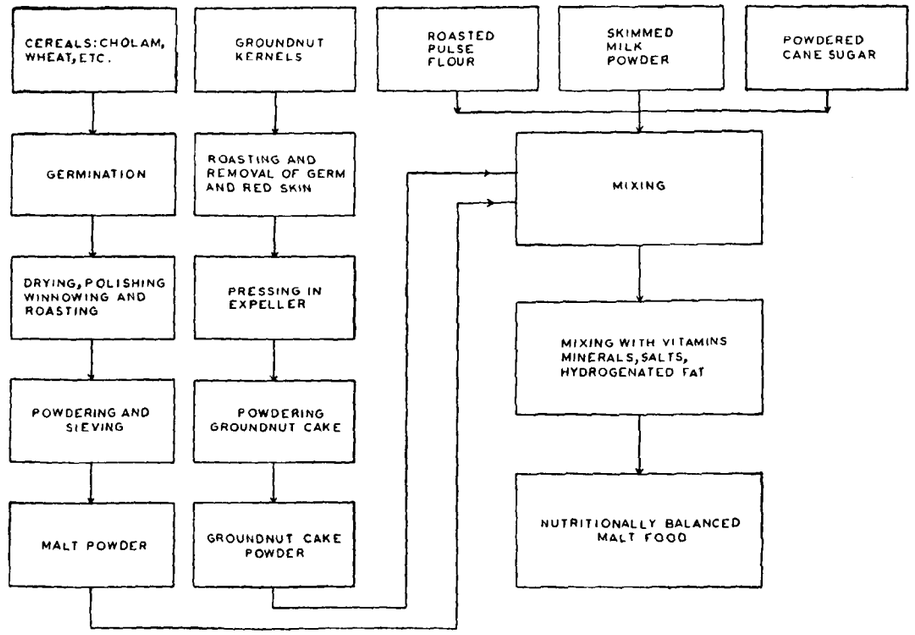


FIG. 1 — PRODUCTION OF CONCENTRATED MALT FOOD — FLOW-SHEET

The equipment required for the manufacture of malt food comprises steeping tanks, racks for malting, malting trays, mixer, shifting units, flour mill, drier, seamer, roaster, polisher, weighing machine and balances. These can easily be fabricated within the country.

Project cost data for setting up a plant (capacity 400 lb. per day) for the manufacture of malt food are given in Table 1. The cost of production comes to Rs. 1·46 per pound.

Treatment for Improving Water Resistance of Sand, Bricks and Cinder

INVESTIGATIONS carried out at the B. & R. Research Laboratory, Karnal have shown that anionic surface-active agents like sulphated castor oil and soap considerably reduce the capillarity and permeability of sand, *surkhi*, cinder, bricks, tiles, etc. The treatment can find application for damp-proofing of floors and in the construction of roads in waterlogged areas where a 1½–2 in. layer of coarse sand treated with 0·1–0·2 per cent soap can be used below the structure instead of a 6–12 in. layer generally recommended. In the building industry, the use of treated sand would yield mortar and concrete with improved water-resistance, requiring less water to make a workable consistency, resulting in better strength. Brick tiles for the roof, soaked in 2-3 per cent soap solution and laid with a cement mortar (containing soap-treated sand), have been found to greatly minimise chances of roof leakage. The extra cost involved in the treatment is estimated to be Rs. 6 per 100 sq. ft. of roof area.

Sand — The treatment is simple and consists in mixing coarse sand with soap solution or sulphated castor oil of a suitable concentration and drying the wet sand in the sun. Sand

TABLE 1 — PERMEABILITY OF CEMENT-SAND MORTAR STICKS

CEMENT : SAND RATIO	SAND USED	CAPILLARY RISE OF WATER IN 24 *hr.* *in.*	MOISTURE ABSORBED IN 24 *hr.*, %	
			Capillary rise	Water immersion
1 : 5	Treated	2·0	0·51	4·50
	Untreated	3·5	3·50	13·20
1 : 6	Treated	1·5	0·45	8·60
	Untreated	5·8	5·50	13·80

treated with 0·3 per cent sulphated castor oil was used for preparing cement mortar in order to test its water-resistance. Sticks (12 × 1 × 1 in.) prepared from the mortar were cured as usual under wet sand and tested for water-resistance by placing them vertically with lower end dipping in a 1 in. water layer in a trough. The capillary rise of water (above water level) in each case was determined after 24 hours. The results are given in Table 1.

Surkhi and Cinder — The materials were powdered and treated with varying proportions of soap (0.05–0·3 per cent) in the same way as sand, and after drying, were subjected to capillary test. Both *surkhi* and cinder responded favourably to the treatment; coarser powders were found to be more suitable for this purpose. The capillary rise in the coarser *surkhi* and *cinder* (— 10, + 100 mesh) treated with 0·1 per cent soap was almost negligible even after 144 hr. of continuous subjection to capillary test. The effect was stable to washing.

Bricks — Dry burnt bricks were soaked in 1 per cent soap solution for 5–10 min. so as to allow the bricks to get saturated with the solution. The bricks were gently rinsed in fresh water to wash off the superfluous soap deposited on the surface and allowed to dry in the sun for a couple of days to constant weight. It was found that when the treated brick was placed vertically with one side dipping in ½ in. layer of water, there was no visible rise of water for four hours, whereas in the case of the untreated brick the water rose to the full height (9 in.) within one hour. The treatment also improves the compressive strength of the bricks. — I. S. UPPAL, *Indian Concrete J.*, **30** (1956), 261; **32** (1958), 82.

Carbon-bonded Graphite Crucibles — *Continued from page 126*

A process for producing carbon-bonded graphite crucibles has been developed according to which the body ingredients are mixed hot and pressed in hydraulic or toggle presses into crucibles. The crucibles are aged, baked in a reducing atmosphere and then flashed at high temperature before storage. The process has been studied on semi-pilot plant scale and crucibles with a capacity of 20–25 lb. of metal have been produced. Service trials in industrial concerns have given satisfactory results.

The crucibles have high corrosion resistance and can, therefore, be used for highly corrosive melts also.

Machinery and equipment required for producing these crucibles consists of size reduction units, mixers, crucible press, baking kilns and flashing furnaces.

Parties interested in undertaking the commercial development of the process are invited to write to the Secretary, National Research Development Corporation, Mandi House, New Delhi.

Cellulose, Lignin, Paper and Other Wood Products

60111 Improvements in preservation of timber : *Pressure impregnating an oil or oily substance along with a toxic element into the timber* — SONTI

Metals and Metal products

61450 Improvements in sheet metal containers : *Flange connecting the plug portion to the sides of the top closely overlies the bead* — METAL BOX CO. LTD.

60509 Process and agent for treating ferrous materials : *Treating agent comprising a mixture of a comminuted metal or alloy and a comminuted refractory material, the refractory material is in the form of particles not larger than 200 mesh* — UNION CARBIDE CORP.

61729 Improvements in steel manufacture : *Injecting a mixture of oxygen and steam or other diluent gases into the charge* — STEEL CO. OF WALES LTD.

58750 Mechano-chemical method for the treatment of molten metal : *Subjecting a shallow stream of molten metal to turbulent flow in a treating zone* — DIAMOND ALKALI CO.

58871 Process and apparatus for enriching titanium ores : *By heating a mixture of TiO_2 containing ore with carbon in three stages i.e. first at 400°-1300°C., then at 1600°–2500°C. and finally at 1200°–2000° C.* — PECHINEY COMPAGNIE DE PRODUITS CHIMIQUES ET ELECTROMETALLURGIQUES

60567 Physico chemical method for the treatment of molten metals : *Subjecting a continuous stream of molten metal to a turbulent flow in a spiral path and contacting the metal with a treating agent* — DIAMOND ALKALI CO.

Engineering

59537 Improvements in the jointing of malleable and thermoplastic materials : *By means of a metallic jointing piece having two end portions of larger width or diameter than the intermediate waist portion* — BATTERY

60598 Improvements in saw teeth, saws, and methods of cutting materials : *Having planing means to plane one side of a saw cut simultaneously with cutting* — WILSON

59807 Improvements in gramophone record changing mechanisms : *Wherein centre spindle has longitudinal slot with actuating rod of record release mechanism* — PLESSEY CO. LTD.

62071 Improvements relating to percussion drills : *A member for abutting the rear end of the tube and having a number of abutments, cooperating means capable of locating at different positions* — SANDVIKENS JERNVERKS AKTIEBOLAG

Miscellaneous

58407 Asbestos wick for safety stove : *Comprising a hollow cylindrical former having an asbestos string wound thereon, and a series of vertical strings constituting the oil carrying medium* — PANTHAKY

59352 An improved advertising or display device : *The advertisement is adapted to be fixed to the outer face of a series of vertical slots forming an endless belt suitably driven* — DANIELS

62543 4 Improvements in dry shaving apparatus having a shear plate which is displaceable in the axial direction or in an inclined position with respect to the axis of the apparatus and a movable cutting member cooperating with the shear plate : *Cutting member and the shear plate are held to one another by resilient means even when no pressure is applied on the shear plate. Movable connection consists of a thin spindle the straight middle portion of which is journalled in the driving shaft and the straight ends journalled in the cutting member* — N. V. PHILIPS' GLOEILAMPENFABRIEKEN

Indian Standards

The Indian Standards Institution (Manak Bhawan, 9, Mathura Road, New Delhi-1) announces the publication of the following standards :

Animal Glue — IS : 852-1957 covers the requirements of animal glue suitable for wood work and joinery. The standard specifies three grades of animal glue having different jelly strength, viscosity and water absorption. Requirements regarding odour, keeping quality, chemical contents and adhesive strength have been specified in the standard. Price Rs. 2·50.

Anhydrous Sodium Sulphite (*Revised*) prescribes the requirements and the methods of test for anhydrous sodium sulphite of technical, photographic, pure and analytical reagent grades. In the revised standard the analytical reagent grade of the hydrated crystalline form of sodium sulphite has been replaced by the analytical reagent grade of the anhydrous form as it keeps free-flowing under all climatic conditions. The requirements for *p*H value have been deleted and new requirements for free acid for the photographic, pure and analytical reagent grades have been added. Requirements for matter insoluble in water for the technical grade and free alkali for the photographic grade and some of the methods of test have been modified in the revised standard. Price Rs. 2.00.

Dye Based Fountain Pen Inks —IS : 1221-1957 prescribes the requirements for sediment, dye content, keeping quality and performance, and also methods of sampling and testing these inks. The Institution had already published an Indian Standard Specification for Blue-Black and red fountain pen inks ; but since red ink is generally dye based, it has also been included in the New Indian Standard.

Steel Doors and Windows — IS : 1038-1957 deals with metal windows, doors and ventilators and covers their range, normally used in houses, flats and office buildings. The present standard is based upon a 10 cm. building module, which has been adopted in India, for purposes of dimensional standardisation in the building industry. Detailed specifications for materials, fabrication and finish have been laid down, as also the standard sizes for guiding the architects and engineers. Sizes of glass panes, required to be used along with the steel windows, have also been given. Price Rs. 3·00.

Identification of Timber of Different Species — IS : 1150–1957 contains the botanical and standard trade names for timber species, along with their abbreviated symbols, with a view to guiding the stockists and other bulk suppliers of timbers in regard to the abbreviations with which each species of timber is to be marked. Such marking will help in classifying timbers for the purpose of seasoning, where different species of timber have to undergo different kiln schedule. Price Re. 1·00.

Mild Steel Square or Hexagon Head Coach Screws with Gimlet Points — IS : 1120–1957. The specification is intended to guide small scale industries in the selection of the raw materials and the manufacture of mild steel coach screws. It lays down the requirements for materials, shape and dimensions and prescribes general requirements for manufacture, workmanship and finish. Tests for materials as well as zinc coating on the coach screws have been specified. The standard covers coach screws of sizes ½ in. to 8 in.; this range is considered to meet the normal requirements of the construction industry. Price Re. 1·50.

Synthetic Resin Adhesives for Construction Work — IS : 851–1957 provides a guide to the selection of the synthetic resin adhesives for general joinery work. It covers three grades, namely, weather and boil proof, moisture resistant and interior. It also covers the gap-filling type as well as the close-contact type of adhesive. The specification lays down the keeping qualities, instructions for use and tests for dry strength, resistance to water and resistance to micro-organisms. Price Rs. 2·00.

Glass Globes for Hurricane Lanterns — IS : 1116–1957 covers two most popular sizes of glass globes, to be fitted in hurricane lanterns. It prescribes the dimensional and performance requirements for the glass globes and lays down the tests for checking compliance with those requirements. Price Re. 1.00.

Reversible Protected Type Two-Pin Plugs and Sockets with Earthing Connections — 1119–1957. The plug and socket combination covered by this standard is the type generally used with portable electrical appliances such as electric irons, heaters, radiators, etc. An important feature of this type is that provision for earthing connection is included in its construction and this adds to safety in the use of the appliance. Besides giving standard ratings, the specification lays down requirements for materials, manner of their construction and detailed tests for electrical performance including current breaking test, insulation resistance test, high voltage test, temperature rise tests and softening point test for the plastic material. The specification also lays down standard dimensions of the plugs and sockets along with the permitted tolerance. Price Rs. 2.00.

Tinmen's Rivets — IS : 866–1957. Tinmen rivets are commonly used in light sheet metal work, such as manufacture of buckets steel trunks and fabrication of air-conditioning ducts. These rivets are required to have adequate hardness, strength and workability. This standard specifies these requirements and deals with the material, shape, dimensions and tests of the rivets. Workmanship, finish and heat treatment have also been included. The specification covers rivets having lengths and diameters up to 14·3 mm. and 7·0 mm. respectively. The standard does not cover large sizes of rivets, commonly known as 'flat-head rivets'. Price Re. 1.00.

Notes & News

Recovery of Waste Calcium Hydroxide

A method for recovering waste calcium hydroxide obtained as a by-product in the carbide process for producing acetylene has been developed in U.K. by *Air Reduction's National Carbide Co.*

The aqueous solution from the acetylene generator containing 12–15 per cent solid calcium hydroxide passes to three continuous solid bowl centrifugal filters, each of which can handle 350 gal. of the slurry per minute. From these is discharged a calcium hydroxide paste containing 60 per cent solids. This paste is conveyed to a rotating kiln, 220 ft. long and 11 ft. diam. heated to 2,000 F. (by natural gas). This produces 335 tons of calcium oxide.

Before entering the kiln the paste is agitated by chains to promote heat transfer. At the exit end of the kiln the temperature of the dry calcium oxide is lowered to about 350 F. by means of an air-cooled heat exchanger. The dry oxide pellets are dropped on to a pan conveyor where further cooling takes place to about 200 F. A vibrating screen then separates out oversize particles which are crushed in a double roll crusher to diameter of $\frac{3}{8}$ in. or less. The screened oxide is passed through a magnetic separator to remove iron particles. The oxide particles ($\frac{1}{8}$ in. and above) are converted into briquettes in specially designed briquetting machines operated at a pressure of 60 tons/sq. in. No binder is used. Highly compacted almond-shaped lumps measuring $1\frac{1}{2} \times \frac{3}{4} \times \frac{1}{2}$ in. are produced. — *Chem. Age*, **79** (1958), 360.

New Process for Calcium Cyanamide

Calcium cyanamide is manufactured by processes based on the reaction between calcium carbide and nitrogen or on the reaction between calcium carbonate and ammonia. Processes based on the first reaction are not very economical because calcium carbide must be used as raw material. Besides, the heat developed during the reaction is difficult to recover because all the reaction products are solid.

The reaction between calcium carbonate and ammonia involves serious technological difficulties; it requires high temperatures at which calcium carbonate tends to break down into calcium oxide and carbon dioxide ($CaCO_3 \rightarrow CaO + CO_2$) and the products obtained have a low fixed nitrogen and high calcium oxide content.

A new process, which eliminates these drawbacks and gives a satisfactory calcium cyanamide yield from calcium carbonate-ammonia reaction while keeping the thermal balance within economical limits, has been patented by an Italian company. Its special feature is that the various factors influencing the result of the operation are strictly controlled. In particular, the linear velocity of the gas stream in the reaction unit and the particles size of calcium carbonate are balanced so as to keep the temperature in the mass almost uniform. Another feature of the process is that it uses carbon monoxide and ammonia instead of ammonia only; carbon monoxide checks the breakdown of calcium carbonate into calcium oxide which would otherwise take place at the high temperature.

Nitrogen is passed slowly into a tube of about 6 cm. diam. heated from outside until the internal temperature of the tube reaches 750 C. Ground marble (400 g.), graded with sieves of 1,600 and 2,500 mesh per sq. cm. is then placed in the tube. A mix of carbon monoxide (50%) and ammonia (50%) is then passed through the tube at the rate of about 400 litres per hour. The temperature of the reacting mass is then rapidly raised to 770–75°C. and maintained at this level for about two hours. During cooling nitrogen is passed through the tube. The product obtained contains about 70 per cent of calcium cyanamide — *Europ. Tech. Digests*, January 1958, 14.

Acetylene and Ethylene Manufacture

A new process for the manufacture of acetylene and ethylene, recently developed by *Tennessee Eastman Corp.*, U.S.A., involves high-temperature breakdown of saturated hydrocarbons and is claimed to be different from any known method for making acetylene. The process has been in operation for over an year on a semiworks plant having a capacity to produce 1 million lb. of acetylene and ethylene per year.

A fuel, such as natural gas, is heated to 600 C. in a preheater from where it goes to the burner in furnace combustion chamber. At the same time, oxygen or air, mixed with a metered amount of low-pressure steam, is heated to 600 C. in a second preheater and also fed to the burner. The amount of oxygen or air used is usually 95 per cent or less than that required stoichiometrically. The plant uses a specially designed furnace having interior made of stabilized zirconia and able to withstand temperatures upto 2,500°C. Hot combustion products discharge from the chamber through a restricted opening at high velocity.

Hydrocarbon cracking feed — propane or natural gasoline — and some low-pressure steam are heated in a third pre-heater. This mixture feeds into the stream of high-velocity combustion products immediately after they leave the combustion chamber. Cracking stocks and combustion products mix in a venturi section and pass into the reaction zone where the dissociation of the cracking stock to form unsaturated products is completed. The products are then quickly cooled with a water spray.

The exist stream is made up of a dozen gases — mainly carbon dioxide, acetylene, ethylene, carbon monoxide, hydrogen, methane, and, in the case of air combustion, nitrogen. Purified acetylene and ethylene are recovered by a hypersorption process, and selective absorption — *Chem. Tr. J.* **142** (1958), 92.

Fluid Coking Process

A fluid coking process has been developed by the *Esso Research and Engineering Co.* for converting residual and related stocks to end products, consisting predominantly of gasoline, gas oil and coke.

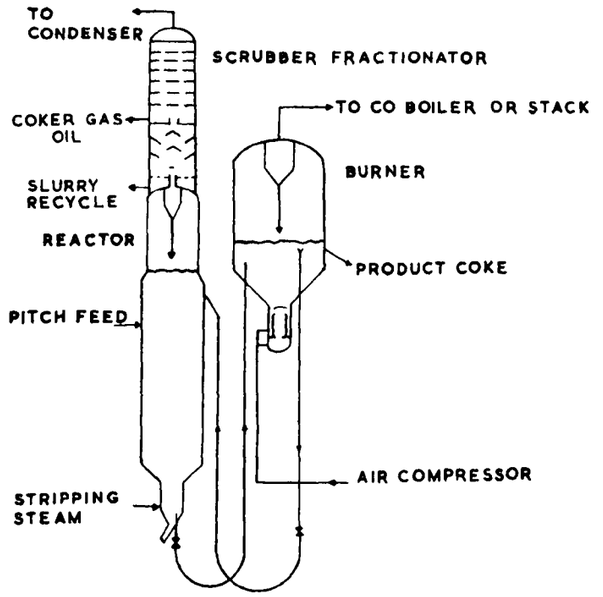


FIG. 1—PILOT FLUID COKING PLANT—FLOW DIAGRAM

The process uses a stirred reactor in which mechanical agitation is substituted for by fluidised gas to obtain the necessary fluidization in the solids bed. The stirred reactor eliminates the necessity for adding extraneous diluent to a small scale, fluidized solids pilot plant to maintain adequate fluidizing velocity. As a result, projected commercial unit process conditions can be more closely simulated in the pilot plant. A flow diagram of the pilot plant (capacity 100 barrels per day) is given in Fig. 1.

