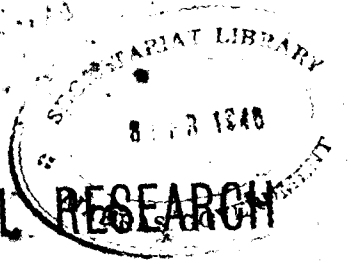


COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH



PROCEEDINGS

OF THE SIXTEENTH MEETING OF THE

BOARD OF SCIENTIFIC & INDUSTRIAL RESEARCH

held on the 17th January, 1946, at New Delhi.

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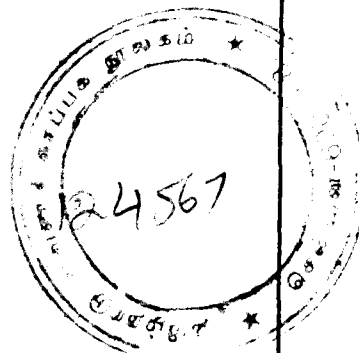
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BOARD OF SCIENTIFIC & INDUSTRIAL RESEARCH PROCEEDINGS

of the 16th Meeting of the Board of Scientific and Industrial Research, held
on the 17th January, 1946, at New Delhi.

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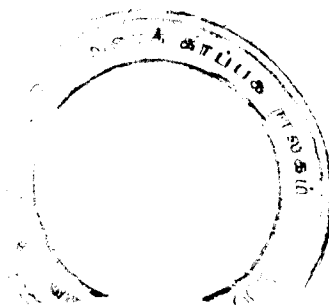


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I. Confirmation of the proceedings of the fifteenth meeting.

II. Research Schemes.



Item No	Particulars.
I.	Confirmation of the proceedings of the 15th meeting of the Board of Scientific and Industrial Research held on 20th September, 1946, at New Delhi.
II. 1.	<i>Subject:—</i> Research Scheme on "Particle Size Problems of Industry" submitted by Dr. L. C. Verman. <i>Synopsis:—</i> 1. Dr. Lal C. Verman, Acting Director, Physical Laboratories of the Council of Scientific and Industrial Research has submitted a scheme of research on 'Particle Size Problems of Industry', for the consideration of the Board. 2. Dr. Verman has stated that in any process involving a physical or chemical reaction between solid phase and solid, liquid or gaseous phase, it is recognised that the surface area available for such reaction, which is invariably related to particle size plays an important part in determining the extent to which the reaction may proceed and its speed of progress. The field of industry covered by such reactions is almost as wide as industry itself. There is a class of phenomena in which both surface area as well as particle size contribute their share as for instance in the case of concrete mixes, mortars and plasters, china-ware, bricks and refractories, plastic filler compositions and rubber mixes, carbon electrodes and pencils, paints and enamels etc. The interphase reactions taking place in these systems are largely influenced by the surface area of the particles. Apart from the influence of surface on interface reactions, the particle size and its distribution also play an important role in determining the final properties of the aggregates. From the investigations carried out by Dr. Verman on lime-surkhi mortars it has been found that the final strength of the aggregates is determined not only by the strength of the bond at the interface but also by the intrinsic strength of the particles themselves i. e. for best results with particle size and surface area must be simultaneously considered. Similar results have been obtained in the case of the mechanical properties of shellac. 3. From the above observations and from a number of others in several fields of industry e.g. carbon electrodes, rubber mixes, plastic filler compositions, paints etc., it has been felt that a detailed mathematical study of fundamental character is long overdue. This will not only enable the enormous amount of experimental data now available to be rationally interpreted, but also assist in guiding future work along more profitable lines. The whole field may be divided into two sets of problems—Geometrical and Physical. 4. Geometrical problems will involve the investigation of the relationships between particle size distribution of a set of particles of a given shape on the one hand and packing density of

Recommendations of the Committee of the Board.

Recommendations of the Board

I. The Committee recommended that the proceedings of the 15th meeting of the Board of Scientific and Industrial Research be confirmed.

1. The proceedings of the 15th meeting of the Board held on the 20th September 1945 were confirmed.

II. Research Schemes.

Item No.	Particulars.
	powders, the number and nature of contact points and the shape and size of interstices on the other.
	5. Physical problems will involve the investigation of the relationship between the properties of the two component phases and those of the bond at the interface on the one hand and the properties of the aggregate mass on the other. The most important property for general application to a large number of industries is the mechanical strength, while other properties will also have to be considered such as extensibility in rubber mixes, softening properties or plasticity of plastic compositions, refractoriness in refractories, porosity in concrete and plasters, hardness in pencils, friction co-efficient in carbon brushes, chemical reactivity particularly to atmospheric influences and other reagents to which a product may be exposed in practice, etc. Besides, an extensive list of problems may be visualised on the physical side of the properties of the aggregate mass.
	6. Dr. Verman proposes to carry out the following investigations:—
	(i) Mathematical problems of powders, packing, specific surface areas, contacts, geometry of interstices, etc.
	(ii) Physical problems of strength, elasticity, plasticity, hardness etc.
	(iii) Experimental investigations on bond strength as a function of angle of stress, thickness of film etc., and others emanating from theoretical developments under (i) and (ii) above.
	7. Dr. Verman states that the following specialised equipment are available: (a) Particle size distribution apparatus, (b) Air Flotation cyclone, (c) Elutriator, (d) Equipment for the manufacture and testing of plastics, carbon electrodes, paints, rubber goods and concrete and cements.
	8. Grant required:
	Equipment ... Nil.
	Contingencies ... Rs. 1,000
	Staff: .. Rs. 7,560
	(1) Mathematical physicist in the scale of Rs. 250-25,600.
	(2) Experimental Physicist in the scale of Rs. 250-25,600.
	(3) Bearer in the usual scale.
	<u>Rs 8,560</u> for one year.
	N. B. In the above, under 'staff' a higher starting salary of Rs. 300/-p. m. may have to be given to the Physicist. This has been taken into consideration in preparing the grant required.

Recommendations of the Committee of the Board.	Recommendations of the Board
II. 1. The Committee recommended that Dr. Verman's scheme on Particle Size Problems of Industry be taken up as a part of departmental work in the Physical Laboratories, utilising laboratory funds.	I. The Board accepted the recommendations of its Committee.

11. Research Schemes.

Item No.	Particulars.
	<i>Subject :</i> Suggestion from R. Johnston, Esq., I. C. S. Commissioner, Agra, regarding the Air conditioning of ships in Tropic water. <i>Synopsis :</i> Mr. R. Johnston, Commissioner, Agra has referred to the Board of Scientific and Industrial Research a suggestion for air conditioning ships in tropic waters. 1. The suggestion consists of compressing ordinary air, cooling in a sea-water condenser and then circulating under pressure at about the same temperature as the outside air, thus ensuring a drop in temperature when the air is released. To avoid the unpleasant hissing noise some form of silent escape can be devised. If, however, a sea-water condenser is thought to be unduly heavy or bulky, cooling can be done with commercial freezing gases in the ordinary way, taking care to cool the compressed air only to about ordinary air temperature. 2. Mr. Johnston says that no effective method has yet been found for air-conditioning ships, especially in tropic waters and when used for troop carrying. The existing system is known as 'Thermotank' in which air is sucked in by power suction fans and distributed all over the ship by a system of ventilating trunks, with numerous small outlets. This system is not altogether satisfactory in hot climates and many experiments have been tried artificially to cool the air as well as delivering it throughout the ship but without success. All the methods failed, not due to inefficiency of the cooling mechanism but because there is so much heat in the ship, which is communicated by conduction to the air-trunks, that the air in its passage through the trunk quickly regained the heat which it had lost on passing to the cooling coils and when it came from the ventilating outlets there was little or no trace of the cooling to which it had been subjected. In other words the effect of the cooling coils was being dissipated in the mass of the ship. Attempts were made to overcome this by insulating the air-trunks, but this was not found a success. Therefore, the problem is not to generate extreme cold at very high efficiency, but to ensure that the air delivered through the ventilating system is not merely fresh but is distinctly cooler than the outside air. Ordinary refrigeration methods have failed to bring about this effect. Mr. Johnston therefore suggests, to get over the difficulty, the air should be compressed at a central plant, the heat of compression absorbed in a sea-water condenser whereby, the compressed air is reduced to approximately normal temperature. As the temperature difference between this compressed air and the walls of the air-trunks will be much less than in the system which was tried and found a failure, there will be no cooling effect (or very little) to dissipate to the mass of the ships. Cooling does not come into effect until the air is released at the ventilation outlet. No doubt the released air will at once begin to get warm by contact with the ship's walls and furniture but at least it will be cool when it is released and it will be constantly renewed. The result therefore should be that even if the cooling is quite inefficient to absorb all the natural heat which a ship seems to collect, yet the air which is in circulation will be very perceptibly cooler than under any existing system and there should in consequence be a great increase in the comfort of personnel on Board. Mr. Johnston states further that a somewhat similar system is being very seriously considered for some of the deep gold mines of South Africa.

Recommendations of the Committee of the Board.

Recommendations of the Board.

II. Research Schemes.

Item No.	Particulars.
	3. Explaining his suggestion in detail, Mr. Johnston states that his method consists of compressing and cooling the air first, bringing it down to something approaching sea-temperature. The compressed air is then led round the ship, but as it is not highly cooled there will be no very steep temperature difference and it will not be possible for the compressed air to absorb much heat. If the sea temperature is somewhat below air temperature and if the compressed air can be brought down to sea temperature, it will start with its temperature on the right side of normal. The ship's hull is usually at more than air-temperature, though this will probably vary between day and night. The compressed air therefore will probably start its journey through the air trunks at slightly below atmospheric temperature and the trunk walls will probably be, as they are now-a-days, at rather above atmospheric temperature. There will therefore be some degree of heat absorption by the compressed air but, averaging out, it will probably reach the outlets at about the same temperature as the atmosphere. The cooling effect does not come into play until the moment when the ventilating air leaves the outlet. There is therefore no possibility of that heat-gain during passage through the air-trunks which has hitherto foiled conventional designers. It is perfectly true that the system, considered purely as a refrigeration one, is very inefficient compared with Freon, sulphur dioxide, carbon-dioxide, ammonia or methyl chloride but it is meant to have the merit that it delivers the goods at the point where they are wanted. This system will reduce the temperature of the air at the moment it escapes into the living space of the ship. The air will be cool to start with and is constantly renewed and will do much to improve comfort. 4. Mr. Johnston states that his proposals have been adversely criticised by two competent mechanical engineers of the United Provinces Government, but neither of them has objected that his scheme would not work. They have criticised it on the grounds that there are other means for attaining the required end and that the use of air as a refrigerant is not economical by comparison with commercial freezing gases. II. 3 <i>Subject:—</i> Scheme on 'Physical and Chemical Survey of Indian Coals', submitted by the Director of Scientific and Industrial Research and Dr. Karimullah. <i>Synopsis:—</i> The Technical Mission on Fertilizers recommended that the possibilities of using lower grade non-coking coal for gas production should be investigated with a view to its possible use for future schemes of ammonium sulphate production. The above recommendation was referred to the Chairman of the Fuel Research Committee, for his opinion. The Chairman recommended that pending the establishment of the Fuel Research Station, which alone would be equipped with facilities necessary for carrying out the investigations

Recommendations of the Committee of the Board.

Recommendations of the Board

II. 2. The Committee recommended that the suggestion of Mr. R. Johnston did not call for any scientific investigation.

II. 2. The Board accepted the recommendation of its Committee and suggested that Mr. Johnston be informed that he may approach the Ministry of War Transport in England in case he wishes to pursue the matter further.

