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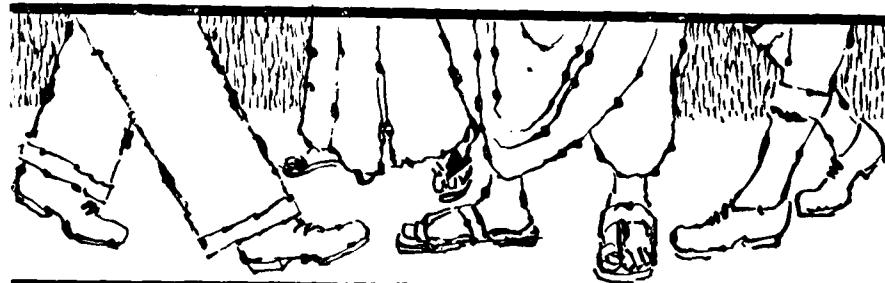
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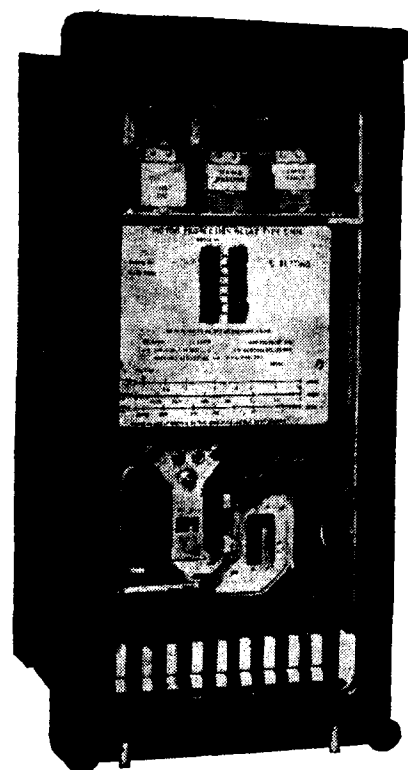
Vol. XIX

OCTOBER - DECEMBER 1964

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USE OF ALTERNATIVE MATERIALS IN BUILDING INDUSTRY

NEW MATERIALS COST LESS AND
ACCELERATE CONSTRUCTION ACTIVITY

Prof. M. S. Thacker, Member, Planning Commission, disclosed that two factories to produce cellular concrete blocks using fly-ash and lime were likely to come up in near future at Bandel near Calcutta and Trombay near Bombay.

Prof. Thacker said that it had been worked out that over and above increasing the production of traditional bricks by nearly 140 crores per annum, the country would require 10 to 12 mechanized brick plants to produce a variety of structural clay products. It was also proposed, he added to establish three more cellular concrete plants and seven, to eight plants to produce sand-lime bricks in localities where good sand and lime were available.

The Planning Commission Member revealed this while addressing the Standing Committee of the National Buildings Organisation of the Union Ministry of Works and Housing, on January 19, which was inaugurated by Shri Homi J. H. Taleyarkhan, Minister for Housing, Maharashtra.

Prof. Thacker made a strong plea for introducing alternative materials in the building industry so that costs could be reduced and building activity accelerated.

He suggested the use of fly-ash which would reduce the consumption of cement by 20 per cent; manufacture of cellular concrete blocks to replace bricks and asphaltic corrugated sheets instead of CGI sheets.

Prof. Thacker said that in the recent Housing Ministers' Conference at Chandigarh the shortage of building materials was

considered to be one of the important causes of shortfall in housing targets and it was suggested that immediate advance action should be taken for establishment of various building material industries. The NBO had been asked to initiate action and preliminary calculations had already been made of the total requirements of different materials required for fulfilling the Fourth Plan targets.

He said that while traditional building material industries had to be expanded, it was imperative to introduce new materials for reducing costs. It had been estimated that nearly three million tons of fly-ash would be available by the end of the Third Plan from various thermal power plants in the country. This material, which goes waste at present, could be profitably used by mixing it with cement.

According to Prof. Thacker, the cellular concrete blocks and sand lime bricks equivalent to 100,000 bricks would require only six to seven tons of coal against 18 tons for the traditional solid clay bricks.

Prof. Thacker also suggested that the National Buildings Organisation should set up offices in different States and extend its training programme.

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CENTRAL GLASS AND CERAMIC RESEARCH INSTITUTE

The Central Glass and Ceramic Research Institute was established in August, 1950. The subjects of study are: glass, pottery, refractories, vitreous enamelling and mica. The main function of the Institute is objective basic research on subjects having a bearing on glass and ceramic sciences and technologies. A few of the completed investigations illustrative of the contributions of the Institute to the Nation are mentioned below:

Survey, evaluation and beneficiation of raw materials: Authentic information on raw materials, such as occurrence, extent of deposits, quality, amenability to beneficiation, etc. is an essential pre-requisite for locating new factories as also for an uninterrupted supply to the existing ones which have already undergone appreciable expansion. Very scanty and sketchy information was available in this regard. Based on the results of investigations, the Institute has published memoirs and monographs on the survey of indigenous resources of glass and ceramic raw materials, such as sands, quartz, felspar, clays, talcs, etc. The survey has established that raw materials for these industries are available in practically all the regions. In addition to helping increased utilisation of the country's raw materials, and making them available in some cases from nearer deposits than hitherto, this work has dispelled the erroneous impression regarding unsuitability of Indian raw materials. Actually, Indian quartzites have been found to be amongst the purest in the world, and by using these, some of the finest varieties of optical glass can be, and are actually being, produced at the Institute. Survey of raw materials is a long

range programme, and work on magnesite, chrome ores, etc. is in progress.

IMPROVEMENT IN QUALITY

Glass containers: A wide variety of glass containers such as, ampoules, vials, bottles, jars and carboys constituting 40 to 50 per cent of the total production of glassware (about 250,000 tons in 1962) and valued at more than eight crores of rupees, are used in the chemical, pharmaceutical, fruit preservation, fermentation, soft drinks, dairy, cosmetics, ink and a host of other industries. Containers of inferior quality are detrimental to the interests of user trades and ultimately of the consumer. Complaints on the poor performance of local products (there were insistent demands for improving empty containers) were often received at the Institute and were investigated in detail over several years and as a result, compositions suitable for the manufacture of glass containers were worked out. There are now very few complaints about the quality of indigenous products. The import of glass containers had substantially reduced even before the present foreign exchange restrictions were imposed. Results have been freely given to industry and have been well utilised.

Saggars: Saggars are used in the pottery industry for keeping articles for firing in kilns and are used over and over again. Consequently, their life appreciably influences the cost of production of potteryware. The average life of saggars commonly used in Indian factories was reported to be about 6 to 8 firings as against 18 to 20 obtained in advanced countries. The Institute investigated the problem and some of the saggars made according to the Institute's findings, by using indigenous raw materials and without involving any radical change in the existing operations, stood even 80 firings under service trials in factories.

Plaster of Paris: Plaster of Paris made by calcining gypsum is an essential material extensively used in ceramic industries for making moulds for forming articles. The methods used in Indian factories were faulty. Further, the quality of Indian gypsum is not comparable to that obtained from Dandot (now in Pakistan) to which Indian factories were used. The Institute worked out in detail the conditions necessary for making good plasters and also designed kilns suitable for the purpose. The results were given to industry in discussions and were also published.

Locomotive headlights: While examining the causes of some railway accidents occurring during nights, a view was expressed that some of these might be due to insufficient light on the railway track. The Indian Railway Board approached the Institute for examining the possibility of reducing the divergence of light from locomotive headlights so as to ensure better illumination of the track by providing a system of lenses. A fairly simple and inexpensive method which would not involve any change in the present assembly of fittings, otherwise necessary according to the Railway Board, has been worked out by designing a special bulb as the source of light. After extensive trials conducted in the workshops of

the Eastern Railway at Jamalpur, its performance has been declared to be quite satisfactory. The Railway Board is now taking steps to put the results to actual practice.

SUBSTITUTES FOR IMPORTED CHEMICALS

In finding out substitutes for imported chemicals, without which some industries would come to a stop, the Institute has successfully worked out some substitutes, mention may specially be made of those for two essential chemicals, viz. borax and selenium.

Borax: Borax is an essential flux for the two-crore worth vitreous enamelling industry of the country, providing a variety of advertisement signs, hospital wares and utensils to poorer sections of the population. The industry consumes imported borax to the tune of rupees 6 lakhs per annum. After detailed investigations, the Institute worked out enamel compositions free from borax by utilising indigenous raw materials. Extensive trials were conducted in factories and the process was covered under patent which has been assigned by the National Research Development Corporation of India to an Indian firm. Apart from saving foreign exchange and assisting the utilisation of indigenous resources, the industry will now become independent of imports for supplies of an essential ingredient.

Selenium: That science, when properly utilised can, contrary to the general belief, materially influence the course of cottage industry has been demonstrated by the Institute's work for the glass bangle industry, one of the biggest cottage industries in the country concentrated at Firozabad near Agra, Uttar Pradesh, providing employment and livelihood to some seventy thousand people in one way or the other. The total annual production of glass bangles is valued at rupees 3 to 4 crores and red bangles which

are particularly favoured constitute about 50 per cent of total production, and in making them selenium, which is entirely imported, is used as a colourant. At one time due to scarcity, the price of selenium rose from rupees 8 per pound prevalent in pre-war days to rupees 300 and the industry faced great hardship, both in regard to availability and high cost.

After extensive investigations in the laboratory and factory trials in the works, in which local artisans and equipment were employed, the Institute succeeded in producing most of the red bangles without the use of selenium and utilising indigenous material. On the basis of successful practical demonstrations of the process, the Glass Technologist to Uttar Pradesh Government, who had been present when these were conducted, recommended progressive reduction in imports of selenium for this purpose. In view of their importance to a cottage industry, the Council of Scientific and Industrial Research gave the results free of charge to the entire glass bangle industry.

In addition to bangles, the Institute had also succeeded in producing selenium-free red signal glasses, extensively used in railways and in road and air traffic control. The samples had given satisfactory performance when used in some railway yards under operating conditions. The question of their official adoption by the Indian Railways is still under consideration.

Although undertaken as an industrial problem, this has led to some remarkable fundamental research on the origin of colour in red glass and the Institute's views have already been well accepted.

PRODUCTION OF IMPORTED MATERIALS

Chemical porcelain: A wide variety of porcelain articles, technically known as chemical porcelain—such as crucibles, dishes, funnels and basins, is used in scientific institutions and research laboratories and these were entirely imported. The Institute has successfully worked out processes for manufacturing from indigenous raw materials, chemical porcelain, declared satisfactory by several chemical laboratories, comparable in quality with some of the best imported products. The process was assigned to an Indian firm and the products are already on the market.

Enamel-coated resistors: A variety of enamel-coated resistors as also enamels used in electrical industries were entirely imported. Investigations were taken up at the Institute and enamel compositions and processes for enamelling resistors to meet the requirements of the specifications laid down for the purpose were worked out. The process was assigned by the National Research Development Corporation to an Indian firm who have been in production for several years.

Automobile spark plugs: Spark plugs used in automobiles were imported and the import of such plugs, in view of the increasing use of vehicles, was quite substantial. Two firms in Bombay and Bangalore started making metallic parts and assembled plugs by importing ceramic parts with electrodes. While examining the case for protection to this industry, the Tariff Commission recommended that the ceramic component of spark plugs

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should also be made in the country and suggested that the Institute should initiate investigations in this regard. Tests and performance trials conducted by the two factories indicated that the ceramic parts made at the Institute by using indigenous raw materials were satisfactory for the types of automobiles used in the country and the Government Test House, Alipore, Calcutta, declared them to conform to the requirements of the Indian Standard Specifications. However, in view of one of the above mentioned firms having been granted collaboration with their foreign manufacturers just when the investigations had been completed and NRDC was considering utilisation, the results were not put for commercial use.

TECHNOLOGY AND PRODUCTION OF STRATEGIC MATERIAL

Optical Glass: A special assignment given to the Institute by the Planning Commission in 1956 was to work out processes for the production of the optical glass to make the country independent of imports for this vitally strategic material. Optical is produced in about half a dozen countries in the world and its manufacture is a carefully preserved secret. Ever since the outbreak of hostilities in 1939, the Government of India had been anxious for its production in the country and negotiations had been in progress for a long time with almost all the foreign manufacturing firms, without success.

The Institute succeeded in establishing the details of manufacturing operations without association of any manufacturing firm. The entire equipment was designed and fabricated at the Institute, since the manufacturers do not for reasons of secrecy, sell such equipment or supply the designs. The samples of optical glass produced in 1958 on a pilot scale were declared to be of A-grade quality. The Government of India and the Planning Commission

entrusted the task of commercial production to the Institute in early 1960 and a plant of a capacity more than the requirements has been fabricated and erected at the Institute and went into production in the later part of 1960.

All the major types of optical glass are now being produced in the plant and the demand which has considerably increased after emergency is being fully met. In addition to relieving the country of its continued dependence for a vital material, the production of optical glass should give impetus to the development of optical instrument industry in the country.