The basic elements of the fluid coker are the reactor or coking vessel, and the burner. Residual feed stocks are sprayed as a liquid directly into the coking reactor. Here the liquid feed is distributed as a thin, oil film on the hot, fluidized coke particles. As the oil in this liquid film cracks, it is vaporised and quickly removed from the coking zone, thus avoiding undesirable secondary reactions.

After steam stripping, dry coke is removed from the coking reactor and conveyed by conventional fluid solid techniques to the heater vessel. Here, a portion of the coke produced in the reactor is burned directly with air to raise the temperature of the coke bed. This reheated coke is then circulated to the coking reactor to supply the heat for the process. Any excess coke produced is withdrawn from the heater vessel, quenched, and conveyed to storage tanks in more or less conventional fluid solids equipment.—*Industr. Engng. Chem.*, **50** (1958), 21.

Surface Protection by Hot-Sprayed Plastics

A process has recently been developed in Czechoslovakia for surface protection of metals by means of a hot-sprayed layer of plastics. The plastic material is in the solid state, so that no solvent is needed and parts of varying size can be easily coated. However, a drawback of the process is that the parts have to be heated to 20–30°C. above the melting point of the plastic before spraying.

The object to be coated is first sand-blasted and preheated. The pulverized thermoplastic powder is fed pneumatically into a special hot-spraying gun, where it passes through a flame before reaching the surface to be covered. The plastic melts on impact under the influence of the flame and the heat of the pre-heated object and flows together into a non-porous cohesive film. Coatings 3 mm. thick and more can thus be produced.

The process can be used with all thermoplastic resins having an adequate melting point, polyamides (nylon), polyethylene, thiocol, epoxy resins, polymethacrylate, polyvinyl butyrate, polyvinyl acetate and polyvinyl alcohol.

Nylon has turned out to be the ideal coating material for this process. The preheating temperature in this case is 270–300°C. After spraying, the part is cooled down to 160°C. with hot water to prevent recrystallisation of the nylon. The coating is thus saturated with water and fully elastic. Coated parts can be machined to exact tolerances by turning or grinding in the usual way. Nylon coatings can be applied on cast iron, steel, aluminium and its alloys, and copper and its alloys. Because of the corrosion resistance of nylon, this coating is being widely used for various equipment in the food processing and pharmaceutical industries. It is of particular interest for the protection of parts normally subjected to wear by cavitation ; magnetostriction tests indicate that nylon shows the same resistance to cavitation as stainless steel. A nylon coated Francis-turbine rotor has now been in successful operation for over two years.

Hot spraying of plastics is done by an oxy-acetylene gun designed by the Czech Material Protection Research Institute, Prague. The secret of this gun is the nozzle design which protects the plastic from burning. The jet flowing through the nozzle is heterogenous with successive concentric layers. A mixture of air and powder flows in the middle surrounded by a layer of air which protects the powder from direct contact with the circular flame burning outside — *European Tech. Digests*, January 1958, 18.

Shellac as Binder in Wash Primers

Wash primers or etch primers are becoming increasingly popular for corrosion protection of aluminium and other light alloys. The most satisfactory composition developed consists of a two-pack system, one pack containing a binder (usually

polyvinyl butyral) in a volatile solvent, into which is ground a corrosion-resistant pigment, such as zinc tetroxy chromate. The other pack consists of an accelerator, usually phosphoric acid, also dissolved in a volatile solvent, together with some water. The two components are mixed together just before use.

As a result of investigations carried out by the author at the Paint Research Station, Teddington (England), it has been found that shellac can be satisfactorily used as a binder in place of polyvinyl butyral. For the conventional two-pack system, shellac has to be pre-treated with magnesium oxide before zinc tetroxy chromate is incorporated. The etch primer produced compares favourably with commercial samples based on polyvinyl butyral in all the tests. A satisfactory single-pack system comprises de-waxed shellac dissolved in a mixture of ethyl and butyl alcohols, phosphoric acid and zinc chromate. The composition has an effective shelf life of several months. It adheres well to practically all types of metallic surfaces and is resistant to accelerated weathering and salt spray. — Y. SANKARANARAYANAN, Indian Lac Research Institute, Ranchi.

Sand-Grinder for Dispersing Pigments

A new type of mill employing sand as the grinding medium has been developed at the *Du Pont's Marshall Laboratories* for grinding of pigments. The pigments obtained are brighter and there is less chalking and 'bronzing' (with phthalocyanines) compared to those obtained with a ball or roll mill. The grinder is quieter and faster, power consumption is less, and wear of sand particles, discs, shaft, etc. is considerably reduced.

The grinder consists essentially of a series of smooth flat discs mounted horizontally on a vertical shaft within an upright pipe, the dispenser is filled with mill-base, a fluid vehicle-pigment mixture, to which sand is added. When the shaft is driven at high speed (2400 r.p.m. for a small 2-quart lab. mill, slower for larger sizes), doughnut-shaped regions of extreme turbulence form in the fluid mixture above and below each disc. Mechanical pressure between the grains of sand crushes the agglomerates. The sand used is an ASTM standard sand having uniform naturally spherical particles about 700 microns in diameter. Optimum operating temperatures are maintained by water jackets at 120-50 F.

Equal amounts of sand and pigment (by vol.) give the best results. Screens at mill outlets keep the sand inside the mill while letting dispersed pigment out —*Chem. Engng. News*, 35, No. 47 (1957), 61.

Corrosion Prevention by Surface Tension

A method developed in Germany for the protection of surfaces against corrosion makes use of surface and interface tension to repel corrosive liquids and gases. By a proper surface treatment it is sought to achieve a maximum difference in the tensions between the surface to be protected and the surrounding medium as well as a regular structure of surface. Applications in the field of fireproof furnace linings have shown striking results.

To neutralize the capillary action in fireproof materials (silicon carbides, chamotte, etc.) special preparations known commercially as *Vanal* have been developed. These form protective layers which prevent penetration of gases, vapours and slag and premature deterioration of the structure. The glaze vapours which condense on the furnace crown can also flow away more easily and troublesome incrustations are effectively avoided. Silicon carbide is protected against oxidation and retains its heat conductivity. *Vanal* coatings withstand temperatures up to 1,770°C. in oxidizing as well as reducing atmospheres. In spite of its negligible thickness ((0·1mm.) the coating remains effective for many years — *Europ. Tech. Digests*, January 1958, 9.

Refining of Cottonseed Oil

The National Research Development Corporation of India has approved the institution of a project at Shri Ram Institute for Industrial Research, Delhi, for collecting data on yield and economics of the process on refining of cottonseed oil developed by Prof. T. R. Seshadri, Head of the Department of Chemistry, University of Delhi under a CSIR Scheme. The project is estimated to cost Rs. 6,680.

The process, which has been worked out on a bench scale (10 lb. per batch), provides a new method for obtaining cottonseed oil of improved quality and is claimed to effect substantial saving in time, minimises oil losses, alkali cost and yields an improved soap stock. Large scale application of this process would provide cottonseed oil of improved quality and is likely to be of considerable benefit to the vanaspati industry.

Processes Released Free to Industry

The National Research Development Corporation of India has decided to release to the industry the following processes free of any charge : (1) Chemical polishing of aluminium — *Indian Patent* No. 47401 ; (2) Improvements in the electroplating of metals on aluminium or its alloys — *Indian Patent* No. 51524 ; (3) Improvements in metalisation of non-conductors — *Indian Patent* No. 45579 ; (4) Improvements in brass plating — *Indian Patent* No. 45565 (National Metallurgical Laboratory, Jamshedpur) ; (5) Synthetic tanning materials — *Indian Patent* Nos. 50803 & 50863 (Central Leather Research Institute, Madras) ; and (6) Ceramic colours and glazes (Central Glass & Ceramic Research Institute, Calcutta).

Parties interested in the above processes should contact the Directors of the Laboratories concerned for necessary details.

DDT Factory, Alwaye

The DDT Factory set up at Udyogamandal P.O., Alwaye, (Kerala State) has gone into production. The plant, erected by the American firm Messrs Singmaster and Breyer, has a capacity of 1,400 tons of DDT per annum.

All raw materials for the plant except benzene are supplied by adjoining chemical factories : *Travancore-Cochin Chemicals (Private) Ltd.* supply chlorine and take back the by-product hydrochloric acid ; sulphuric acid (oleum), steam and water are supplied by *Fertilisers & Chemicals (Travancore) Ltd.* and alcohol is obtained from *East India Distilleries & Sugar Factories Ltd.* Benzene is the only raw material which has to be transported from the coke ovens in Bengal and Bihar.

The Process — Manufacture is carried out in three stages : (1) Monochlorobenzene is formed by the reaction of chlorine and benzene and the crude product is distilled. (2) Alcohol is chlorinated with chlorine and the chloral formed is reacted with the monochlorobenzene in the presence of strong sulphuric acid (oleum) to make DDT. The product after purification is obtained in a molten state and cast in slabs. (3) This material called Technical DDT, is ground to a fine powder with china clay and wetting and dispersing agents to make the finished formulated DDT.

The plant, set up at a cost of about Rs. 80 lakh, is modern in design and contains glass lined tanks, graphite pumps and condensers. Much of the piping in the DDT section is made of Corning Visible Glass.

With the going into production of the Alwaye plant and the doubling of the capacity of the Delhi DDT factory, the country's current requirements of antimalarial insecticides will be met from indigenous production. About 2,000 tons of insecticides other than DDT are being produced by private manufacturers ; the total requirements are estimated at 5,000 tons per annum.

Plant for Mica Insulating Bricks

A new industry in India, for manufacturing heat-insulating mica bricks by a process developed at the Central Glass & Ceramic Research Institute (*Indian Pat.* No. 48667) has been established. The factory of Messrs *Bhupal Mining Works* at Bhilwara (Rajasthan) was formally inaugurated by Shri Manubhai Shah, Minister for Industries on 29 March 1958.

The plant for the production of bricks has been designed at the Institute and fabricated by *Western Engineering Co.*, Calcutta. The present capacity of the plant is 2,000–3,000 bricks (nearly 3 tons) per day ; this is expected to be doubled by the end of the current year.

Insulating bricks are extensively used as backing material in the construction of industrial furnaces. The present annual requirements, valued at over Rs. 20 lakh, were being hitherto met by imports of vermiculite bricks.

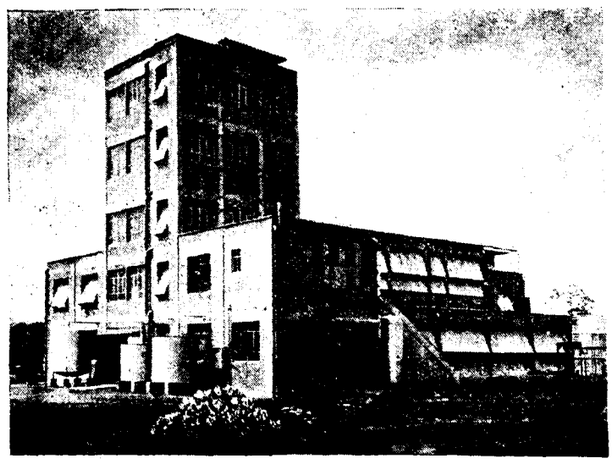
The factory at Bhilwara utilizes scrap or waste mica of the Indian mica industry.

Ethylene Dichloride and Ethyl Ether

Licences for commercial production of ethylene dichloride and ethyl ether according to new fluidised bed processes developed at the Shri Ram Institute for Industrial Research under CSIR schemes have been issued by National Research Development Corporation of India to Messrs *P. Ramanlal & Co.*, Bombay.

Ethylene dichloride is employed as a grain fumigant for domestic fumigation, solvent extraction of oil cakes, degreasing of metal articles, industrial dry cleaning, etc. It is estimated that roughly 1,000 tons of ethylene dichloride and similar materials are at present being imported annually.

Ethyl ether finds extensive use in chemical and pharmaceutical industries, in surgery and as a general anaesthetic.



DDT FACTORY, UDYOGMANDAL (ALWAYE)

Malted Milk Powder and Allied Products

The National Research Development Corporation of India has granted a licence for the commercial development of the Central Food Technological Research Institute's process on Malted milk and allied products (*Indian Patent* No. 46995) to *United Breweries Ltd.*, Bangalore.

Large quantities of products of this type are being imported ; the present annual demand is estimated at over Rs. 1 crore.

Mineral Wool

A licence for the commercial production of mineral wool according to the process developed at Shri Ram Institute for Industrial Research has been issued by the National Research Development Corporation of India to Messrs *R. A. Cole Private Ltd.*, Bombay.

Mineral Wool is an excellent thermal insulating and soundproofing material suitable for insulation of buildings, hospitals, studios, industrial plants, dwelling houses, etc. Materials such as fibre glass, magnesia, cork, loose asbestos and foam plastics, etc., at present used for this purpose, are largely imported. The process of manufacture (*Indian Patent* No. 44382) is based on the use of press mud, a waste material from carbonation sugar factories.

TABLE I—INDUSTRIAL UNDERTAKINGS GRANTED LICENCES

Industrial Undertaking	Line of Manufacture	Capacity sanctioned
Khandelwal Udyog (Private) Ltd., Bombay	Steel storage tanks, rolling structures, trusses and other fabrication works	3,600 tons/ annum
Structural Engineering Works Ltd., Bombay	M.S. Pipes and auxiliary equipments	18,000 tons/annum
Dhrangadhra Chemical Works Ltd., Dhrangadhra	Steel drums	15,000 drums/month
Durgapur Industries Board, Govt. of West Bengal, Calcutta	Coke oven plant	1,300 tons/day of coal and coal breeze
	By-product coal tar distillation plant	50 tons/day
	By-product sulphuric acid plant	9·5 tons/day
Air Conditioning Corporation (Private) Ltd., Calcutta	Industrial blower and exhaust fans	35/month in 1958 45/month in 1959
Textool Co., Coimbatore	Ring frames	75/month
	Fly frames	8/month
	Drawing frames	8/month
	Carding engines	75/month
	Reeling frames	100/month
	Bundling press	8/month
	Blow room	2 lines/month
Machinery Manufacturers Corp. Ltd., Calcutta	Carding engines	600/month
Calcutta Chemicals Co. Ltd., Calcutta	Phenacetin	360 lb./month
Himalay Paper and Board Mills, Calcutta	Mill Board	30 tons/month
Bharat Board Mills Ltd., Calcutta	Mill board, straw board, grey board, ticket board and duplex board	300 tons/month
Bharat Board Factory, Nadiad, Bombay St.	Compressed board, mill board, straw board	1,200 tons/annum
B. D. Gupta & Bros., Thaparangar, Meerut	Crushing sugarcane	800 tons/day
Walchandnagar Industries, Bombay.	Power alcohol, rectified spirit and denatured spirit	30,000 gal./month
Commerce & Industry Deptt., Govt. of Madhya Pradesh, Bhopal	Power alcohol, rectified and methylated spirits	90,000 gal./month
Govt. Alcohol Factory, Hyderabad, Dn.	Power and industrial alcohol	100,000 gal./month
Karnal Distillery Co. Ltd., Karnal	Power alcohol	42,000 gal./month
Manohar Oil Mills, Muthiaganj, Allahabad	Manufacture of vegetable oils	278 tons/month
Omrao Industrial Corp. Ltd., Kanpur	Crushing of oilcakes	70 tons/day
Coimbatore Oil & Fertilizers, Coimbatore, Madras	Solvent extraction of oilcakes	50 tons/day
Swastik Oil Mills Ltd., Bombay	Glycerine	60 tons/month
Associated Cement Co. Ltd., Bombay (plant to be located at Mancherial, Andhra Pradesh)	Portland cement	165,000 tons/annum

Licences for Industrial Undertakings

The Government of India have recently granted licences under the *Industries (Development and Regulation) Act, 1951* to a number of new and existing undertakings for the manufacture of new products and for substantial expansion of existing capacity. Particulars in respect of some of the licences are given in Table 1.

Prestressed Concrete as Applied to Buildings

A symposium on 'Prestressed Concrete as applied to Buildings' was held at the Central Building Research Institute, Roorkee during 10-12 Feb. 1958. Distinguished delegates from China, U.K., France, Japan, U.S.A. and U.S.S.R. and delegates from the building industry in the country took part in the deliberations of the symposium. Dr. A. N. Khosla, Vice-Chancellor, Roorkee University, inaugurated the symposium.

Dr. A. N. Khosla, in his address surveyed the use of prestressed concrete (P.S.C.) in India and abroad. He observed that the greatest obstacle to the use of P.S.C. in India, in spite of its low cost, was the undue difference on the part of engineers in treading new ground and trying new techniques. Other obstacles are the non-availability of high tensile steel and the absence of a system of anchoring prestressed steel bars.

Twenty-two papers dealing with materials and methods, prestressed concrete roofs, and research in and economics of prestressed concrete as applied to buildings were discussed at the symposium.

Lieut. Gen. H. Williams, Director, CBRI, in his paper entitled 'Prestressed Concrete in Building Construction' examined difficulties which stood in the way of extensive use of P.S.C. in building construction in India and made a few suggestions for overcoming those difficulties. He suggested that the National Buildings Organisation (N.B.O.) should organise a course on the use of prestressed concrete for the benefit of building contractors and engineers, and a manual containing recommendations of the code practice and constructional details should be published by the N.B.O.

Referring to the contributions of the Institute, Lieut. Gen. Williams made special mention of the prestressing screw-jack of 5 tons capacity capable of simultaneously tensioning two wires and a simple form of 'individual mould pretensioning bed' for use in the manufacture of pre-cast beams up to 20 ft., fabricated at the Institute.

Panel of Experts for Leather Industries

The setting up of a Panel of Experts for leather and leather goods industries was suggested at a meeting convened recently in New Delhi by the Ministry of Commerce and Industry, to consider the problems facing the industries and their development programmes.

The Panel will consider from time to time problems like shortage of raw hides in the country, survey of indigenous tanning materials, plantation of trees like wattle, *babul* and others, which provide tanning materials, and marketing of tanned hides and skins.

Standardization of leather goods for export markets and efficient functioning of existing units will also be examined by the proposed Panel. It will make recommendations to Government for the development of the industry.

Quality Control of Vanaspati

The Government of India have constituted a Vegetable Oil Products Technical Committee, consisting of nine members, under the Chairmanship of Shri T. Prasad, Chief Director, Directorate of Sugar and Vanaspati, Ministry of Food and Agriculture.

The Committee will advise the Vegetable Oil Products Controller for India on matters of technical nature regarding control over the quality of vanaspati manufactured in India.

ISI Certification Marks

The Indian Standards Institution has granted the following licences for the use of its Certification Mark :

Wrought Aluminium Utensils and wrought aluminium sheets, strips and circles : Rashtriya Metal Industries Ltd., Bombay.

Rectified Spirit : Messrs Carew and Co. Ltd., Asansol.

Tea-chest Plywood Panels : Seventeen firms have been granted licences to use ISI Certification Mark on tea-chest plywood panels manufactured by them. The Standard Mark 'PLYWOOD' will be stamped on plywood panels under the supervision of Development Wing, Ministry of Commerce and Industry, Government of India.

BHC and DDT Dusting Powders and Dispersible Powder Concentrates : Bharat Pulverizing Mills (Private) Ltd., Bombay.

Naphthalene : Shalimar Tar Products Ltd., Calcutta.

Turpentine Oil : Indian Turpentine and Rosin Co. Ltd., Bareilly, U.P.

Copper Sulphate (Technical) : Travancore Chemical and Manufacturing Co. Ltd., Alwaye.