II. Research Schemes.

Item No.	Particulars.															
	suggested by the Fertilizer Mission, a physical and chemical survey of all Indian Coals be conducted without delay. The Board of Scientific and Industrial Research at their 15th meeting considered the above recommendations and resolved that the Director of Scientific and Industrial Research be requested to carry out a physical and chemical survey of Indian Coals in consultation with the Labour Department of the Government. The Director of Scientific and Industrial Research and the Acting Director of the Chemical laboratories have accordingly submitted scheme, for the consideration of the Board. 2. The following investigations have been proposed under the scheme on 'The Physical and Chemical Survey of the Indian Coals': Determination of moisture content, volatile matter, fixed carbon, ash carbon, hydrogen, nitrogen and sulphur contents, calorific value, specific gravity and bulk density, melting point and analysis of the ash. It has also been stated that the usual laboratory apparatus and other facilities are available in the laboratories of the Director of Scientific and Industrial Research. 3. Grant asked for: <table><tr><td>Equipment :</td><td>Rs. 3, 500</td></tr><tr><td>1. Muffle furnace</td><td rowspan="4">}</td></tr><tr><td>2. Combustion apparatus</td></tr><tr><td>3. Bomb calorimeter</td></tr><tr><td>4. Miscellaneous</td></tr><tr><td>Contingencies :</td><td>Rs. 1, 000</td></tr><tr><td>Staff :</td><td>Rs. 4, 032 plus usual allowances</td></tr><tr><td>(Two Technical Assistants on Rs. 150/- per mensem in the scale 150-10-300-20-400. Two bearers on Rs. 18 in the scale 18-$\frac{1}{2}$-30)</td><td></td></tr><tr><td>Total</td><td>Rs. 8, 532 plus usual allowances admissible to the staff for 1 year</td></tr></table> Subject:— Dr. Karimullah, Assistant Director, Laboratories of the Council of Scientific and Industrial Research has submitted a scheme of research on 'Drugs in general'. Synopsis:— Schemes on 'Drugs in general', submitted by Dr. Karimullah. The scheme pertaining to investigations on (1) Kakra Singi (2) Herpestis Monniera (3) Hydrocotyle Asiatica, which are well-known indigenous drugs used as specifics in	Equipment :	Rs. 3, 500	1. Muffle furnace	}	2. Combustion apparatus	3. Bomb calorimeter	4. Miscellaneous	Contingencies :	Rs. 1, 000	Staff :	Rs. 4, 032 plus usual allowances	(Two Technical Assistants on Rs. 150/- per mensem in the scale 150-10-300-20-400. Two bearers on Rs. 18 in the scale 18- $\frac{1}{2}$ -30)		Total	Rs. 8, 532 plus usual allowances admissible to the staff for 1 year
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Total	Rs. 8, 532 plus usual allowances admissible to the staff for 1 year															

II. 4.

Recommendations of the Committee of the Board.

Recommendations of the Board.

II. 3. The Committee recommended that the scheme be not sanctioned in view of their recommendation (vide Item IV. 3 sub-paragraph 2, page 58) that the work of physical and chemical survey of Indian coals be conducted by Dr. Lahiri at the Fuel Research Station, Dhanbad, and that the nucleus staff be appointed immediately for the purpose.

II. 3. The Board accepted the recommendation of its Committee.

II. Research Schemes.

Item No.	Particulars.																					
	Ayurvedic and Unani systems. It is stated that very little work has been done so far on these drugs from chemical and pharmacological standpoints.																					
1.	Kakra Singi : Kakra Singi is a gall-like excrescence, which is formed on the leaves and petioles of Pistacia Integerrima N. O. Anacardiaceae. It has been long held in the indigenous system of Materia Medica as a useful remedy for cough, pthisis, Asthma, pulmonary affections, diarrhoea,, vomiting etc., Investigations have been conducted by Dr. Karimullah and his assistants in the Council's laboratories on the chemistry of the drugs during the latters' spare time. The results of these investigations have been published in the Journal of Scientific and Industrial Research. Work on the drug has now reached a stage that it requires the attention of a full time worker. It is, therefore, requested that one research assistant may be sanctioned to carry out the investigations.																					
2.	Herpestis Monniera and Hydrocotyle Asiatica : These two drugs are popularly known as Brahmi and Brahmi-Manduki respectively and are grown abundantly throughout the country. They are supposed to have great medicinal value especially in the diseases of skin, nervous system and blood. They are supposed to cure leprosy and epilepsy. Since very little work has been done on the active principles of these drugs, Dr. Karimullah and his assistants have carried out some preliminary investigations on the drugs. In order to carry out full systematic work it is requested that one research assistant may be sanctioned for work on both the drugs.																					
3.	Dr. Karimullah states that no special equipment is necessary. The usual apparatus, chemicals and other facilities available in the Laboratories of the Director, Scientific & Industrial Research are enough for the proposed work.																					
4.	Grant Required :																					
	<table><tr><td>Staff :</td><td>Rs. 4,216</td><td>plus usual allowances.</td></tr><tr><td>(Two Research Assistants in the scale 150-10-300-20-400.</td><td></td><td></td></tr><tr><td>One Bearer in the scale 18-$\frac{1}{2}$-30)</td><td></td><td></td></tr><tr><td>Equipment :</td><td>„</td><td>Nil</td></tr><tr><td>Contingencies :</td><td>Rs. 1,000</td><td></td></tr><tr><td></td><td>-----</td><td></td></tr><tr><td>Total</td><td>5,216</td><td>plus the usual allowances admissible to the staff for one year.</td></tr></table>	Staff :	Rs. 4,216	plus usual allowances.	(Two Research Assistants in the scale 150-10-300-20-400.			One Bearer in the scale 18- $\frac{1}{2}$ -30)			Equipment :	„	Nil	Contingencies :	Rs. 1,000			-----		Total	5,216	plus the usual allowances admissible to the staff for one year.
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One Bearer in the scale 18- $\frac{1}{2}$ -30)																						
Equipment :	„	Nil																				
Contingencies :	Rs. 1,000																					

Total	5,216	plus the usual allowances admissible to the staff for one year.																				

Recommendations of the Committee of the Board.

Recommendations of the Board

II. 5. Research Schemes.

Item No	Particulars.
II. 5.	5. Dr. Karimullah recommends that Mr. Uma Shankar, Research Assistant on the scheme 'Extraction of Rubber from Cryptostegia Grandiflora' be appointed as a research assistant on the scheme on 'Drugs in general', without any disadvantage to Mr. Uma Shankar, due to the transfer. The scheme 'Rubber from Cryptostegia Grandiflora' will be discontinued owing to the cessation of the hostilities. <i>Subject:—</i> Research Scheme on the Chromium Plating of glass, wood and other non-metallic materials by Dr. B. C. Kar, Dacca. <i>Synopsis:—</i> Dr. B. C. Kar, Lecturer in Chemistry, Dacca University has submitted a scheme of research on chromium plating of glass, wood and other non-metallic materials. 1. Dr. Kar states : The electro-deposition of metals has made considerable advances in recent years due to organised research initiated and carried out in America by the Washington Bureau of Standards and in the United Kingdom by the Department of Scientific and Industrial Research. No phase of electro-deposition has created greater interest and has found wider industrial application than chromium plating. The rapid growth of chromium plating since its commercialisation in 1924 is ascribed to the outstanding properties of chromium namely, high resistance to atmospheric corrosion at ordinary and elevated temperatures, high degree of hardness and wear resistance, low coefficient of friction and good reflectivity. Today, chromium plating has found very wide applications in many industries. The importance of electro-deposition of metals on glass, wood etc., needs no emphasis. All civilised countries are now thinking of the conservation of metals, for Nature's gift of minerals is limited. It is therefore necessary that attempts should be made to find proper substitutes for metals. The possible substitutes that may be considered are glass, porcelain, hardened wood, plastics etc. If these materials can be properly electro-plated with suitable metals they may serve many purposes as efficiently as the metals themselves. It is a simple matter to deposit chromium on glass, wood, plaster, china and other materials such as textiles, plastics etc. It is first of all necessary to obtain a perfectly adherent deposit of copper on the articles treated. Once the layer of copper has been applied to the article under treatment any desired finish such as chromium, silver, brass etc. can be given and this may be taken advantage of in the ornamental and art industries to produce a wide range of handsome articles. A possible method of depositing copper upon glass, wood etc., is to give a suitable adherent coating of some conducting material and then depositing copper or any other metal. 2. The scheme is to be carried out in the chemical laboratory, Dacca University under Dr. Kar's supervision. A moderately well-equipped laboratory is available at the University.

Recommendations of the Committee of the Board.

II. 4. The Committee recommended that Dr. Karimullah's scheme on "Drugs in general" be sanctioned with a grant of Rs. 4,216 for staff.

Recommendations of the Board.

II. 4. The Board accepted the recommendation of its Committee but decided that the title of the scheme be changed to "Investigations of Kakra Singh, Brahmi and Brahmi-Manduki".

II. Research Schemes.

Item No.	Particulars.	
3.	Grant required :	
	Equipment	Rs. Nil :
	Contingencies, apparatus and chemicals	Rs. 600
	Staff : (1 Research asst. in the scale 150-10-250. } 1 skilled operator on 50 p. m } 1 Bearer on Rs. 25/- p. m. } 1 Part-time clerk on Rs 33 p.m } Rs. 3, 060	
	Total	Rs. 3, 660 for 1 year
4.	The Electro-chemical Industries Research Committee has approved of the scheme and has recommended the following grant to Dr. B. C. Kar:	
	Staff : (1 Research Assistant on Rs 150/- p. m.)	Rs. 1, 800
	Contingencies	Rs. 800
	Total	Rs. 2, 600
II. 6.	Subject:—	
	Research Scheme on 'The Mechanism of Combustion', by Dr. N. R. Tawde, Professor of Physics, Royal Institute of Science, Bombay.	
	Synopsis:—	
	Dr. Tawde, Professor of Physics, Royal Institute of Science, Bombay has submitted a scheme of research on 'The Mechanism of Combustion'.	
	1. Dr. Tawde states :	
	The nature of the mechanism of combustion is one of the most difficult problems in fuel technology. Our knowledge so far in the field of study of combustion by various methods has not led to the elucidation of the primary processes of chemical reactions happening in the flames of different fuel gases. In the field of theory, an aspect, which is more or less speculative still persists owing to the fact that observational data under rigorously controlled and defined conditions are wanting. This is due to the difficult nature of the problem of combustion in flames and of the experimental technique to be adopted for investigation of the same. The reasons are that in flames the combustion reactions are so rapid that it becomes difficult to follow precisely the cause of changes or chemical chain. Flames therefore hide many mysteries which can only be solved by having recourse to proper methods investigation. The distinction between an ordinary slow chemical reaction and the rapid combustion process being the emission of light, spectroscopy may very well be brought	

<i>Recommendations of the Committee of the Board.</i>	<i>Recommendations of the Board</i>
II. 5. The Committee recommended that Dr. Kar's scheme on "Chromium plating of glass, wood and other non-metallic materials" be sanctioned with a grant of Rs. 2.600 as recommended by the Electro-chemical Industries Research Committee.	II. 5. The Board accepted the recommendation of its Committee.

11. Research Schemes.

Item No.	Particulars.
	to bear on this problem. Whatever the speed of reactions, the spectroscope can reveal some of the constituents of flames by the radiator they emit. The radiations thus provide a clue to what is happening in flames. In recent years therefore, the tendency is to follow the various flame reactions and the associated phenomena by spectroscopic methods. Recent Advances in the knowledge of molecular spectra have provided interesting applications in the study of the nature of combustion processes. Radiations from flames give chiefly the molecular spectra of such radicals as C_2, CH, OH, & NH. Of these C_2 (Swan spectrum) is of universal occurrence in many hydrocarbon flames. Besides flames; it also occurs in many other non-thermal sources, such as are, spark, discharge tubes etc. By comparing controlled production of Swan Bands of carbon by different thermal and electrical methods it would be interesting to see if the nature of combustion can be understood. Further, by taking the flame sources alone, it is possible to develop the molecular spectra of different radicals and measure quantitatively their relative enrichment at various stages of the flame. In other directions, the vibrational, rotational and translational temperatures could be measured by spectroscopic methods in order to understand the energy processes, so essential for the knowledge of combustion mechanism. 2. Dr. Tawde states that the Physics Laboratory of the Royal Institute of Science has been specialising in investigations on molecular spectra for a number of years. Spectral Intensity technique has been particularly developed which allows quantitative measure of weights of bands systems to be taken accurately. A good deal of work has been done in the laboratory on C_2 (Swan) bands in flames, arc, sparks discharge, under certain conditions. The existing spectral equipment, general resources and specialisation in intensity technique be utilised to make a start in this scheme of the mechanism of combustion. 3. The following investigations have been proposed under the scheme : - Investigation of the phenomenon of combustion by spectroscopic methods. - Exploration generally of the types of radiations resulting from combustion at different stages. - Study of the swan bands which are common in many hydrocarbon flames. - Study of the swan bands in many other sources, such as sparks and discharge tubes under controlled conditions. - Correlations of the results obtained under c and d above in order to establish relations between combustion and spectra. - Obtaining of a quantitative experimental measure of the relative weights of different molecular band systems in as successive stages to determine the course of reactions.