A MATERIAL OF SPECIAL INTEREST

Foam Glass: Foam glass is an efficient thermal insulating material approaching cork in its performance, with the added advantage of being non-combustible, rigid and unaffected by the action of moisture and termite. It is extensively used in building, air-conditioning and cold storage industries, as well as for insulating hot and cold pipes, storage tanks, etc. The processes for its production are kept secrets in the few countries where it is produced. Foam glass can be a very good substitute for cork which is entirely imported. In 1955-56 imports of cork slabs were valued at about rupees 50 lakhs. The Institute has successfully worked out complete processes for producing foam glass from Indian raw materials. The patent has been assigned to one firm which has erected a factory near Bombay and initial production trials are in progress.

RESEARCH ON MICA

In the mining of mica, only about 15 per cent is saleable, the rest is waste. The Institute has worked out two processes for utilising this waste—one for making heat insulating materials extensively used on industrial

furnaces and these were being made from imported vermiculite and the other for wet grinding of mica. An entirely new industry has been established and two factories, one in Rajasthan and the other in Bihar, are already producing and supplying such heat insulating bricks to some of the steel plants, oil refineries, power plants, etc. One more plant is being established in Gudur, Andhra Pradesh.

The methods for wet grinding of mica which is used as a filler in rubber, wall paper industries and could replace aluminium in paints, are closely guarded secrets of some U. S. firms. The Institute has worked out complete processes for their manufacture.

Under the present system in the mica trade, mica is shipped to consuming countries and appraisal of its quality is made at the landing ports on the basis of some arbitrary visual examination. As a result, large quantities of mica are either rejected or downgraded, resulting in substantial loss of foreign exchange in

addition to the country getting a bad name in international trade. The Institute has developed a handy apparatus for rapid evaluation of the quality of mica on the basis of its electrical properties. Its suitability as a useful apparatus has been established by satisfactory performance by some mica manufacturers. The apparatus is being fabricated at the Institute and supplied to needing parties.

PRODUCTION OF SPECIAL GLASS AND CERAMIC ARTICLES

While engaged in investigations on examining the possibility of manufacturing imported articles in the country, the Institute had worked out methods for producing several glass and ceramic articles, e.g. pyrometer sheaths, refractory tubes and plates, combustion boats, glass electrodes for pH meters, enamel stains, etc. Though not very costly and also not required in large quantities to induce entrepreneurs to undertake their production, these are

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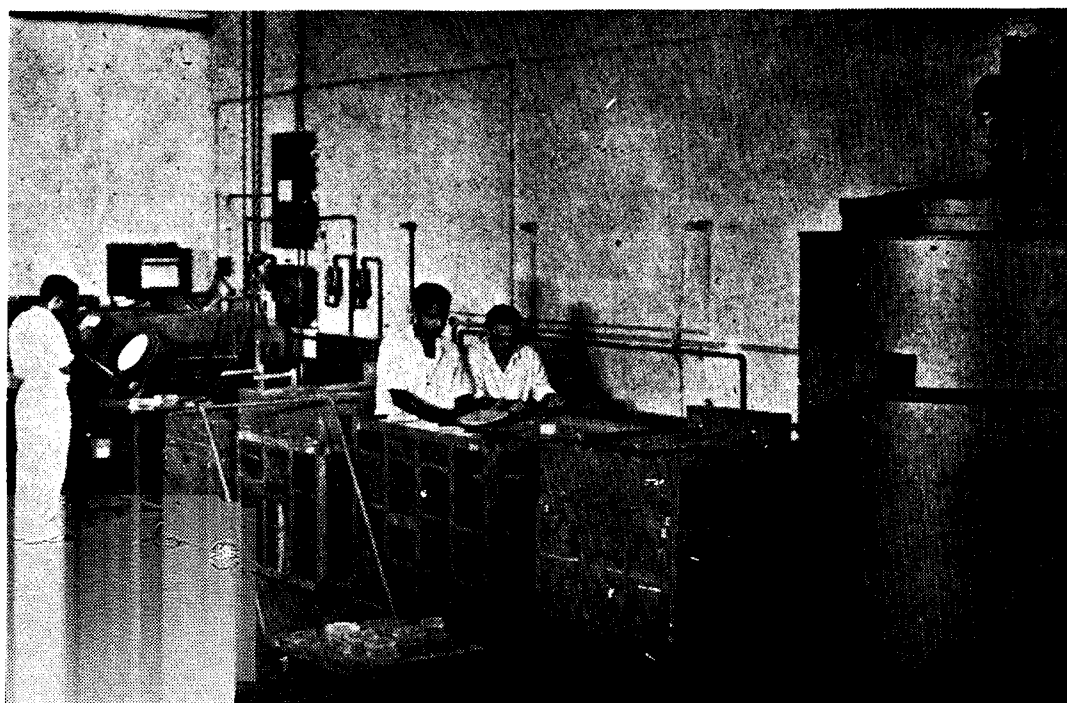
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Slumping of optical glass produced at the Institute.

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indispensable either as parts of essential equipment or as necessary ingredients for certain processes. For want of their ready availability in the country, serious difficulties have been experienced by the users, occasionally even dislocating industrial production. These small items had therefore to be imported, which apart from the delay causing interruption in work, was not desirable in view of the difficult foreign exchange situation. In order to render assistance in this regard, the Institute had been supplying these articles to a limited extent, but persistent requests for increased supplies from the industry, educational and technical institutions and research organisations induced the Council of Scientific and Industrial Research to create in 1950 a special production cell at the Institute financed by a loan from the Government of India at 4 per cent annual rate of interest. During the short period of its functioning, even with the small size of production, it has already paid off three return instalments together with interest. This service is in the nature of assistance and as soon as manufacture of any of the items is taken up by some party, its production will be discontinued. Already some parties have approached the Institute for undertaking production of some items.

FUNDAMENTAL RESEARCH

Amongst the fields of fundamental research pursued at the Institute special mention may be made of: the origin of colour in coloured glasses, special titania glasses, thermal conductivity of low conductive materials, mineralogy of clays and introduction of polarographic technique in the analysis of silicates.

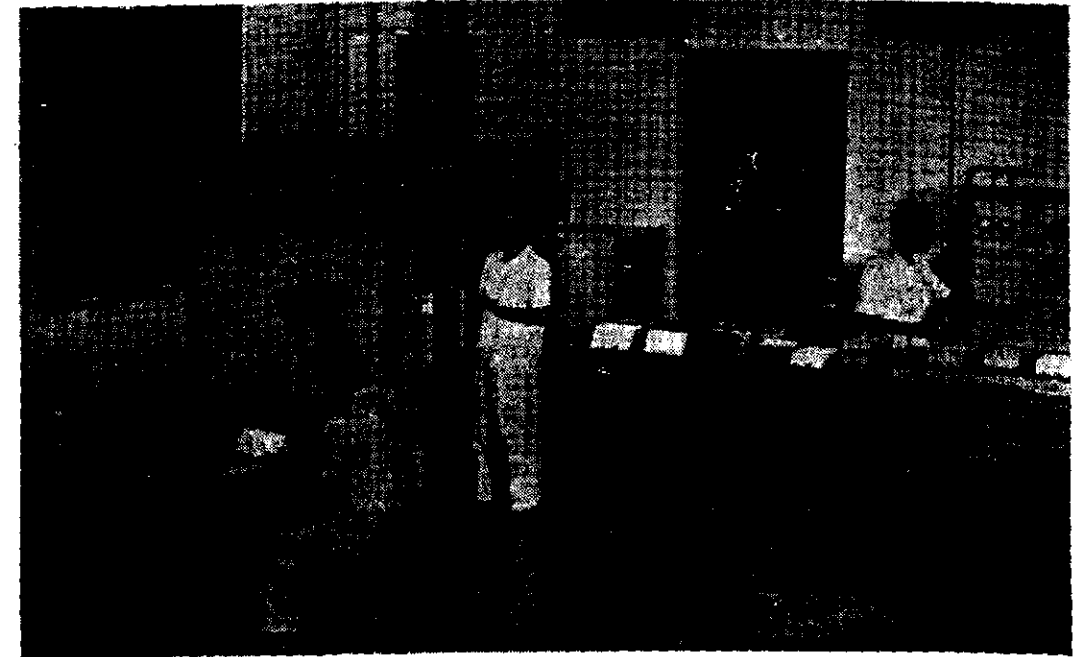
THE INSTITUTE BULLETIN

Dissemination of information is one of the functions of the Institute. The Institute publishes a quarterly bulletin. Generally, it publishes in the bulletin results of investigations carried out at the Institute and in that respect has acted as a suitable medium for their dissemination and also for other information, but communications from noted investigators outside the Institute are also accepted for publication.

CONCLUSION

The above account briefly outlines some of the technological researches done at the Institute. In addition to improving quality of production, starting new industries, finding better and wider utilisation of country's raw materials thus providing additional employment, the work so far done by the Institute, when fully utilised, will save foreign exchange to a considerable extent.

Although one of the functions of a laboratory primarily devoted to objective research is to produce utilisable results, industrial progress cannot be achieved merely by scientific researches, however brilliant. The existence of an industry receptive to scientific approach and of conditions conducive to the utilisation of worthwhile results is essential. To assist in creating this attitude and temper should be an even more important function of a centrally organised laboratory. Some of the leaders of industries connected with the Institute's work, who have spent most of their life in the fluctuating vicissitudes of these industries, have often complimented the Institute for creating a feeling of science consciousness in the industry. The Institute feels gratified to see this outlook developing steadily, though much more still remains to be done.



Testing of mica-based aluminium paint produced at the Central Glass and Ceramic Research Institute, Calcutta.



Laying of foam glass for insulation against heat.

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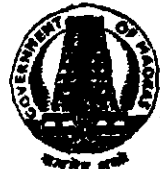
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DOUBLE-WEIGH HOPPER DESIGNED FOR SPINNERS OF COARSE YARNS

BY WALTER ANDREW, A.M.C.T., F.T.I., F.R.S.A.,
Editor, "Textile Recorder", Manchester

In woollen and waste spinning, long-term count variation depends to a very considerable extent on the accuracy of the weigh hoppers used to feed the carding sets, and in recent years machinery makers have devoted a great deal of attention to improving the design and operation of units of this type.

A recent British development in this field is the Type 880 double hopper (1), a machine which incorporates two separate hoppers arranged in tandem, and is designed primarily to cater for the requirements of spinners of carpet, blanket and other coarse yarns.

The fibre is fed in the normal way into a large-capacity preliminary hopper from which it is delivered into the relatively small second hopper by a conventional spiked elevating lattice assembly. The second hopper is V-shaped and has no bottom lattice, the material being confined between a back plate and a spiked elevating lattice. An automatic filling mechanism controls the delivery from the first hopper to ensure that a constant level of material is maintained in the second hopper.

The spiked elevating lattice in the second hopper delivers the material at a constant

rate to a double weigh pan mechanism, the filling being under the control of a micro-switch on the sensitively balanced scale beam.

An important feature of this machine is that, in addition to providing an extremely accurate feed to the card, the hoppers are self-emptying when it is necessary to change the blend, delivering, it is claimed, absolutely correct weighs right up to the end of the run. The lattices are of all-metal construction.

CYLINDER DRYER WITH WIDTH CONTROL

A number of improvements have recently been made to a novel high-capacity drying machine (2), introduced in the U. K. a short time ago, and this machine is now being offered in conjunction with a specially designed mangle (3) and an ingenious arrangement of flexible tapes (4) which control the width of the fabric as it passes round the drying cylinder.

In the drying machine the cylinders are arranged in a clover-leaf formation and are fully enclosed by a system of covers. The drying action is accelerated by the controlled circulation of hot air through the unit, and detailed improvements have now increased the evaporation rate to about 450 kg. of water per hour, with a steam consumption between 1.35 and 1.58 kg. of steam per 1 kg. of water evaporated.

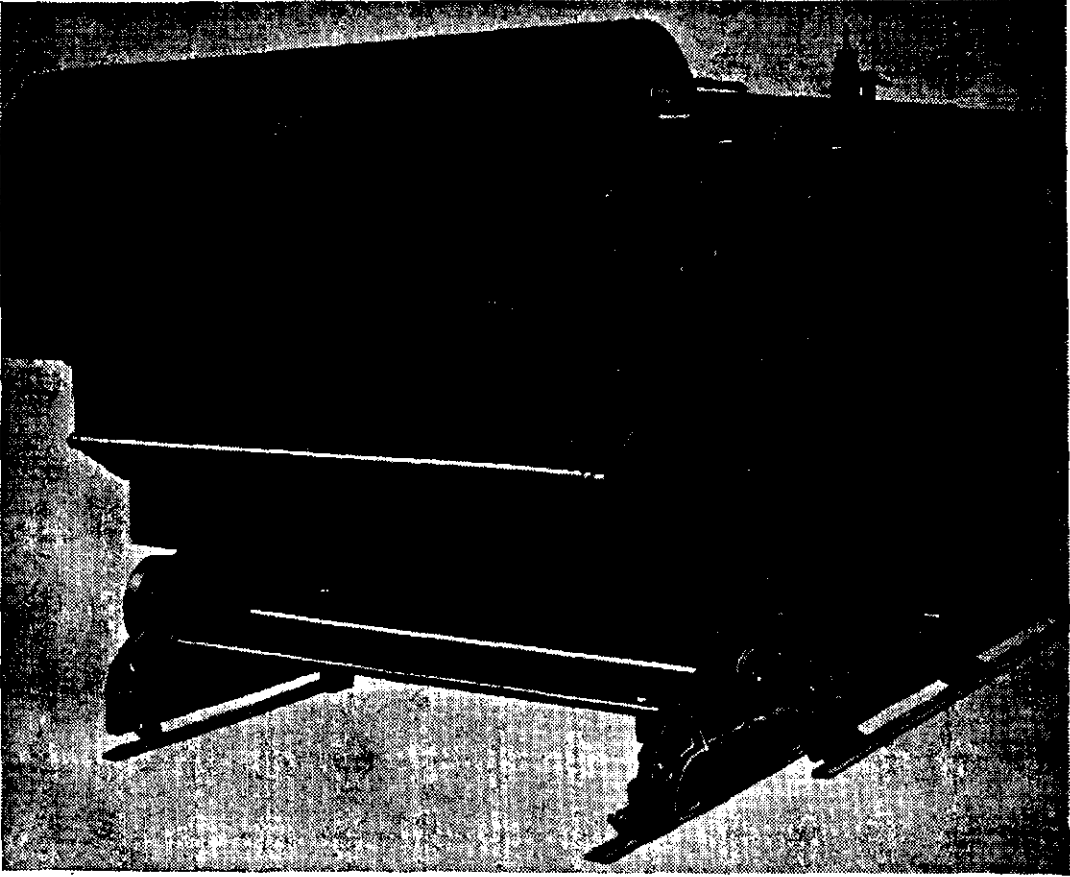
The object of introducing the mangle into the set is to obtain the maximum expression possible, mechanically, before evaporative drying. The mangle has three bowls disposed horizontally and the load is applied pneumatically; it can be increased up to 28½ kg. per cm. of roller width.