Three-Phase Induction Motors : Hindustan Electric Co. Ltd., Faridabad (Punjab).

Pruning Knives (hooked and curved): Great Eastern Cutlery Works, Calcutta.

Marconi 1958

The new catalogue published by *Marconi's Wireless Telegraph Co. Ltd.*, England gives an overall picture of the extensive range of radio equipment manufactured by Marconi group of companies. The products have been so arranged that with the help of the comprehensive index given at the end, the reader may immediately turn to the pages covering items of his interest. The book has been sectionalised according to functional importance; there are 7 sections dealing with Aeronautical, Broadcasting, Communications, Maritime, Radar, Crystals and Electronic Tubes, and Miscellaneous equipment. Each section has its own contents page which indicates the broad classification of equipment within that section. The publication (632 pages) should be useful to management officials, engineers, agents, buyers and other users of radio equipment.

In Parliament

Utilization of Non-Metallurgical Coal — A scheme has been finalised for setting up a pilot plant to conduct experiments with iron ores of those regions where no metallurgical coal is available to see how far coals locally available would be suitable for the manufacture of steel. Orders have been placed with a German firm for erection of the plant.

Neiveli Lignite Project — Among the different schemes covered under the Neiveli Lignite Project, only the mining part is included in the core of the plan. Although the remaining schemes are not in the core, it is expected that the thermal plant (the foreign exchange requirements of which are being met out of the Russian aid) would also be completed by the end of the Second Plan. Sufficient progress is expected to be made on the fertilizer plant also during the Second Plan period.

The progress made by each of the schemes is as follows : *Mining*—Up to the end of February 1957, about 26·54 lakh cu. yd. of earth had been removed as against 27 million cu. yd. programmed to be removed by the middle of 1960. Lignite is expected to be exposed in early 1960, and by the end of the year, the quantity required for the first unit of the thermal station will become available. The full production stage will be reached in 1961. *Thermal Plant* — An agreement has been signed with Messrs Techno Export of Moscow for the preparation of a detailed project report. *Fertilizer Scheme* — Government have accepted in principle the scheme for the setting up of a fertilizer plant at Neiveli for the production of 152,000 tons of urea containing 70,000 tons of fixed nitrogen per annum at an estimated cost of Rs. 21 crore, subject to adequate credit facilities being available in respect of the foreign exchange requirements of the plan. A detailed project report has been prepared and specifications, on the basis of which invitations to tenders will issue, have been drawn up. *Briquetting & Carbonising Plant* — Tests on bulk samples of lignite carried out in the West

German laboratories have established that the Neiveli lignite is of good quality capable of yielding satisfactory briquettes. Pilot plant experiments, with a view to ascertaining optimum conditions of briquetting etc., are proposed to be undertaken shortly at Neiveli. A provision of Rs. 7 crore has been made in the 1958-59 budget for expenditure on all these schemes.

Fertilizer Plants — No concrete proposal has so far been received by Government from private parties for establishing new plants for manufacture of nitrogenous fertilizers. When such proposals are received they would be considered by Government on merits, if the parties interested in this development are able to secure the foreign exchange requirements for the projects. There are already 14 factories producing phosphatic fertilizers and two factories producing synthetic nitrogenous fertilizers in the private sector.

Dolomitic Lime Manufacture — Dolomitic lime is not being manufactured in India. Government are taking steps to obtain through the T.C.M. the services of a foreign expert to advise in this matter. The question of establishing an experimental centre would be considered in the light of the expert's report. Both dolomites and magnesium lime-stones are available in sufficient quantity in the country.

Production of Rayon Yarn — Three schemes for the production of rayon yarn are expected to be completed before the end of 1958. Two more schemes are scheduled to be completed before the end of 1959 ; work on another scheme to be completed after 1959 is also in progress. Three of the schemes are for substantial expansion of the existing industrial undertakings while the other three are for starting new factories.

Oil Refinery at Gauhati — The Government of India have accepted the offer from Rumania for collaboration in setting up the oil refinery at Gauhati.

The offer has been accepted subject to consideration of the detailed terms on which the refinery is to be installed.

Manufacture of Motor Cycles— During 1957, 1,827 motor cycles were manufactured by a firm in Madras.

The programme of complete manufacture of motor cycles in India is spread over a period of five years. The capacity for which the Madras firm is licensed is 5,000 motor cycles per year ; this is considered sufficient at present to meet the country's full requirements. The present annual demand is estimated at 3,000–4,000 motor cycles.

The following motor cycle parts and accessories are being manufactured in India : piston (complete), seat, petrol tank, spark plug, silencer, inflator, frame, tyres and tubes, battery, rubber parts, bolts, nuts, pins and studs.

The value of the imported parts and accessories is about 60 per cent of the value of a complete motor cycle.

Cultivation of Patchouli — Results of experiments on cultivation of patchouli carried out under CSIR scheme have shown that the plant can be grown successfully in different parts of India. CSIR has been supplying rooted cuttings at the rate of Rs. 5 per hundred and ordinary cuttings at Rs. 2.50 per hundred cuttings to the parties interested in its cultivation. CSIR has also taken steps to publish the results of investigations in a popular form. A note on the production of patchouli oil giving information on the improved methods of cultivation of patchouli with higher yield of oil has been published in *Research & Industry*, 3 (1958), 26.

Building Centre — The National Buildings Organisation has prepared a scheme for the establishment of a building centre ; the scheme is being examined by Government. Meanwhile, steps are being taken to establish a small temporary centre in the Exhibition Grounds on Mathura Road, New Delhi.

Training in Petroleum Technology — A course in petroleum technology has been instituted at the Indian School of Mines and Applied Geology, Dhanbad with effect from July 1957. The course is designed to train petroleum technologists required for the Department of Mines and Fuel, Geological Survey of India, oil companies, etc.

Errata

This Journal, Vol. 3, No. 4, April 1958, article entitled 'Sulphur Recovery from Industrial Gases', page 87, L.H. column, line 7 (from bottom) *for* disulphide *read* dioxide; R.H. column, line 3, *for* water *read* hydrogen sulphide.

Article entitled 'Recent Developments in Foundry Technology', page 94, L.H. column, line 16 (from bottom) *for* resins *read* risers.

Production — Data on capacity and production of alcohol in relation to availability of molasses are given in Table 1. It is seen that there is considerable scope for utilizing more of the available molasses. The gap between molasses available and actually utilized is becoming larger year by year.

Consumption — Table 2 gives data on the pattern of consumption of alcohol as obtaining in 1955. It is seen that of the 5 million gal. of rectified spirit produced, about half the quantity is used as denatured spirit. This includes its use in shellac varnish, lacquer, French polish and a few miscellaneous industries. The production and use of rectified spirit for industrial purposes has not increased beyond one million gal. per year during 1950–55. The quantity used in the pharmaceutical industry is estimated at half a million gallons. About 3 million gal. of rectified and lower strength spirits are also used in the manufacture of potable spirits.

Development Prospects

The prospects for the development of the alcohol industry have to be examined mainly with respect to the availability of raw-materials for alcohol manufacture and the demand which can be built up for the product.

Raw Materials — As the cost of production of alcohol will have to be maintained at the lowest possible level to stimulate new demands, the Committee considers that molasses will continue to be the main raw material for the manufacture of power or industrial alcohol. Besides, the quantity of alcohol that could be produced from molasses, expected to be available during 1955–60, will be much greater than the possible demands for industrial purposes and would leave a considerable surplus to be absorbed as power alcohol. The only other material which is in use to a small extent as a source of alcohol is *mahua* flowers ; this material could continue to be used at certain locations where it is available at a low cost and where the alcohol is intended for use mostly for potable spirits. In the event of pulping plants being established in the country in the near future employing the sulphite process, the manufacture of alcohol as a by-product from the waste liquors would require consideration.

TABLE 2 — PATTERN OF ALCOHOL CONSUMPTION — 1955

(*100% by vol.*)

CONSUMPTION	*Gal.*
Power alcohol	9,300,000
Rectified spirits	2,011,000
Denatured spirits	2,168,000
Potable spirits	4,161,000
TOTAL	17,640,000
Additional anticipated demand on the basis of schemes under implementation*.	44,800,000
TOTAL	22,400,000

* D.D.T., 280,000 gal.; Sirsilk expansion, 800,000 gal. ; Polythene, butanol esters and ethylene dichloride, 3,720,000 gal.

TABLE 1—PRODUCTION OF MOLASSES AND ALCOHOL IN VARIOUS STATES

STATE	MOLASSES (1954-55) (*in thousand tons*)		TOTAL ALCOHOL (1955) (*in million gal.*)		POWER ALCOHOL (1955) (*in million gal.*)	
	Produced	Utilized	Capacity	Production	Capacity	Production
U.P.	350	210	12·7	10·5	10·2	8·1
Bihar	80	40	2·6	2·0	1·3	0·97
Bombay	57	24	3·1	1·2	1·1	0·25
Punjab	11·7	12	1·8	0·6	0·8	...
Southern States	97	50	5·5	2·8	1·5	1·1
Other States	17	20	3·7*	1·5	...	...

* Includes low strength spirit.

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Shellac Adhesives: Part I — Electrical, Automobile and other Industries

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Adhesive compositions containing shellac are used for cementing electric bulb caps, bonding of glass and porcelain surfaces, fixing of brush bristles, and in electrical, automobile and aviation industries.

India's requirements of shellac adhesives have, until recently, been largely met from imports. With the increased requirements of these adhesives for the country's developing economy and the severely restricted imports, there has been a pressing demand for formulations based on indigenous materials. The results of some recent investigations on shellac adhesives carried out at the Institute are reported in this article.

SHELLAC has been used as a constituent of adhesives and cementing materials from early times. Because of its property of adhering strongly to smooth surfaces, such as glass, glazed porcelain, metals, mica, etc. and its resistance to attack by transformer oil and petroleum hydrocarbons, adhesives based on shellac are becoming increasingly popular. However, in spite of the abundant availability of shellac in India the manufacture of shellac adhesives has been mostly confined to foreign countries and the country's requirements of such adhesives, till quite recently, have been largely met from imports. A case in point is micanite, both the principal ingredients of which, namely, lac and mica, are indigenously available ; the method of manufacture is also well known. Yet practically all our requirements of micanite have always been imported.

A beginning in the formulation of shellac adhesives was made during World War II when the imports were almost cut off. A number of compositions were then developed by the Board of Scientific & Industrial Research, Indian Lac Research Institute, *Angelo Brothers* and a few others to meet the war needs. Some of the promising compositions were even patented[1].

Investigations were recently undertaken at the Institute to develop some shellac-based adhesive compositions with a view to explore the possibility of their manufacture in this country. Some findings of practical interest are reported in this article.

Cement for Electric Bulb Caps

Shellac has been used in several compositions for cementing brass caps to electric bulbs and radio valves in the past. During World War II, a composition suitable for low watt bulbs was formulated by reacting hydrolysed lac with furfural or furfuryl alcohol in the presence of an acid catalyst and mixing the resulting product with fillers like kaolin, mica dust, zinc oxide, etc.[2]. A transparent glass-like cement for fixing metal caps to torch light bulbs, automobile lamps, etc. was also made from aleuritic acid, a major component of shellac[3]. These compositions, however, required prolonged curing at 100–105°C. ; besides, these could not be used for high watt bulbs, as the heat developed during the lighting of such lamps softened the cements.

Attempts were, therefore, made to develop cements with better thermosetting properties. In the absence of any standard specifications, the cements were tested according to the specifications followed by the Indian Lamp Manufacturers' Association, Calcutta.

Some of the lac based cement compositions recently developed were tested according to these specifications and the results are recorded in Table 1.

Methods of Preparation — Compositions 1 and 2 (Table 1) were prepared by mixing shellac with saponified lac on an oil bath at 140°C. for one hr., after which the hot melt was poured on a tinplate, cooled and powdered. It was next mixed with fillers, etc. by hot rolling at 90–95°C., cooled and powdered to 80 mesh.

TABLE 1 — CEMENT ADHESION TEST ON ELECTRIC BULB CAPS

	Composition	Curing Time *min.*	Adhesion Test, Glue Failure, %		Moisture Absorption Test Failure after, *min.*	
			Cold cap	Hot cap	Storage in damp atmosphere	Immersion in boiling water
1.	Shellac, 66⅔ parts; hydrolysed lac, 33⅓ parts; zinc oxide, 12 parts; calcium oxide, 8 parts; mica dust, 80 parts; chalk, 200 parts.	4	nil	50	nil	15
2.	do.	4	nil	50	nil	15
3.	Shellac, 30 parts; P.F. resin, 20 parts; calcium oxide, 3 parts; chalk, 200 parts.	3	nil	nil	nil	90

Composition 3 was prepared by intimately mixing shellac and hardners with phenol-formaldehyde resin between hot rollers at 90–95°C. for 5 min., after which the fillers were added and hot rolling was continued till the mixed mass came out in a sheet form. The mass was then cooled and powdered to pass 80 mesh. Pastes for cementing bulbs were prepared by mixing 100 g. of powdered cements with 20–25 ml. of methylated spirit in a mortar or automatic cement mixer till a uniform consistency was attained. The cements were then applied to brass caps which were then set on to the glass bulbs in the capping machine and tested as per specifications. The results are given in Table 1.

It is seen that composition 3 satisfies all the requirements. All the compositions, however, possessed corrosion and insulation resistance specified in the test.

Micanite

Among the different types of lac-bonded insulators, micanites are the most important. These are made by pressing together layers of selected mica splittings, bonded with shellac adhesives. Micanite is generally manufactured on a large scale by building up alternate layers of mica and shellac in an automatic machine, in the shape of a tower, about 20 ft. high, with mica distributing arrangement at the top and means of applying shellac composition at the bottom. In one process, the bond is used in the dry form, in which case, shellac is introduced as a fine powder from the top. When the desired number of layers is built up, the sheets are examined against strong light to ensure uniform distribution of the adhesive and the mica splittings, and absence of any foreign matter, etc. They are then hot-pressed in a multiplaten hydraulic press, provided with steam heating and water cooling. The pressed sheets are then removed.

There is, however, a persistent demand from manufacturers of electrical appliances in India for a process of making micanite on a small scale. To meet this demand optimum conditions appropriate to small scale manufacture have been worked out in respect of (1) the strength and mode of application of shellac adhesive so as to ensure exact bond content, (2) temperature and pressure for baking and pressing, and (3) use of modified shellac composition so as to give better adhesion. The process of manufacture is described below.

Mica Splittings — Mica in the form of flakes or splittings of thickness about 0·001 in. and below and grade 5 to 5½ (i.e. about 2½ to 5 sq. in. area) is generally used. Muscovite or potassium mica, which includes the well-known Indian Ruby mica, is the grade usually employed but, for special purposes, e.g. flush micas for commutators, heating appliances, etc., phlogopite or magnesium mica, known in the trade as 'Amber' mica, is employed. This variety is more flexible than the muscovite and stands higher temperatures without disintegrating.

Shellac adhesives — Kusum shellac of low colour index and good life and flow is best suited for bonding mica flakes. An alcoholic

solution of shellac is generally employed but a better composition can be prepared by dissolving 100 g. of shellac and 2 g. of tartaric or oxalic acid in 200 ml. of methylated spirit and refluxing the solution on water bath for 2 hours. It is then cooled and diluted to the desired strength before use.

There are three broad types of micanite, namely, hard or segment micanite, moulding micanite, and flexible micanite.

Hard or Segment Micanite — This variety, mostly required for commutator segments, is made from muscovite mica splittings for undercut commutators, and from phlogopite mica splittings for commutators in which the segments are not undercut; mica splittings of grades 5 to 5½ are mostly used. A layer of mica splittings is laid on a piece of wire netting (30 mesh) by placing the flakes side by side, so that the splittings are uniformly overlapped and distributed all through. Shellac adhesive, as prepared above, is sufficiently diluted with methylated spirit before application, so as to make an 8–10 per cent shellac solution. The varnish is lightly sprinkled uniformly as fine droplets on the mica layers with a brush, care being taken to avoid distributing the splittings. A second layer of mica is now laid on the first in the same way as before. Shellac varnish is again sprinkled and the droplets spread uniformly by brushing. The cycle of operation is continued until the requisite number of layers has been laid and varnished. Great care is needed in the application of the varnish as the quantity of bond specified for segment micanite is very low (3–5 per cent).

The sheets are next examined over an illuminated screen. As the average sheets are semi-transparent, this method is very helpful for detecting the defects. Any foreign material seen in the sheet is removed, and mica from relatively thick places is spread out with the finger, thus making the sheet more uniform. The sheets are then dried in an oven. In large-scale operation, a vacuum oven, equipped with steam-heated shelves and solvent recovery plant, is most convenient; when operating on a small-scale baking in a steam-heated oven (90–95°C.) for 30 min. serves the purpose. The micanite sheets with the wire nettings are placed between platens in a hydraulic press and hot pressed at 150–60°C. under a pressure of ½ ton/sq. in., for 20–30 minutes. The platens are then cooled before removing from the press. Micanite sheets made by the above method have been found to possess good toughness and strength.

Uniformity of thickness within very fine limits is essential for commutator micanite[4]. These sheets are, therefore, ground to uniform thickness in a sanding machine.

Hard micanite, principally used for commutator segments, also finds application in field spool insulations, insulating barriers, small terminal boards, etc.

Moulding Micanite — Moulding micanite differs from hard or segment micanite in respect of higher bond content (18–20 per cent). When warmed on a steam table (105–15°C.), it becomes perfectly flexible so that it can be moulded into different shapes or used for wrapping round mandrels and conductors.

Usually muscovite mica splittings of grades 5 and 6 are employed for its manufacture and shellac adhesive of thick consistency is used either as such or after diluting with methylated spirit, depending on the desired bond content of the finished material. The method of building up the layers, application of the shellac bond and baking are the same as described before. The sheets are pressed at 120–30°C. under a pressure of 200 lb./sq.in. for 10 min. and cooled to room temperature before removal.

The most extensive use of moulding micanite is in the manufacture of armature slot linings, troughs, angle pieces, tubes, cones, commutator V-rings, etc. To make the V-rings, the most important of these, moulding micanite is cut into suitable segments and built up in staggered layers; these are afterwards moulded in special moulds at slightly higher temperature and pressure than those employed for making the sheets and are finally removed after cooling.

Flexible Micanite — In the manufacture of flexible micanite generally one or two layers of muscovite mica splittings of grades 4 and 5 are bonded together with an adhesive which remains permanently flexible at room temperature so that the sheets can be formed or shaped without the application of heat. The sheet, thus built up is then passed over a hot steam table to drive off the volatile solvents.

TABLE 2 — PROPERTIES OF BLEACHED HYDROLYSED LAC

Starting Material	Yield of Bleached Hydrolysed Lac %	Colour Index (N/1000 Iodine Solution)	Life under Heat, *min.*	Acid Value
Bleached lac	40–45	0·83	81	159·7
Seed lac	55–60	0·50	121	158·5

To facilitate handling and winding operations, the sheet is generally built on strong backings of fine cloth, silk, tissue paper or kraft paper ; sometimes both the sides are reinforced with the same backing material.

The adhesive used for the manufacture of flexible micanite is prepared by heating together rosin and castor oil with or without a small quantity of glycerine. This gives a practically clear and transparent product. Hydrolysed or saponified lac may be used in place of rosin. This has been found to give a better quality of flexible micanite as regards electrical insulation and durability, but the colour of the resulting product is brown or dark brown. This defect may, however, be overcome by using bleached hydrolysed lac (obtained by saponifying bleached lac). It has been further observed that if the composition is prepared by first hydrolysing seed lac with caustic alkalis and then bleaching immediately before precipitating with acid, not only is the cost appreciably reduced, but colour index and other properties of the material also improve considerably (Table 2).

Flexible micanite has many and varied applications in electrical insulation since it can be formed and bent into any desired shape without the application of heat. It is extensively used for slot lining, coil insulations in electric machines and extra high tension transformers. Different varieties of the material under various trade names such as micafolium, mica cloth and paper, mica tape, mica cambric, etc.[5], are manufactured using the same type of adhesive and mica splittings, varying only the number of mica layers, backing fabric, etc.