Recommendations of the Committee of the Board.

Recommendations of the Board.

II. Research Schemes.

Item No.	Particulars.
	g. Measurement of the temperatures spectrally by the study of the distribution of vibrational, rotational and translational energies.
	4. Dr. Tawde states that the spectral equipment, resources and the spectral intensity technique of the Physics Laboratory provide a nucleus for making a beginning in the study of the problem.
	5. Grant required.
	Equipment : Rs. 16,400
	Microphotometer Rs. ... 900
	Quartz spectrograph „ ... 3000
	Optical pyrometer „ ... 1500
	One Blower „ ... 800
	H. F. unit discharge tubes ... „ ... 1500
	One Hyvac pump „ ... 600
	Contingencies : Rs. 1,400
	Staff : Rs. 3,030
	1 research asst. on Rs. 150 plus 17½% war allowance
	1 laboratory attendant on Rs. 23 plus 30 plus 4=47
	Honorarium for clerical work Rs. 30
	Total Rs. 20,830 for 1st year.
	6. Dr. Tawde further states that a few problems of flames have already been worked out in his laboratory by spectroscopic methods. Further work is being done in consultation and co-operation with Dr. W. M. Vaidya of Delhi University. In case the scheme is sanctioned Dr. Tawde recommends that Mr. G. K. Mehta, B. Sc., who has long experience in investigational work on spectroscopy and discharge phenomena in gases in his laboratories be appointed as Research Assistant on the scheme.
	7. In this connection it may be mentioned that Dr. W. M. Vaidya of Delhi University has carried out investigations on 'Spectroscopic Investigation of Fuels and their combustion', under the auspices of the Fuel Research Committee. He has investigated the intensity changes in the spectra of hydrocarbon flames in order to understand more fully the mechanism of combustion in such flames. He is continuing the investigations to obtain full data regarding the fuel air ration, intensity changes in the spectra and the flame temperatures etc., for the building of a proper theory of the mechanism of hydrocarbon combustion.

Recommendations of the Committee of the Board.

Recommendations of the Board.

II. 6. The Committee recommended that Dr. Tawde's scheme on "The Mechanism of Combustion" be referred to the Fuel and Applied Physics Committees who may be asked to examine the scheme in the light of investigations already being carried out by Dr. Vaidya.

II. 6. The Board accepted the recommendation of its Committee.

II. Research Schemes.

Item No.	Particulars.																																													
II. 7.	<i>Subject:—</i> Scheme on 'Fat Liquor, Degras and Chemical Tanning Agents' by Dr. M. N. Goswami. <i>Synopsis:—</i> Dr. M. N. Goswami, Professor of Applied Chemistry, Calcutta University has submitted a scheme of research on 'Fat Liquor Degras and Chemical Tanning Agents'. 1. The object of the scheme is to carry out investigations on the following :— (a) Utilization of different kinds of sulfonated oils for fat liquoring utilising oils and fats available in India and to improve upon the present processes. (b) Possibility of using animal and vegetable oils available in India for degreasing purposes. (c) Preparation of different kinds of chemical tanning agents so as to assist present methods of tanning or substitute them entirely. 2. Grant Required : <table><tr><td>Equipment :</td><td>...</td><td>...</td><td>...</td><td>Nil</td></tr><tr><td>Staff :</td><td>...</td><td>...</td><td>...</td><td>Rs. 3,300</td></tr><tr><td>1 Research scholar in the scale 150-10 250 plus dearness allowance</td><td></td><td></td><td></td><td></td></tr><tr><td>1 Laboratory assistant on Rs. 60 p. m. plus dearness allowance.</td><td></td><td></td><td></td><td></td></tr><tr><td>1 Laboratory Boy on Rs. 18 p. m. plus dearness allowance</td><td></td><td></td><td></td><td></td></tr><tr><td>Contingencies.</td><td></td><td></td><td></td><td>Rs. 2,000</td></tr><tr><td></td><td></td><td></td><td></td><td>-----</td></tr><tr><td></td><td></td><td></td><td></td><td>Total Rs. 5,300 for 1 year.</td></tr><tr><td></td><td></td><td></td><td></td><td>-----</td></tr></table> 3. Dr. Goswami states that the scheme should be continued for five years as suggested by the Chairman, Leather Research Committee, under the Committee's five-year Research Plan. 4. It may be pointed out that under the auspices of the Council of Scientific and Industrial Research investigations have been carried out on the sulfonation of vegetable oils and the utilisation of these sulfated oils for various purposes, including fat liquoring of leather. Dr. K. G. Naik of Baroda has investigated the sulfonation of castor oil. Under the ground nut scheme in operation in the laboratories of the C. S. I. R., sulfonation of ground nut oil has been investigated and it has been found that sulfated ground nut oil is especially useful as a fat liquoring agent in leather industry. Further in the same laboratories Dr. S. Siddiqui is carrying out investigations on the 'Syntans' or Synthetic tanning agents.	Equipment :	...	...	...	Nil	Staff :	...	...	...	Rs. 3,300	1 Research scholar in the scale 150-10 250 plus dearness allowance					1 Laboratory assistant on Rs. 60 p. m. plus dearness allowance.					1 Laboratory Boy on Rs. 18 p. m. plus dearness allowance					Contingencies.				Rs. 2,000					-----					Total Rs. 5,300 for 1 year.					-----
Equipment :	...	...	...	Nil																																										
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Contingencies.				Rs. 2,000																																										

				Total Rs. 5,300 for 1 year.																																										

Recommendations of the Committee of the Board.	Recommendations of the Board.
II. 7. The Committee did not recommend the scheme as work on these subjects had already been done and the grants for the purpose had already been sanctioned by the Council to the Madras University and to the Bengal Tanning Institute, Calcutta.	II. 7. The Board accepted the recommendation of its Committee.

II. Research Schemes.

Item No.	Particulars.																								
118.	<i>Subject:—</i> Research scheme on Study of Microbiological methods for the estimation of complex organic substances of Industrial and Nutritional importance by Dr. Bashir Ahmad, <i>Synopsis:—</i> Dr. Bashir Ahmad, Chairman, Industrial Fermentation and Biological Products Research Committee has submitted a scheme, 'Study of Microbiological methods for the estimation of complex organic substances of Industrial and Nutritional importance' for the consideration of the Board of Scientific and Industrial Research. The details of the scheme are as follows :— I. It is well-known that a large number of complex organic substances are produced as the result of diverse biochemical activities of microorganisms. These products are specific and characteristic of the species and strains of organism employed. Some of the products are of nutritive importance and others of considerable industrial use. Although these fundamental synthetic capacities of different strains of organism are results of inherent potentialities, yet these may be modified by environmental factors. The resultant and products cover a wide field such as organic acids, pigments, antibiotic substances, and growth of factors. The accurate determination of these substances in the culture solutions and in micro-organism themselves is of fundamental importance. It has been found that even minute traces of large number of metabolic products of microorganism influence certain biochemical activities of microorganisms to a great deal. These effects which can be detected by different methods have been made use of in determining minute traces of these products. A number of methods have been developed in U. S. A. for the estimation of various substances such as thiamin, riboflavine, nicotinic acid, inositol, pyridoxin p-aminobenzoic acid, folic acid, penicillin and other such antibiotic products, glycine, glutamic acid and other amino acids. These days, these represent the most accurate methods for the estimation of these compounds in small amounts. A list of some of the organism along with the factors for which they are employed is given below :— <table><tr><td>Yeasts</td><td>S. Cerevisae</td><td>Thiamin, pyridoxin,</td></tr><tr><td></td><td>S. Carlsbergenes</td><td>Pantothenic acid,</td></tr><tr><td>Lactobacillus casei.</td><td></td><td>Pantothenic acid,</td></tr><tr><td></td><td></td><td>Riboflavine,</td></tr><tr><td></td><td></td><td>Nicotinic acid,</td></tr><tr><td></td><td></td><td>Pyridoxin,</td></tr><tr><td></td><td></td><td>folic acid,</td></tr><tr><td></td><td></td><td>Biotin.</td></tr></table>	Yeasts	S. Cerevisae	Thiamin, pyridoxin,		S. Carlsbergenes	Pantothenic acid,	Lactobacillus casei.		Pantothenic acid,			Riboflavine,			Nicotinic acid,			Pyridoxin,			folic acid,			Biotin.
Yeasts	S. Cerevisae	Thiamin, pyridoxin,																							
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		Pyridoxin,																							
		folic acid,																							
		Biotin.																							

Recommendations of the Committee of the Board.

Recommendations of the Board

Item No.	Particulars.											
	L. arabinosus. Nicotinic acid. Neurospora sitophila Pantothenic acid. Neurospora crassa. Pyridoxin. Phycomyces blackesleeianus p-aminobenzoic acid and amine acids. Streptococcus salivarius B₁ Streptococcus lactic R B₁ Staphylococcus aureus Folic acid. Acetobacter suboxydans p-amino benzoic acid. Clostridium acetobutylicus " Staphylococcus aureus penicillin. It has been found that a large number of mutant strains of certain microorganisms can be suitably adapted for these assays. A lot of work is required to be carried out before the methods developed in foreign countries can be suitably employed in India for the various estimations. It is possible to develop even better strains of micro-organisms in this country which are fully acclimatized to Indian environments and are for this reason better suited for estimations. PLAN OF WORK. It is proposed to develop methods for the estimations of complex organic substances produced as a result of biochemical activities of microorganism on similar lines as in other foreign countries. A large number of cultures available in this country would be critically examined from the point of view of their nutritive requirements and the influence of these products on the biochemical activities of the available strains. Work of this nature is already being carried out in the laboratories of the B. S. I. R. and a method has been developed for the estimation of vitamin B₁ using a specially adapted strain of torula utilis. A paper based on this work has been communicated to the Journal of Scientific and Industrial Research. It is proposed to extend further this work under the proposed scheme. 2. Grant required : <table> <tr> <td>Staff</td><td>Rs. 2,748</td></tr> <tr> <td>1 Research asstt. on Rs. 150 p. m. in the scale 150—10—250 plus dearness allowance</td><td rowspan="2">}</td></tr> <tr> <td>1 Laboratory attendant on Rs. 25 p. m. plus dearness allowance.</td></tr> <tr> <td>Equipment :</td><td>Rs. 2,252</td></tr> <tr> <td>Contingencies</td><td>Rs. 1,000</td></tr> <tr> <td>Total</td><td>Rs. 6,000 for 1 year.</td></tr> </table> 3. Dr. Bashir Ahmad states that the members of the Industrial Fermentation & Biological Products Committee have all whole-heartedly supported the above scheme.	Staff	Rs. 2,748	1 Research asstt. on Rs. 150 p. m. in the scale 150—10—250 plus dearness allowance	}	1 Laboratory attendant on Rs. 25 p. m. plus dearness allowance.	Equipment :	Rs. 2,252	Contingencies	Rs. 1,000	Total	Rs. 6,000 for 1 year.
Staff	Rs. 2,748											
1 Research asstt. on Rs. 150 p. m. in the scale 150—10—250 plus dearness allowance	}											
1 Laboratory attendant on Rs. 25 p. m. plus dearness allowance.												
Equipment :	Rs. 2,252											
Contingencies	Rs. 1,000											
Total	Rs. 6,000 for 1 year.											