At one edge, the flexible steel tapes are formed into a series of teeth. Separate tapes are provided for each side of the fabric, and work in conjunction with an entry frame with electronic selvage guiders, an overfeed device, and so forth, of the type used on normal stenters. This frame is placed between the mangle and the entry part of the dryer, and is used to feed the fabric on to the endless tapes.

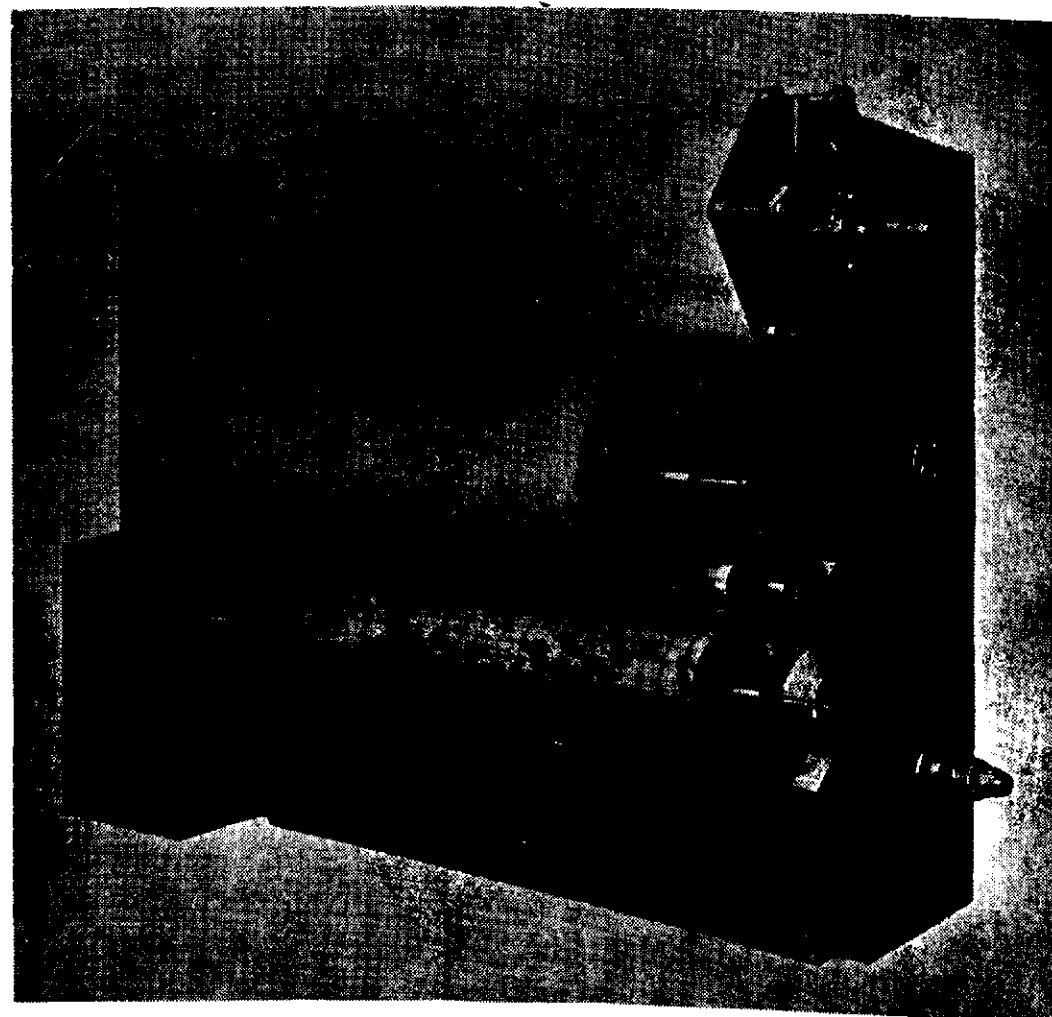
The tapes are controlled by guides which hold them over vertical at the fabric pickup point and then gradually turn to a horizontal position in the same plane as the fabric. The width between the tape guiders is adjustable. In the horizontal position, the tapes can pass round the drying cylinders with the fabric

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Rear view of the Type 630 Double Weigh Hopper, designed primarily for spinners of carpet, blanket and other coarse yarns.



Neat compact laminating machine of a new design.

and serve to control its width during the drying operation.

It is claimed that the system can control the width of the fabric during drying in a way comparable with that of the claims on a conventional stenter, resulting in a tremendous saving in both capital costs and floor space occupied by the machine. The tapes can be made to virtually any length, and it is thought that, in addition to its uses in conjunction with the dryer, the tape arrangement (named the Tenterflex system) could be used to convey and control the width of fabric through a series of continuous dyeing or finishing processes. Being only a fraction of a millimetre thick, the tapes can pass through roller nips with the fabric.

ADHESIVE LAMINATING MACHINE

Although the fabric/foam laminating process is of relatively recent origin, laminated fabrics are now being produced in considerable quantities, and a whole range of special machinery has been developed. The latest British machine (5) is a compact, inexpensive unit designed for producing fabric/foam fabric/fabric or fabric/foam/fabric laminates on a batch production basis. As such, it is particularly suitable for use by firms wishing

to cater for short runs or for speciality production, or intending to diversify existing activities in this field.

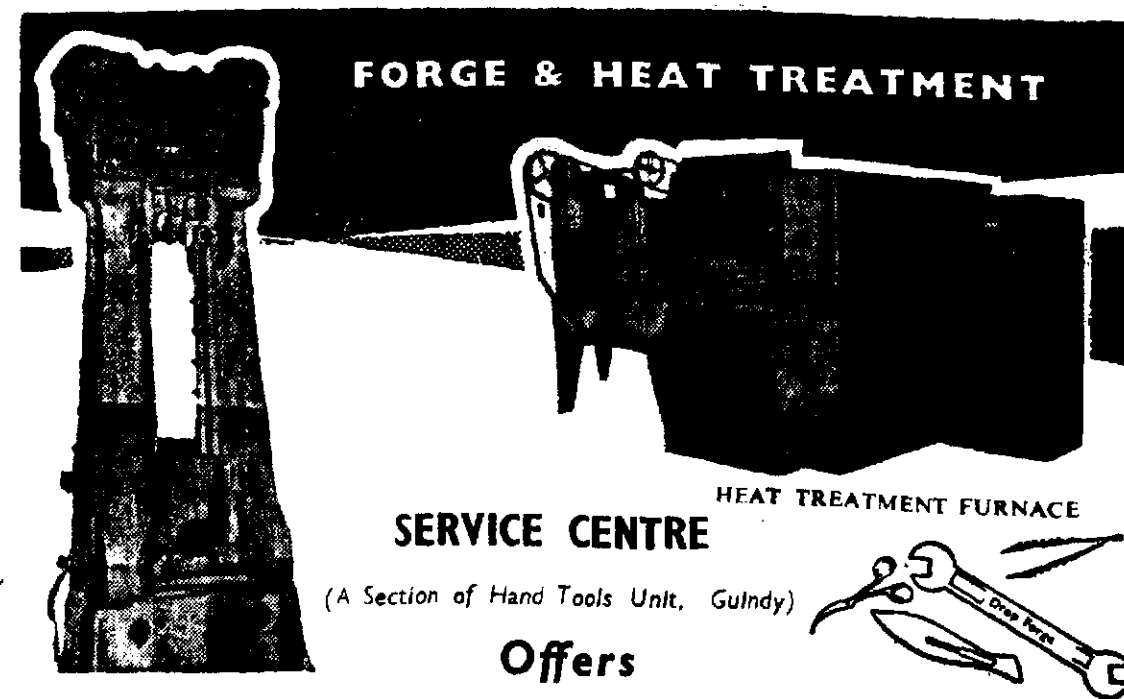
The machine is based on the film transfer principle, a film of adhesive being formed between a large cylinder and a roller spreader which are positioned to form a reservoir for the adhesive. The pressure between the large cylinder and the spreader is controlled pneumatically and determines the thickness of the adhesive film formed. The spreader can be a plain or an engraved roller to produce either a uniform or a discontinuous film in almost any kind of pattern formation.

The film of adhesive so produced passes round on the surface of the large cylinder from which it is picked up by the fabric, the film and the fabric being pressed firmly together at the pick-off point. The fabric and the foam (or second fabric) are then brought together under the action of a further roller and the resulting laminate passes to a heated drum for curing of the adhesive.

Pressure at the film pick-off and laminating points is controlled pneumatically, while the laminate is held firmly against the surface of the heated combining drum over an arc of about 270 degrees by an endless fabric apron.

Key to references in the article:

- (1) Platt Wool Machinery Sales Ltd., Hartford Works, Oldham, Lancashire, England.
- (2) Solar Industries Ltd., 123, Hope Street, Glasgow, C. 2, Scotland.
- (3) F. Smith and Company (Whitworth) Ltd., Sunnyside Works, Whitworth, Rochdale, Lancashire, England.
- (4) Bates Textile Machine Company (Leicester) Ltd., 5 Lower Church Gate, Leicester, England.
- (5) Weston-Evans and Company Ltd., Avanti Works, Manchester Road, Clifton, Manchester, England.



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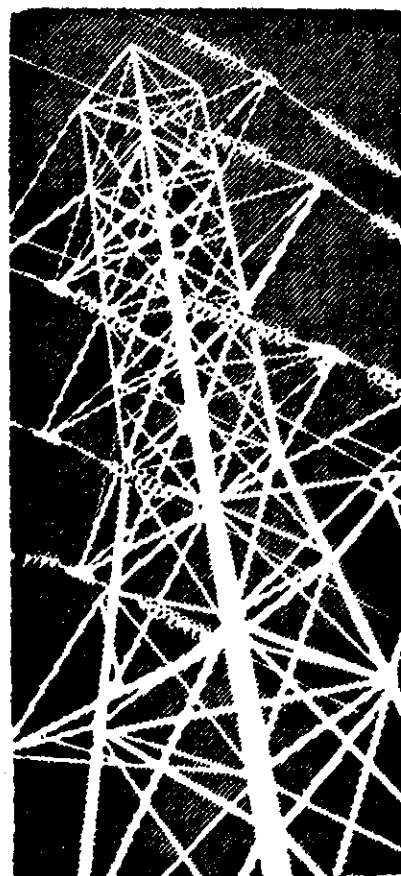
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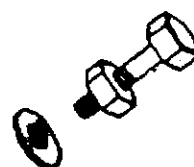
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The Superintendent,
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MALLEABLE IRON CASTINGS

PRODUCTION BOOSTED 20 PER CENT BY NEW INVENTION

SAVES POWER AND WEAR AND TEAR OF FURNACES

A new instrument E. 600 Polyvac, a British invention saves power and wear and tear of furnaces in the manufacture of "black-heart" malleable iron castings. Besides production is quicker and there is less waste by adoption of this modern device.

The instrument is the Hilger and Watts Ltd., E. 600 Polyvac. Equipped with twelve photosensitive detectors or photo-multipliers the instrument examines selected elements of samples taken from a furnace before a molten alloy is poured and so provides an automatic analysis.

Because of its combination with a hot blast cupola as a primary melting unit, production of malleable iron at the works is being boosted by 20 per cent or 100 tons a week.

At the Hale and Hale Ltd., foundry in Tipton, Staffordshire, a new instrument is being used for the first time in the manufacture of "black-heart" malleable iron castings. The device means greater accuracy and speed of control.

The process of analysis is simple. A small sample is taken from the molten metal in the furnace and this is cooled and then cut in to a slug two inches (5 centimetres) square by five inches (13 centimetres) long. This slug is then

placed in a sparking chamber and electrically fired into incandescence. The light from this is spread by a prism into selected ray each of which has a wavelength as individual to the element observed as are a human being's fingerprints. The intensity of these rays is measured by the photomultipliers and the result is an analysis in code figures—finally typed out on an electric typewriter.