Miscellaneous Applications

Adhesive for Brush Bristles — The following composition has been found suitable for fixing bristles of shaving brushes : Shellac (100 parts) is dissolved in spirit (300 parts) and urea (15 parts) and formalin (50 parts) are added and the solution is boiled under reflux for 2 hr. on water bath, after which maleic acid (1 part) is added and refluxing continued for another ½ hour. When cold, sawdust (20 parts, sp.vol. 90 cc.) is mixed with the adhesive. Bristles fixed with the above composition have to be baked at 100–110 C. for 3–4 hr. for proper setting.

Adhesive for Glass and Porcelain — A cementing composition for bonding glass and porcelain was developed earlier at the Indian Lac Research Institute by esterifying the condensation product of shellac acids with maleic anhydride followed by reacting the resulting product with benzoyl peroxide[6]. The method of preparation of the adhesive was rather involved and required long hours of heating followed by vacuum distillation. As a result of recent investigation, a much simpler recipe has been developed.

Hydrolysed lac (50 g.) and maleic anhydride (5 g.) are condensed on an oil bath at 120–130°C. for 2 hr. with stirring. Shellac (25 g.) is dissolved in rectified spirit (75 ml.) and the solution is added slowly to the condensed product after it has cooled down to 80–90°C., and then mixed well. Zinc chloride (5 g.) is finally added and the paste thus made is diluted with spirit to working consistency.

For bonding glass or porcelain surfaces, the adhesive paste is applied on the clean and dry surface which is then baked under slight pressure at 80°C. for 2 hr. and finally at 130°C. for ½ hour.

Gasket Shellac Compound — On account of its high resistance to attack by oils and petroleum hydrocarbons, shellac is extensively used in the automobile and aviation industries, for making petrol and gas-tight seals in engines and fuel lines[7]. It is also used as a jointing compound in ordinary cargo and passenger vessels for plate seams and water-tight bulk heads.

A composition for gasket shellac compound developed at the Institute has been found to be superior to those ordinarily available in the market as regards adhesion, flexibility, and shock and oil resistance. The composition is prepared by mixing the following ingredients : shellac, 1 lb. ; saponified lac, ⅛-¼ lb.; methylated spirit, 450 ml.; *n*-butyl alcohol, 60 ml. ; and toluene, 90 ml.

The composition has been tested in the laboratories of the Technical Development Establishment, Kanpur and reported to work excellently as a jointing harmetite compound.

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Recent Developments in Thermal Insulating Materials*

The article describes some recent developments in thermal insulating materials for use in industrial equipment, building insulation, cold storage, domestic refrigerators, etc.

A large part of the country's requirements of insulating materials is still met through imports. A review of the developments in the field would show that there exists wide scope in the country for the expansion of the industry. Some of the insulating materials recently developed, such as foam glass, foam concrete, mica insulating bricks, mineral wool, and thermocole are capable of effectively replacing many of the imported materials.

INSULATING materials having low thermal conductivity, find extensive application in air-conditioning, refrigerators, insulation of hot and cold pipes, residential and factory buildings, studios, etc. In industrial plants they are used to lower the temperature of pressure vessel shells and to prevent 'sweating' or 'icing' on warmer surfaces of equipment operating below ambient temperatures.

The materials commonly used for thermal insulation are cork and cork products, wood fibres (loose or felted), processed agricultural wastes, mineral wools, cellular rubber, foamed plastics, magnesia, asbestos, porous clay products and aluminium foil. Corn husk, sawdust shavings, etc. are also used, on a limited scale, particularly where cost is the prime consideration. Organic substances being more susceptible to damage by water, moulds and fungi, find lesser use in thermal insulation than inorganic materials. India's annual requirements of some of the insulating materials are estimated as follows : fibre glass 1,000 tons, magnesia (85%) 1,200 tons,

* Contributed by the Survey and Statistics Section, National Research Development Corporation of India, New Delhi-1.

loose asbestos 25,000–30,000 tons and insulating bricks 60,000 tons (by 1960–61). The consumption is expected to increase considerably with the progress of development plans.

A substantial part of the requirements of insulating materials is at present met through imports. Data for imports of some of the materials during 1956–57 are given in Table 1.

Some of the properties which determine the suitability of an insulating material for various applications are thermal conductivity, density, strength, hardness, flexibility, inflammability and thermal expansion; chemical properties are also important, particularly with regard to the corrosive effects, if any, on structural materials. Thermal insulating materials are generally classified according to the temperatures at which they are used.

Table 2 gives data on the temperature range and typical applications of some insulating materials.

Recent developments in respect of some important insulating materials are surveyed here.

Cork and Cork Products

A fibrous sheet material[1] containing cork has recently been developed in U.S.A. The product consists of paper making fibres and fine cork particles and is bonded with a synthetic rubber latex.

A number of substitutes for cork are known. A method of preparing artificial cork stoppers, refrigerator pads and other insulating materials has been patented by the Council of Scientific & Industrial Research[2]. The process consists in heating rubber to 50–80°C., mixing it with cotton, bamboo or Jute waste and a mixture of sulphur, zinc oxide and sodium bicarbonate. The mixture is cooled, solid stearic acid is sprinkled on the surface and the mass baked in an oven.

TABLE 1 — IMPORTS OF SOME INSULATING MATERIALS, 1956-57

MATERIAL	QUANTITY	VALUE *Rs.*
Cork manufactures, *cwt.*	31,380	4,798,814
Asbestos		
Raw, *cwt.*	347,003	22,257,351
Manufactures, *cwt.*	...	11,282,312
Magnesium Carbonate		
Natural, *cwt.*	15,767	469,040
Calcined, *cwt.*	4,040	80,610
Precipitated, *cwt.*	17,422	883,030
Insulating Bricks*, *No.*	727,734	1,639,558
Insulating Boards, *cwt.*	13,673	701,651
Glass Wool*		
Loose fibrous, *cwt.*	...	413,478
Fabrics, *yd.*	13,324	16,995
Fibrous glass-textile products, *cwt.*	...	80,131

* Jan. – Oct., 1957

Wood & other Cellulosic Fibres

Insulating boards made of wood fibres or bagasse are extensively employed as sheathing material and as a plaster base of inner surfacing of rooms. These boards have good structural strength, can be handled easily and are available at a low cost.

A light weight insulating material *Thermocoustic* based on bonded agricultural fibres has been recently placed in the market by *Messrs Vishwakarma Constructions (Private) Ltd.*, Calcutta. The material has a thermal conductivity of 0·36 B.t.u./sq. ft./hr./in./°F. and weighs about 15 lb./cu. ft.

A process developed by the Council of Scientific & Industrial Research[3] for the manufacture of heat insulating light weight padding materials from agricultural wastes consists in partially cooking bagasse with lime or alkali and adding short-sized fibrous materials such as disintegrated sisal, jute flax, rice husk or asbestos for obtaining the necessary porosity. Partially digested bagasse acts as a binder. These materials, if developed in the country, could largely replace insulating and sound proofing boards such as *Duplex*, *Cellotax*, etc. which are at present imported in large quantities.

Cattle hair in the form of felt blankets together with asphalt are used (for temperatures up to 200°F.) for insulating pipe bends, fittings and other irregular surfaces. Insulating materials from leather scrap[4] and vegetable oil pitch[5] have also been developed.

Foam Plastics and Cellular Rubber

Insulating materials made from foam plastics and cellular rubber are finding considerable application because of their low thermal

TABLE 2 — APPLICATIONS OF SOME THERMAL INSULATING MATERIALS

MATERIAL	TYPICAL USES
I. *For use below 50°F.*	
Cork	Ice-boxes, cold storage
Mineral Wool	
Loose fibrous or granulated	Fill insulation
Lightly bonded blankets, blocks or boards	Refrigerated cars & trucks, domestic refrigerators, food storage boxes & portable equipment
Silica aerogel	Cold storage
Cellular plastics & rubber	Liquid gas containers, domestic refrigerators
Cattle hair	Pipe bends, fittings & other irregular surfaces
Aluminium foil	Railway vans & refrigerated trucks
II. *For use from 50 to 300°F.*	
Mineral wool blankets	Walls & ceilings
Expanded vermuculite	Filling wall cavities of buildings & between top floor ceiling joints
Cotton fibres treated with flame proofing composition	Sheathing, plaster base or as inner surfacing of rooms
Insulating boards made of wood, fibres or begasse	Between joints of buildings
Mineral wool	
Blankets reinforced by asbestos wiremesh or expanded metal	Heated tanks, towers, ovens, dryers
Blankets without reinforcing	Domestic range, heated pipes
Asbestos	
Corrugates asbestos paper sheets or blocks	Hot-water heaters, ovens, hot water pipes, low pressure steam pipes and process lines
Boards	Fire-proof surfacing material
Insulating cements (containing asbestos, mineral wool and 85% magnesia)	Used where insulation is required in transit
Wool felt	Hot & cold water lines
III. *For use from 300 to 600°F.*	
85% magnesia	Ovens, boilers, locomotives, steam pipes, stills
Asbestos blankets	For frequent removal and re-application of insulation, wrapping pipes and for application on irregular surfaces
IV. *For use above 1000°F.*	
Diatomite	Furnaces, kilns, high pressure boilers, steam lines, metallurgical furnaces, flues and regenerators (up to 1900°F.)
Calcium silicate	High pressure boilers, steam lines, furnaces (up to 1200°F.)
Asbestos	
Blankets	Turbines, fitting flanges, valve bonnets (850°F.)
Blankets enclosed in metal foils	High pressure turbines, jet engines
Insulating firebricks & blocks	Furnaces up to 3000°F.
Insulating bricks	Backings for industrial furnaces
Ceramic fibre, loose or felted	Thin insulation papers (2300°F.)
Fibrous silica	Jet aircraft (up to 2000°F.)

conductivity and good water resistance. An excellent material *Thermocole* (density, 1·0–1·25 lb./cu. ft.; K value, 0·179 at 0°F.) is now being manufactured in India. This material is a foamed polystyrene and is finding extensive use, particularly for low-temperature insulation.

Recent developments[6–9] in the manufacture of cellular plastic materials for thermal insulation include products like cellular polyamides, polyesters, polyacetals, polyethers and polyanhydrides wherein cyclic ethylene carbonate is used as a blowing agent. Foamed synthetic resins coated with other resins (to render them moisture resistant), fibrous material consisting of reclaimed tirecord, cotton fibres and powdered phenol formaldehyde resins and cellular thermoplastic bodies based on PVC have also been

developed. Several other thermoplastic resin compositions using various blowing agents under heat and pressure to produce expanded materials have also been patented[10, 11].

A recent Japanese patent[12] describes a hard rubber composition based on vinyl chloride and butadiene polymer ; the material is water-resistant and heat-insulating.

Another heat insulating coating[13] especially for fuel tanks of aeroplanes, fuel hoses, cables, etc. has been developed in U.S.A. from chloroprenepolymer, diammonium hydrogen phosphate and urea formaldehyde resin dissolved in a volatile liquid.

Foam Glass

Foam glass is a lightweight thermal insulating material consisting of glass expanded 10–16 times into a multitude of non-communicating cells resembling the structure of a honey comb. It combines rigidity and moderate strength with lightness and high insulating efficiency. Being incombustible, rotproof and impervious to moisture and vapour it does not break down or deteriorate during use. Foam glass is being manufactured on commercial scale in U.S.A. and U.S.S.R. and finds extensive application in air conditioning and cold storage as well as for insulating hot and cold pipes, tanks, etc. Investigations undertaken at the Central Glass & Ceramic Research Institute, Calcutta to develop an indigenous material with similar insulating properties have led to the development of a process for the manufacture of foam glass[14]. The manufacturing details and cost data have been worked out on a pilot plant scale. The process consists in melting glass of suitable composition, grinding to a fine powder and mixing it intimately with a foaming agent. The mixture is charged into moulds and heated when the mass swells to several times its original volume. The foamed mass is then taken out of the moulds, annealed and cut into blocks of desired size and shape.

Foam glass weighs only 1/15 as much as concrete and can carry a load of 6–7 tons/sq. ft. It can be easily cut and worked with common masonry or carpentary tools and is simple to install. The pieces can be joined together with asphalt or asphaltic cement and can be plastered directly with a suitable medium. A 2-in. layer of foam glass on the roof of a house will substantially reduce room temperature. In a tropical country like India this material has immense potentialities.

Other methods [15–18] for the preparation of cellular glass from suitable compositions include the use of coke, iron oxide, antimony oxide, or gassing agents like calcium carbonate, urea, etc. A foam-forming acid-resistant cement which is also heat insulating has been prepared from water glass, talc, ammonium sulphate and aluminium powder.

Foam Concrete

Foam concrete of low density (20 lb./cu. ft.) is also used for heat insulation in cold storage, air-conditioning, pipe insulations, blocks, etc. The concrete is prepared by adding a foaming agent to a cement and sand mixture. New foaming agents suitable for production of low-density concrete have been developed at the Central Building Research Institute, Roorkee. The process has recently been released for commercial development to the *Hindustan Housing Factory*, New Delhi.

Asbestos

Asbestos is used for insulation of hot water pipes, low pressure steam pipes and process lines. Asbestos blankets are used for application on irregular surfaces and also where removal and re-application of insulation is required. Asbestos blankets enclosed in metal foils are used at higher temperatures for insulating high pressure turbines, jet engines, etc. Corrugated asbestos paper sheets and blocks made up of alternate plies of corrugated or plain paper and asbestos are employed in the manufacture of water heaters, ovens, etc. Asbestos impregnated with asphalt[19] or cyclic pentene[20] and drying oils gives insulating material having high dielectric strength and resistance to moisture and heat.

Magnesia

A mixture of basic magnesium carbonate (85%) and asbestos fibre (15%) is probably the most widely used insulating material up to 600°F. Magnesia (85%) is used for insulating ovens, boilers, locomotives, steam pipes, stills and for many other applications. For higher temperatures 85% magnesia is used as the outer layer ; it is made in blocks, pipe section and other special shapes. A composition[21] containing sawdust, magnesia and magnesium chloride gives a light, porous and non-inflammable insulating material.

Silica Aerogel

Silica aerogel is a fine powder having a remarkably low thermal conductivity. It is prepared[22] by treating sodium silicate with sulphuric acid and heating the mixture in an autoclave or treating[23] the conventional gel with acetone or ethylene oxide. Silica aerogel is used mainly for low temperature insulation, especially in liquid gas containers and domestic refrigerators.

Insulating Bricks

The present production capacity of insulating bricks in India is 4,000 tons per annum. The country's requirements by 1960–61 have been estimated at 60,000 tons per annum. Licenses have recently been issued to two firms for the production of nearly 12,250 tons of insulating bricks per annum.

Insulating bricks or high silica bricks are extensively used in furnace linings to back up refractories ; they are, however, not suitable for direct exposure to flame. Insulating fireclay bricks are suitable for direct flame exposure and can withstand temperatures up to 3,000°F. The bricks are rendered porous by mixing with the clay an organic material like sawdust which is later burnt out during firing. Processes in which clay is mixed with waste sulphite liquor or waste products from sugar factories (like molasses) and fired to give porous structure have also been described[24, 25]. Incorporation of alumina and metallic aluminium in clay[26] increases the volumetric stability of insulating refractory bricks at high temperatures. A process relating to the preparation of heat insulating bricks from paddy husk ash and iron oxide granules with an organic binder has been reported[27].

For moderate temperature furnaces, vermiculite bricks are used. Good quality vermiculite has to be imported and is expensive. The Central Glass & Ceramic Research Institute, Calcutta has developed a process[28], by which insulating bricks comparable in properties and performance to vermiculite bricks can be made from waste mica.

Trials of mica bricks conducted on laboratory and industrial furnaces have yielded highly satisfactory results with regard to thermal insulation. The use of such bricks on a muffle furnace resulted in a fuel saving of 30–40 per cent. A plant for the manufacture of mica bricks has recently been installed at Bhilwara (Rajasthan).

Mineral Wool

Mineral wools such as rock wool, slag wool, glass wool, and ceramic fibre are useful for low and high temperature insulation. Such wools are obtained in the form of fine fibres by drawing or blowing air or steam through molten rocks or molten slag from blast furnaces. Recently a process for the manufacture of slag wool by suction effect has also been patented[29].

A process for the production of mineralwool[30] from press mud obtained from carbot nation sugar factories has been developed a. Shri Ram Institute for Industrial Research The process consists in mixing press mud with river sand in requisite quantities together with a fluxing agent. The mixture is melted in a specially designed high temperature furnace. The molten mass which comes out at about 1,000°C. is atomised, using high pressure steam or air, into tiny globules which are attenuated into fine fibres. These fibres are collected in a chamber and taken out continuously over a belt conveyor. Mineral wool obtained by the above process consists of fine resilient mineral fibres which are fire-proof, rot-proof, and vermin-proof. This wool is safe to handle and easy to install ; one ton of wool can cover 25,000 sq. ft. of surface area, 1 in. thick.

Loose, fibrous or granulated mineral wool is used when a fill insulation is desired. Lightly bonded blankets or matresses are employed to insulate refrigerated tank cars and trucks, domestic refrigerators, food storage boxes, portable equipment, buildings, domestic ranges, hot and cold pipes, etc. Mineral wool obtained from lead slag and press mud in the form of boards or blocks can withstand temperatures up to 1,400°F. and that obtained from kaolin or bauxite up to 2,300°F.[31].

Mineral wool also possesses excellent sound absorption properties. Sound absorbing and insulating building materials have been obtained from rock wool, gluten[32] and frothy sodium carbonate solution. Insulating sheets are prepared by coating the mineral wool fibres with and casein[33] in ammoniacal solution.

The present production of mineral wool in India is negligible. Licences for the manufacture of mineral wool have been recently issued to *Messrs Punj Sons Ltd.*, New Delhi, *Pandit Kanahya Lal Punj*, Delhi, *Hoare Mills & Co. Ltd.*, Calcutta, *Bombay Co.*, Bombay ; *Insulating Material Manufacturers*, Bombay and *Messrs R. A. Cole & Co.*, Bombay.

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Tata Iron & Steel Company, 1908—1958

THE fiftieth anniversary of the birth of the Indian steel industry was celebrated at Jamshedpur on 1 March 1958. On this day, 50 years ago, was founded through the genius and pioneering efforts of Jamshetji Tata, India's first integrated steel works at what was then Sakchi, a tiny village, 150 miles west of Calcutta.

When *Tata Steel* was first formed, the initial ingot capacity of the plant was 100,000 tons per annum ; it consisted of a battery of coke ovens, two blast furnaces, one steel melting shop, a blooming mill, a rail and structural mill, and a bar mill. After the First World War, the plant capacity was expanded to 450,000 tons of ingot steel. With further additions to the plant over a period of years, the steel works, during the Second World War, achieved a peak production of 1,237,000 tons of pig iron, 1,082,000 tons of steel ingots and 839,000 tons of saleable steel. The plant, in fact, was over-worked during the Second World War and a modernisation and expansion programme was introduced to raise the capacity to 1·3 million tons of steel ingots. Into this was dovetailed in 1955, a new expansion programme, the two together being designed to raise the output of the works to two million tons of steel ingots per year. For this purpose, the Company entered into a 130 million dollar contract with *Kaiser Engineers*, a Division of the *Henry J. Kaiser Corporation*, for the engineering, procurement, construction and supervision services ; the project was to be completed in thirty months.

The scope of the two million tons programme (TMP) ranges from the mining of ore and other raw materials to the finishing mills and embraces practically every phase of production. It also involves improvement and expansion in services, such as electrical distribution, water, fuel, roads, sewers and

Top : A TISCO BLAST FURNACE, 1,650 TONS PER DAY, UNDER ERECTION

Bottom : CHARGING AN OPEN HEARTH FURNACE. FIVE 200-TON LIQUID FIRED OPEN HEARTH FURNACES HAVE RECENTLY BEEN SET UP

transport. The principal items included in TMP are a battery of 26 coke ovens ; a new blast furnace with a 28 ft. hearth designed for top pressure operation (output, 1,650 tons of pig iron per day) ; a sintering plant of 5,000 tons per day capacity to use iron ore fines ; a new steel melting shop with seven 200-ton open hearth furnaces and three 32-ton converters, and three new rolling mills — a 46 in. blooming mill, a medium and light structural mill, and a sheet bar and billet mill.