Recommendations of the Committee of the Board.	Recommendations of the Board
II. 8. The Committee recommended that the consideration of the scheme be postponed for the present.	II. 8. The Board accepted the recommendation of its Committee.

III. Scheme on 'Incidence and Elimination of Rancidity in Vegetable Oils', by Dr. V. Subrahmanyam, Indian Institute of Science, Bangalore.

Item No.	Particulars.
III.	<i>Subject:—</i> Scheme on 'Incidence and Elimination of Rancidity in Vegetable Oils', by Dr. V. Subrahmanyam, Indian Institute of Science, Bangalore. <i>Synopsis:—</i> In December 1944, Dr. V. Subrahmanyam, Professor, of Biochemistry Indian Institute of Science, Bangalore submitted a scheme of research on the 'Incidence and Elimination of Rancidity in Vegetable Oils', for the consideration of the Board of Scientific and Industrial Research. The Vegetable Oils Committee considered the scheme on the 12th January 1945 and recommended that further details on the scheme be obtained to enable it to examine the scheme thoroughly. The Board at its XIVth meeting also recommended that the Chairman of the Vegetable Oils Committee be requested to obtain further details on the scheme from Prof. V. Subrahmanyam and forward the final recommendations of his Committee to the Director of Scientific and Industrial Research, for the consideration of the Board. In accordance with the above recommendations, the Chairman of the Vegetable Oils Committee obtained the necessary details from Prof. Subrahmanyam. On further consideration of these details the Vegetable Oils Committee was of the opinion that the proposed investigations were outside the purview of the Committee and that the scheme should be referred to the Imperial Council of Agricultural Research. The above is placed before the Board for information.

Recommendations of the Committee of the Board.

Recommendations of the Board.

III. The Committee recommended that Dr. V. Subrahmanyam's scheme on "Incidence and Elimination of Rancidity in Vegetable Oils" be referred by the author to the Imperial Council of Agricultural Research.

III. The Board recommended that the scheme be referred back to the Vegetable Oils Committee for re-examination.

Item No.	Particulars.
IV. 1.	<i>Subject:—</i> Proceedings of the Plastics Committee meeting. <i>Synopsis:—</i> A meeting of the Plastics Committee was held in New Delhi on the 20th August 1945. 1. The Chairman, in opening the proceedings, informed the members of the Committee that the Board and Council of Scientific and Industrial Research had approved the various problems of research suggested by the Plastics Research Committee at its last meeting held on the 17th and 18th September 1944. It was now necessary that detailed proposals of research under various heads with estimates of grant-in-aid required be submitted. It was noted in this connection that the appointment of an assistant for a period of six months for compiling a list of problems of research on plastics in consultation with all the research laboratories and research workers in India who are interested in the subject, had just been made, and it was hoped that Dr. Verman would present a report before the expiry of six months in consultation with the Director of Scientific and Industrial Research. 2. The Committee considered the developments that had already taken place in the field of plastic industry since its last meeting and took up certain items of research for consideration. It was noted that the three most important chemicals for the manufacture of synthetic plastics e. g. phenol, urea and formaldehyde were receiving attention of the various committees of the Board and Government. For example, the Heavy Chemicals Committee of the Board has recommended intensive work on the preparation of phenol from benzene by reaction with sulphuric acid and hydrolysis and also on the decomposition of chloro-benzene with steam. It is understood that they have recommended that urea should be manufactured in India in a plant of daily capacity of 10 tons in the factory that the Government of India is setting up for the manufacture of 350,000 tons of ammonium sulphate in Bihar. The Chairman informed the Committee that the cost of urea manufacture on a large scale in America amounted to 55 dollars per ton and the United States Department of Agriculture considered that urea was in many respects a more suitable fertiliser than ammonium sulphate. 3. <i>Formaldehyde</i> The Committee noted that a scheme for the manufacture of formaldehyde from carbon monoxide and hydrogen via methyl alcohol is already in operation in the Indian Institute of Science, Bangalore, but felt that ethyl alcohol being one of the most important solvents now available in India on a very large scale, a systematic attempt should be made to find out the conditions under which formaldehyde can be obtained from ethyl alcohol. In this connection they discussed a scheme of research submitted by Dr. S. K. K. Jatkar and recommended that a sum of Rs. 6,000 be sanctioned for a period of one year in the first instance in order to enable Dr. Jatkar to undertake this research.

Recommendations of the Committee of the Board.	Recommendations of the Board

IV. Proceedings of Research Committees.

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Item No.	Particulars.
	The details of the expenditure for the first year are as given below :
	Staff : Rs. 4,416-0-0 1 Senior research assistant on Rs. 150 in the scale 150-10-250 plus war allowance at 17½% } 1 Junior research assistant on Rs. 100 + dearness allowance of Rs. 18 - p. m. } 2 Laboratory bearers on Rs. 25 p. m. + dearness allowance of Rs. 16 p. m. } Contingencies Rs. 1,584-0-0 Total Rs. 6,000-0-0 for the first year.
	4. The Committee discussed the general question of manufacture of several raw materials required in plastic industry.
	(i) <i>Phthalic Anhydride</i> : Dr. Sir S. S. Bhatnagar stated that Phthalic Anhydride was being produced by the Shalimar Tar Products Ltd., at Calcutta and that no further research was necessary in this connection. The Committee decided to recommend to the Board of Scientific and Industrial Research that the process for the manufacture of Phthalic Anhydride as developed in the Director of Scientific and Industrial Research's laboratories may be made available to any other manufacturers who may be interested in its production.
	(ii) <i>Maleic Anhydride</i> : It was considered that Maleic Anhydride was as important a raw material as Phthalic Anhydride. It was decided that Dr. Ghatak, Research Officer of the Chemical Laboratories of the Council of Scientific and Industrial Research be requested to undertake the development of a process for the manufacture of Maleic Anhydride from benzene and also to investigate the possibility of using vegetable oils as a raw material. The work might be further extended to include the production of condensation products from Maleic Anhydride and turpentine fractions. It was decided that if Dr. Ghatak required any financial assistance in this connection he might make the necessary request to the Board for a research grant.
	(iii) <i>Furfural</i> —Furfural was regarded as a very important material. Dr. Sir S. S. Bhatnagar stated that the raw materials for the manufacture of furfural had been investigated in his laboratories and considerable amount of data was available on the subject including plant details. The Chairman suggested that a bulletin may be prepared for publication by the Board. On Sir S. S. Bhatnagar's suggestion it was decided that all information available might be published in the Dictionary of Economic Products and Industrial Resources of India now being compiled under the auspices of the Council of Scientific and Industrial Research.
	(iv) <i>Glycerine</i> : The Committee decided that sufficient quantity of glycerine was available in the country and the question of its production therefore required no further attention.

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Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 1. 3. The Committee recommended that Dr. S. K. K. Jatkar's scheme on the manufacture of formaldehyde from carbon monoxide and hydrogen via methyl alcohol be sanctioned with a grant of Rs. 6,000 as recommended by the Plastics Committee.	IV. 1. 3 Dr. Sir J. C. Ghosh pointed out that the scheme of Dr. Jatkar related to the manufacture of formaldehyde from power alcohol. The Board noted the correction and accepted the recommendation of its Committee sanctioning the scheme.
IV. 1. 4 (i) The Committee understood from the Director of Scientific and Industrial Research that action had already been taken in the matter.	IV. 1. 4 (i). The Board noted the observations of its Committee.
IV. 1. 4 (ii) The Committee recommended that Dr. Karimullah and Dr. Ghatak be requested to put up a scheme on the manufacture of Maleic Anhydride from turpentine fractions.	IV. 1. 4 (ii). The Board accepted the recommendation of its Committee.
IV. 1. 4 (iii) The Committee recommended that all information on furfural be published in the Dictionary of Economic Products and Industrial Resources of India.	IV. 1. 4 (iii) The Board accepted the recommendations of its Committee.

Item No.	Particulars.
	(v) <i>Polyhydric alcohol</i>. Sir J. C. Ghosh informed the Committee that he had recently been successful in producing allyl alcohol from glycerine in the vapour phase by simultaneous dehydration and deoxidation. This together with Phthalic Anhydride would form raw material for the production of high grade resinous compounds. The Committee commended the work and hoped that it would be continued to completion and funds for pilot experiments might be sanctioned by the Council of Scientific and Industrial Research if necessary. The Committee took notice of the fact that the Director, Scientific and Industrial Research's laboratories were working on the development of processes for the production of Sorbitol and Mannitol by electrolytic method. (vi) <i>Glycol</i>.—Dr. Habib Hassan pointed out that Glycol was an important material and the possibilities of manufacturing it from molasses must be investigated. Dr. Sir S. S. Bhatnagar undertook to look into this question in conjunction with the activities of the Plastics Panel of the Planning and Development Department. (vii) <i>Cresol</i>: It was noted that some quantity of cresol was available in India but a note should be prepared on the subject to indicate what has to be done to increase its production. (viii) <i>Hexamine</i>: It was decided that a note might be prepared on the production of Hexamine in India. (ix) <i>Acetic Acid</i>: The Chairman pointed out that a plant exists in South India for the production of Acetone from ethyl alcohol and certain quantities of acetic acid were also being manufactured. If necessary details of this plant may be obtained for starting this industry in other parts of the country. The question of production of Acetic Anhydride may be linked with the production of Acetic acid and the necessary experimental work may be carried out in this connection at the Indian Institute of Science, Bangalore. (x) <i>Cellulose Pulp</i>: This is an important raw material for the production of cellulose nitrate, acetate and others. The Committee understood that some work had been done on this subject in Baroda; and decided to call for a report on the work done. (xi) <i>Fillers</i>.—Dr. Sir S. S. Bhatnagar pointed out that some work had been done on production of wood fillers under Dr. H. K. Sen and later on under Dr. P. K. Bose both of the Indian Lac Research Institute. He was however, not certain as to what extent the progress had been made. He suggested that the work on this subject should be extended to include the production of fillers from all available sources including mineral, agricultural and animal wastes and that this work might be entrusted to Dr. L. C. Verman for which purpose the latter may be requested to formulate a scheme for the consideration of the Committee. Dr. Verman undertook to formulate the scheme. The Committee felt that Dr. Verman might also consult Dr. Astbury in connection with the X-ray equipment that is required for the study of fibre structure of fillers.

Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 1. 4. (v) The Committee recommended that Sir J.C. Ghosh be requested to put up a scheme on the manufacture of Polyhydric alcohol.	IV. 1. 4 (v) The Board accepted the recommendation of its Committee.
IV. 1. 4 (vi). The Director of Scientific and Industrial Research informed the Committee that the possibilities of molasses had been investigated by the Plastics Panel of the Planning and Development Department and the Report will be published when the Panel's report was ready.	IV. 1. 4 (vi). The Board accepted the recommendation of its Committee.
IV. 1. 4 (vii). The Committee noted that a Report had been prepared by the Plastics Panel which will be published when the final report of the Panel is ready.	IV. 1. 4 (vii). The Board noted the observations of its Committee.
IV. 1. 4. (viii). The Committee recommended that the Plastics Panel of the Planning and Development Department be requested to prepare a note on the production of hexamine in India.	IV. 1. 4 (viii). The Board accepted the recommendation of its Committee.
IV. 1. 4 (ix). The Committee endorsed the recommendations of the Plastics Committee.	IV. 1. 4. (ix). The Board endorsed the recommendations of the Plastics Committee.
IV. 1. 4 (x). The Committee noted the observations of the Plastics Committee.	IV. 1. 4 (x). The Board noted the observations of the Plastics Committee.
IV. 1. 4 (xi). The Committee recommended that Dr. Verman be asked to prepare a scheme on the production of fillers for plastics and submit the scheme to the Plastics Committee.	IV. 1. 4 (xi). The Board accepted the recommendations of its Committee.