For the analysis of complex alloys such as stainless steel the E. 600 can be quickly adapted to take up to 25 detectors, thus enabling 25 selected elements to be observed if required.

The prism which splits the observed rays for analysis is enclosed in a vacuum to eliminate oxygen which would otherwise absorb the light of some of the wavelengths of the elements thus examined. For the same reason, the sparking chamber itself is flooded with argon, a heavy inert gas, to get rid of the oxygen that would otherwise be present.

When translating the code analysis into the final concentrations required all that has to be done is to refer to prepared graphs and read off the answer. If need be, even this sole remaining possible source of human error can be cut out using a simple, cheap computer

attachment. Associated electronic data-processing devices can also be supplied to give the typed answer in "computer language" which can then be fed into a big computer with related information and so provide a complete breakdown of a plant's characteristics.

The E. 600 carries out an analysis of a metal sample in three to four minutes compared to the hours this process took before. Molten metal thus need no longer be

kept waiting a long time at intense heat in furnaces while analysis is made by "wet" methods. Not only does this save power and wear and tear on furnaces, but production is quicker and there is less waste because of the improved control provided.

On the one hand, the analysis itself is far more accurate and detailed on the other, chemical changes that took place in the melt, during the delay in pouring that occurred with former methods of analysis, have been eliminated.

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CHIPBOARD

(PARTICLE BOARD)

SCOPE FOR DEVELOPMENT

Particle board may be defined as a sheet material manufactured from small particles or pieces of wood or other lignocellulosic materials e. g. chips, flakes, splinters, strands and sieves etc. agglomerated by use of organic binders, together with one or more of the following agents; heat pressure, humidity, catalyst etc. Industrial wood residues, logging and forest management wastes and residues, etc. which have not been exploited so far and which have low economic value can be profitably converted into particle board.

Particle board is a very versatile board material and among others can be used in place of solid timber in the manufacture of furniture. Medium density particle board can be used as panel material for walls and ceiling interiors in houses, railway carriages and ships etc. Low density particle board can find its use as an insulating material.

At the beginning of the Second Plan there was only one unit in the Country at Sitapur (U. P.) with an annual capacity of 6 million sq. ft. As on December, 1964 there are 23 applicants holding industrial licences for a total capacity of 167,326 tonnes. Of this, only one belongs to Madras State with a licensed capacity of 1,700 tonnes (M/s. N. R. Krishnama Raja of Rajapalayam). This unit is likely to go into production in 1965-66. In addition, M/s. Cork Industries, Madras has applied for licence to set up a factory at Allipayanagar, Coimbatore District with a capacity of 7,500

tonnes. A list of units in Production in this Country is given below :—

Sl. No.	Name and address	Capacity tons
1.	M/s. Plywood Products, Sitapur, Utter Pradesh ...	6,000
2.	M/s. Bharat Plywood & Timber Products, Cannanore, Kerala ...	2,500
3.	M/s. Jolly Brothers (Particle Boards (I) Ltd.) Khetan Bhavan, Bombay ...	4,000
4.	M/s. Indian Plywood Manufacturing Co. Dandeli, Mysore. ...	4,250
5.	M/s. Indian Plywood Manufacturing Co. Itarsi (Madhya Pradesh) ...	4,250

92462

As a result of the increase in population and the planned economic growth, requirements of industrial wood will double by 1975 whereas supply is likely to increase by only 20% leaving a gap of about 4.3 million tons by 1975 and 6.3 million tons by 1985. The Planned development of the wood based panel industries, particularly particle board is expected to play a major role in bridging the gap between the supply and demand of sawn timber required by the Building industry, transport and communication industry and the furniture industry. Particle board can rightly be described as reconstituted timber and can successfully replace, supplement or substitute sawn timber in most non-structural uses—in other words adequate availability of particle board will enable us to augment the much needed supplies of sawn timber required to sustain the economic development in the next 20 years.

The performance of the units licensed has been reviewed by the Government of India and it is expected that the capacity likely to be developed by the end of the Third Plan will be 88,500 tonnes.

It is proposed to put a production target of 100,000 tons of particle board by 1970-71, which may require a licensed capacity of not

more than 1,50,000 tons. Thus we have still to fill in a gap of about 80,000 to 70,000 tons by issue of new licences for the industry.

There is thus scope for one or two more units in Madras State. There are some bottlenecks in the establishment of new units. Applicants are expected to execute a bond agreeing to export 15% of the production for the first 10 years, and this bond should be supported by a Bank guarantee equal to the value of the imported equipment less any foreign contribution to the equity.

Liberalisation of these conditions is proposed to be considered shortly by the licensing committee.

RAW MATERIALS

The development of the chipboard industry depends upon the development of Urea Formaldehyde. In India there are only 2 units manufacturing 3,160 tons per annum—of which one is in Madras, viz. Reichhold Chemicals India Limited., Madras (Capacity 1,000 tons). The demand by 1966-68 would be 5,000 to 6,000 tons of U. F. resin. The demand by the end of the Fourth Plan will be of the order of 10,000 tons. The question of permitting Chipboard Plants to set up captive capacity for the manufacture of U. F. resins, is also engaging the attention of the authorities

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A UNIT OF THE SMALL-SCALE
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INDUSTRIES FOR FURTHER EXPANSION

The following is the list of industries favoured by the Planning Commission for further expansion in the Small Scale Sector during the Fourth Plan Period.

1. All wire products such as wire nails, hob nails, panel pins, hand-out tacks, horse shoe nails (sheets):
2. Wirebrushes and fibre brushes.
3. Metal buttons and bandges.
4. Square, hexagonal and welded wires mesh.
5. Expanded metal.
6. Steel furniture.
7. Weights and measures.
8. Beam scales.
9. Barbed wire.
10. Machine screws.
11. Wood screws.
12. Ordinary bolts and nuts.
13. Builder's hardware.
14. All types of locks.
15. Ball points and refills.
16. Press buttons and snap fastners.
17. Shoe eyelets;
18. Stoves, lanterns, blow lamps and burners.
19. Spray paint guns.
20. Mechanical toys.
21. Collapsible tubes.
22. Flexible tubes (Metal).
23. Cycle pumps.
24. Garment hook and eyes.
25. Cigarette lighters.
26. Rivets of all types.
27. Student and medical type microscope.
28. Spectacles hinges and frames.
29. Garment buckles.
30. Hand numbering machines.
31. Postal franking and cheques writing machines.
32. Pressure cookers.
33. Spring washers.
34. Machine shop vices.
35. Diamond tools.
36. Steel wool.
37. Wood wool.
38. Tape recorders.
39. Mechanical gramophones.
40. Hearing aids.
41. House and industrial wiring accessories.
42. Hair clippers.
43. All plastic processed products as decided by the licensing committee in its meeting held on 23rd December, 1962.
 - (i) Bottle caps, buttons, lamps, shades, etc, produced by the compression moulding technique.
 - (ii) Plastic articles manufactured from plastic sheets rods, or tubes by the fabrication technique including the technique of vacuum forming.
 - (iii) Polythylene films (films with a thickness of less than 1 millimetre +

and products made from the film such as bags, etc.

- (iv) Mono filaments from polyolefins.
- (v) Blow moulded containers and similar products manufactured by the blow moulding techniques.
- (vi) Finished products manufactured from expanded (formed) polystyrene beads.
- (vii) Spectacle frames from sheets by the fabrication technique or by injection moulding.
- (viii) Manufacture of polyester sheets from buttons and the processing of these sheets so produced to manufacture buttons dyes (i) azodyes (ii) basic dyes (iii) all processed dyes such as stabilised azoics, indigosols; vat dyes paste, pigment paste, pigment emulsions; paints and varnishes-dry distempers, red lead, red oxide aluminium paints, bitumen paints to I.S. specification, wagon blacks, graphite paints, all past paints. All pesticide formulations detergent, formulations, laundry soap, leather footwear; sports goods; paper conversion products; glass products which may be made by the batch process; fire chemicals and formulated perfumery compounds.

COMMON PRODUCTION PROGRAMMES

Besides this reservation, common production programmes are favoured in the following 26 industries; electrical and electronic measuring and indicating instrument, electric motors, record players and changers; bicycles and their components, cameras, enlargers and projectors; radios and their components public address equipment; plant protection equipment like sprayers, and dusters, pressure and vacuum gauges; water meters. A. A. Conductors; plastic processed products (excluding those decided by the Licensing Committee to be reserved exclusively for development in the Small Scale Sector in its meeting held on 23rd December, 1962); dyes (Excluding those reserved for development in the Small Scale sector); paints and varnishes (excluding those reserved for development exclusively in the small scale sector); soap excluding laundry soap destergental food industries, leather tannery, pharmaceuticals and drugs, glass and ceramics; cosmetics and perfumes, industrial rubber products, synthetic resins, synthetic driers, printing inks; and inorganic pigments.

CRITERIA FOR SMALL SCALE ANCILLARY UNITS

Certain modifications and additions as given below have been made in respect of the criteria for ancillary units and in the list of industries in respect of which the upper limit for investment on land, building and machinery has been raised to Rs. 10 lakhs for small scale units.

Criteria for ancillary Units: "A Unit which produces parts, components, sub-assemblies and tooling for supply against known or anticipated demand of one or more large units manufacturing assembling complete products and which is not a subsidiary to or controlled by and large unit in regard to the negotiation of contracts for supply of its goods to any large unit. This shall not, however, preclude an ancillary unit from entering into an agreement with a large unit giving it the first option to take the former's output."

The units which are set up primarily for replacement market also fall within the scope of the above criteria. Units manufacturing tools, jigs and fixtures will also be recognised as ancillary units.

The list of 16 industries recommended for encouragement of ancillaries has been revised as under:—

1. Industrial Machinery.
2. Agricultural and Earth Moving machinery.
3. Machine Tools.
4. Industrial, Scientific and Mathematical Instruments (Mechanical).
5. Locomotives and Rolling Stocks, Ships Aircrafts.
6. Bicycles.
7. Boilers and Steam-generating Plants.

8. Steam Engines, Turbine and Internal combustion Engines.
9. Automobiles.
10. Commercial Office and House-hold Equipment.
11. Electrical Machinery, Equipment and Appliances.
12. Tele-communication Equipment.
13. Industrial Instruments-Electrical.
14. Radios and Electronic Equipment.
15. Air-conditioners and Cold storage equipment—including Refrigerators.
16. Mineral Oil and Petroleum Industries.

In regard to item 11 viz. Electrical Machinery, Equipment and Appliances, emphasis should be mainly on electrical machinery rather than on appliances, which would cover also those of the consumer type, the scope for the development of which is somewhat limited at present.

In respect of item 16 viz. Mineral Oil and Petroleum Industries only such small scale units which serve as ancillaries to large scale units engaged in the manufacture of the equipment for the marketing of the refined petroleum products should be encouraged.

Copy of No. 2 (10) 64-Anc. Government of India, Ministry of Industry and Supply, Office of the Development Commissioner, (SSI), New Delhi, dated 12th October, 64.

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BY SRI N. K. N. IYENGAR

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TECHNICAL INFORMATION SECTION

Industrial Estate, Guindy,

MADRAS-32.

USE OF STAINLESS STEEL SCRAPS 18-8 (CUTTINGS AND TURNINGS) IN SMALL SCALE FOUNDRY UNITS AS ALLOYING ELEMENTS IN PLACE OF NICKEL AND CHROMIUM

Stainless steel scraps (Cr. 18% ni. 8%) are available in plenty in India. At present these scraps are being exported to foreign countries. On the contrary Nickel F shots, Nickel Electro Squares and Ferro-Chromium are being imported.

In the event of industrial development in our country demand of high duty and special purpose nickel chrome alloy castings have gone up considerably. Particularly, Ni-Hard castings requirements for cement factories, coal and gold mines have to be met by indigenous supply only since the import is restricted on such castings from abroad.

Manufacturers of Ni-Hard and other special purpose castings are facing a great problem in procuring nickel and chrome which are in acute shortage.

To ease the present situation, stainless steel scraps which are available in plenty can be economically used in place of nickel and chrome.

The following method can be adopted for an effective use:

When we consider the nickel chrome percentage in Ni-Hard castings in general Nickel from 3% to 5.5% and chromium from 1.5% to 7.5%. To achieve the required composition stainless steel scraps should be melted in crucible furnace. Addition of nickel if required to increase the percentage can be made at this stage, and poured in a convenient size pigs. There is no oxidation loss in nickel and allowing 15% loss on chromium,

we know the exact percentage in the master alloy Ni-Hard pigs. These pigs in required percentage according to nickel and chrome composition of the castings could be charged directly into the cupola along with foundry pigs and steel scraps. A typical charge composition should be worked out according to the individual requirements.

If proper care is taken while calculating the additions and charges, quality Ni-Hard castings can be manufactured without any deviation in required specifications.

In view of the above, details on effective use of stainless steel scraps as alloying elements, necessary steps may please be taken to utilise the available scraps in this direction. Small scale foundry units can also take advantage of this particularly when nickel chrome is of much demand and in short supply.

The above matter was also discussed in length with Shri H. G. Shastri, Nickel Information Bureau, Bombay, who was also of the opinion that due to the acute shortage of foreign exchange it will be beneficial to small scale units to use 18-8 stainless steel turnings as a Ni & Cr. alloying elements in foundry castings.