In 50 years, *Tata Steel* has made over 22 million tons of steel, paid Rs. 175 crores in wages and bonuses, Rs. 45 crores in dividends, Rs. 70 crores in taxes and Rs. 40 crores into the Government price equalisation fund. It has saved the country hundreds of crores in foreign exchange ; such savings amount to some Rs. 50 crores a year at present and will rise to Rs. 90 crores with the completion of the two million ton programme.

Manufacture and Use of Building Lime in India — A Symposium

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The shortage of cement required for various development projects has brought into focus the need for developing the building lime industry in India. It is estimated that even after taking into consideration the proposed plans for the expansion of the cement industry, there would still remain the need for reviving the building lime industry in the country.

The symposium discussed the factors responsible for the decline of the building lime industry and the problems connected with the renovation and development of the industry.

THE building lime industry in India, which has been a flourishing industry in the country from early times, has been on the decline in the past few years. The set-back started with the advent of cement in the country and was aggravated subsequently by the non-availability of standard quality lime in adequate quantities due to lack of organised industry and proper marketing methods. In the absence of an adequate and stable demand from the public sector, the industry was left only with small lime manufacturers catering to the requirements of mostly individual builders.

In recent years, however, the shortage of cement required for the various development projects has brought into focus the need for developing lime as a substitute for cement. It is estimated that even after the planned production of cement has been realised, its *per capita* consumption in India will be a small fraction of the quantity consumed in industrially advanced countries. In these countries lime is being used even today as a building material in plaster and mortar to an appreciable extent. Thus even after taking into consideration the proposed plans for the expansion of the cement industry there would still remain the need for reviving the building lime industry in the country.

With a view to consider the various problems connected with the industry and its revival, the National Buildings Organisation (NBO) organised a symposium on the Manufacture and Use of Building Lime in India during 15 - 18 March 1958 at Rewa (Madhya Pradesh), in the heart of the lime producing region. This enabled the delegates participating in the Symposium, numbering over 125, to study at first hand the present position of the industry and to discuss the various problems with the manufacturers.

Shri A. K. Chanda, Union Deputy Minister for Works, Housing and Supply, while addressing the symposium, analysed the factors responsible for retarding the development of the industry. He made particular reference to the present policy of leasing the quarries on short term basis, transport bottlenecks, lack of facilities for testing and certifying the quality of lime produced, lack of initiative on the part of industry to mechanise and improve the methods of quarrying and winning and to set up efficient kilns for production of lime on a large scale. This state of affairs of the industry could be attributed to the lack of demand arising from lack of knowledge among the users about the correct methods of slaking, mixing, curing, etc., of lime and its advantage over cement in certain respects. Shri Chanda observed that up-to-date plant and machinery to produce quality lime, which could be marketed in the same way as cement, would help develop this industry.

Shri C. P. Malik, Director, National Buildings Organisation observed that while there were limitations for stepping up the production of cement in the country because of the limited availability of foreign exchange required for importing the machinery, lime could be manufactured in the required quantity at a much lower cost. The production of lime is simple and lime-mortar has good plasticity and workability ; it is, therefore, easier to apply and gives good adhesion to bricks. Because of these advantages some of the industrially advanced countries are producing lime and using it as a building material in plaster and mortar.

Shri Malik stressed the need for popularising the use of lime and indicated the steps which NBO has taken in this direction. He referred to the report of the Experts Committee published by NBO which recommended increased use of lime in place of cement ; efforts are being made to give effect to these recommendations. The NBO has also published a bulletin on Masonry Mortars (*Technical Information Series* No. 2 (1957) which contains valuable information on lime mortars.

Recently a country-wide survey of the lime industry in India was conducted on behalf of NBO by an expert from the lime industry. The report, which is now available, presents information, statewise, on lease procedure, quarrying practices, transport facilities, coal allotment, kiln design and burning and marketing facilities. It deals with the difficulties which the industry would have to face for its development and recommends ways and means of tackling them.

The NBO is now trying to secure the services of a foreign expert to assist the industry in its development.

Shri Malik suggested the formation of an All India Lime Manufacturers' Association to promote the development of the industry. This suggestion was later discussed by the manufacturers and a Sub-Committee was formed to take further action in the matter.

Dr. K. N. Katju in his inaugural address observed that lime had been a traditional building material all over the world and with increased knowledge of its properties its field of application had widened. He referred to buildings like the Taj and Khajuraho temples in the construction of which lime formed the principal material. He felt that efforts must be made to remove the restrictions which affected adversely the quality, marketing and use of lime. Lime industry was also intimately connected with mining and chemical industries. It was, therefore, desirable that research should be conducted in the methods and techniques of using lime.

Twenty technical papers dealing with limestone deposits, quarrying practices, kiln operation, and testing and standardization were presented and discussed at the Symposium in four technical sessions.

Limestone Deposits

The papers presented on behalf of the Indian Bureau of Mines and Geological Survey dealt with limestone deposits in India with respect to their quality and quantity. Limestones occur in almost all the geological formations but there are some regions in the country with major deposits, e.g. the Himalayas in the North, which contain inexhaustible reserves of high quality limestone ; the Vindhyan formations in Central India, which constitute the most important source of the material for the lime and cement industries in the country ; the coastal deposits of Kathiawar ; Cuddapah and Kurnool formations ; pre-cambrian and Cretaceous lime-

stones of the Indian Peninsulas ; and high grade reserves of Assam.

Most of the bedded limestone deposits are of marine origin and are uniform in physical characteristics and chemical composition. The Archaean limestones which have undergone metamorphism are generally crystalline and show wide variation in composition and texture. The other common deposits are Marl, traverine, chalk, concretionery limestones (*kankar*) shell limestones, etc. A detailed report on the subject is proposed to be issued by the Geological Survey of India.

The Director of Mines and Geology, Rajasthan, made an assessment of the limestone reserves occurring in different parts of Rajasthan, and gave details regarding production in some of the lime producing centres of the State.

Quarrying Methods

A paper dealing with the existing practices of leasing the quarries in so far as they affect the building lime industry was presented by Shri Rabinder Singh of National Buildings Organization. At present there are no set rules in a number of States for leasing of limestone, as a minor mineral ; the lease period varies from 1 to 20 years. In order to encourage the development of the industry on a sound basis, it was emphasized that the Mineral Concession Rules which apply to limestone leasing for steel and cement industries, should also be applicable to limestone used for production of building lime on an organized basis. The methods of quarrying in vogue in the industry and the possibility of using machinery for the purpose to save labour and working costs were dealt with by Shri Baijal of *Satna Stone & Lime Co.* Improved methods for removal of overburden such as the use of bulldozer and scrapers, and tipping wagons were suggested. The difficulties experienced by the industry, such as shortage of electric power, high cost of explosives, imported machinery, and shortage of empty wagons were also mentioned.

Design and Operations of Lime Kiln

Shri N. Macedo of *Dyers Limestone Co.* discussed three types of kilns for burning lime : (1) Rotary kiln (2) Fluo-solids kiln and (3) Vertical kiln. The merits and demerits of each of these were discussed. The vertical kiln is considered to be the most suitable on account of its high efficiency and possibility of easy adaptation from the existing kilns.

Shri Macedo dealt with common operating difficulties in lime kilns and the possible methods of their rectification. The major drawbacks were hot-lime, over-burnt lime, excess air discoloured lime and the problem of smalls.

The economics of oil-fired kilns was discussed by Shri P. Govindakrishnayya of *Burmah-Shell.* He advocated the use of oil particularly in the coastal areas. The use of Hoffman kiln and steam burners was also recommended to raise productivity in the industry.

Hydrated Lime

Method of hydrating lime and equipment required for the purpose were discussed in a paper from *Mettur Chemicals.* The paper also gave cost data for various methods of bagging lime. The use of cement gunnies lined with alkathene has been found to be the best and most economical ; the cost works out to 75 nP. per bag of 56 lb. of lime.

The advantages of marketing ready for use hydrated lime were mentioned in a paper from *Bisra Lime Stone Company.* It was stated that slaked lime and granulated blast furnace slag made an excellent hydraulic cement.

Use of Building Lime

Lime in Mortars — Five papers on the use of building lime were presented at this session. Shri M. S. Bhatia, Housing Adviser, Govt. of India in his paper indicated important features of a good lime mortar. Fat lime could be used in building construction with coarse sand or pozzolanic material. Shri Bhatia dealt with the choice of material, properties of mortar, classification and setting action of lime, storage and slaking and preparation of mortars.

Lime for Irrigation Work — The use of lime for irrigation works in India was discussed by Dr. R. C. Hoon, Director (Design), Central Water Power Commission. Dr. Hoon cited instances of the use of *kankar* lime concrete for such purposes. Alternative practices of construction of certain projects in cement

were discussed and their requirements were indicated.

Testing and Standardization

Important engineering properties of lime and tests for determining them formed the subject of a paper from Railway Testing and Research Centre, Lucknow. Some field tests for lime were surveyed and critically analysed in another paper from Central Building Research Institute, Roorkee.

Specifications for building lime with regard to its classification, chemical composition, soundness, properties, etc., and scope for their implementation were examined in a paper from the Indian Standards Institution. Methods of testing and certification were also discussed.

Insulating Bricks from Waste Mica

THE annual output of mica from India's mica mines is estimated at 51,300 tons, of which 85-90 per cent is wasted during mining, and rifting and dressing of mica blocks. It is estimated that India produces more than 50,000 tons of scrap every year. Besides, there are huge quantities of scrap dumped near the pitheads of the mines. The mica industry has long been interested in exploring the possibilities of utilizing this accumulating waste. As a result of investigations carried out at the Central Glass & Ceramic Research Institute (CGCRI), Calcutta, a method (*Indian Pat.* No. 48667) has been worked out to process waste mica into heat-insulating bricks required for lining laboratory and industrial furnaces, boiler packings, cold storage plants, studios, etc. Until recently bricks made from imported vermiculite, valued at over 20 lakhs per annum, were being employed for such purposes.

The CGCRI process is doubly important, because it not only provides an outlet for a waste product but also forms the basis for a new industry the establishment of which will lead to a substantial reduction in the import of heat-insulating materials. The Planning Commission estimates the total requirements of insulating bricks at 60,000 tons per annum by 1960-61. Even if 25 per cent of the requirements are met by mica insulating bricks, about 10,000 tons of waste mica can be annually utilized for this purpose.

A factory for manufacturing mica bricks by the CGCRI process has been set up at Bhilwara (Rajasthan) by Messrs *Bhupal Mining Works.* It was formally declared open by Shri Manubhai Shah, Union Minister for Industries, on 29 March 1958. The present production capacity of the plant is 2,500 bricks per day ; this is likely to be doubled by the end of next year.

The Process

Waste mica obtained during mining (Fig. 1) and rifting and dressing of mica blocks (Fig. 2) is calcined and then ground (Fig. 3) to a powder. The ground product is mixed with clay and other ingredients, pressed into bricks (Fig. 4) and loaded into a car. The loaded car is pushed into a furnace (Fig. 5) and fired to 1,000-1,050° C. After 16-20 hr., the bricks are withdrawn from the furnace for use.

FIG. 1 — HUGE QUANTITIES OF WASTE MICA ARE OBTAINED DURING MINING AND ARE DUMPED AT PITHEADS

FIG. 2. — MORE SCRAP IS OBTAINED DURING RIFFING AND DRESSING OF MICA BLOCKS

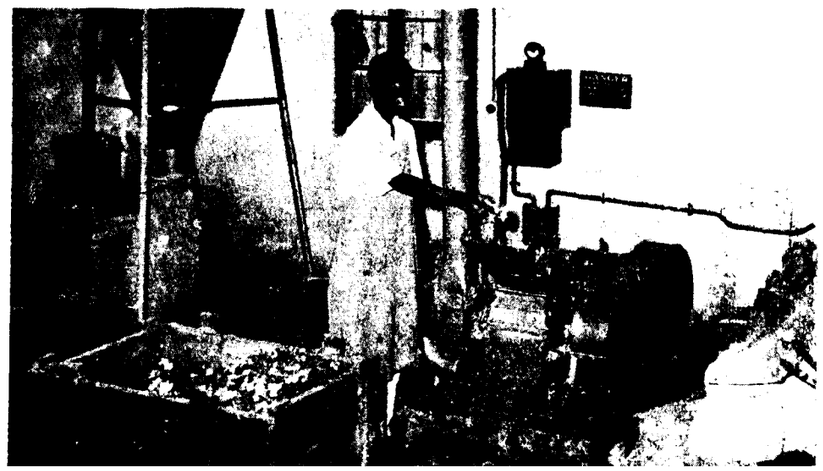


FIG. 3. — FOR PROCESSING INTO BRICKS, WASTE MICA IS CALCINED AND THEN GROUND TO A POWDER

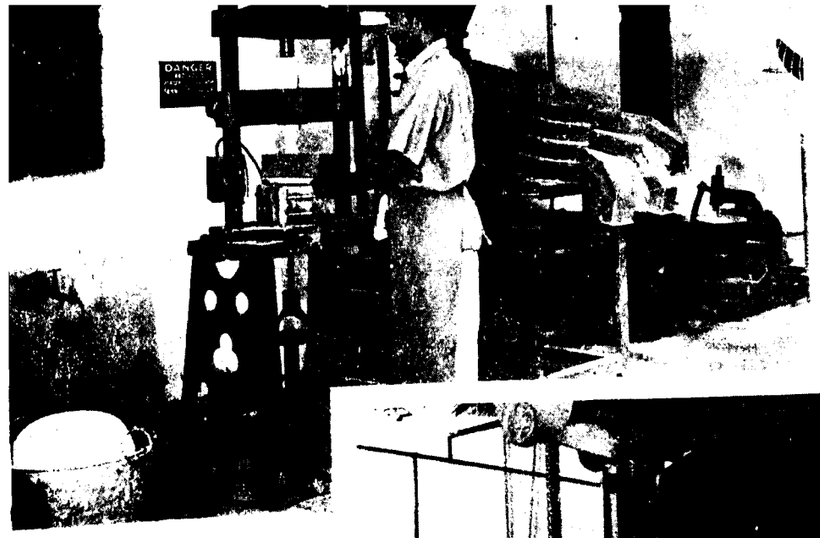


FIG. 4. — THE PULVERISED MATERIAL MIXED WITH CLAY AND OTHER INGREDIENTS IS PRESSED INTO BRICKS

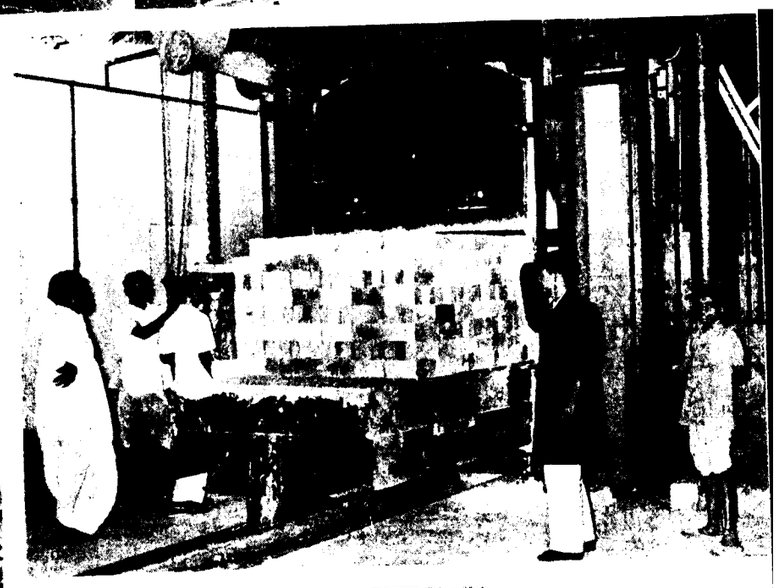


FIG. 5. — THE BRICKS LOADED IN A CAR ARE PUSHED INTO THE FURNACE FOR FIRING

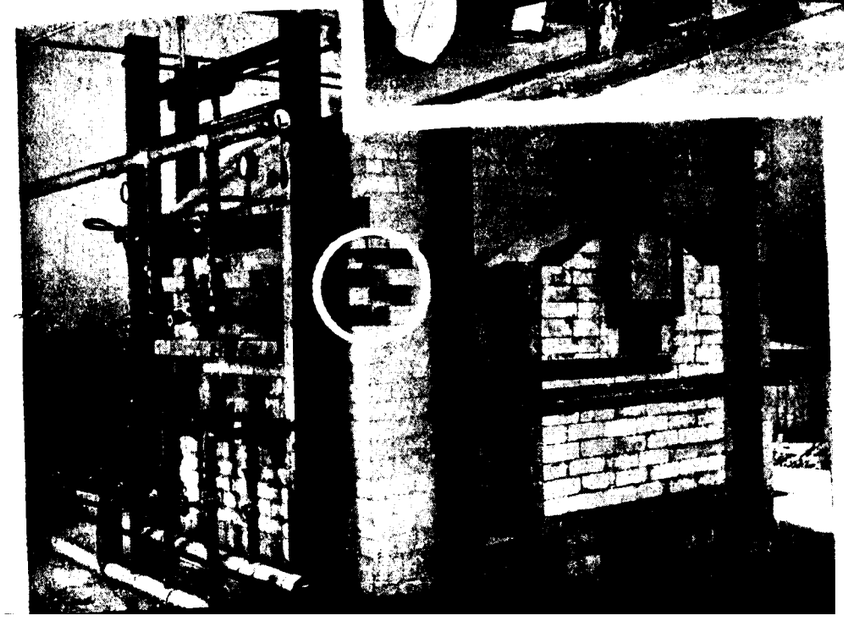


FIG. 6. — MICA BRICK INSULATION USED AS AN OUTER LAYER ON AN INDUSTRIAL FURNACE

Properties

The heat insulating efficiency of mica bricks is comparable to, and even better in some respects than that of vermiculite bricks (Table 1).

Mica bricks have been tested as a lining material in a variety of furnaces. They not only reduce heat losses but also improve the thermal efficiency of furnaces appreciably. In an industrial furnace in which the last firing was done between 4·0 and 4·30 p.m. daily and which was then allowed to cool overnight, the temperature dropped to room temperature by 7 a.m. next morning when no mica bricks were used ; under the same conditions and employing mica bricks, the temperature at 7 a.m. on the following day was 400°C. The saving in fuel was of the order of 30-40 per cent.

The insulating properties of mica bricks do not deteriorate even after continuous use. Observations on the furnace referred to above have shown that the drop in furnace temperature in the initial stages was from 1,000° to 400° in 14–15 hr. during which the furnace was not fired. The drop at the end of three years was from 1,000° to 600°.

TABLE 1 PROPERTIES OF MICA & VERMICULITE BRICKS

	Mica Bricks	Vermiculite Bricks
Bulk density, lb./cu. ft.	35–45	35–45
Thermal conductivity, hot face temp. 500°C., B.t.u./sq. ft./°F./in.	0·8–1·3	0·95–1·35
Cold crushing strength, lb./sq. in.	100–150	100–125
Safe operating temperature under load of one ton/sq. ft., °C.	975	860

Mica bricks have been tested in reverberatory furnaces, oil fired tilting furnaces, and other types of furnaces with highly satisfactory results.

Fuel Efficiency Committee

The Government of India have decided to constitute a Fuel Efficiency Committee to evolve suitable measures for achieving optimum economy and efficiency in the use of fuel resources in the country, particularly coal. The Coal Controller of India will be the *Chairman* of the Committee.