Item No.	Particulars.
	(xii) <i>Ethylene</i>: Dr. Sir S. S. Bhatnagar pointed out that some work had been done on the production of ethylene from alcohol but the product was rather expensive. After some discussion it was decided that the question of recovery of ethylene from coke oven gases might be entrusted to the Fuel Research Station of the Council of Scientific and Industrial Research who may also be asked to enlist the co-operation of The Tata Iron & Steel Co., Ltd. Simultaneously with the recovery of ethylene recovery of coumarine, indene and cyclopentadiene etc. may also be carried out. It was decided that the production of polythene from ethylene by high pressure technique should be given a very high priority in the National Chemical Laboratories when they were established. The production of polythene by hydrogenation of rubber latex may be studied at the Indian Institute of Science, Bangalore. (xiii) <i>Melamine</i>: This is an important material for the production of melamine formaldehyde resins and requires calcium carbide for its production. Dr. Sir S. S. Bhatnagar pointed out that Mr. Gilmore, late of this Department, had been engaged for some time in an attempt to put a calcium carbide plant in the country. The Chairman pointed out that some quantity of calcium carbide of 60% purity was available in the country but whether this would do for the production of melamine was a question that required research. Experiments in this connection need to be carried out at some suitable laboratory. (xiv) <i>Butyric Acid</i>: This material is required for the production of cellulose butyrate and Dr. Habib Hassan pointed out that the work had been done on this subject at Hyderabad and a report would be published shortly. (xv) <i>Camphor</i>: The Chairman pointed out that since Indian turpentine was deficient in the pinene content it was not possible to produce camphor in India on a large scale from indigenous materials, but, since the Indian turpentines are rich in 3-Carene (70 %), the possibilities for the use of its derivatives as plasticisers in place of camphor might be investigated. It was decided that the problem be referred to Dr. S. Siddiqui, Director of the Chemical Laboratories, Council of Scientific and Industrial Research. (xvi) <i>Plasticisers & Lubricants</i>: It was noted that while certain types of lubricants such as stearic acid and its soaps were readily available in India further work on more scientific lines was needed in order to determine the plasticising and lubricating properties of materials readily available and/or producible in India. Dr. Habib Hassan undertook to submit a note dealing with certain esters for use as plasticisers. 5. <i>Vegetable Oils Plastics</i>: Dr. Jatkarn pointed out that while some attempts had been made for the production of vegetable oil plastics by high pressure technique, a more scientific method would be to utilise the products of disintegration obtained from vegetable oils rather than by the use of oils as such. It was decided that Dr. Jatkarn might undertake the work on this subject in connection with the scheme dealing with cashew shell oil and that a part of the grant of Rs. 6,000/- recommended for him under item 8 above, might be diverted for this purpose.

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. I. 4 (xii). The Committee recommended that the Fuel Research Station be entrusted with the investigations on the recovery of ethylene from coke oven gases in co-operation with the Tata Iron and Steel Co. Ltd., and that recovery of coumarine, indene etc. be also carried out along side. The Committee understood that for the proposed National Chemical Laboratory due priority had been given to high pressure technique. The Committee recommended that Sir J.C. Ghosh be requested to investigate the production of polythene by the hydrogenation of rubber latex. IV. I. 4 (xiii). The Committee noted the observations of the Plastics Committee. IV. I. 4 (xiv). The Committee noted the observations of the Plastics Committee. IV. I. 4 (xv). The Committee recommended that the problem of production of plasticisers from Indian turpentines be referred to Dr. Siddiqui, Acting Director of the Chemical Laboratories. IV. I. 4 (xvi). The Committee noted that the note promised by Dr. Habib Hassan had not yet been received. IV. I. 5. The Committee recommended that Dr. S.K.K. Jatkarn be requested to undertake work on the production of plastics from vegetable oils as recommended by the Plastics Committee and that a part of the grant of Rs. 6,000 recommended for his scheme on formaldehyde (vide para 3 on page 32) be utilised for the purpose.	IV. I. 4 (xii). The Board accepted the recommendations of its Committee. IV. I. 4 (xiii). The Board noted the observations of the Plastics Committee. IV. I. 4 (xiv). The Board noted the observations of the Plastics Committee. IV. I. 4 (xv). The Board accepted the recommendations of its Committee. IV. I. 4 (xvi). The Board noted the observation of the Plastics Committee. IV. I. 5. The Board accepted the recommendation of its Committee.

IV. Proceedings of Research Committees.

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Item No.	Particulars.
6.	<i>Sugar Plastics</i>: The Chairman pointed out that the production of plastics from sugar by condensation with phenol or formaldehyde should be investigated and that the Institute of Sugar Technology, Cawnpore, be requested to take up this work. It was pointed out that propiolic acid was a useful ingredient for the production of sugar plastics. It was decided that Dr. S. Siddiqui be requested to look into the production of this acid in India.
7.	<i>Lignin Plastics</i>: The Chairman brought to the notice of the Committee that, under the plans of the Planning and Development Department, it was intended to produce 1,20,000 tons of paper in the next 5 years which would yield, a by-product about 60,000 tons of sulphite liquor. It was important that this Committee should investigate the possibilities of utilising lignin in this liquor for the production of plastics. Dr. Habib Hassan undertook to formulate a scheme on this subject and submit it within the next two months.
8.	<i>Chemistry and Physics of High Polymers</i>: Dr. Jatkar undertook to give a note on this subject for the consideration of the Committee.
9.	<i>Processing Plant and Moulding Equipment</i>: Dr. L.C. Verman pointed out that, for the development of plastics in India, it was important that processing plant for the production of resins and moulding powders and equipment for the production of finished moulded articles should ultimately be manufactured in India on a large scale. It was decided that attention of the Machine Tool Industries Panel and Ferrous and non-ferrous Industries Panels of the Planning and Development Department should be drawn to this requirement. It was felt that this aspect of research should receive considerable attention in the National Research Laboratories dealing with this subject.
10.	<i>Lacquers, Varnishes, Enamels, Paints etc.</i> For this industry raw materials requirements include oils, pigments, dyes, resins, solvents, plasticisers, etc. It was decided that an enquiry be made from Dr. R. Bhattacharya of the Supply Department to ascertain the research requirements for this industry in the post-war period in India.
11.	The Committee noted that the Council of Scientific and Industrial Research had decided that for the present the needs of plastic research could be met by the National Chemical Laboratory and other research institutions in India and not by a separate plastic research institute as recommended by the Committee at its last meeting. The Committee was of the opinion that a separate section dealing with the problem of high polymers should form an important feature of the National Chemical Laboratory. The Committee requested the Director of Scientific and Industrial Research to bring this point to the notice of the National Chemical Laboratory Planning Committee.

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Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 1. 6. The Committee recommended that the D.S.I.R. be requested to get into touch with the Director of Sugar Technological Institute, Cawnpore, regarding the manufacture of plastics from sugar. The Committee also recommended that Dr. Siddiqui be asked to examine the question of production of sugar plastics.	IV. 1. 6. The Board accepted the recommendation of its Committee. It was pointed out that Dr. Siddiqui be asked to examine the question of the production of acids for sugar plastics.
IV. 1. 7. The Committee noted that Dr. Habib Hassan had undertaken to prepare a scheme on the manufacture of plastics from lignin wastes.	IV. 1. 7. The Board noted the observation of the Plastics Committee.
IV. 1. 8. The Committee noted that Dr. S.K.K. Jatkar had undertaken to prepare a note on the chemistry and physics of High Polymers.	IV. 1. 8. The Board noted that Dr. Jatkar had undertaken to prepare a note on the chemistry and physics of high polymers. The Board recommended that Dr. Jatkar should prepare his note with special reference to the Chemistry and Physics of high polymers from Indian raw materials.
IV. 1. 9. The Committee recommended that Dr. Verman be asked to prepare a note on Processing Plant and Moulding Equipment for plastics industry.	IV. 1. 9. The Board accepted the recommendation of its Committee.
IV. 1. 10. The committee endorsed the suggestion of the Plastics Committee.	IV. 1. 10. The Board endorsed the suggestion of the Plastics Committee.
IV. 1. 11. The Committee noted that provision had already been made for a section of High Polymers in the proposed National Chemical Laboratory.	IV. 1. 11. The Board noted that provision had already been made for a section of high polymers in the proposed National Chemical Laboratory.

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IV 2.	<i>Subject :—</i> Report of the Dyestuffs Exploratory Committee. <i>Synopsis:—</i> An Exploratory Committee to consider ways and means for the manufacture of synthetic dyes was set up by the Government of India on the recommendation of the Board of Scientific and Industrial Research. The Committee has now submitted its report, which is placed before the Board for consideration. Besides exploring the possibilities of establishing a synthetic dyestuffs industry in India the Committee has also concerned itself with individual problems of research in synthetic as well as vegetable dyes referred to it from time to time by the Board of Scientific and Industrial Research. A summary of the Committee's report is given below: A.—History of Dyestuff Industry in India: Dyestuff industry was first founded in Great Britain in 1856 by Perkin at Greenford Green near London. In 1858 Natonson discovered Magenta and the first dyestuff industry in France was established. Germany founded her first dyestuff industry as late as 1863 but made rapid progress in the line which enabled her practically to control the world markets in its own and allied fields through skilful organisations and close attention to research. The British Dyestuff industry declined to a very great extent before the Dyestuff Importation Act of 1920 was passed, which forbode the entry of dyes and intermediates into Great Britain except such dyes as could not be produced in the country at a reasonable price. Of the many reasons attributed to the cause of decline of the British dyestuff industry during tho period 1864-1920, the following are of significance to the project for establishing an Indian Colour Industry: (1) the unsatisfactory patent laws which enabled the Germans to take out British patents without any intention of exploiting them. (2) free trade in England in contrast to the high tariff walls raised by Germany. (3) the active encouragement in Germany of research in Organic Chemistry with special reference to the Chemistry of Colouring matters. (4) the heavy excise duty on alcohol and the regulation which circumscribed its use in England. (5) the superior selling organisations of the Germans.

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	Germany, the U. S. A., Russia, Great Britain, Japan, Italy, France, Switzerland and Poland were the main dye manufacturing countries in 1936. Except in the case of Germany and Switzerland the industry in each country concentrated largely upon production for the domestic market. It is observed that (a) the dyestuff industry is essentially of an international character and that no country is capable of standing on its own feet with regard to all products; (b) this industry cannot be developed successfully by comparatively small individual firms, but that amalgamation and organisation on a nation-wide basis are essential for success, (c) this industry requires extensive and continual research. B—The value and importance of the dyestuff industry in the economy of a country. The dyestuff industry acts as an important link in the chain of other essential chemical industries. Such as heavy chemical industry and coal tar industry on the one hand, and the fine chemical and pharmaceutical industry, explosives, synthetic plastics and solvents on the other. The importance of the dyestuff industry to the economy of the country is only just being realised and inadequately realised even to-day. Its value as the highest development of the chemical industry and as a basis from which almost any organic material could be manufactured its wide ramifications and interconnection with other industries, several of them larger in size and money value than the dye industry itself, such as inorganic chemical and coal tar industries and the explosives, fine chemicals, pharmaceuticals and synthetic plastics is still inadequately appreciated. The textile industry is the premier industry of India, and yet on the outbreak of war it had to face an acute shortage of dyes and auxiliary chemicals. The dyestuff industry helps the following classes of industry : (a) Feeder industries, such as, coal-tar distillation, the heavy chemical industry and to a certain extent the solvent industry. These industries are closely associated with the dye industry. (b) Industries which have developed from the dye industry or depend on it for some of their raw materials, such as pharmaceuticals and fine chemicals, synthetic resins, explosives, photographic chemicals and essences. C. Survey of the consumption of Dyes in India. The Committee regrets to record its inability to produce satisfactory figures of the consumption of dyes in India due to lack of actual statistical figures of consumption obtained from the consumers of dyes as well as insufficient import statistics. Some attempt has, however, been made to make a rough survey of the consumption of the various kinds of dyes in India. In Appendix I is given the statistics of dyes classified under thirteen heads during the years 1937 to 1940. In Appendix II are given the figures provided by the late Mr. Fuchsman of consumption for dyes classified into 80 to 100 groups.