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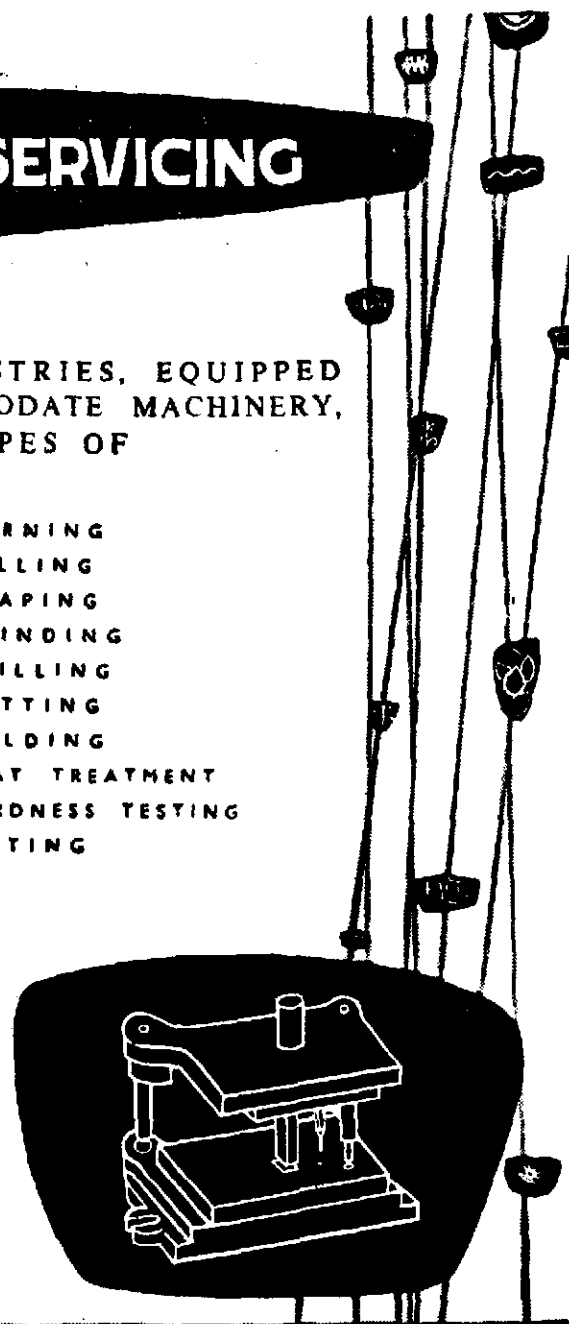
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GOVT. TOOL ROOM SERVICING SHOP

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APPLICABILITY OF NUT COKE IN CUPOLA MELTING

In the event of the present days non-availability or meagre supply of B. P. hard foundry coke, this technical note is being prepared to impress upon the small scale industries the applicability of nut coke which is available in adequate quantity at present in place of B. P. hard coke.

Nut cokes are manufactured at Rourkela, Durgapur and Bhilai. The following are the compositions of nut coke and B. P. hard coke, furnished by M/s. Hindustan Steels Ltd., Calcutta.

Heads	Nut Coke	B. P. Hard Coke
Ash	22.5—24%	22.5—24%
Volatule matter	2" max.	2% max.
Fixed carbon	75—76%	75—76%
Phosphorous	0.10—0.13%	0.13—0.13%
Sulphur	0.52—0.62%	0.52—0.62%
Moisture	0.4% max.	0.4% max.
Size	20—40 mm	40—100 mm
Caloriphic Vale	5,790 Cal/g	6,970 Cal/g

From the above two compositions, we may find that there is no difference between nut coke and B. P. hard coke excepting the coke size and moisture content.

For a successful operation of cupolas up to 36" inside dia. with nut coke, the following

operational methods are found suitable and hence recommended.

1. Bigger size available coke from 1" and above should be separated and kept for the use exclusively for bed coke charges. Nut coke has got a good shatter index value and maintains the bed height in good condition for longer cupola heats.
2. Coke size 1" and below should be screened through No. 2 mesh and what remains in the sieve can be used as a fusion or charge coke along with the metal.
3. Cupola preparation of sandbed, bed coke height etc. can be kept as per normal practice according to the cupola size. Care should be taken in kindling with sufficient quantity of dry fire wood so that the time taken in preparing a well lighted coke bed upto the top can be quickened. Induced air can also be given for faster lighting of bed. When the bed is ready, unit charge of metal coke and limestone or shell should follow

OCTOBER—DECEMBER 1964

in quick succession without delay upto the height of the charging door. Soaking time need not be given and the blower should be started immediately. Care should be taken in keeping the charge level upto the top of charging door, during the cupola operation till the final charge completes.

4. Regarding metal coke ratio in nut coke practice, normally 5:1 or 6:1 can be used depending upon the steel scrap percentage. With 5% steel scrap 7:1 ratio was also produced a satisfactory result. For longer heats, it is recommended to give extra one unit fusion coke with lime shell or lime stone can be kept 4 to 5% of metal charges.

5. Careful control should be kept on cupola to maintain a constant blast pressure according to the size of cupola and bed height during the operation and in the end i.e after the last charge given the pressure should be reduced gradually to the minimum pressure required.

Nut coke has been tried on many occasions during last year and is being used regularly for cupola melting at the Government of India Production Centre Foundry and the results are quite satisfactory. Hence we can confidently recommend nut coke for cupola melting to small scale foundries having cupola upto 36" internal diameter.

Whoever wants any further details or demonstration in this connection may contact Government of India Production Centre for necessary guidance.

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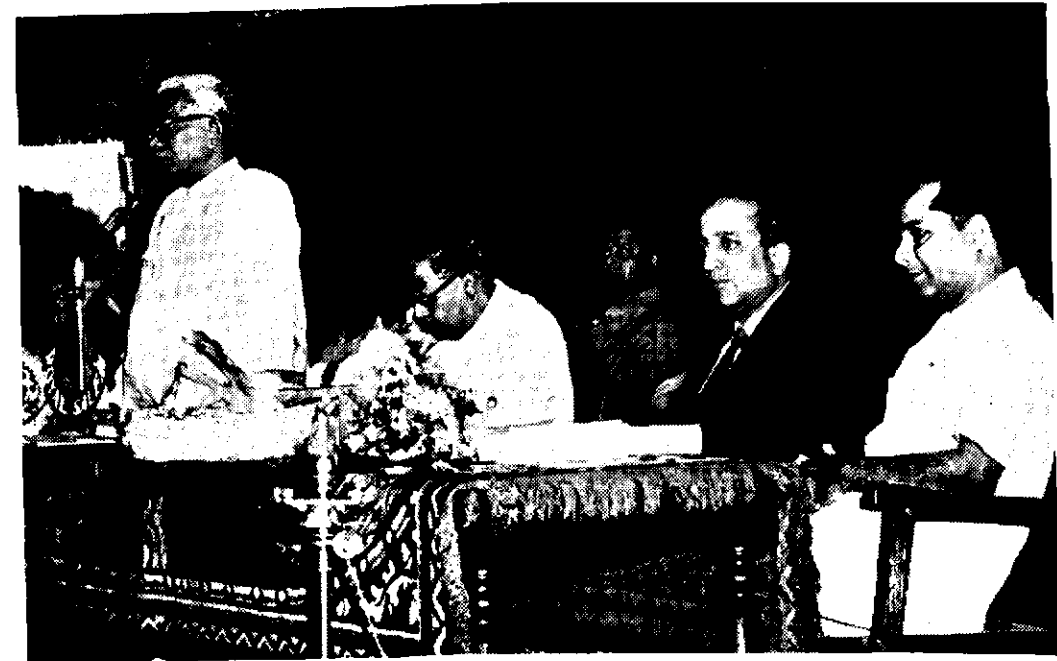
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ROLLERS, RLY. FITTINGS AND P.V.C. MOULDINGS.



Sri M. Bhaktavatsalam, Chief Minister of Madras, addressing the delegates to the Salem District Industrial Seminar, held at Salem.



Members of the Estimates Committee of the Madras Legislative Assembly at the Industrial Estate, Ambattur. In the centre is Sri T. A. S. Balakrishnan, Director of Industries & Commerce, Madras.



The Government Scientific Glass Apparatus Factory, Industrial Estate, Guindy, held a function to present articles produced in the factory to select invitees. Picture shows Sri R. Venkataraman, Minister for Industries, who presented the articles, conversing with Sri T. N. Lakshminarayana, Secretary, Industries, Labour & Co-operation Department, Madras, (second from left) and others.



The late Union Minister for Industries and Supplies Sri H. C. Dasappa (centre) at the Industrial Estate, Guindy, during his visit.

RESEARCH ON SALT AND MARINE CHEMICALS

The Central Salt and Marine Chemicals Research Institute at Bhavnagar in Gujarat, which completed its first decade of existence this year, has already to its credit, substantial achievement in working out processes for chemical manufacture of better grades of salt.

Besides research on salt, the Institute is also working on the possibility of the utilisation of sea-water for agriculture and conversion of the sea-water into fresh water for drinking and irrigation. It is also carrying out research on the cultivation of marine algae and extracting chemicals from them.

The Institute, which was inaugurated by the late Shri Jawaharlal Nehru in 1954, not only carries out basic research but also gives technical guidance and assistance to industry so as to improve the quality of the products as well as methods of manufacture.

The Institute is also engaged in research on recovery of chemical from sea-water and from bittern, which is the left-over after crystallisation of common salt from sea-water and on the utilisation of these products in the manufacture of industrial products.

Detailed processes have already been worked out at the Institute for the production of table salt, dairy salt, iodised salt and A. R. and B. P. Sodium chloride. The Institute has itself produced and supplied quantities of dairy salt and sodium chloride.

MECHANIZATION OF SALT FARMS

With a view to expanding the scope of its work, the Institute is now setting up an experimental salt farm at Bhavnagar.

The salt farm will help the Institute to collect data on design and lay-out and on mechanisation of salt farms; these are also being especially investigated.

These studies will help the Institute to try out mechanisation appliances specially designed for Indian conditions, to carry out large scale trials of production of salt of various grades and to study the economics of salt production.

RAW MATERIALS FOR CHEMICAL INDUSTRIES

The salt farm will also be in the nature of a demonstration farm for manufacturers to study the scientific methods of salt farming. It will also serve as a pilot plant for the recovery of by-products from bitterns. Sea-water and inland saline lakes can yield many chemicals besides common salt. These include potassium chloride, potassium sulphate,

calcium carbonate, gypsum, magnesium sulphate, magnesium chloride, sodium sulphate and sodium carbonate—all of them essential raw materials for a variety of chemical industries.

In this way the Institute hopes to help towards the creation of a larger and better chemical industry in the country.

Bittern is a major source of potassium salts. After evaporation under controlled densities, bittern can yield mixed salt from which fertiliser-grade potassium chloride and other potassium chemicals can be recovered. The Institute has set up a plant at Kandla with a capacity of 900 tons of potassium chloride and 3,000 tons of magnesium sulphate per year.

The Institute is also setting up another plant at Tuticorin for manufacturing potassium chloride, magnesium sulphate and sodium sulphate. This plant is being financed by the State Trading Corporation.

CHEMICALS FROM THE SEA

Substantial research work has been done on the recovery of chemicals from sea-water and from Sambhar bittern and on the utilisation of gypsum. While work is proceeding on a number of projects, the processes worked out by the Institute for hydrated calcium silicate and light basic magnesium carbonate have been released to industry. A pilot plant of

the Institute is also manufacturing heavy basic magnesium carbonate.

FRESH WATER FROM THE OCEAN

Conversion of sea water into fresh water has always excited the imagination of people all over the world for it opens up new vistas for humanity.

The Institute is tackling two problems: Conversion of sea water into fresh water and the use of sea water for cultivation of crops and plants.

Considerable work has been carried out in other countries on conversion of sea water into fresh water. The Institute is now making a survey to determine as to which of the various methods or combination of methods will be suitable and feasible under Indian coastal conditions. Studies are being conducted on the chemical compositions of sea water at different places in India and on the corrosion in the sea water and in marine atmosphere.

IRRIGATION FROM THE SEA

Equally interesting is a project for studying the possible utilisation of sea water for agriculture. Detailed studies have been made on salt-tolerance of plants and the utility of the various salts for sea-water irrigation. Experiments are being tried out with certain strains of wheat, paddy, santhi, mung and linseed. Work is also being done on certain types of fodder.

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It is considered that if highly permeable soils go down much deeper than the root-layers of the plants, then no accumulation of salts need be feared, even if the water has a salt content of the sea. The soils of Saurashtra coast are being investigated to determine their suitability.

About three years ago, the Institute also started research work on marine algae. As many as 2,000 samples have been collected. Since India is not self-sufficient in respect of algae, the Institute has undertaken

mass culture of seaweeds and started studies on the ecology and physiology of different varieties of the Saurashtra and Madras coasts. The blue-green algae of Sambhar Lake is being studied for fixing nitrogen and mass culture in sea water.

Thus the Institute, shoulder to shoulder with other new laboratories set up since independence, is playing a significant role in the technological development of India, which is so essential to its future economic growth.

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A Division of the
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NEW LENS OPENS UP NEW FIELDS FOR LOW - COST TELECAMERAS

By C. Douglas Woodward

Entirely new fields are claimed to have been opened to low-cost vidicon television and cine cameras by the introduction of a new British stabilised lens. The main feature of this lens, available "off-the-shelf" in Britain for £100, is that it will accept radiation bombardment without discolouration.