The Committee will work in close co-ordination with the Department of Iron & Steel and the Railways. In matters relating to research and technical investigations, the Committee will be assisted by a Fuel Efficiency Cell to be located at the Central Fuel Research Institute, Jealgora.

The Committee will evolve a pattern of survey, investigation and research in consumption of coals used in steam raising, power generation, processing and combustion in industrial furnaces and study the combustion characteristics of the different types of coals used. It will study the fuel problems of industries and advise them on the use of proper types of appliances. It will also draw up a comprehensive schedule of grades and sizes of coal for the various classes of consumers.

The Committee will initiate and organise studies and surveys to ensure that the coals allotted to consumers are consumed with maximum fuel efficiency. It will also make recommendations for setting up regional technical organizations for fulfilling the above objectives.

Technical Digest

Manufacture of Edible Groundnut Flour

A PROCESS has been developed at the Central Food Technological Research Institute, Mysore for the manufacture of edible groundnut flour from groundnut kernels. The flour is a low-cost protein food containing 2½ times as much protein as some of the common pulses. It can replace cereal flours in many food preparations and also adds to their nutritional value.

Groundnut kernels of good quality are cleaned to remove foreign matter, broken shells and damaged seeds. The cleaned kernels are gently roasted for about 10 min. in an open pan or an electric roaster to facilitate the removal of cuticle. The roasted kernels are then cooled and the cuticle (testa) removed by mechanically rubbing the kernels and blowing off the detached cuticles in a current of air. Damaged seeds, if any, may be removed by hand picking. The decuticled kernels are then crushed in an oil expeller. The light yellowish brown press cake is powdered in a disintegrator or a flour mill. The resulting groundnut cake flour has an attractive light yellow colour and an acceptable taste and flavour and keeps well in air-tight containers for a period of 6–8 months without developing any off flavour.

Edible groundnut flour has been found to contain : moisture 10–11, protein 48–52, fat 7–10, ash 4·5, calcium 0·05–0·07 and phosphorus 0·45–0·50 per cent ; vitamin B 0·90–0·95 mg. and nicotinic acid 18·0–20·0 mg. per 100 grammes.

The equipment required for the manufacture of edible groundnut flour comprises screening machine for cleaning groundnut kernels, roasters (electrically heated), de-cuticling machine, picking belts for sorting groundnuts, flour mill, weighing machine, trays, sieves, etc.

Project cost data for the production of edible groundnut flour is given in Table 1.

TABLE 1 — PRODUCTION OF EDIBLE GROUNDNUT FLOUR — PROJECT COST

(*1 ton per day, 300 days per year*)

		Rs.
Capital		
Buildings		18,000
Plant and Equipment		45,000
	TOTAL	63,000
Working capital		35,000
Direct Cost		
Raw Materials		*Cost per day*
Groundnut kernels, 7080 lb. @ Rs. 34 per cwt.		2,154
Utilities		
Power, 340 kWh. @ Re. 0·06 per kWh		21·25
Engineering @ 5% on plant		7·50
Services @ 3% on buildings		1·80
	TOTAL	30·55
Supervision and Labour		
Manager 1, @ Rs. 10 per day		10·00
Chemists 2, @ Rs. 7·50 per head per day		15·00
Labourers 30, @ Rs. 2·50 per day		75·00
	TOTAL	100·00
Packing		
Alkathene-lined jute bags chemically impregnated, @ Rs. 2 each		40·00
	TOTAL DIRECT COST	2,324·55
Indirect Cost		
Depreciation on plant @ 10%		15·00
Depreciation on buildings @ 5%		3·00
Supervision and administration, insurance, taxes, etc. @ 50% on labour and supervision		50·00
Interest on working capital @ 6%		7·00
	TOTAL INDIRECT COST	75·00
	TOTAL DIRECT AND INDIRECT COSTS	2,399·55
Credits for By-Products		
Groundnut oil, 2993 lb. @ Re. 0.64 per lb.		1916·00
Commercial groundnut cake, 1008 lb. @ Re. 0·10 per lb.		101·00
	TOTAL	2017·00
Cost per ton of edible groundnut flour.		382·55
Cost per lb.		0·16 nP.

The cost of production of the flour has been worked out to Re. 0·16 per lb.

Sintering of Iron Ore Fines

INVESTIGATIONS carried out at the National Metallurgical Laboratory, Jamshedpur have paved the way for the profitable utilization of iron ore fines in the country for the production of iron. Large quantities of fines obtained during mining and crushing of iron ore have been accumulating as waste because,as such, they are not suitable for charging into the blast furnace.

The fines are sintered into sizable lumps by mixing with coke breeze, blast furnace flue dust, finely crushed limestone, etc. and igniting the wet mixture in a chamber by means of air sucked through the mixture. Optimum conditions have been determined for producing a good sinter using iron ore fines from Rajharapahar (Madhya Pradesh) with other raw materials likely to be used in the Bhilai Steel Plant. Factors such as coke and moisture content in the sinter mix, basicity, sintering time and their effect on the quality of sinter produced have been studied.

TABLE 1 — A TYPICAL SINTER CHARGE

Material	%
Iron ore, — 5/8 in.	66·6
Manganese ore, — 5/8 in.	1·2
Flue dust, — 28 mesh	6·2
Mill scale, — 3/8 in.	2·5
Sinter fines, — 5/8 in.	23·5

A sintering furnace designed at the Laboratory (Figs. 1 & 2) consists of a combustion chamber with gas burner *1*, a sinter box *2*, with two cast iron grates one above the other (grate area 1 ft. square), and a lower chamber *3*. The lower chamber is connected through a pipe *4* to a 10 h.p. suction fan *5*, having a capacity of 1,350 cu. ft. of air/min. at N.T.P.

The Process — The raw materials in the required quantity (Table 1) were mixed thoroughly with the requisite amount of water. The sinter bed was then made up in three distinct layers with varying quantities of coke : (i) bottom 1 in. layer without coke, (ii) middle layer 7-8 in. thick with sufficient quantity of coke, and (iii) top 1 in. layer richer in coke to facilitate ignition. The total weight of the charge in the sinter box was kept at about 100 lb.

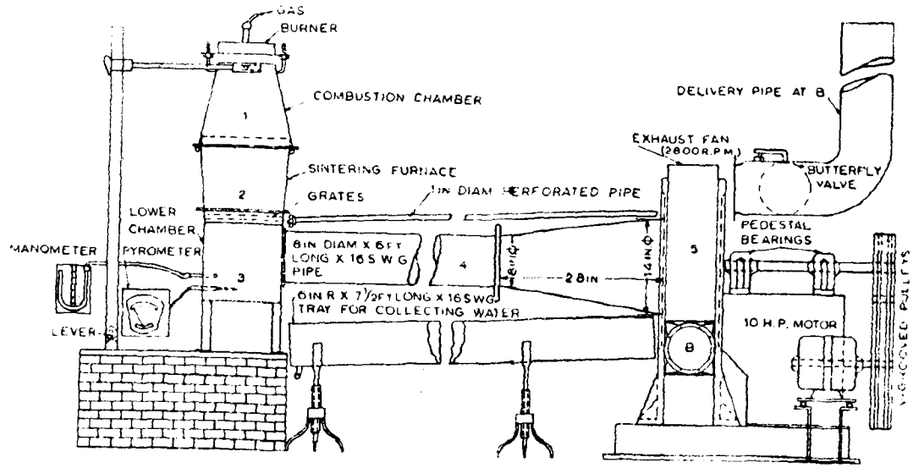


FIG. 1 — BATCH TYPE SINTERING PLANT FOR IRON ORE FINES — DIAGRAMMATIC SKETCH

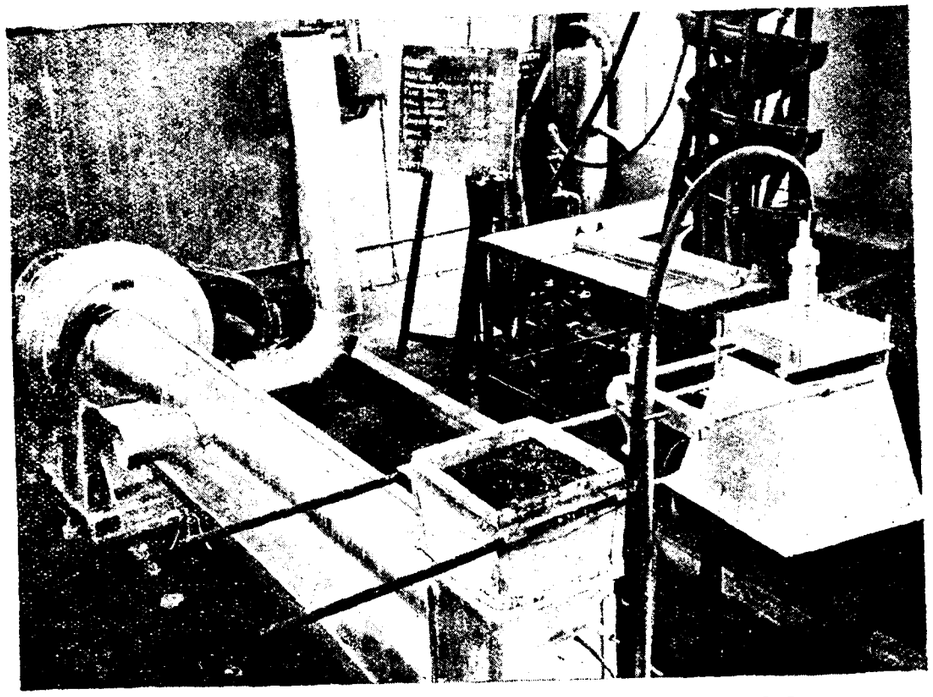


FIG. 2 — PLANT FOR SINTERING IRON ORE FINES, DESIGNED AND FABRICATED AT NML, JAMSHEDPUR

The sinter bed was ignited with coke oven gas. After ignition, the ignition chamber was swung aside and the suction increased to about 20 in. water gauge. The suction dropped to about 15 in. water gauge, when sintering was complete, i.e. when the temperature of the exhaust gases started falling.

Test results on sinter samples have shown that coke has a pronounced effect on the sintering properties while the moisture content directly affects permeability and sintering rate. The optimum coke and moisture contents for producing a good sinter were found to be 6·1 and 7 per cent respectively. A basicity of 0·8 produced a good self-fluxing sinter in the minimum time.

The raw materials used in the production of sinter, such as ore fines, coke breeze, flue dust, mill scale, limestone fines, etc. are all waste materials of no commercial utility. Thus the production of sinter with these materials and its use for manufacture of pig iron will not only help in lowering the production cost but will also help in conserving the country's iron ore deposits.

Patents & Processes

Duplicating, Printing and Allied Black Inks
Patent No. 40257
National Physical Laboratory, New Delhi

PRINTING, duplicating and other similar inks are consumed in large quantities in the country ; for newspaper and allied printing alone the consumption of high speed rotary inks is of the order of 20 lakh lb. per annum. The requirements of duplicating inks are estimated at about 2·5 lakh lb. Other important varieties, the consumption of which amounts to about 80,000 lb. annually, are stamp cancelling ink, thumb impression ink and stencilling ink for marking porous surfaces. With the rising standard of education and literacy in the country, these demands will increase considerably.

A large part of the present requirements of the inks is met from imports. A few firms are producing some of these inks on a small scale but there is great scope for improving the quality of the inks produced. A common drawback in most inks is their instability ; the pigment tends to separate and settle at the bottom on keeping.

A process has been developed for producing stabilized black inks of various types. The novelty of the process lies in the addition of substances which stabilize the dispersion and maintain the homogeneity of the inks over long periods. In other respects the process of manufacture is more or less identical with the established practices, namely, mixing the ingredients in suitable proportions in an edge runner and passing them through a roll mill for thorough and uniform dispersion. The product obtained after sieving is directly packed for storage and use ; alternatively, the material after passing through the roll mill is processed through a colloid mill to ensure better and stabler emulsion.

The economics of the process has been established through pilot plant runs (1,000 lb. per day) conducted over the last 5 years. Duplicating, printing and allied black inks manufactured in this plant have been widely accepted in the market.

The equipment consisting of edge runner, roll mill, colloid mill, automatic filling and closing machines for containers and folding and crimping devices for tubes are the same as used normally in ink manufacture.

The process is simple and easy to operate and can be adopted on small as well as large scale. All the ingredients required in the formulations for various types of inks except carbon black are easily available in the country.

Vitamin C (Ascorbic Acid)
Patent No. 39442
National Chemical Laboratory, Poona

VITAMIN C (ascorbic acid) has been synthesized at the Laboratory using D-sorbitol as the starting material. The process, carried out in 4 stages, is based on the original Reichstein method which has been modified to improve the conversion yields. D-sorbitol used in the process has to be imported. Pilot plant investigations on the preparation of sorbitol from glucose, which is indigenously available, are in progress.

India's annual requirements of vitamin C are estimated at 75,000 lb.

Parties interested in undertaking the development of these processes may write to the Secretary, National Research Development Corporation of India, Mandi House, New Delhi.

Indian Patents

A few of the Patent Applications notified as accepted in the *Gazette of India*, Part III, Section 2, 12 April - 3 May 1958 are listed below :

Plant and Equipment

61622 Clarification, settling and like tanks : *Clarification equipment and facility for accommodating surges in supply are embodied in single unit* — DORR-OLIVER INCORP.

57838 Improvements in tea-crushing and tea-screening machinery : *Comprises one or more pairs of rollers of flexible material with circumferential flanges which interdigitate with those of complementary rollers and means for driving them* — KERR

59384 A method of and an apparatus for making a container body of sheet metal : *Expanding die provided with four pressure members having elongated transversely curved operating faces directed at right angles* — METAL CONTAINERS (INSTALLATION) LTD.

59426 An improved bullock-driven double acting pumping machine : *Comprising a plurality of double acting piston pumps of same size and capacity wherein pumps are driven by common crank shaft having multiple pins at 180° apart and shaft is geared with a larger gear of driving shaft* — CHAKRAVORTTY

59884 Improvements in apparatus for electrostatically depositing liquid coating material : *Of the kind comprising a source of unidirectional high potential, a charging electrode connected to said source, means connecting the grounded article in an electrical circuit with the high potential source* — RANSBURG, RANSBURG, RANSBURG & RANSBURG

60158 Improvements in knife-sharpening appliances : *Two co-axial sharpening members, each with radiating gaps separating radiating abrading surfaces* — WALKER

60605 Improvements in vacuum deposition equipment : *Includes a trough, a movable carrier and means for moving the trough* — STANDARD TELEPHONES AND CABLE LTD.

59806 Process for the separation of mixtures of liquids : *Separating by partial vaporisation or partial condensation in presence of layers of large surface solid bodies which are warmer than the mixture and whose infra-red oscillation bands of one of the components of liquid mixture* — CASSELLA FARBWERKE MAINKUR AKTIENGESELLSCHAFT

59681 Apparatus for treating a liquid with a gas : *Comprising a gas contact chamber having a rotor, inlet means for introducing gas and liquid, and a liquid solids separation compartment within said chamber* — INFILCO INCORP.

Chemicals, Paints, Varnishes and Inks

58706 High carbon black content printing ink and process of producing same : *Comprising at least 16 per cent by weight of total ink carbon black and hydrocarbon vehicle constituted of greater than 80 per cent by weight of mineral oil hydrocarbon, dispersing agent and antiflocculant* — J. M. HUBER CORP.

60743 Process for fixing pigments on fibrous materials and two-dimensional structures : *Applying to the fibrous material a pigment together with carbo bean flour and polyfunctional compounds* — FARBWERKE HOECHST AKTIENGESELLSCHAFT VORMALS MEISTER LUCIUS & BURNING

58891 Continuous chlorine purification process : *Gaseous chlorine is passed through liquid chlorine, a portion of the liquid chlorine, is continuously removed and treated to separate organic impurities therefrom* — DIAMOND ALKALI CO.

Fine Chemicals, Pharmaceuticals & Perfumes

59277 Process for the manufacture of anthraquinone vat dyestuffs : *1-amino-5-benzoylaminoanthraquinone and 1-aminoanthraquinone are reacted with an azo-diphenyl dicarboxylic acid* — CIBA LTD.

59800 Process for stabilizing organic substances : *Incorporating 2, 4-diaminophenyl ether or 2, 4-diaminophenyl sulfide* — UNIVERSAL OIL PRODUCTS CO.

60921 Improvements in the method for manufacture of ether : *Comprises vapour phase catalytic dehydration of alcohol in fluidised catalyst bed of activated bauxite or alumina* — COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

61086 Process of catalytic refining of crude benzene : *Supply of heat to the hydrocarbon mixture is effected by hot oil* — STILL

60879 New Derivatives of the lysergic acid series and process for their manufacture : *Lysergic acid is reacted in liquid ammonia with alkali metal amide and the product is reacted with an alkyl or benzyl halide* — SANDOZ LTD.

61076 Process for the production of tetracycline : *A chlorotetracycline producing species of Streptomyces is grown in a culture medium in the presence of a compound selected from the group comprising a thiazole or thiol* — BRISTOL LABORATORIES INC.

61603 Vaccines and preparation thereof : *An aqueous preparation containing infectious microorganism and antigens is subjected separately to the action of formaldehyde and to the action of β-propiolactone* — INSTITUT PASTEUR

57888 Improvements in the production of hydroxy, alkoxy or aryloxy substituted aryl alkyl ketones : *By reacting phenol or phenol ether with an aliphatic acid using a mixture of phosphorus oxychloride and anhydrous zinc chloride* — COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

Pesticides and crop-control Agents

62562 Improved insect-repellant compositions : *One or more liquid insect repellant compounds in association with a gelling agent* — BOOTS PURE DRUG CO. LTD.

Glass and Ceramics

59456 Improvements in the manufacture of hot face insulating bricks and blocks : *Mixing with water ground cyanite with combustible matter and a binder and pressing and firing the mixture* — COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

58308 Improvements relating to electrodes for glass melting or refining furnaces : *Comprising an electrode body and a supporting stem having an internal passage for cooling liquid and accommodating a conductor member for conveying current to the electrode body* — ELEMELT LTD.

58307 Improvements relating to electric furnaces for glass melting : *Having an electrode provided with means for controlling the extraction of heat from the current communicating face towards a cooled part thereof comprising a thermally resistive barrier* — ELEMELT LTD.

58580–1 A method of and furnace for refining glass : *By passing electric current through glass between horizontally placed electrodes so as to promote an upward convention flow of glass and withdrawing glass so as to exert a downward pull upon elemental volumes therein.*

By subjecting glass to heating effect of electric current passed between electrodes disposed at opposite ends of an outlet opening through which glass passes through a duct to a further chamber and passing an auxiliary current from said opposite ends and then through the duct — ELEMELT LTD.

58591 Improvements in methods of, and apparatus for, severing glass tubing : *Which comprises a repetition of the steps of pre-heating an annular zone of the tubing and then passing an electric current round a circumferential path to effect severing* — G.E.C. LTD.

59404 Improvements relating to glass : *Comprising 40–60 per cent SiO_2, 15–45 per cent CaO, 0–20 per cent MgO and 0–15 per cent Al_2O_3 by weight*— PILKINGTON BROTHERS LTD.

61538 Improvements in the manufacture of gilded glass beads : *Deposition of gold on inner walls of beads effected on individual beads separated from one another from a row of beads on a beaded glass tube and under conditions in which they are kept gently rolled* — PEALS & BEADS (INDIA)

58647 Improvements relating to the manufacture of flat glass in continuous ribbon form : *Wherein a fire finish is produced on both surfaces of the ribbon by immersion in a bath of molten metal inert to the glass* — PILKINGTON BROTHERS LTD.

Building Materials

60929 Improvements in manufacture of cementing materials : *Well burnt and overburnt bricks are mixed with cement clinker and gypsium* — DATTA

62799 Parker concrete mixers : *A concrete mixer having rotatable mixing drum and feed mechanism comprising an annular Channel* — FREDERICK PARKER LTD.