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	D. A plan for an Indian dyestuff industry. The importance of the dyestuff industry has been properly emphasised. Raw material position for the industry is sufficiently favourable to enable the industry to be started in India. This fact has been studied specially in a report submitted by Pai and Venkataraman. The Committee has come to the conclusion that it is possible under the conditions indicated in a later section to manufacture these 51 dyes which are in great demand by the textile industry in 5 years and that within a period of 15 to 20 years it is feasible to manufacture all the dyes in substantial demand in the country. From the figures obtained from the I.C.I. regarding the dyestuff prices, it is clear that the 51 dyes which constitute the first part of the plan would represent about 50% of our dyestuff consumption. E. Raw materials for the manufacture of dyestuffs in India. The Committee reports that before the war capacity of heavy chemical industry in India was not adequate to meet the demands of the dyestuff industry. The position has improved since the outbreak of the war, as many new plants have been erected and brought into operation. (i) Purity of commercial dyes: Nearly all the commercial dyes, except perhaps those used in the pharmaceutical industry and for colouring foods, are adulterated or standardised by the use of inorganic salts or organic diluents. Due to this fact, it became difficult to survey the requirements of the raw materials for the manufacture of parent dye or dyes. Research on the commercial dyes in the plan, the nature of the adulterants, the auxiliary agents that may be present, and in some cases the chemical constitution of the parent dyes, has been taken up by the Committee, but an investigation to cover the entire range of commercial dyes could not be made in the time at its disposal. (ii) Manufacturing Practice. In the absence of accurate data regarding manufacturing practice, a general idea of the total requirement of the raw materials for the purpose of manufacturing 51 dyes in the plan in respect of inorganic chemicals, coal-tar materials and solvents, has been ascertained. The figures arrived at are recorded in Appendices IV, V and VI. In arriving at the figures in the report, allowances have been made for the recovery of excess chemicals, and the figures in Appendices IV, V and VI refer to the essential "consumables" required annually. The procedure followed has been explained in detail in the Pai-Venkataraman Report. Mr. Pink of the Imperial Chemical Industries, at the request of the Committee submitted an independent report (Appendix VII) on the different aspects of dyestuff industry in India. His figures were in some cases different from those contained in the Pai-Venkataraman

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	Report, the significance of which has been explained in detail in the addendum to the latter's report. (iii) Production Data: In order to get a comprehensive idea of the production data, appendices IV and V may be studied. Appendix IV—is a combined list of requirements of inorganic chemicals as finally computed with their availability, according to the latest information at the Committee's disposal. Appendix V—is a similar list of coal tar raw materials. The whole position is presented in a series of flow sheets indicated below:— 1. Intermediates from benzene. 2. „ „ phenol. 3. „ „ toluene. 4. „ „ naphthalene. 5. „ „ anthraquinone. 6. Raw materials (organic and inorganic) for the dyes from benzene. 7. „ „ „ „ „ from (benzene toluene, naphthalene.) 8. „ „ „ „ „ anthraquinone. E. (IV) Review of the raw material position. This matter has been dealt in full in the Pai-Venkataraman Report and has been discussed in short only with regard to the major requirements in the Committee's report. Recommendations made by the Committee with respect to the raw material for the dyestuff industry are briefly summarised at the end of the Committee's Report. The Committee concludes that the raw material position is reasonably satisfactory, though there are problems regarding the scale of production, the availability of some of the chemicals and, above all, the prices. It is observed, that in the early stages of the establishment of the industry it will be necessary to import a good many of the raw materials which it should be found feasible at a later stage to manufacture in the country itself. The Committee also opines that within a period of ten years, India will be in a position to manufacture practically all the intermediates required for a full-scale dye industry. From a study of the prices of many of the raw materials actually available in the country, the position appears to be depressing. The problem of price, however, is mainly of supply. So long as chemicals are manufactured in small quantities to meet only some special requirements, their prices will continue to rule high, but if their manufacture is enlarged

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	to meet the requirements not only of the dye industry but of other industries which are likely to come into existence in the post-war period, the prices will come down. F. Plant and Equipment for the Dyestuff Industry The varied and specialised plant required for dyestuff manufacture appears to be a difficult problem, but it is easier of solution, because the requirements could be met by import to whatever extent it is necessary. For detailed information the matter may be referred to the Chemical Plant Committee of the Board of Scientific and Industrial Research. The Committee's recommendation in this matter is given in "Summary of Recommendations" paragraph (10). G—Location of the Dyestuff Industry. The selection of a suitable site for locating the dyestuff industry is one of the factors that will decide the success of the plan. The Committee considers the following points, in a general way and has made its recommendation on this basis:— (i) Relationship of raw material position with the dye industry; (ii) The advantages of location near the great consuming centre such as, textile centre. (iii) Transportation facilities, for the raw materials as well as plants and equipment. (iv) Water-supply position. The Committee has not surveyed suitable sites, and it suggests that ultimate choice should be made by a special Committee of experts who have had practical experience of the requirements of the industry. However, on the basis of the considerations referred to above it is of the opinion that the most suitable location for the dyestuff factory will be in the neighbourhood of Bombay city or the coalfields area. H—The Organisation of the Dyestuff Industry The economic aspect of the dye industry is discussed in a very brief outline. No estimate of the total cost of manufacturing all the dyes and intermediates required by the country is given, because of the various difficulties mentioned. Rough estimate of the total cost is given as rupees twenty-five crores. From the history of the industry in other countries and the very difficult and complex nature of the processes involved it is seen that it is essentially an industry in which no single country can be entirely independent and self-contained. The establishment of the industry on the lines mentioned before in this report and other allied reports would become feasible if India was to come to an agreement for co-operation with a large and well established concern in Europe or America, so that the latter's technical experience and expert advice might be available at every stage. Such cooperation should not,

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	however, be in any way at the expense of Indian interests. Any company or companies that may be formed on this basis must have a majority of Indian capital and Indian Directors and an agreement should be definitely made for the training of India technical personnel from the highest to the lowest, so as to enable Indian personnel to direct the conduct of the industry within a reasonable period. The control of policy should always remain in Indian hands. Government should maintain a careful watch over its progress and its activities with a view to ensuring that the national interests involved are not in any jeopardised. I. The Organisation of the Feeder Industries. The feeder industries, such as (i) heavy chemical industry, (ii) the coaltar distillation industry and (iii) the aliphatic chemical industry, exist in India but in varying stages and degree of development. The dyestuff industry should manufacture its own five important heavy chemicals (Sulphuric acid, hydrochloric acid, nitric acid, caustic soda, chlorine). It might encourage the free growth of the other inorganic chemicals required (oleum, sulphur and phosphorous chloride and oxy-chlorides, aluminium chloride etc.), if they can be made available at economic prices. The dependence of the coaltar industry and dyestuff industry is mutual, and thus the establishment of coaltar distillation on the requisite scale should be the outcome of the joint efforts of the dyestauff industry and the by-product coke-oven industry. A central plant could be set up where all the crude fractions be collected from the smaller coaltar works, and the pooled products could be refined on a large scale to benzene, toluene, etc. of specified purity. The wastage and uneconomic use of tar products should be prevented by law. J. The Internal Organisation of the Dyestuff Industry. This may take the form of many units with a vertical or horizontal organisation or be a completely unified centralised industry. From the economic point of view, the case for one centralised factory, manufacturing the whole series of dyes through all the stages starting from the coaltar raw materials, is very strong. The Committee has made some recommendations in this matter, summary of which is given below: K. Summary of Recommendations. (1) In view of the vital importance of the dyestuff industry in the national economy, the industry should be established in India as early as possible. (2) The plan for an Indian dyestuff industry should comprise:— (a) the manufacture of the 51 dyes listed in appendix I within a period of about five years after a brief period of preparation;

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	(b) the manufacture of some of the intermediates during this 5-year period; (c) the production of all the intermediates required for the 51 dyes within 10 years; (d) the production of all the dyes in substantial demand in the country, together with all the necessary intermediates, within a period of 15-20 years. (3) The products of the Indian dyestuff industry should be marketed in their own specific names, so that in course of time Indian dyes will be recognised and valued throughout the world. (4) The wastage and uneconomic use of coal-tar and its products should be prevented by law. The specifications for road tar should be modified in order to ensure that the constituents valuable to the synthetic organic chemical industries are recovered as fully as possible. (5) The dyestuff industry should if possible manufacture the following five important heavy chemicals, which are required in large quantities: sulphuric acid, hydrochloric acid, nitric acid, caustic soda and chlorine. In view of the inadequate resources of sulphur, gypsum must be employed as raw material for the production of sulphuric acid. (6) Arrangements should be made with existing manufacturers of heavy chemicals for the supply of the other heavy chemicals required by the dyestuff industry; but in the case of chemicals which are unobtainable at reasonable prices and in the requisite quantities, the dyestuff industry should itself undertake their production. (7) A nitrogen fixation industry should be established as early as possible, under Government auspices if necessary. While the fixation of atmospheric nitrogen is necessary for the supply of nitrogenous fertilisers, the scale of production of synthetic ammonia should take into account the requirements of the dyestuff industry. (8) Apart from the requirements of the dyestuff industry in this regard, production of synthetic methanol and formalin therefrom on a scale adequate for the purposes of the chemical industry in general, and an Indian plastic industry in particular, should be undertaken in India, under Government auspices if necessary. (9) The manufacture of synthetic acid and its derivatives on an adequate scale should be organised as early as possible. (10) Immediate steps should be taken for the creation of a chemical engineering industry specialising in the fabrication of autoclaves, glass-lined and enamelled equipment and other plant required by the dyestuff and chemical industries. If such equipment cannot be manufactured in India in the immediate future facilities should be provided for its importation from the United Kingdom and the United States of America. (11) The location of the dyestuff industry should be decided by an expert committee after a survey of sites.

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	(12) The Indian dyestuff industry should come to an agreement for co-operation with a large and well established organisation in Europe or America, so that their technical assistance and expert advice would be available at every stage. Such co-operation should not be in any way at the expense of Indian interests and any company that may be formed should have a majority of Indian capital and Indian directors. As part of the agreement, arrangements should be made for the training of Indian technical personnel from the highest to the lowest, so that the industry may be entirely manned by Indian personnel within a reasonable period. (13) The manufacture of intermediate and dyes should be carried out in one centralised factory manufacturing the whole series of dyes through all the stages, starting from the coal-tar raw materials. (14) In providing for the organisation of an Indian dyestuff industry, every care should be taken that national interests are not sacrificed in favour of any external or group interests. State aid in the following forms is recommended: (a) assurance of protection against external competition; (b) financial participation or/and subsidies for the manufacture of intermediates required for the other chemical industries and which the dyestuff industry may not be able to produce economically; (c) modification of excise policy, which will encourage the growth of the dyestuff, pharmaceutical and fine chemical industries; (d) special freight rates for dyes and dye intermediates, so that haulage cost may not constitute a heavy burden on the industry; (e) modification of Indian patent laws, so that patents taken out in India by foreign firms may be utilised by the Indian industry by payment of reasonable royalties; (f) grants to be made to the National Chemical Laboratory and University Departments for training and research in the chemistry and technology of intermediates and dyes. (15) Government should take early steps to institute to accurate survey of the production and consumption of inorganic chemicals, coal-tar distillation products and aliphatic chemicals in the country. (16) The Department of Commercial Intelligence and Statistics should indicate in the published trade returns the import figures relating to each important individual dye.

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IV. 2. The Committee recommended the Dyestuffs Exploratory Committee Report for adoption and due consideration of their various recommendations. In this connection, the Committee also passed the following resolution: "The Committee recommends to the Board that steps be taken to obtain secrets of the manufacture of dyestuffs in the enemy countries".	IV. 2. The Board accepted the recommendation of its Committee. They further recommended that the D.S.I.R. should prepare a detailed report for the consideration of the Board at its next meeting on the action he has already taken on the various recommendations of the Dyestuffs Report and also indicating what action is to be taken by the Government and other organisations. In a general discussion which ensued on the desirability to obtain German dyestuff secrets, the Board recommended that the Government should take steps to obtain German dyestuff secrets. The President informed the Board that the Government of India are already endeavouring to obtain the services of German specialists and technicians.