In the past, radiation-proof lenses for television and cine cameras had to be specially ordered at a price which precluded their use in all but the most sophisticated equipment.

The London firm of Optec Reactors Ltd. claims that its new lens makes possible the wide use of ordinary cameras in high-activity radiation areas.

Dr. Brian Stanford, the company's technical director, commented: "This lens can be fitted to standard Type C video camera lens mounts and its definition and performance is fully up to the level of modern unstabilised lenses. It opens up entirely new uses for small industrial cameras and will result in greater safety of personnel engaged on such tasks as monitoring the inside of reactors,

surveillance of machines manufacturing fuel rods under remote control and, in cancer hospitals, using advanced, high-power techniques."

The price has been held down to less than nine times that of ordinary standard lenses instead of the 40 to 50 times cost of special lenses required previously. Another feature of the new lens is its small size—only one inch (2.5 centimetres) in diameter and one inch in length.

The lens is available in three form:

1. Simple lens assembly: one inch focal length. F/1.9 aperture.
2. Lens with iris diaphragm capable of remote control.
3. Lens with iris diaphragm and fully focusing mount.

Firm:

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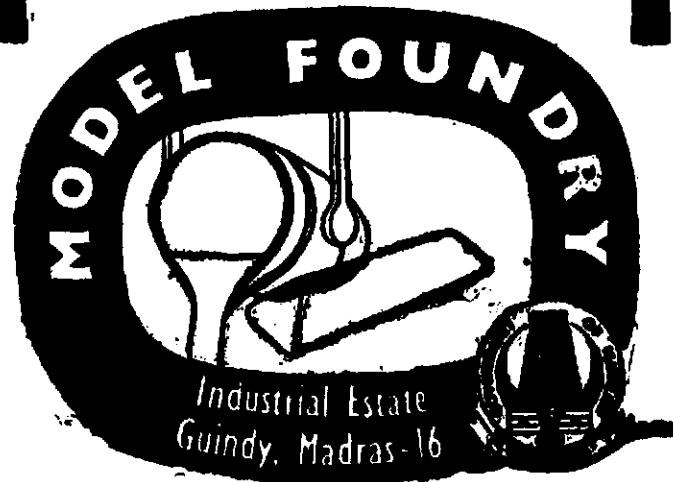
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BY-LAWS AMENDED

The Government have approved the proposal of the Director of Industries and Commerce for the substitution of the existing by-laws Nos. 39 and 43 of the Madras State Industrial Co-operative Bank which are shown in column (1) below by the amended by-laws as indicated in column (2).

<i>Present by-laws</i>	<i>As now approved</i>
(1)	(2)
39. Loans shall be granted to members only for such purposes as may be notified by the Registrar from time to time. The loans granted to a member should at no time exceed 20 times the paid up share capital to his credit in the Bank and Rs. 2 lakhs in the case of an Industrial Co-operative and Rs. 50,000 in the case of an Industrialist. The Bank shall ordinarily entertain loan applications for Rs. 2,000 and above.	39. Loans shall be granted to members only for such purposes as may be notified by the Registrar from time to time. The Bank shall ordinarily entertain loan applications for Rs. 2,000 and above. The loan granted to a member should at no time exceed— (a) twenty times the paid up share capital to his or its credit in the Bank and (b) Rs. 2 lakhs in the case of an individual member and Rs. 5 lakhs in the case of an Industrial Co-operative Society.
43. The Executive Committee shall consider all applications for loans and sanction loans upto Rs. 25,000 in deserving cases. The Executive Committee shall place applications exceeding Rs. 25,000 before the Board of Directors for its consideration.	43. The Executive Committee shall consider all applications for loans and sanction loans upto Rs. 50,000 in deserving cases. The Executive Committee shall place applications exceeding Rs. 50,000 before the Board of Directors for its consideration.

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DIPLOMA COURSE IN FORESTRY

SCHEME FOR TRAINING OF PRIVATE CANDIDATES

1. *The Course*: The Course commences on the 1st April each year and extends over a period of 2 years. *Category of students*: Private students—four private candidates sponsored by the well established industrial firms and non-Government Institutions will be admitted along with the probationers from the Superior Forest Services of Central and State Forest Departments of India and those from foreign countries. The sponsoring industrial firms or non-Government institutions will however, have to give a guarantee of appropriate employment to their candidates after successfully completing the course. The guarantee of appropriate employment will be in the form of a contract deed between the candidate and the sponsoring organisation providing *inter-alia* payment of compensation in the event of non-fulfilment of the contract by the sponsoring authorities and such other penalties for violation of the contract by the private candidates.

2. *Selection of trainees*: The sponsoring authority should intimate their requirements to the Government of India well in advance and get the required seats allotted for them. The total number of seats for private candidates will not exceed 4 (four) for the course. The sponsoring authority will select their candidates on the basis of the minimum educational qualifications and physical standards as laid down in para 3 (b) and 3 (c).

The approval of the President, F. R. I. & Colleges for the selected candidates will be necessary before deputing them for training. No direct applications are entertained by the College. candidates who do not satisfy the standards shall be refused admission by the President F. R. I. & Colleges whose decision in the matter will be final.

3. *Entrance qualification*: (a) *Age*: Candidates must neither be less than 19 nor more than 24 years of age on 1st April of the year of admission to the College.

(b) *Educational qualification*: No student will be eligible for admission to the college unless he holds a second class Bachelor's degree in Natural Sciences, Mathematics, Statistics, Geology, Mechanical Engineering, Civil or Chemical Engineering, Agriculture or Economics of a recognised Indian University or holds equivalent foreign qualifications provided that in the case of graduates with pure Mathematics or Statistics or Economics, they must have taken one of the following subjects in their Higher Secondary/Matriculation or equivalent examination:-

(1) Biology, (2) Physics or (3) Chemistry.

Note :—In the case of a University which does not award classes the candidate must have secured at least 45% of the aggregate marks.

(c) *Physical standards:* The following minimum standards physical fitness are prescribed.

Height — 163 Cms.

Chest — 79 Cms. Expansion at least 0.0508 metre at 5 Cm. (round).

Candidates must undergo a physical test consisting of a walk over 25 Km. to be covered in 4 hours. This test will be conducted by the Industry Organisation sponsoring the candidates. The sponsoring authority shall furnish a certificate to the President F.R.I. and Colleges about their candidates having undergone successfully the prescribed test. It will be left to the discretion of the President, Forest Research Institute & Colleges to accept such a certificate.

(d) *Health:* The candidates will have to produce a medical certificate of fitness issued by the Civil Surgeon or the District Medical Officer of the District in which the sponsoring Institution is situated testifying to the candidates' sound hearing and general physical fitness for rough out door life and to the fact that he bears on his body marks of successful vaccination.

DEPUTATION OF SELECTED CANDIDATES

The names of the private candidates selected for admission to the College by the sponsoring authority must reach the President,

F. R. I. & Colleges not later than March, 1, of the year of admission along with the certificates and the documents for approval. The private candidates will be admitted to the Colleges only after approval by the President, F. R. I. & College and subject to the concurrence of the Government of India. During the course of the training, the candidates will be subject to all the existing Rules and Regulations of the College and those that may be framed hereinafter.

4. *Certificates and documents:* The following certificates must accompany the list of names of candidates deputed for training;

- Certificate of age.
- Original Degree Certificate or other certificates of educational qualifications.
- A Certificate of physical fitness issued by the Civil Surgeon or the District Medical Officer.
- A Certificate from the Chief Conservator of Forests of the concerned State indicating successful completion of physical test of walk over 25 Km. in 4 hours.
- A certified copy of the contract deed between the candidate and the sponsoring organisation for appropriate employment to the candidate after successfully completing the course and providing inter-alia payment of compensation in the event of non-fulfilment of the contract by the sponsoring organisation and such other penalties for violation of the contract by the private candidates.

(f) A no objection certificate of antecedents from the District Superintendent of Police of the District.

(g) A declaration from the candidate that he is not a person dismissed, removed or debarred from Government service at any time.

The sponsoring organisation deputing the private candidates will pay in advance the cost of training of their candidates.

The candidate will receive Rs. 175/- per month for his living expenses at the College during the training Course of the years.

5. *Cost of Training:* The total cost of training per student is as follows, which is, however, subject to revision from time to time.

	Rs.
(i) Tuition fee for the entire course ...	7,000
(ii) Living expenses @ Rs. 175 per month for 2 years ...	4,200
(iii) Travelling expenses for the 2 years ...	2,400
(iv) Cost of initial camp equipment etc. ...	1,250
(v) Caution money and mess advance ...	200
Total ...	15,050

6. *Curriculum:* The Curriculum includes forestry subjects, allied subjects and practical instructions at the head quarters and on extensive tours conducted in the various representative forests of the country.

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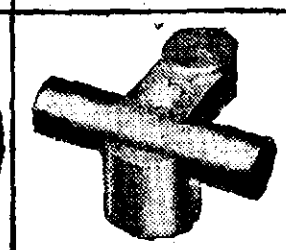
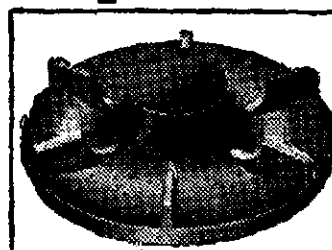
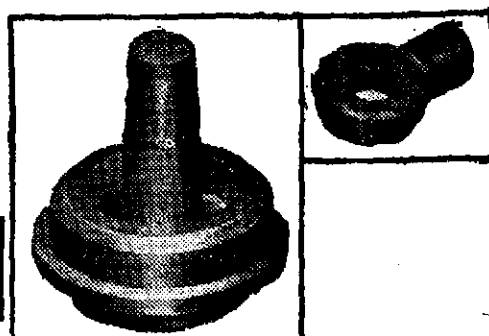
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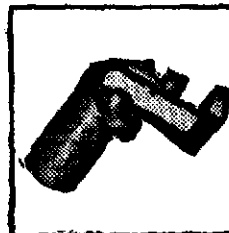
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IND-COM JOURNAL

PRODUCTION OF HEAVY DUTY BRICKS AND CLAY TILES

STEPS TO SET-UP PLANT BEING TAKEN

The National Buildings Organisation, Ministry of Works & Housing, is taking steps for the establishment of an integrated plant for the production of facing bricks, heavy duty bricks and vitreous clay tiles.

The proposed plant will have a capacity of producing 2.5 million facing bricks, 2 million heavy duty bricks and 0.5 million sq. ft. vitreous clay tiles per year from clays of the Indo-Gangetic Plane.

The capital investment required will be Rs. 8,50,000, the foreign exchange component of which will be about Rs. 50,000 only.

The heavy duty bricks, called engineering bricks, are known for their high strength and can be used in multistoreyed construction for load bearing purpose. Facing bricks for

external cladding are likely to be in good demand in big cities because they do away with plastering. Paving and flooring bricks can replace the concrete and other special floors which are resistant to heat and chemical attack.

The vitreous clay tiles provide a permanent floor finish and are cheaper than conventional flooring material. The use of these products will result in saving of cement and a reduction in the cost of construction.

A pavement constructed with paving bricks will save about 0.16 tons of cement per 100 sq. ft. The vitreous clay tiles will be cheaper and are estimated to cost Rs. 24 as against the cost of cement and terrazo tiles which ranges from Rs. 55 to Rs. 155 per 100 sq. ft.

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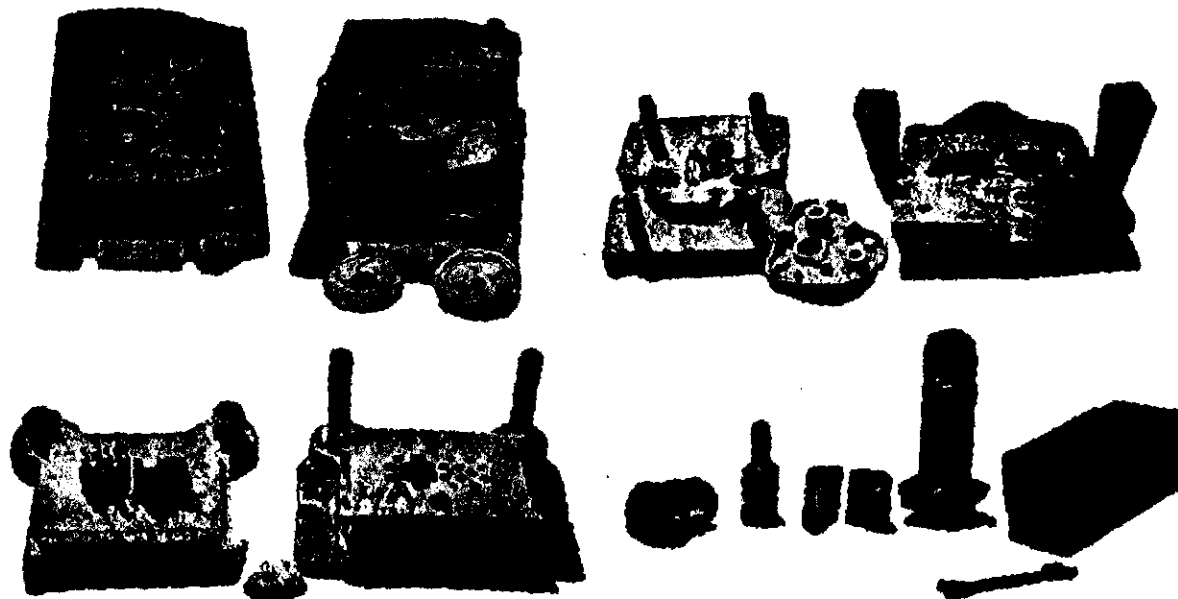
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FOUNDATIONS FOR PROGRESS

By G. THIRUGNANASAMBANDAM B.E.