62218 Improvements in cements : *Blast furnace slag is mixed with an alkali salt and like* —SOCIETE FINANCIERE DE TRANSPORTS ET D'ENTREPRISES INDUSTRIELLES (SOFINA) SOCIETE ANONYME

57926 Improvements relating to the manufacture of cement and cementitious substances : *Containing minor proportion of low temperature carbonaceous oil* — WALSH

Fuels, Coal Products and Lubricants

61020 Continuous devolatilisation of fuels on a moving bed : *Carbonising fuel materials by heating them on a moving grate inside a coking chamber wherein heat of carbonization is provided by burning volatile material* — COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

61865 Pulverised coal burner : *Outlet orifice of the primary air nozzle surrounded by a mouthpiece adapted to be movable in the direction of the longitudinal axis of the nozzle* — MASCHINENFABRIK AUGSBURG-NURNBERG A. G.

58571 Improvements relating to the discharging of coke from horizontal coke oven batteries : *Comprising a transmitter located on one of the operating machines and adapted to project a beam of electromagnetic radiation parallel to the longitudinal axes of the ovens*—WOODALL-DUCKHAM CONSTRUCTION CO. LTD.

61325 Improvements relating to the production of carbonised briquettes from coal : *Adding to coal, an oxidising agent which decomposes below the temperature of plastic range of coal, briquetting the mixture and carbonising the same* — NORTH WESTERN GAS BOARD

Fibres, Textiles and Dyestuffs

60785 Improved textile materials and processes for making the same : *Reacting cellulosic fibres in swollen condition with a cross linking agent* — DEERING MILLIKEN RESEARCH CORP.

60973 Azo-dyestuffs insoluble in water and process for their manufacture : *A diazonium compound from an orthoaminoazo compound is coupled with an arylamide of 2 : 3-hydroxynaphthoic acid* — FARBWERKE HOECHST AKTIENGESELLSCHAFT VORMALS MEISTER LUCIUS AND BRUNING

58753 Process for the treatment of textile materials : *Wherein the fabric is treated with a textile lubricating agent and with a resin forming intermediate condensation product formed from formaldehyde and melamine or a derivative thereof* — TOOTAL BROADHURST LEE CO. LTD.

59776 New dyeing process for silk and superpolyamide textile material : *An aqueous solution of a water-soluble azo or anthraquinone dyestuff is applied for dyeing silk* — I.C.I. LTD.

59962 Process for the manufacture of vat dyestuffs and treatment for dyeing or printing textiles with vat dyestuffs :— *A 1,4-diaminoanthraquinone is condensed with a 1,4-dichloroanthraquinone and the product treated with carbazolising agent* — CIBA LTD.

Rubbers, Resins and Plastics

59960 Improvements in the formation of moulded articles from sinterable materials : *Comprises the steps of mixing sinterable material with moulding vehicle, forming into required shape, removing soluble part of moulding vehicle and finally firing to densify the shape* — STANDARD TELEPHONES AND CABLES LTD.

61879 Rapidly hardenable mixtures of epoxy resins and polyamide resins : *The composition comprises an epoxy resin and a polyamide resin containing a Mannich base* — CIBA LTD.

62655 Improvements in polymerisation processes : *Anionic dispersing agent added when polymerisation exceeds 10 per cent by weight of the aqueous phase plus polymer* — I.C.I. LTD.

Cellulose, Lignin, Paper and Other Wood Products

58588 Improved method and apparatus for manufacturing paper or fibrous board : *By adding subsequent layers of watery pulp on opposite faces of base layers and dewatering the same from exposed surfaces* — ST. ANNE'S BOARD MILL CO. LTD.

Metals and Metal Products

60076 Refining molten pig iron : *Droplets of molten pig iron are subjected to a stream of oxidising gas in a vertical path* — UNION CARBIDE CORP.

61569 Apparatus for electroplating articles : *In which articles to be treated are contained in a rotating barrel immersed in a liquid contained in a vat* — ROUND

62016 Improvements relating to electric arc stud welding equipment : *Includes a solenoid for retracting a stud from a workpiece to strike a pilot arc the current of which is limited*—CROMPTON PARKINSON LTD.

57893 A method of, and apparatus for, recovering magnetisable metal bearing material from scrap : *Method comprising feeding the scrap to and through a rotating and apertured tumbler barrel to break away encrusting substances from metal-bearing pieces and particles of the scrap and to separate larger pieces, dividing smaller pieces into two sizes classifications, subjecting each of the said size classifications to the action of a corresponding magnetic separator* — HARSCO CORP.

59229 Apparatus for stripping ingot moulds and/or ingots : *Lifting gear is provided with control elements which operate the outer tongs of stripping gear by lifting ropes* — WAAGNER-BIRO AKTIENGESELLSCHAFT

61774 A process for the manufacture of magnetic oxide : *Calcining ferrous oxalate in an atmosphere of inert gas* — COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH

58724 Improvements in the manufacture of metallic bodies : *Wherein a plurality of suitably shaped laminations are superimposed and brazed together to form the body* — GENERAL ELECTRIC CO. LTD.

58898 Process and apparatus for surface hardening steel articles : *By preheating the work piece surface to a temperature lying above the Ac_3 point in the range of 950–1160°, and keeping the work piece in a zone of incandescence* — VEREINIGTE OSTERREICHISCHE EISEN-UND STAHLWERKE AKTIENGESELLSCHAFT

Leather and Leather Products

60540 Improvements in shoe moulding machines : *Plurality of movable last transporting elements, certain of which being movable independently of others, certain being adapted to move certain of lasts into and out of adjacently situated moulds* — BATA SHOE CO. LTD.

Engineering

58699 Improvements in television receivers : *With A.G.C. applied to a video I.F. valve and in which the cathode of said valve is connected to earth or chassis via a low-value resistance which is shunted by a condenser* — E. K. COLE LTD.

Miscellaneous

60134 Process for the production of a relief image on a photographic material : *Recorded images employed to cause images to be formed in colloid layer on photographic material and developing the image to a relief image corresponding to the image already recorded* — CIBA LTD.

60135 Apparatus for projecting particularly for the purpose of projection printing of photographic pictures : *Light employed for projection, particularly for projection printing of photographic pictures containing a relief image and/or tanned image, is of very small aperture* — CIBA LTD.

61935 Improvements in the manufacture of cricket, hockey balls and other balls of a like character : *A core of un-vulcanised rubber cork or like composition is placed between pre-moulded hemispherical cover members, the assembly of core and cover members being then applied to a finishing mould and vulcanised* — LEWIS AND RUBBER IMPROVEMENT LTD.

58937 Improvements in the printing of coloured pictures or the like on a transparent base material : *Matting transparent base on one surface and printing different coloured picture components laterally reversed on matted surface and in reverse order to that employed when printing on paper so that composite final picture will be direct and correcting coloured as viewed through the base* — LINDMARK

59026 Improvements in goggles or like protective devices for the eyes : *Frame having groove into which eyepiece is fitted and then hooks of eyepiece are engaged into slots of the frame, thereby providing interengaging means for frame and eyepiece which are detachably assembled together* — BRIGHT BROTHERS (PRIVATE) LTD.

Indian Standards

The Indian Standards Institution (Manak Bhawan, 9, Mathura Road, New Delhi-1) announces the publication of the following standards :

Inlet and Exhaust Valves — IS : 810–1957 is one of a series dealing with components of I.C. Engines ; only high-speed engines have been covered by this standard which specifies the chemical composition of the material for the manufacture of the valves, the dimensional tolerance and other requirements, such as locking arrangement, hardness, etc. Price Re. 1·50.

Biscuits — IS : 1011–1957 lays down requirements which are applicable to all types of biscuits and which would act as the basis for determining the wholesomeness of these products and their freedom from likely deleterious contaminations.

Specifications for requirements, ingredients, methods of tests to check conformity to the requirements, have been included. Methods of packing and marking have also been specified so that the material may reach the consumer in good condition and enable him to get certain essential information about the packed material. Price Re. 1·50.

Methods of Testing Natural Building Stones — IS : 1121–1957 lays down methods for determination of compressive, transverse and sheer strengths of natural building stones. Price Rs. 1·50.

Sodium Thiosulphate (Revised) — IS : 246–1957 prescribes the requirements and methods of test for sodium thiosulphate of technical, photographic, pure and analytical reagent grades. In the revised standard the limits of *p*H value have been modified. The requirements for sulphates and sulphites for the technical and photographic grades have been deleted and the requirements for thiosulphate content and insoluble matter for the technical grade have been made less stringent than those for the photographic grade. Price Rs. 2·00.

Methods of Test for Ethylene Dichloride-Carbon Tetrachloride (EDCT) Mixture—Ethylene dichloride by itself is a powerful fumigant for pests of stored foodgrains, but on account of its inflammable nature has to be mixed with carbon tetrachloride to reduce fire hazards. The standard prescribes requirements, such as specific gravity, refractive index, distillation range, chlorine content and flash point of the mixture as also the mode of packing and marking, and methods of sampling and tests, etc. Price Rs. 3·00.

Grey Filter Cloth for Sugar & Oil Industries — IS : 1178–1957 covers requirements, such as quality of yarn and cloth, ends and picks per cm. and weight per sq. m., warpway and weftway breaking strength, and length and width of cloth. Price Rs. 1·00.

Electrical Wiring Accessories — IS : 119–1957 covers reversible protected type two-pin plugs and sockets with earthing connection. The plug and socket combination, covered by this standard, is the type generally used with portable electrical apparatus, such as electric fans, heaters, irons, radiators, etc. Provision has been made for earthing connections which ensures safety in the use of electrical appliances. The standard lays down the requirements for materials, manner of construction, and detailed tests for electrical apparatus, including current breaking test, insulation resistance test, high voltage test, temperature rise test, and a test for the plastic insulating material. The standard also lays down the dimensions and associated tolerances of the plugs and sockets. Price Rs. 2·00.

Cotton Cambric, Scoured, for Oil Dressed Fabric (IS : 1142–1957); *Cotton Mosquito Netting, Square Mesh, Dyed* (IS : 1143–1957) ; and *Cotton Cellular Shirting, Dyed* (IS : 1144–1957).

The standards cover general requirements, e.g. quality of yarn and cloth, and specific requirements, e.g. ends and picks per cm., weight per sq. metre, constructional details, warpway and weftway breaking strength, and length and width in shrinkage of cloth. Price Rs. 1·50, 1·00 and 1·00.

All Weather Black Duplicating Ink for Rotary Type Machines — The standard covers requirements for duplicating ink, suitable for use in all types of weather on rotary type machines. Methods of drawing tests, samples and evaluating various characteristics such as consistency, stability, drying performance, etc. have been prescribed. Price Re. 1·00.

Lettering Brushes — IS : 1104–1957 covers 12 sizes of lettering brushes and prescribes requirements for their shape and design ; dimensions, description and weight of bristles ; requirements and species of timber suitable for manufacture of the handles ; and the material requirements of the ferrules, silk binding and the cement used for holding the bristles. In addition, it includes details regarding workmanship and finish, packing and preservation, performance test, and methods for determining the weight of the bristles.

The standard also stresses on the manufacturers the need to issue hints for the guidance of the users, along with the brushes they manufacture, so that their life and serviceability are not unnecessarily reduced due to lack of adequate knowledge of correct painting routine. Price Rs. 1·50.

Maize Starch for use in the Cotton Textile Industry — IS : 1184–1957 prescribes requirements of maize starch (as manufactured by the sulphitation process) in respect of size of granules, moisture, starch, ash, protein, ether extract, free acidity, relative viscosity, and cold water solubles. Methods of test for various characteristics of the starch are appended to the standard. Price Rs. 1·50.

Notes & News

Ferro-coke from South Arcot Lignite

Investigations are being carried out at the Central Fuel Research Institute, Jealgora to explore the possibility of making ferro-coke from South Arcot Lignite. Results obtained so far have shown that ferro-coke suitable for low-shaft furnace can be made from South Arcot lignite–iron ore blends by carbonizing the briquettes under suitable conditions.

South Arcot lignite with different moisture contents was blended with different proportions of magnetite, and hematite, and briquetted at 8 tons/sq.in. pressure. The iron ores used were (1) magnetite from Salem supplied by the Industries Department, Govt. of Madras and (2) hematite received from National Metallurgical Laboratory, Jamshedpur. The briquettes were carbonized at different rates of heating to 600° and 900°C.

The strength of the lignite briquettes in the green state increased considerably on addition of up to 60 per cent Salem ore and up to 40 per cent of hematite. On carbonization of the briquettes prepared from lignite iron ore blend, the strength of the carbonized briquettes decreased progressively with increase in the proportion of iron ore. The maximum strength obtained was about 1,200 lb./sq. in. with 20 per cent of Salem ore. The results suggest that ferro-coke suitable for low shaft furnace can be obtained from South Arcot lignite-iron ore blends by carbonizing the briquettes under suitable conditions. The influence of addition of binders and blending of coking coals with South Arcot lignite is being studied.

Ammonia Recovery from Coke Oven Gas

A new process of ammonia recovery from coke oven gas is being introduced in the TISCO coke plant at Jamshedpur in which the gas from the coke ovens will be treated with waste pickle liquor after it has been used in the sheet mills for galvanising steel sheets. The use of this waste liquor — which is highly noxious and corrosive — does away with the difficult problem of its disposal. Further, the new process will yield, besides ammonium sulphate, other products such as hydrogen sulphide, ferrous hydroxides and cyanide sludge — all of which have important industrial applications. This recovery process was developed at the instance of the Tata Steel Company by the West German firm, *F. J. Collin & Co.*, Dortmund, and is being tried out on a commercial scale for the first time at Jamshedpur. This process has been patented in different countries of the world under the name Tata-Collin process. The cost of this plant is approximately Rs. 72 lakhs.

Gum from the Seed Flour of Guar

Guar (*Cyamopsis tetragonoloba*) is cultivated throughout the country. The plant is used as a nutritious green fodder ; the pods containing pea-shaped seeds are also valued as cattle feed. The seed is rich in proteins and contains appreciable quantities of sugars and fats.

The seed flour of *guar* is the commercial source of a gum which is dispersible in hot or cold water, yielding dispersions of exceptionally high viscosities at low concentrations and possessing 5–8 times the thickening power of ordinary starch. On account of this property of the gum and its extensive availability at a low cost, the material was studied in this laboratory to determine its suitability as a sizing material for textiles and in the preparation of jellies, jams, jubjubes, etc. The results are presented in this note.

Preparation of Guar Gum — *Guar* seeds were broken into halves and the gum-containing portion was separated from the outer coat by sifting and winnowing. The endosperm was then partially ground to separate the outer husk from the inner hard crust of the gum. The seeds contain about 25 per cent gum of which 20 per cent could be recovered by this process in a very pure state. The product is suitable for industrial use.

Since the gum contains some fibrous matter, it has to be purified further for marking transparent films. For this purpose the granular gum (50 g.) was autoclaved with distilled water (1500 ml.) in a stainless steel container at a pressure of 18–20 lb./sq. in. for 4–5 hours. The mass was allowed to cool overnight and filtered through cloth over a Buchner funnel under suction. The filtrate was treated with rectified spirit (b.p. 76°C.) with constant stirring, when the gum precipitated in the form of long threads. This was filtered, pressed with linen and again treated with rectified spirit. After leaning the suspension overnight, the gum was again squeezed to remove as much of the solvent as possible, dried at temperature not exceeding 40°C. and powdered.

The gum analysed for moisture, ash and total sugar in the usual manner gave the following values : Moisture, 11·12 ; ash, 0·99 ; total reducing sugars, 81·08 ; mannose, 50·80 ; and galactose, 31·03 per cent.

As a Sizing Material — A sample of the gum was tried as a sizing agent at the laboratories of the Ahmedabad Textile Industries Research Association (ATIRA). It was observed that guar gum by itself is a poor sizing material ; the main drawback is that it does not give a coating to the yarn strong enough to protect it from the abrasive action of the reed.

Use in Confectionery — *Guar* gum was found suitable in the preparation of confectionery like table jellies, jams, and jubjubes or jelly-drops. The following mix was found to give the best results : *guar* gum (granular), 2 oz. ; crystal sugar, 28–32 oz. ; citric acid, 3 g. ; water, 4 lb. ; flavour and dye, as required. The gum mixed with 4 oz. sugar is added to boiling water and stirred continuously till the grains of gum are well cooked and become soft. The remaining sugar is made into a syrup boiled to 140°C. and the cooked gum added to it. The mixture is stirred and boiled till it acquires a thick consistency. Citric acid and colouring matter are then added to the mixture ; flavour is added on cooling. The jelly formed is

poured out in flat dishes and dried in an oven at a temperature not exceeding 40°C. till a cake is formed. The jelly is cut, covered with fine granular sugar and packed.

Capsules — Another possible use of the gum is in making transparent films, which being water soluble, could be made into capsules for pharmaceutical use. Work in this direction is in progress. — C. N. HAKSAR & S. G. KENDURKAR — *Jiwaji Industrial* Research Laboratory, Madhya Pradesh Government, Gwalior.

Syrups from Waste Apricots

The apricot crop requires critical ripeness and consistency conditions ; if ripeness is excessive (10–14% sugar), the fruit deteriorates rapidly. A method for recovering sugar from ripe apricots in the form of syrups suitable for use in food industry has been developed by the Plant Chemistry Department, 'Juan de la Cierva', Sciences Faculty, Valencia, Spain. The process consists of separation of juice and its purification with ion exchange resins.

Over-ripe apricots of the Valencia variety fallen from the tree were crushed and the thick paste obtained was prevented from fermentation by steam sterilization or by the addition of an anti-ferment. In the first case the enzymes destroyed by the steam must be replaced in order to hydrolyse pectic matters, thus allowing juice separation by filtration after 24 hours.

The best results were obtained by using anti-ferment and 0·4 per cent of pectic enzyme, which gave a yield of 85 per cent in 24 hours. The same result can be obtained without enzymes, by prolonging the anti-ferment treatment for 48 hr., as the action of natural enzymes contained in apricots is then sufficient. The mass obtained is fluid and easily filtered.

The apricot juice obtained by this treatment is first clarified with kieselguhr and subjected to the action of ion exchange resins (De-Acidite and Zeo-Karb), in a double column device. — *Europ. Tech. Digests*, 1958, No. 2, 31.

Sweating in Soap

Sweating in soap is always connected with a certain level of humidity of the room atmosphere and also with the mean temperature and temperature variations. It occurs in confined atmospheres and poor ventilation because soap is to a certain extent hygroscopic ; while it acts as an absorbent at low relative moisture contents, it is apt to behave a hygroscopic substance in a highly humid atmosphere.

Observance of the following points helps in the production of a soap which is not liable to sweating : (i) salt and free alkali contents should be kept to a minimum (potash is distinctly more satisfactory than soda) ; (ii) soap should be prepared from distilled fatty acids and soda, so as to be as neutral as possible, (iii) any mechanical processing liable to upset the flake pattern of the soap phase (milling, rolling, extruding) will considerably increase resistance to sweating at least as long as the micellation pattern remains disturbed. — *Europ. Tech. Digests*, No. 2 (1958), 10.

Swastik Syndet Plant

A modern continuous plant set up by *Swastik Oil Mills Ltd.*, Bombay for manufacture of synthetic detergents went into operation recently. The plant is the first major unit of its kind established in the country and has a production capacity of 1,000 lb. per hour. The products manufactured are of the alkyl aryl sulphonate type which are the cheapest and most versatile of synthetic detergents.

Raw Materials for Sulphonation — For the production of alkyl aryl sulphonate, three main raw materials are required : dodecyl benzene, oleum or sulphuric acid and caustic soda. Dodecyl benzene or alkyl benzene is produced from tetra-propylene benzene which is imported.

The sulphonating agent, sulphuric acid is used to the extent of about 1 to 1·25 parts for 1 part of dodecyl benzene. The sulphonic acid of dodecyl benzene is neutralised by caustic soda solution, giving sodium dodecyl benzene sulphonate ($C_{12}H_{25}C_6H_4SO_3Na$). This is alkyl aryl sulphonate, the active ingredient for various types of detergents ; the ratio of this active ingredient to dodecyl benzene is 1·35.