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IV 3.	<i>Subject:—</i> Proceedings of the Meeting of the Fuel Research Committee. <i>Synopsis:—</i> A meeting of the Fuel Research Committee was held on the 29th October 1945, at Dhanbad. 1. Tentative Proposals for the establishment of Fuel Research Institute. The Chairman referred to the comprehensive memoranda prepared and circulated by the Secretary to the members of the Committee. The members of the Committee were generally in agreement with the memoranda. Dr. Dunn suggested that there was no necessity for the organisation of a permanent geological staff at the Fuel Research Institute since geologists could be delegated from time to time from the Geological Survey of India. But the other members of the Committee were of the opinion that an independent geological staff under the jurisdiction of the Director of the Fuel Research Institute was necessary; and that this staff would not necessarily be engaged in geological mapping and other work ordinarily carried out by a geologist but the chief duty would be in connection with fuel research. 2. Survey of Indian Coals. The Committee was of the opinion that a physical and chemical Survey of Indian Coals should be inaugurated without delay and that a nucleus of staff should be appointed to collect and collate all information available in connection with Indian Coals. The Committee further decided that Dr. Lahiri should be authorised to form the nucleus of the staff from any suitable candidates that might be available. The Chairman was further requested to put up proposals and recommendations to the Council for the necessary staff for this survey work. 3. Building. The Committee discussed at length the question of providing staff accommodation near the Fuel Research Institute, and decided that the estimates of the Institute should be revised and that provision should be made immediately for staff accommodation either in Dhanbad or at the site of the Fuel Research Institute for essential members of staff required in the near future. It was further decided that the Chairman should write a letter to Sir S.S. Bhatnagar and Sir A. R. Dalal explaining the very great necessity of housing accommodation for the staff. 4. Progress Reports The Chairman and Sir S.S. Bhatnagar explained to the Committee the reasons for keeping the reports on the progress of researches confidential. They stated that the procedure adopted was that all progress reports must first of all be submitted to the Council direct by the Chairman of the Committee and that they could not be released to the members of the Committee or to the public until considered and approved of by the Board of Scientific and Industrial Research when they would be printed and published and issued simultaneously to all parties.

IV. 3. 5. The Committee recommended that a Sub-Committee as proposed by the Fuel Research Committee be formed to investigate the possibilities of utilising lower grade non-Coking coal for gas production.

IV. 3. 5. The Board accepted the recommendation of its Committee.

IV. 3. 6. The Committee recommended that investigations should be carried out on the Brown Coal from Madras at the Fuel Research Station.

IV. 3. 6. The Board accepted the recommendation of its Committee.

IV. 3. 7. The Committee noted the observations of the Fuel Research Committee.

IV. 3. 7. The Board noted the observations of the Fuel Research Committee.

IV. 3. 8. The Committee recommended that the following two gentlemen be appointed as members of the Fuel Research Committee.

Dr. N.N. Chatterjee,
Professor of Geology,
Presidency College,
Calcutta.
Dr. M. Qureshi,
Hyderabad (Deccan).

IV. 3. 8. The Board accepted the recommendation of its Committee.

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	This prevented any individual, company or corporation from taking any undue advantage of the results of such research at the expense of any other. 5. Possibilities of utilising lower grade non-coking coal for gas production : It was decided that this should form the subject of investigation to be taken up immediately if the necessary staff and research workers were available. It was agreed that this research work should apply not only to lower-grade non-coking coal for gas production but also to all kinds of coal and coke breeze. The Committee further decided that a small Scientific Committee should be appointed to make enquiries as to the best type of apparatus to be used for this purpose and that contacts should be made with manufacturers for recommendations and specifications. It was further resolved that the Sub-Committee should consist of : Sir J. C. Ghosh (Chairman) Dr. A Lahiri Mr. B. Wilson Haigh Dr. Sen. 6. Brown Coal from Madras. The Committee considered the question of Brown Coal from Madras. Dr. Vadia and Dr. Dunn said that the discovery of this brown coal in Madras, which so far had to depend on Bengal and Bihar coalfields and Singhareni Coalfields for supplies would prove a very valuable asset. As research was essential the Committee decided that the Fuel Research Committee should follow this matter up. It was pointed out, however, that the Fuel Research Committee could do nothing to exploit the field but if samples were delivered research would be carried out. Dr. Dunn was requested to arrange to obtain samples of the coal early. 7. Punjab Coals. The Committee was informed that the Punjab Government had undertaken to carry out investigations on Punjab Coals, under their auspices. It was therefore agreed that there was no need for the Fuel Research Committee to carry out this work but that co-operation and interchange of information, should be maintained with the Punjab Government. 8. Appointment of a New Members. The Chairman informed the meeting that on his recommendations to Sir S.S. Bhatnagar Mr. Peeling had been appointed as a member on the Committee representing the Coal Consumers Association. Dr. Sen subsequently had put up alternative proposals and stated that the late Dr. H. K. Sen who was Chairman of the Committee had been an eminent scientist and an additional scientist should be appointed to the Committee and he suggested the name of Dr. Guha. The Chairman asked Sir Bhatnagar if the membership of the Committee could be increased or if the Board of Scientific and Industrial Research wished to impose a limit on the membership. Sir Bhatnagar was not in favour of increasing the membership of the Committee

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IV. 3. 1. The Committee were of opinion that a Geologist be appointed directly under the Council but in view of the difficulties pointed out by the DSIR it was recommended that the Geologist whose services are to be borrowed for the purpose from the Geological Survey of India should continue in that line in order that the Council may have the benefit of his expert knowledge. II. 3. 2. The Committee recommended that a nucleus staff be appointed immediately to collect and collate all available information in connection with Indian Coals and to chalk out a programme of work on the physical and chemical survey of Indian Coals under Dr. Lahiri's direction. The Committee further recommended that this work should be taken in hand at an early date by the Fuel Research Station. The appointment of the following staff for this work was recommended : 1. Chemist and 1 physicist in the scale Rs. 150-10-300-20-400. 2. Patrologist in the scale Rs. 250-25-600. IV. 3. 3. The Committee recommended that the matter be referred to the Governing Body of the Council. IV. 3. 4. The Committee passed the following resolution recommending a procedure for the review of the progress of researches : "The Chairman of each Research Committee will receive Reports on the progress of Researches coming under the purview of his Committee, from the investigators concerned every six months and forward them with his and his Committee's comments to D.S.I.R. The Research Committees will review the progress of the schemes coming under their purview, every six months and the opinion of the Chairman and of the Committee will be communicated to the D.S.I.R. along with the Progress Reports. Research schemes coming for renewal must be recommended by the Chairman of the Research Committee under which the scheme is in operation. In circulating the abstracts to the members of the Committee, the Chairman should ensure that all such secret results as may be contained in the reports are safely guarded and that undue advantage out of the results of one party's investigations are not derived by another".	IV. 3. 1. The Board accepted the recommendation of its Committee. IV. 3. 2. The Board accepted the recommendation of its Committee. As regards the salary of the proposed staff they recommended that the chemist and the physicist should be appointed on a salary of not less than Rs. 200 p.m. in the proposed scale of salary. IV. 3. 3. The Board recommended that the Labour Department should be approached for the provision of quarters for the staff of the Fuel Research Station. IV. 3. 4. The Board accepted the recommendation of its Committee with the modification that the full progress reports instead of abstracts should be circulated to the members of the Committee and the Chairmen should ensure that the secret results contained in the reports are kept confidential.

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	and considered it to be already large enough. If however the Committee considered that it was necessary to increase the membership then he would be prepared to consider recommendations. He requested the Chairman therefore to go into the matter again and suggest the names of 4 or 5 persons who would take a keen interest in the work of the Fuel Research Committee, but any such members proposed would have to be scientists. This was agreed to and the Chairman was instructed to prepare a list of names to be submitted to Sir S. S. Bhatnagar. 9. Dr. Dutta Roy. A reference had been made to the Chairman of the Fuel Research Committee by Delhi to consider the appointment of Dr. Dutta Roy as a research chemist in the Research Department at Jamshedpur. Since there were no vacancies in this Department, the Chairman suggested that he should be taken on for the Fuel Research Institute and in the first instance he could possibly be employed for the physical and chemical survey already discussed. Dr. Dunn was requested to give his opinion about the qualifications etc. of Dr. Dutta Roy and he stated that he was a very good research chemist. It was decided that his case should be considered when the appointments are made for the physical and chemical survey. 10. Coal Blending and Cooking Research Sub-Committee This Sub-Committee had so far been functioning directly under the Board of Scientific and Industrial Research and did not come within the jurisdiction of the Fuel Research Committee. Since it was essential to have all such Research Sub-Committees co-ordinated and centralised under the Fuel Research Committee and eventually under the Fuel Research Institute, the Director of Scientific and Industrial Research had arranged for the Coal Blending and Coking Research Sub-Committee now to come under the jurisdiction of the Fuel Research Committee. The progress reports of this Committee will also be submitted to the Chairman of the Fuel Research Committee in the same way as those of the other Committees and forwarded to the Director in Delhi. 11. Coal Washing. It was explained that this question of coal washing had now assumed such important dimensions that larger scale research was essential. So far only laboratory research had been carried out but it was evident from the work done on Indian coals both locally on a small scale and in England and in America on a large commercial scale that it now warranted the installation of a commercial scale washing plant without delay. It was the unanimous opinion of the Committee that funds should be provided for this purpose without delay and the Chairman was instructed to put up a note to the Council of Scientific and Industrial Research on the subject and request sanction for the necessary amount for this purpose. 12. Soft Coke Committee. Dewan Bahadur D.D. Thacker, Member, Soft Coke Cess Committee and Mr. Harrison, the Chairman, contacted Sir Shanti Swarup Bhatnagar on the 29th October 1945. Sir Shanti suggested that Mr. Harrison should attend the meeting of the Fuel Research Committee of

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IV. 3. 9. The Committee noted the observations made by the Fuel Research Committee. IV. 3. 10. The Committee noted the observations. IV. 3. 11. The Committee recommended that a big-scale pilot plant for coal-washing be put up and the Chairman of the Fuel Research Committee be requested to obtain details of the plants etc. and get into touch with the D.S.I.R. about the funds required for the purpose.	IV. 3. 9. The Board noted the observations of the Fuel Research Committee. IV. 3. 10. The Board noted the observations of the Fuel Research Committee. IV. 3. 11. The Board accepted the recommendation of its Committee.

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	which Dewan Bahadur is a member, to be held on the same day in Dhanbad and to explain to the members of that Committee the difficulties which the Soft Coke Cess Committee had in carrying out satisfactorily, research work in connection with the manufacturing of soft coke. The Chairman of the Committee, Mr. Farquhar, Sir Shanti and Members of the Fuel Research Committee agreed with Mr. Harrison that it was impracticable for the Soft Coke Cess Committee with the limited fund at their disposal to carry out any useful research on manufacture of Soft coke and recovery of bye-products from its manufacture and that any attempt to do so would only mean duplicating the work which the Fuel Research Committee intended to carry out, viz. (a) means to improve the quality of inferior coals from which soft coke is manufactured by picking and washing. This was, in fact, the only way of reducing the ash content of the coke and so of obtaining better quality coke. (b) To ascertain the best method of extracting the bye-products in the manufacturing of soft coke and the best type of plant to adopt for this purpose. It was also suggested that any surplus funds from the collection of cess on soft coke despatches should be handed over to the Fuel Research Committee. At the moment there was an ever increasing demand for this class of fuel irrespective of the quality of the coke now being supplied and provided wagons could be given for transporting the coke to the various consuming centres, immediate demands would be in the neighbourhood of one million tons per annum. At present despatches are restricted to 48,000 tons per month or 5,76,000 tons per annum. Meanwhile the Soft Coke Cess Committee should continue its propaganda work in connection with use and sale of soft coke at the various consuming centres as it did in the pre-war period and the Railways should be asked to make more wagons available for the transport (This matter has already been taken up by the Soft Coke Cess Committee). Sir Shanti Swarup promised to give his views on the subject to the Labour Department when he returned to Delhi. 13 Journals etc. Dr. Forrester raised this question and emphasised the importance of building up the requisite items of literature in connection with fuel research. It was explained that Dr. Lahiri had already taken the necessary action to procure all current journals etc. but the difficulties involved were very great. Sir Bhatnagar explained that the Council had already committed themselves to a great deal of expenditure for such literature and that there should be no difficulty in future. He further pointed out that all such literature had to be obtained through the proper channels which Government had arranged for this purpose. 14. Local Planning Committee. Minutes on the Local Planning Committee were put up by Mr. Kirby, the Chairman of the Local Planning Committee and approved of.