(In this article the author covers the objectives
for which a number of State-owned Small
Industries were established in the Madras State)

India's economic development is beset with problems not met with by most countries of the World. For two hundred years, India's image was that of a helpless subject country which was a part of the British Empire. Whatever industry there was languished and the land's agriculture decayed. From a manufacturing country, India became a producer of raw materials for the industrial revolution in Britain. This degrading experience of two centuries cried a halt to all progressive forces and the country went into a sort of oblivion while, at the same time, the European Countries stole a big march in the industrial and agricultural spheres. To be left behind a couple of centuries alone does not present as much of an obstacle as the other graver problems with which we have now to grapple. Uncommon with most other countries was the problem of our population; the birth rate far outstripped the death rate and tended to keep the standard of living at a constant figure whatever the measures taken to boost production. The foreign rule also left the majority of the people of this Country unlettered and the price we have to pay to bring them in line with other advanced

countries is not to be counted in terms of money but in the invaluable years of precious life lost. When I say 'years of precious life' it is not the life of one man, but it is the life of a nation for two hundred years. For, in a nation that is free, there is growth, there is dynamism, there is development of individuality. Crafts evolve flourish, spread and multiply; skills are nurtured, developed, and handed down from generation to generation with further refinements and embellishments.

With the ushering in of the industrial revolution in Europe, the age of machinery dawned an Europe, and in its wake brought in hundreds of new skills and crafts and skills further developed over a period of two to three centuries and the products of this mammoth effort are the millions of skilled workers in the countries of Europe and U.S.A. It is this treasure of years and years of skill that we are not able to acquire in a small number of years; it is not a thing to be learnt by short cuts or even by extra hours of work, the only way is the hard way of training those with proper aptitude for years and years under expert guidance.

The nation braved all these difficulties and problems when it launched on the Five Year Plans. And with the commencement of the 2nd Plan emphasis was shifted to the industrial sector and the basic industries of iron and steel, coal and cement, chemicals and fertilisers were all set up. Development of Small Scale Industry also received the due and proper attention at the hands of the Government and various measures were instituted to initiate entrepreneurs into Small Scale Industries and sustain them in that activity. The scope of this article precludes consideration at length of all that has been and is being done to promote the growth of S.S.I. except a few facets of activity.

To convert a people with a predominantly agricultural background to a different way of life can hardly be done by granting a loan here or concession there, though there is no denying the fact that these are incentives. The conversion has to be attempted with a religious zeal in many a channel of approach. The State Government of Madras did pioneering work in this respect when it established a chain of State-owned factories, each with different objectives throughout the length and breadth of the State. The presence of a solitary factory in rustic surroundings though sounded odd and foolish to any industrial economist, really kindled the flame of inquisitiveness in the minds of the rural

folks. In the minds of the more intelligent of them it created a sort of an industrial consciousness that goaded perhaps a small number of them into thinking in terms of setting up similar enterprises. The village lads who were admitted and appointed in these factories were the first ones to undergo this transformation in occupation and it would be proper to say that in this was a great task achieved—the task of introducing a people to the skills of industry. Though this looks not so important to a casual observer its real import and significance will be appreciated when viewed from the larger perspective of a historian who records the various important measures taken to get a nation geared to the wheels of progress at various junctures in the history of a nation.

TRADITIONAL SKILLS

Factories established by the State Government included carpentry and blacksmithy shops, General Purpose Engineering Workshops, Foundries, Shops for fabrication of structurals, Tool Rooms, Forge shops, a Pressure Die Casting Unit, a Lock Unit and some Shops for production of specified goods. The one class from which we can draw our future potential in craftsmen is the artisan class. Given the right tools, a reorientation training and machinery they can in quick

time develop into technicians required by modern industry. Most of our artisans are carpenters and Blacksmiths though there are a host of others too. Several Blacksmithy and carpentry shops established in the State initiated the local carpenters and Blacksmiths into using modern machinery and Tools and also learning newer methods. That we should take to the development of traditional skills is only a logical step in the process of industrialising a country; for it is the one place where there is some latent talent waiting to be further developed or shaped into something of better value and utility for the present day. One such traditional skill that was left without succour for years was the Locksmithy at Dindigul. Till the year 1957, the industry was badly disorganised, producing sub-standard goods and marketing its products in an unhealthy manner in competition with other products from the north. The establishment of a modern factory at Dindigul put an end to this sad State of affairs and rejuvenated this industry. This Factory started standardising the Locks and components and supplied machine cut components to the Locksmiths for assembling Locks of high quality. Besides, modern flush door locks of many kinds flowed out of this Unit to meet the growing demands for such high priced products.

GENERAL PURPOSE ENGINEERING WORKSHOPS

Many General Purpose Engineering Workshops have been established and they turn out a variety of products such as steel furniture, hospital furniture and equipment, Cycles, Perambulators, Tricycles, etc. besides undertaking light fabrication work. These Factories serve as a nucleus around which there will be a cluster of industrial activity. The type of work that is carried on in these units is of the simpler kind and lends itself for being copied by others with some enterprise

and imagination. For those who want to make a beginning in industry there is nothing like the one which demands less by way of skills and technology. The role that is being played by these G. P. E. Workshops in promoting growth of industry and creating an industrial climate in the industrially backward areas is being increasingly recognised and before long they will bring forth tangible results.

FOUNDRIES

Metal parts have been shaped by casting for thousands of years. Thus the Foundry Industry represents one of the oldest techniques which men have used in their unremitting efforts to produce and improve useful products. During the last decade some major developments have taken place in the casting field, and these appear likely to revolutionise foundry industry. In our country which has so far remained predominantly agricultural in character, it is but natural that the number of Foundries have been very small and the methods adopted in those Foundries have remained primitive. In Madras State the necessity for starting Model Foundries was keenly felt and therefore a few Model Foundries have been set up with the objectives of disseminating knowledge on proper Foundry practice and training men in the correct techniques and methods of production. What has been attempted now in the establishment of these Model Foundries is to provide the base or ground work which will create the basic skills and methods of this industry. Once this is done the human material becomes available for being further shaped and refined to tackle the more skilful jobs of steel and alloy steel founding work. It is hardly necessary to emphasise that this important branch of engineering industry deserves the most careful attention if we want to make real progress in industrialising the Country.

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AGRICULTURAL IMPLEMENTS

That we have been woefully lacking in our agricultural methods is common knowledge. Our farmers implements have remained the same as those of his forbears over the centuries and have been of no avail in augmenting the farm output. Fully conscious of this situation the State Agricultural Department started introducing modern improved implements. The Farm Implements Unit established by the Industries Department at Tiruchirapalli and the Brassware Unit at Kumbakonam were geared to the production of modern agricultural implements and equipments. Providing the teeming millions of the Indian Sub-continent with food is dependent upon the employment of modern agricultural implements in agriculture and hence the importance of these implements. Sometimes it becomes obligating on the part of the State to give a lead to the others in manufacturing certain products especially when the products are now and are likely to meet with a certain amount of consumer resistance.

TOOL ROOMS

Yet another branch which Dristles with just too much technical know-how is tooling for Industry. This is a vast field and persons with knowledge in this field are very few in this country; but its part in the functioning of industries big and small is so vital and significant that there can be no progress without it. Though it is true that almost all large Scale Industries have their own Tool Rooms, some of them continue to impart a large volume of their Tooling requirements. The Small Sector almost entirely depends on indigenous Tool Rooms. It can be laid down as an axiomatic truth that the true and intrinsic measure of a nation's technological progress lies in its capacity to produce the wide range of Press Tools, Dies, Jigs, Fixtures and other Tooling required by its industry. The Industries Department established a number of Tool Rooms in this State recognising their import-

ance and place in the context of our growing industrial activity. The Tool Room at Guindy has been doing some pioneering work in this part of the country and has delivered over Rs. 15 lakhs (fifteen lakhs) worth of Tooling to a variety of Industries since its inception in 1957.

OTHER FIELDS

While there is wide agreement on the need for setting up Industries in the State the method of going about the job was rather delicate and considerable thought had to be given to the subject. In areas which are barren industrially a basic network of some Industries has to be initially established to serve as a springboard from which many others can be brought into existence. The Government of Madras only established such a basic network in starting Units all over the State. A further step in the right direction was the establishment of a Unit for producing machine Tools and accessories at Erode. In Madras State an attempt has thus been made to make a beginning in this field of machine building. There are several other fields such as Pressure Die Casting, Forging, Wire drawing etc. in which it was considered best to make a start so that in the times to come there can be balanced development in all fields of Engineering industry. It is a matter for gratification that in some of these fields we have already made considerable headway and reached a fairly good degree of Technological proficiency.

Though the progress that has been achieved in this State is something that those associated with it can be rightly proud of, there is no room for complacency; for we have only made a beginning and what remains to be done is so colossal that it requires the unceasing effort, will and determination of all concerned in as much greater measure. We only wish and hope that we can rise up to the great levels of achievements that lay in waiting for us in the future.

INDUSTRIAL LICENSING

LIST OF INDUSTRIES IN RESPECT OF WHICH APPLICATIONS FOR LICENCES UNDER THE INDUSTRIES (DEVELOPMENT AND REGULATION) ACT, 1951 MAY ORDINARILY BE REJECTED WITHOUT REFERENCE TO THE LICENSING COMMITTEE TILL 30th JUNE, 1965.

A--ENGINEERING INDUSTRIES

- | | |
|---|---|
| 1. Aerial—net type. | 17. Brass/copper extruded pipes and tubes / extruded rods and sections and sheets / circles/strips. |
| 2. Aerial—telescope type (except expansion schemes). | 18. Builders' hardware. |
| 3. Agricultural tractors of 25 h.p. upto 50 h.p. | 19. Car lifts. |
| 4. Air compressors (expansion schemes for compressors upto 700 cfm. will be permitted). | 20. Cast iron castings industry (commercial castings) for sale to public). |
| 5. Air conditioning and refrigeration machinery for industrial use, including water coolers and ice plants. | 21. Cast iron pipes including spun pipes. |
| 6. Aluminium strips / sheets / circles / foils / extruded rods and sections. | 22. Chaff cutter blades. |
| 7. Amplifiers. | 23. Cinema arc carbon. |
| 8. Antimony (except for expansion schemes). | 24. Circles / sheets and rods of stainless steel. |
| 9. Automobile ancillaries (only expansion or diversification in the range of the same products of the existing units will be considered). | 25. Coal washery plants. |
| 10. Ball and roller bearings (except expansion schemes for making uneconomic units economic). | 26. Collapsible tubes and rigid containers. |
| 11. Barbed wire. | 27. Commercial vehicles (except expansion schemes). |
| 12. Bare copper conductors. | 28. Conductors (ACSR/AA) |
| 13. Bare copper strips. | 29. Conduit pipes. |
| 14. Bicycle and bicycle parts (except when expansion of bicycle tube valves is desirable for making the unit an economic one). | 30. Control cables for automobiles, motor cycles and scooters. |
| 15. Bifurcated rivets. | 31. Conveyor belting. |
| 16. Bolts, nuts and rivets. | 32. Copper wire for non-electrical purposes. |
| | 33. Cotton and hair belting. |
| | 34. Crawler tractors. |
| | 35. Data processing machines (except for expansion and diversification of existing units. |
| | 36. Diamond drill bits. |
| | 37. Domestic utensils. |
| | 38. Domestic refrigerators. |
| | 39. Drums and barrels, and tin containers excepting those for manufacturers' own consumption. |

40. Dry battery.
41. Electric fans.
42. Electric lamps—GLS and others.
43. Expanded metal.
44. Ferro manganese.
45. Ferro-silicon.
46. Flash light and torch containers.
47. Fluorescent lamps.
48. Fork lift trucks and the like (expansion or diversification in the range of the same products of the existing units will be considered).
49. Hand stapling machines.
50. Hand tools, namely spanners (all types), wrenches (all types), pliers (all types) sockets, hammers and screw drivers.
51. Heavy earth-moving equipment (only shovels).
52. Hollow wares and tubular rivets (except expansion of the existing units).
53. Hospital furniture.
54. Household appliances (such as electric irons, heaters and the like).
55. H. T. bolts and nuts.
56. Hurricane lanterns.
57. H.T. switch—gears 33 k.v. and above.
58. Industrial fans and blowers.
59. Internal combustion engines including petrol/kerosene and marine engines (excluding vehicular type except expansion schemes).
60. Jeep type vehicles and station wagons.
61. Kerbside petrol pumps.
62. Metal clad electrical switches upto 200 amps.
63. Meters—single and polyphase.
64. Miniature lamps (except automobile headlight lamps).
65. Motor vehicles and scooters, autocycles, mopeds and three wheelers.
66. Non-ferrous alloys.
67. Non-ferrous castings (including pressure die castings).
68. Oil filter elements.
69. Paper and pulp making plants upto 50 tons per day capacity including wire cloth for paper machinery.
70. Passenger cars.
71. Plates and sheets (M. S.) excluding cold rolled sheets.
72. Pressure gauges.
73. Railway wagons (except expansion schemes).
74. Razor blades (except expansion of existing units).
75. Road rollers (expansion of existing units will be considered).
76. Roller chains for automobiles motor cycles and scooters etc.
77. Rolling shutters.
78. Room air conditioners.
79. Rubber-ply transmission belting.
80. Solvent extraction plant.
81. Saws of all types including hacksaw blades.
82. Sewing machines—domestic and parts thereof; and sewing machine needles both domestic and industrial.
83. Steel pipes and tubes (welded)—(excepting expansion scheme of existing manufacturers).
84. Steel doors and Windows (excepting on indigenous sections).
85. Steel sheets (black)—galvanising and corrugation of (except for main producers).
86. Steel measuring tapes.
87. Steel—re-rolled products including wire rods.
88. Steering wheels for automobiles.
89. Storage battery.
90. Stranded wire.
91. Sugar mill machinery (except milling plant and centrifugals).
92. Tea processing machinery.
93. Tin plates.
94. Trailers (except expansion of existing units).