Raw Materials for Detergents — Alkyl aryl sulphonate is formulated with various chemicals to make detergent for different uses. The raw materials generally required are : (1) sodium phosphates, especially trisodium phosphate, sodium tripolyphosphates, tetra sodium pyrophosphate, sodium hexameta phosphate, (2) sodium sulphate — anhydrous or Glauber's salt, (3) sodium silicate — liquid silicates or sodium ortho, meta silicates, (4) Carboxymethyl cellulose (CMC), (5) sodium perborates or percarbonates, (6) soda ash, (7) optical bleaches, and (8) foam stabilizing or boosting agents.

The formulations vary depending on the ultimate use for the product — laundry, cleaning of flat hard surfaces, sanitizing detergents, textile wetting and dispersing agents, detergents for wool for rayon industries, insecticides mixtures, paints formulations, leather industry, etc.

The Process — The process comprises three operations : (1) sulphonation, (2) building and (3) spray drying.

In the sulphonation plant (*Fig. 1*) dodecyl benzene and oleum are mixed slowly with agitation, keeping the temperature below 40°C. by a special cooling system. This ensures production of a white and uniform product. The sulphonated product is then diluted with water so that the excess acid is diluted to 70–80 per cent strength ; at this concentration, it is easier to separate the sulphonic acid from the spent sulphuric acid. The bottom layer of spent acid is drained off and the top sulphonic acid layer is neutralised with caustic soda. The dilution and neutralisation reactions being exothermic, the temperatures are kept below 40 C. by cooling water. The final product contains 50 per cent sodium alkyl sulphonate, sodium sulphate and water.

In the building plant, various other raw materials such as phosphates, CMC, etc. are added to the above slurry in a crutcher vessel provided with a heavy stirrer and heating facility. After mixing, the slurry (about 50 per cent solids content) is passed through various strainers and pumped at high pressure through the spray nozzles in the drying tower.

In the spray drying plant, hot air generated by burning oil is sent to a co-current drying tower. Hot air at about 400–550°F. is blown from top of the tower along with

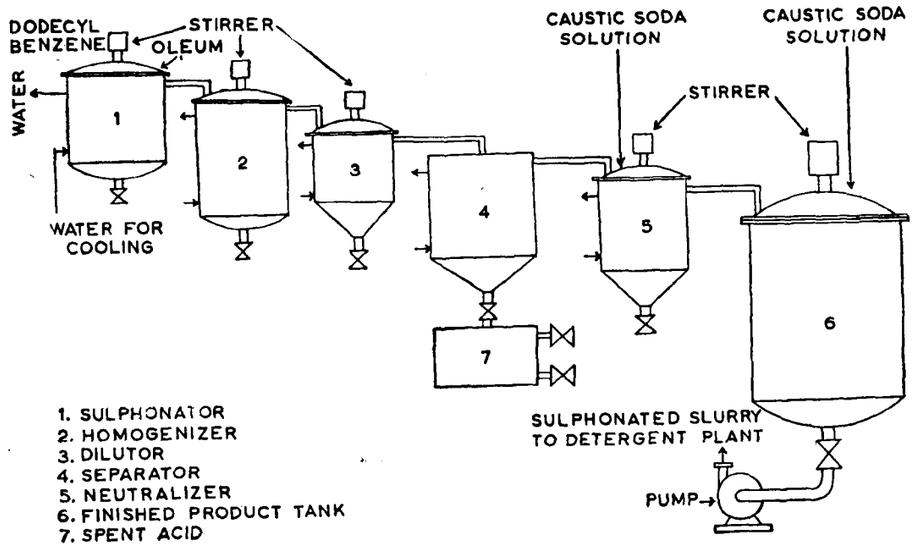


FIG. 1—SULPHONATION OF ALKYL ARYLS : FLOWSHEET—SWASTIC OIL MILLS LTD., BOMBAY

fine spray of detergent slurry. The slurry is atomised at pressures ranging from 150–400 lb./sq. in.

The resultant dry beads of detergents are transferred pneumatically to a separator vessel from which they are collected and sent for packing.

Production of Ferro-Manganese

India's production of ferro-manganese has hitherto been very limited ; only 15,000 tons a year were produced at the Tata Steel Works in its blast furnaces, mainly to meet its own requirements. The product was, however, unacceptable to export markets because of its high phosphorous content which was inevitable on account of the nature of indigenous raw materials. This difficulty could only be overcome through electric smelting of ore, which was so far not feasible because of the lack of cheap power. With free availability of power from hydro-electric projects close to the areas in which manganese deposits are located, it will be possible to export ferro-manganese rather than the raw ore because of the better earnings the former would bring in. India exports a million tons of manganese ore a year of which about 600,000 go to U.S.A.

The Second Plan has laid down a target of 160,000 tons of ferro-manganese which, it is assumed, would require double the qauntity of manganese ore — about a third of the total quantity mined every year. Government has granted licences for setting up about a dozen units to be located in different parts of India. One of the plants, put up by Tata Steel, is located at Joda in the Keonjhar district of Orissa. Situated in the heart of a region rich in manganese deposits, this plant will draw power from Hirakud. Initially, it will have an annual capacity of 30,000 – 35,000 tons which could ultimately be stepped up to 100,000 tons. This plant will produce standard grade high-carbon ferro-manganese. In the early stages, the plant is expected to have a surplus of 10,000 tons after meeting Tata Steel's own requirements. When all the units — some completed and other under construction — go into production, there will be a large surplus of ferro-manganese for export. This, the planners estimate, will bring in foreign exchange of about Rs. 10 crores a year.

The adoption of electrical smelting of manganese ore at Joda will result in a number of benefits and substantial all round economies. First, it will release blast furnace capacity at Jamshedpur for production of pig iron. Secondly, electric smelting calls for lower consumption of coke than in the blast furnace. Thirdly, it will be possible to replace good metallurgical coke suitable for use in a blast furnace by coke breeze and any poor quality coke. Finally, it will also help to ease the transport problem considerably around Jamshedpur. Manganese ore, limestone and dolomite, used in the manufacture of ferro-manganese, will not now require to be transported from the Orissa mines to Jamshedpur, while the finished product from Joda will weigh only a third of the primary raw materials. Manganese ore will be brought to the plant at Joda from the nearby mines while limestone and dolomite would be obtained from Birmitrapur and the adjacent areas.

The main equipment for the Joda plant — two rotating hearth furnaces — has been obtained from Norway. Both furnaces have gone into operation.

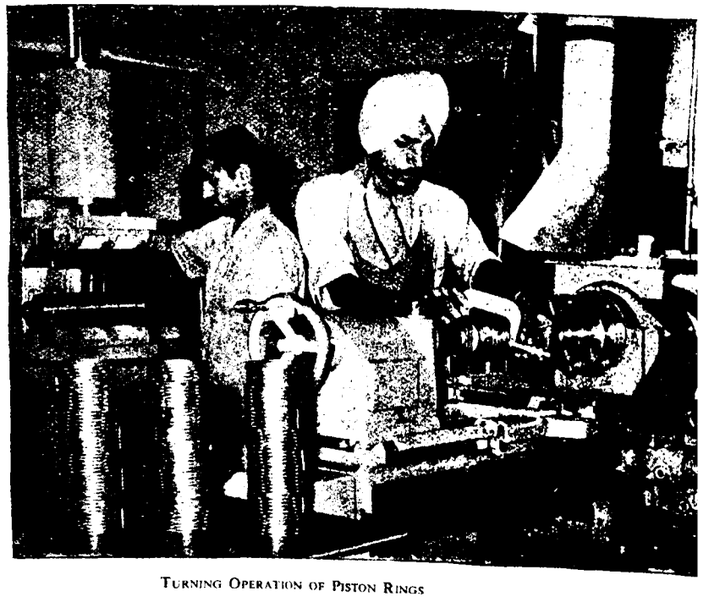
Goetze Piston Ring Factory, Patiala

A new piston ring factory set up at a cost of Rs. 55 lakhs by Messrs *Goetze (India) Private Ltd.* recently went into production at Patiala (Punjab). The factory has been established with the technical collaboration of the well-known German firm of Goetze whose experts supervised the erection of machines and equipment.

The factory produces from indigenous raw materials piston rings of 2–6 in. diam. for all types of internal combustion engines. It is capable of meeting not only the internal demand for piston rings but also the requirements of some of the neighbouring countries like Nepal, Burma, Ceylon, Malaya, Indonesia, etc.

The factory is a self-contained unit. It has a mechanised foundry equipped with a low induction electric furnace and fast automatic moulding machines. A conveyor system (underground and overhead) is provided for sand, molten metal and piston rings. The rings are cast individually and the special grinding and honing techniques employed ensure dimensional accuracy and fine surface finish. The factory is also equipped with modern chromium and tin plating plants and has a workshop for making tools for manufacture of piston rings.

It is proposed to undertake the manufacture of cylinders also at the factory in the near future.



TURNING OPERATION OF PISTON RINGS

Development Council for Soap, Paints & Plastics

A new Development Council for oil-based industries comprising soap, paints and plastics has been set up under the *Industries (Development & Regulation) Act*. Shri P. A. Narielwala of the *Tata Industries (Private) Ltd.*, Bombay, is the Chairman of the Development Council. The Council has 21 Members including representatives of the three industries.

The Council will recommend to Government targets for production, coordinate production programmes and review the progress of the industries from time to time. It will also suggest norms of efficiency with a view to obtaining maximum production, improving quality and reducing costs. Another function assigned to the Council is the promotion of standardization of the products of the industry and measures for increasing the productivity of labour.

At its first meeting held in New Delhi during May 1957 the Council decided to divide into three separate panels for the three industries — soap, paints, and plastics — to discuss their individual problems.

Inaugurating the Council Shri Manubhai Shah, Union Minister for Industry called upon the soap industry to use non-edible oils to the maximum possible extent and conserve oils like groundnut and coconut for edible purposes. Attention should be paid to the production of synthetic detergents so that new chemical industries could spring up.

Referring to the paint industry Shri Shah pointed out that the foreign exchange spent on imports of raw materials was of the order of Rs. 1·5 crores per year. It was necessary for the industry to develop indigenous resources of raw materials and increase production of pigments and nitrocellulose lacquers and finishes based on synthetic resins.

Standardization —Shri Shah underlined the need for standardization of paint quality. He suggested that the paint industry should form a central association of paint manufacturers which could pay attention to maintenance of standards and establishment of a central laboratory.

Plastics — The plastics industry has made enormous progress during the last few years and the quality of goods produced in the country is also satisfactory. There is vast scope for production and export of plastic goods.

Many of the raw materials and basic chemicals such as styrene, formaldehyde, phenol, etc. have to be developed. A programme for the manufacture of such basic materials in the country in the shortest possible time has been drawn up and the Development Council should help in its implementation.

Vegesize

Vegesize is a hardened vegetable fat developed by *Berar Swadeshi Vanaspati Co. Ltd.*, Shegaon (Bombay State) for use as a substitute for mutton tallow in yarn sizing.

The physical and chemical characteristics of Vegesize are almost similar to that of mutton tallow (Table 1).

Vegesize imparts a higher strength and better weavability to size warp than mutton tallow under similar conditions. As an emolient Vegesize is comparable in performance to mutton tallow, is cheaper and can be used as a softener also. The product has been tried at the *Swadeshi Cotton Mills Co. Ltd.*, Kanpur and is reported to have given satisfactory results. Over 30,000 lb. of warp are treated with Vegesize at the mills every day. — B. L. TALWAR & N. A. GULATI, Swadeshi Cotton Mills Co. Ltd., Kanpur.

TABLE 1 — CHARACTERISTICS OF VEGESIZE AND MUTTON TALLOW

	VEGESIZE	MUTTON TALLOW
Physical appearance	Solid fat	Solid fat
Colour	Cream white	Cream
Moisture content, %	about 0·1	> 0·1
Total Fatty matter, %	about 99·5	> 99·5
Saponification value	191·41	199·85
Unsaponifiable matter, %	2·5	2·4
Iodine Value	47·18	43·41
Ash content	nil	nil
Melting point, °C.	40·5	48·8
Total alkali (Na_2O), %	nil	nil

Export Promotion Council for Chemicals and Allied Products

An Export Promotion Council for chemicals and allied products has been set up with the support of the Government of India.

The main object of the Council will be to maintain and promote exports of all chemical, pharmaceutical and allied products.

The Council will consist of 11 panels : pharmaceuticals and fine chemicals, glass and glassware, ceramics and enamels, acids and fertilizers, alkalis, dyestuffs, salt and heavy chemicals, miscellaneous chemicals, soaps and toiletries, and rubber and paints.

Shri Charat Ram, President of the Indian Chemical Manufacturers' Association, Calcutta will be Chairman of the Council which will include representatives of manufacturers and exporters.

Hindustan Salt Company

The Government of India have appointed a Board of Directors for the *Hindustan Salt Company (Private) Limited* with Dr. G. P. Kane, Industrial Adviser (Chemicals), Ministry of Commerce and Industry, as Chairman and Shri R. N. Vasudeva, Salt Commissioner, as Managing Director. The other Members of the Board are : Shri T. Vedantam (Ministry of Finance) ; Dr. A. N. Kappanna (Central Salt Research Institute, Bhavnagar), Shri P. N. Kathju (Council of Scientific & Industrial Research) and Shri G. D. Somani and Shri N. C. Kaslival (Members of Parliament).

The Company has been set up by the Government of India to take over the Government salt works at Sambhar and Didwana in Rajasthan and Kharaghoda in Bombay.

The Company, which was registered on 12 April 1958, under the *Companies Act* will, among other things, undertake the manufacture, utilisation and processing of salt and its bye-products. The authorized capital of the Company is Rupees one crore.

Increased Production of Industrial Machinery & Machine Tools

There was a considerable rise in the output of heavy and light industrial machinery and machine tools during 1957.

A significant rise was recorded by the textile machinery industry. The number of carding engines manufactured during the first eleven months of 1957 was 883 as against 726 during the corresponding period in the previous year. Similarly the number of ring frames rose from 1,110 to 1,255, drawing frames from 24 to 30, automatic looms from 161 to 282 and reeling machines from 1,158 to 1,841. The output of speed frames, bundling and baling presses also went up, but there was a slight decline in the production of plain looms.

During the short period of its existence the industry has made appreciable progress. In regard to three major items particularly, ring frames, looms and carding engines, the indigenous manufacturers are in a position to meet a large part of the country's demand.

Foreign Collaboration —There was a considerable rise in the production of jute mill machinery during the year. The production of sugar mill machinery also showed an upward trend. A Bombay firm has completed preliminary arrangements for taking up the assembly of cane crushing plant. This is being done in collaboration with a Czech firm. The firm is also producing other items of sugar machinery like vacuum pans, evaporators, condensers, etc. Another firm, with West German collaboration, has installed most of the plant and machinery required. A Madras firm is reported to have manufactured sugar machinery for four co-operative sugar factories in Bombay State.

A printing machinery manufacturer turned out the proto-type of stereo rotary printing machine of the Duplex type during the year. The production of new ranges of stone breakers and granulators was taken up by a firm with British collaboration.

The possibility of manufacturing paper machinery is being examined by a Committee. Some firms in the U.K., Sweden and Germany have shown interest in collaborating in the manufacture of paper machinery.

Knitting Machines — A scheme for the manufacture of the domestic type hand-operated knitting machines in collaboration with a Japanese firm has been received from an industrialist and is being examined by Government. Knitting machines of the industrial type are already being produced in the country.

Machine Tools — The increase in the production of machine tools over 1956 was almost 100 per cent. This is largely attributed to the remarkable increase in the output of the *Hindustan Machine Tools*, Bangalore which reached the monthly production rate of nearly 30 machine tools. The factory has also undertaken a fresh programme for the manufacture of milling machines. The other firm in the public sector at Ambernath has also made progress. Firms in the private sector also recorded an increase in production.

Ninth Census of Indian Manufactures

The total value of the output of registered factories in 28 major industries in India increased from Rs. 1,123 crores in 1953 to nearly Rs. 1,288 crores in 1954, according to the Report of the Ninth Census of Indian Manufactures, 1954, just released.

The productive capital investment of the factories also showed a marked increase during the period. It rose from Rs. 728·65 crores in 1953 to Rs. 787·75 crores in 1954.

The industries covered by the census are : cotton, woollen and jute textiles, chemicals, iron and steel, aluminium, copper and brass, bicycles, sewing machines, electric lamps and fans, general engineering and electrical engineering, glass and glassware, ceramics, cement, plywood and tea-chests, paper and paper-board, matches, tanning, paints and varnishes, soap, vegetable oils, starch, distilleries and breweries, sugar and *gur*, fruit and vegetable processing, wheat flour, rice-milling and biscuit-making.

The Report contains valuable statistical information about the factories in each of the 28 industries, their capital, employment and output. There is a chapter for each industry in which details about the consumption of materials, fuel and power, manufacture of products and by-products, distribution of ownership, salaries and other benefits to the employees, etc. are given.

ISI Certification Marks

The Indian Standards Institution has granted the following licences for the use of its Certification Mark :

Conductors for Over-head Power Transmission Purposes (IS : 449–1955 and IS : 282-1951) : Messrs Devidayal Cable Industries (Private) Ltd., Bombay.

Rectified Spirit (Grade A) : Rampur Distillery and Chemical Co. Ltd., Rampur.

Non-pressure Concrete Pipes : Messrs Concrete Spun Pipe Works, Kanpur.

Tea-chest Plywood Panels : Messrs National Timber Industries, Calcutta ; Messrs Das & Co., Calcutta; National Plywood Industries, Calcutta ; Dhubri Plywood Factory, Dhubri ; Bando Plywood Works, Calcutta ; National Saw & Plywood Works, Tinsukia ; Hindustan Timber Industries, Calcutta and Messrs Surma Match and Industries (Private) Ltd., Calcutta.

Copper Sulphate (Technical) : The Travancore Chemical and Manufacturing Co. Ltd., Alwaye.

B.H.C. Water Dispersible Powder Concentrates : Alkali and Chemical Corporation of India Ltd., Calcutta.

Three-phase Induction Motors : The Hindustan Electric Co. Ltd., Faridabad (Punjab).

In Parliament

Iron Ore Deposits in Andhra — The total iron ore reserves in Andhra State are estimated to be about 430 million tons. The best quality of iron ore with 50–65 per cent iron content is found in Kurnool district which is estimated to have a reserve of 3·7 million tons. The quality of iron ore found in Hyderabad district (37–43 per cent iron content) is estimated to be of the order of 37 million tons.

The largest deposit (296 million tons) has been traced in Guntur district with an iron content of 33 to 37 per cent.

Of the total reserves in the State, the poorest quality of iron ore with 25 per cent iron content only, is found in the district of Nellore which has 93 million tons of reserve.

Manufacture of Streptomycin — The *Hindustan Antibiotics (Private) Ltd.* has entered into an agreement with Messrs *Merck & Co.* of U.S.A for the manufacture of streptomycin and dihydrostreptomycin in India.

Merck & Co. will make available all the up-to-date technical know-how and the use of their current comprehensive range of patents covering the manufacture of streptomycin and dihydrostreptomycin, for a period of ten years without payment of any royalty or fees by *Hindustan Antibiotics (Private) Ltd.* Merck & Co. will provide the latest type of sub-cultures of a high yielding streptomycin-producing strain of *S. greseus*.

Manufacture of Carbon Black — The Government of India have invited two Rumanian experts to visit India very shortly for exploring the possibilities of manufacturing carbon black in the country. Government are also exploring the possibilities of manufacturing carbon black by utilising coal-tar fractions in consultation with a German firm.

An Indian industrialist is also negotiating with a leading American firm for setting up a plant for the manufacture of carbon black.

During the first eleven months of 1957, 8,268 tons of carbon black were imported from U.S.A., U.K., France, West Germany, Canada, Greece and Italy.