95. Tungsten carbide tips and intermediates thereof.
96. Twist drills.
97. Utensils of stainless steel.
98. Vacuum cleaners.
99. V.I.R. and P.V.C. cables (except power cables).
100. Washing machinery (except industrial washing and dry cleaning machines).
101. Water meters (except expansion schemes).
102. Welding electrodes (except expansion of existing units).
103. Welded wire mesh.
104. Winding wires.
105. Wind screen wipers.
106. Wire—M.S. Med/H.C. and special wire.
107. Wire nails.
108. Wire ropes (except expansion schemes).
109. Wood screws.
110. Zinc sheets / strips.

B - NON-ENGINEERING INDUSTRIES

1. Abrasive grains.
2. Acetic acid.
3. Activated bleaching earth.
4. Art silk, waving, hosiery, twisting, doubling and synthetic yarn crimping / stretching by other than primary yarn manufacturers.
5. Azo dyes.
6. Barium carbonate.
7. Barium chloride.
8. Barium nitrate.
9. Barium sulphate.
10. Basic dyes.
11. Beer.
12. Beta naphthylamine.
13. Bichromates.
14. Blanc fixe.
15. Bleaching powder.
16. Blow—moulded containers and other similar products manufacture by the blow moulding technique which is normally called extrusion blow moulding and which consists of extruding a tube into a mould and blowing air to form the finished product.
17. Borax and boric acid.
18. Bottles and vials (excluding penicillin vials).
19. Brake fluid.
20. Calcined petroleum coke.
21. Calcium carbide.
22. Calcium carbonate (precipitated and activated).
23. Camel back.
24. Campher.
25. Carbon black.
26. Carbon dioxide gas (other than by-product carbon dioxide).
27. Carboxy methyl cellulose.
28. Cashew kernels (applications from new areas to be considered on merits).
29. Cellulose acetate flakes for moulding powder.
30. Cellulose film (cellophane).
31. Copper sulphate.
32. Cosmetics and toiletries.
33. Cotton mesh fabrics.
34. D. D. T. (excepting for expansion).
35. Dissolved acetylene gas.
36. Drugs and pharmaceuticals :
 - (i) Antibiotics—penicillin, streptomycin and tetracycline.
 - (ii) Bismuth salts.
 - (iii) Chloral hydrate.
 - (iv) Empty hard gelating capsules.
 - (v) P. A. S. acid and salts.
 - (vi) Salicylic acid-sodium salicylate, acetylic salicylic acid.

- (vii) Sulpha drugs.
- (viii) Surgical adhesive tapes.
- (ix) Vitamin 'A'.
- (x) Vitamin 'C'.
- 37. Dyes - all types falling under Sch. Ind. No. 21 (including vat dyes).
- 38. East Indian Tanned (semi-tanned) kips and skins.
- 39. Fast colour bases.
- 40. Fire works and paper caps.
- 41. Gelatine (edible, photographic and technical, except pharmaceutical).
- 42. Glass mineral wool and allied products.
- 43. Glass fibre and products thereof.
- 44. Glass-hollow-ware (semi-automatic).
- 45. Glass-table and pressed ware.
- 46. Glass tubes and rods, sheet-glass, glass bottles, wired/figured and rolled glass.
- 47. Glassware - laboratory.
- 48. Graphite electrodes.
- 49. H. T. / L. T. insulators.
- 50. Hoses (vacuum brake)
- 51. Hoses - other types.
- 52. Hydrogen peroxide.
- 53. Items produced by the compression moulding technique such as bottle caps, buttons, lamp shades etc.
- 54. Laminates (industrial and decorative including malamine laminates)
- 55. Lead oxides.
- 56. Manganese dioxide.
- 57. Manufacture of polyester sheets for buttons and the processing of these sheets so produced to manufacture buttons.
- 58. Matches - safety.
- 59. Menthol.
- 60. Methanol.
- 61. Mono-filaments from polyolafins.
- 62. Myrobalan extract.
- 63. Naphthols.
- 64. Newsprint*.
- 65. Nitric acid.

- 66. Nylon textile yarn.
- 67. Organic pigments.
- 68. Oxygen gas (as applied for cutting and welding for steel only).
- 69. Paper and paper board*.
- 70. Pesticidal formulations (except formulations based on B. H. C., melathion and dithio carbonate)
- 71. P. F. moulding powder.
- 72. Phenol.
- 73. Photographic raw film and paper.
- 74. Phthalic anhydride.
- 75. Polyethylene Films (i. e., films with a thickness of less than 1 mm and products made from the films such as bags etc.).
- 76. Potassium chlorate.
- 77. Potassium permanganate.
- 78. Processing (excluding printing) of cotton textiles.
- 79. Pulp (paper and rayon grade).
- 80. Rayon tyre cord yarn.
- 81. Reclaimed rubber.
- 82. Refractories.
- 83. Refrigeration gases.
- 84. Rubber accelerators and antioxidants.
- 85. Sanitaryware.
- 86. Soap.
- 87. Sodium aluminate.
- 88. Sodium bi-carbonate.
- 89. Sodium hydrosulphite and derivatives.
- 90. Sodium sulphite, bi-sulphite and sulphide
- 91. Sodium thio sulphate.
- 92. Spectacle frames made from sheets by the fabrication technique or by injection moulding.
- 93. Sulphuric acid.
- 94. Sulphur black.
- 95. Sulphur dioxide.
- 96. Sulphur dyes.

* Applications for substantial expansion from existing units as well as applications for setting up of new units in areas, where raw material resources have remained untapped, would be considered on merit.

- 97. Synthetic rubber (SBR type).
- 98. Synthetic tops.
- 99. Textiles made of art silk.
- 100. Tyres and tubes (automobiles).
- 101. Tyres and tubes (bicycles).
- 102. Vacuum flasks.
- 103. Vanaspati (except expansion of small and medium size units to achieve economic capacity)
- 104. Various finished products which could be manufactured from expanded (foamed) polystyrene beads.
- 105. Vegetable oil industry (oil milling).
- 106. Viscose filament yarn.
- 107. Viscose tyre yarn.
- 108. Wool tops.
- 109. Woollen and shoddy yarn (except expansion schemes).
- 110. Woollen/worsted cloth.
- 111. Worsted yarn.
- 112. Zinc oxide.

AN ILLUSTRATIVE LIST OF INDUSTRIES IN RESPECT OF WHICH
APPLICATIONS FOR LICENCES UNDER INDUSTRIES (DEVELOP-
MENT AND REGULATION) ACT, 1951 WILL BE CONSIDERED ON
MERITS TILL 30th JUNE 1965.

ENGINEERING INDUSTRIES

- | | |
|---|--|
| 1. Agricultural machinery. | (iii) Motorised graders. |
| 2. Air rifles. | 28. Hospital equipments. |
| 3. Alloy steels. | 29. Industrial centrifuges. |
| 4. Aluminium ingots. | 30. Industrial gas plants. |
| 5. Antimony (expansion cases only). | 31. Industrial sewing machines and sewing machine parts. |
| 6. Biscuits and bread making machinery. | 32. Jute machinery :— |
| 7. Boats and crafts. | (i) Carding engines. |
| 8. Boilers. | (ii) Drawing frames. |
| 9. Calculating machines. | (iii) H. S. Centrifugal spinning frames. |
| 10. Ceramic machinery. | (iv) H. S. High draft first drawing frames.) |
| 11. Chemicals and pharmaceutical plants and equipments. | (v) H. S. High draft second drawing frames. |
| 12. Chip board and fibre board plants. | (vi) Jute machinery and parts (including 10 jute sliver spinning frames) |
| 13. Cigarette making and tobacco machinery. | (vii) Self doffing silver spinning frames. |
| 14. Coated abrasives. | (viii) Spinning frames. |
| 15. Conveyors. | 33. Light house equipment. |
| 16. Dairy machinery. | 34. Machine screws (socket head, allen and other specialised types. |
| 17. Well boring equipment. | 35. Machine tools. |
| 18. Electric furnaces. | 36. Malleable cast iron castings. |
| 19. Electric motors (above 10 h. p.) | 37. Malleable pipes fittings. |
| 20. Electrical measuring instruments. | 38. Medical / surgical instruments equipment and appliances. |
| 21. Electronic components. | 39. Metallurgical machinery. |
| 22. Electronic measuring and testing equipments. | 40. Oil firing equipment. |
| 23. Flour mill machinery. | 41. Oil separators. |
| 24. Fractional horse power motors. | 42. Oxygen and acetylene plants. |
| 25. Grinding media balls. | |
| 26. Grinding wheels. | |
| 27. Heavy earth-moving equipment (except shovels): | |
| (i) Motorised dumpers. | |
| (ii) Motorised scrapers. | |

- | | |
|--|---|
| 43. Paper and pulp making plant (above 50 tons capacity). | 59. Steel structurals. |
| 44. Photoflash lamps. | 60. Steel strips-cold rolled. |
| 45. Pig iron. | 61. Switchgear and control gear (below 33 k. v.) |
| 46. Plastic industrial machinery. | 62. (i) H. T. switchgear (below 33 kv). |
| 47. Power driven pumps. | (ii) Iron clad switches and switch-fuse units. |
| 48. Power factor correction capacitor. | (iii) L. T. Switchgear. |
| 49. Power rectifiers. | (iv) Motor controlgear. |
| 50. Power tillers. | 63. Textile machinery. |
| 51. Rolls. | 64. Tool bits (lathe tools) |
| 52. Rubber machinery. | 65. Tractors, harvestors, and the like (excluding agricultural tractors of 25 h. p. — 50 h. p.) |
| 53. Shots and grits. | 66. Transformers. |
| 54. Small tools (threading tools, milling cutters and reamers). | 67. Typewriters. |
| 55. Speed reduction units. | 68. Weighing machines. |
| 56. Steel files. | 69. Weights and measures. |
| 57. Steel ingots/billets (by concast and electric furnace). | 70. X-Ray equipment. |
| 58. Steel pipes and tubes (seamless and expansions in welded to make existing units economic). | |

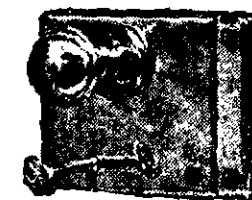
NON-ENGINEERING INDUSTRIES

- | | |
|---|---|
| 1. Activated carbon (only superior grade) | 20. Man-made fibres except viscose tyre yarn and viscose filament yarn. |
| 2. Alcohol - industrial. | 21. Marine paints. |
| 3. Bromine. | 22. Metallic stearates. |
| 4. Canned fruits and fruit products. | 23. Milk powder. |
| 5. Cement. | 24. Nitrogenous fertilizers. |
| 6. Chip board (particle board) | 25. Paints, enamels and varnishes. |
| 7. Chlorinated paraffin. | 26. Sodium cyanide, potassium cyanide, double cyanide of sodium and potassium ferro-cyanide and ferri-cyanide etc., (by producers of acrylic plastics only) |
| 8. Cocoa powder. | 27. Pressed porcelain excepting insulators. |
| 9. Cotton seed oil. | 28. Solvent extraction oil cakes rice bran. |
| 10. Dextrose powder. | 29. Superphosphates (applications are to be considered only where by product sulphuric acid is available) |
| 11. Essential drugs and pharmaceuticals. | 30. Synthetic detergents. |
| 12. Fatty acids. | 31. Tetra chloro ethane. |
| 13. Fatty alcohol. | 32. Urea (technical grade). |
| 14. Glass shells for tubes and lamps. | |
| 15. Glazed tiles. | |
| 16. Glycerine. | |
| 17. Grease. | |
| 18. Industrial explosives. | |
| 19. Liquid glucose. | |

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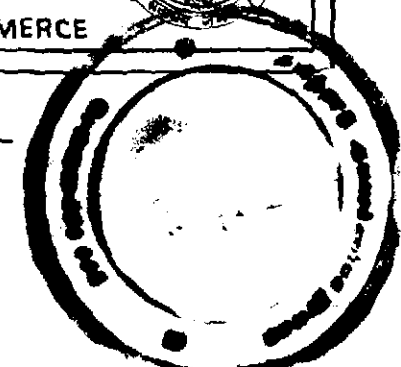


- SAFETY
- DURABILITY



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