Recommendations of the Committee of the Board.

Recommendations of the Board

IV. 3. 12. The Committee understood from the D.S.I.R. that he had taken up the matter with the Labour Department.

IV. 3. 12. The Board noted that the D.S.I.R. had taken up the matter with the Labour Department.

Item No.	Particulars.
IV 4.	<i>Subject:—</i> Resolutions adopted by the Atmospheric Research Committee at its meeting held in the Meteorological Dept., New Delhi on November 20, at 2 p.m. (1945) <i>Synopsis:—</i> 1. That the Physical Laboratory of the India Meteorological Department, New Delhi, be recommended a lump sum grant of Rs. 2,000/- spread over two years and appointment of one Research Fellow at Rs. 250-350 p.m. for two years to enable Dr. K. R. Ramnathan to carry out the research programme on 'Radiation Equilibrium in the Atmosphere' drawn up by him. (vide appendix 1) 2. That the Physical Laboratory of the Government College, Lahore, be recommended a lump sum grant of Rs. 3,200/- to enable Dr. P.K. Kichlu to undertake the Research programme on 'Photo-chemistry of Ozone' submitted by him. 3. That the Physics Laboratory of the Foreman Christian College, Lahore, be recommended a lump sum grant of Rs. 2,500/- and an annual grant of Rs. 3,060/- for three years to enable Dr. P. S. Gill to carry out the research programme on "Correlation of Cosmic Ray Intensity with Atmospheric Variables" drawn up by him. 4. That the Physical Laboratory, Presidency College, Calcutta, be recommended a lump sum grant of Rs. 11,500 spread over three years as Rs. 4,900 in the first year, Rs. 3,000 in the second year and Rs. 3,600 in the third year to enable Dr. R. L. Sen Gupta to carry out his research scheme on the 'Investigation of the Mechanism of Production of Mesons and their properties with the help of Wilson Cloud Chamber' drawn up by him. 5. That the Physical Laboratory, India Meteorological Department, Poona, be recommended the appointment of one Research Student at Rs. 125 for three years to enable Dr. L.A. Ramdas to carry out his programme of research on Infra red radiation from the Atmosphere and Solar radiation drawn up by him. 6. That a sub-committee consisting of : - Sir C. V. Raman (Chairman) - Dr. K. R. Romanathan - Dr. R. N. Ghosh - Dr. L. S. Mathur be formed to work out the details of the scheme of "Exploration of upper air atmosphere by means of sound waves produced by large scale explosives" and to ascertain the nature and extent of co-operation required from universities and to work out the financial implications of the scheme. 7. That a complete ozone survey of India may be undertaken and for this purpose the Director-General of Observatories may kindly negotiate with the Meteorological Research

Recommendations of the Committee of the Board.	Recommendations of the Board.
	IV. 4. 1. The Board accepted the recommendation of its Committee. IV. 4. 2. The Board accepted the recommendation of its Committee. IV. 4. 3. The Board accepted the recommendation of its Committee. IV. 4. 4. The Board accepted the recommendation of its Committee. IV. 4. 5. The Board accepted the recommendation of its Committee. IV. 4. 6. The Board accepted the recommendation of its Committee.
IV. 4. The Committee recommended that the grants asked in paras 1 to 5 of the Atmospheric Research Committee's resolutions on page 66 be sanctioned. IV. 4. 6. The Committee recommended that a Sub-Committee to explore the upper atmosphere as suggested by the Atmospheric Research Committee, be formed.	

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Item No.	Particulars.
	Committee of U.K. and Prof. Dobson to help the Atmospheric Research Committee in getting 3 Dobson apparatus. 8. That Prof. M.N. Saha may kindly negotiate to get a duplicate Nielsen apparatus from Ohio University, U.S.A. for investigating infra-red radiation of the Atmosphere for researches on the same lines in the India Meteorological Department, Poona. 9. That Dr. K. R. Ramanathan be entrusted to draw up a detailed constitution of the Atmospheric Research Committee on the line of the Meteorological Research Committee set up in the United Kingdom. The Constitution drawn up by Dr. Ramanathan is enclosed in Appendix 7. 10. That the U.S. Military authorities at Bangalore be thanked for their generous co-operation in the Cosmic ray investigation of Prof. Bhabha by arranging a number of specially high aeroplane flights at Bangalore for this purpose. 11. That Prof. H.J. Bhabha, F.R.S., may be elected Chairman of the Atmospheric Research Committee in place of the present Chairman, Prof. M.N. Saha, who has resigned the chairmanship of the committee, but continues to be a member of the Committee.
IV 5.	<i>Subject:—</i> Proceedings of the Heavy Chemicals and Chemical Industries Committee Meeting. <i>Synopsis:—</i> A meeting of the Heavy Chemicals and Chemical Industries Committee was held in New Delhi on the 18th and 19th August 1945. 1. A general discussion on the systematic work of the Committee was initiated by the Chairman and the members offered concrete suggestions for a planned programme of research. The Committee adopted the following resolutions: 'In the opinion of the Committee industrialists should be advised to put up economic units for the production of various chemicals. For major basic industries in India, if the Unit is not too small, the cost of production does not compare unfavourably with that in foreign countries.' 'The Committee recommends that in order that the raw materials for the heavy chemical industries should be available in India, a department like the Bureau of Mines should be set up.' 2. The Committee reviewed the progress of research schemes sanctioned in previous years. The Chairman informed the Committee that investigations in the manufacture of carbon disulfide had been completed at the Indian Institute of Science, Bangalore and that a pilot plant was being put up. The cost of production of this chemical was estimated to be Rs. 6/8/-

Recommendations of the Committee of the Board.

Recommendations of the Board

IV. 4. 8, 9. The Committee noted the action proposed by the Atmospheric Research Committee.

IV. 4. 8-9. The Board noted the action proposed by the Atmospheric Research Committee.

V. 4. 10. The Committee endorsed the recommendation of the Atmospheric Research Committee.

IV. 4. 10. The Board endorsed the recommendation of the Atmospheric Research Committee.

IV. 4. 11. The Committee recommended that Prof. H.J. Bhabha, F.R.S. be appointed Chairman of the Atmospheric Research Committee in place of Prof. M. N. Saha, F.R.S.

IV. 4. 11. The Board accepted the recommendation of its Committee.

Item No.	Particulars.
	per lb. but it was expected that it would be reduced to Rs. 3/8/- per lb. The scheme on the extraction of sulphur compounds from Assam coal, which was in operation in the laboratories of the Director, Scientific and Industrial Research has been transferred to the Indian Institute of Science, Bangalore. The investigations on the manufacture of titanium di oxide from Indian bauxite has been completed and a non-technical note has been prepared.
3.	Manufacture of Phenol. The Committee considered the following three research schemes received on the subject.
	A.— Phenol from chlorobenzene , by Dr. G. P. Kane: The Committee recommended that Dr. Kane be requested to investigate the effects of various catalysts with a view to lowering the temperature of the reaction and to determining the equilibrium constant of the reaction; and also recommended that a grant of Rs. 2,000-(Rs. 125 p. m. for a scholar and Rs. 500 for contingencies) be made to Dr. Kane.
	B.— Phenol by the benzene sulfonic acid process employing Ottmer's technique, by Dr. P. C. Guha:—The Committee decided that the Chairman should get into touch with Dr. Guha and find out whether Dr. Guha would investigate the azeotropic separation of phenol from the other bye-products using solvents other than Kerosene. The Committee recommended a grant of Rs. 6,500 per annum to Dr. Guha under the following heads:—
	Equipment and contingencies Rs. 4,000
	Staff (Mechanics, Laboratory helpers etc. Rs. 2,500
	Total Rs. 6,500
	C.— Phenol by the Benzene Sulfonation method , by the Industrial and Testing Laboratory, Bangalore: The Laboratories had asked for the following grant for conducting investigations on a pilot plant scale:
	Power, Steam, Electricity, Water etc. Rs. 500
	Other Equipment and Unforeseen expenses Rs. 8,000
	Staff Rs. 3,380
	Total Rs. 11,880
	The Committee understood that no research was contemplated under the scheme and that the grant was required for pilot-plant experiments. The Committee recommended that a grant be given to the Industrial Testing Laboratory for fabricating a pilot-plant capable of producing half-a-ton of phenol per day; and requested the Director of Scientific and Industrial Research to contact the Industrial Testing Laboratory regarding the setting up of this plant.
4.	Manufacture of Sulphur Compounds from Coal by Sir J.C. Ghosh: Assam Coal which is available in large quantities (1000 million tons) when heated to 900°C yields coke which is rich in sulphur (7 per cent). This sulphur does not disintegrate at this temperature and hence the coke is useless for metallurgical operations, which require that the sulphur content of

Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 5. 3-A. The Committee recommended that Dr. Kane's scheme on Phenol from chlorobenzene be sanctioned with a grant of Rs. 2,000 as recommended by the Heavy Chemical Research Committee.	IV. 5. 3-A. The Board accepted the recommendations of its Committee.
IV. 5. 3-B. The Committee recommended that Dr. P.C. Guha's scheme on Phenol from sulfonic acid process be sanctioned with a grant of Rs. 3,500 made up of Rs. 1,000 for contingencies and Rs. 2,500 for staff.	IV. 5. 3-B. The Board accepted the recommendations of its Committee.
IV. 5. 3-C. The Committee recommended that D.S.I.R. be requested to examine problems of production of Phenol from Benzene Sulfonation method on a pilot plant scale at Bangalore.	IV. 5. 3-C. The Board accepted the recommendations of its Committee.

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	the coke should be less than 1 per cent. But Sir J.C. Ghosh expects that if the temperature is raised to about 1800°C, most of the sulphur would be available in some pure form or the other and that the percentage of sulphur in the coke can be reduced to less than 1 per cent. The Committee discussed the scheme and felt that (i) the physical condition and properties of the coke might change when it is chilled from 1800°C to 900°C and (ii) it might be more economical to collect the volatile matter in the coal first, and then the carbon disulfide at a higher temperature. The Committee felt that this was an important problem and recommended a grant of Rs. 8,000 itemised as under for carrying out the investigations : <table> <tr> <td>Staff</td><td>Rs. 6,500</td></tr> <tr> <td>Contingencies</td><td>Rs. 1,500</td></tr> <tr> <td>Total ...</td><td>Rs. 8,000</td></tr> </table> 5. Efficient Method of burning pyrites for the manufacture of sulphuric acid : Pyrites in the form of lumps are easily burnt, but their burning in the powder form (60 mesh) would be a problem as they would choke the pipes. Mr. L. Gupta stated that pyrites could be burnt in both the forms and that he could fabricate a plant for the purpose. The Committee agreed to recommend a special grant of Rs. 14,500 to Mr. Gupta for the design and installation of a suitable plant, from locally available materials and from certain apparatus imported from abroad. The details of the grant are as follows : <table> <tr> <td colspan="2">1. Parts to be imported from abroad:</td></tr> <tr> <td>(a) Regulators metal Heavy Type Suction Fan with Motor</td><td>Rs. 1,500</td></tr> <tr> <td>(b) One complete driving unit for Hereshoff or Wedge Type of burners.</td><td>Rs. 5,000</td></tr> <tr> <td>2. Materials to be purchased and fabricated in India.</td><td>Rs. 8,000</td></tr> <tr> <td>Total ...</td><td>Rs. 14,500</td></tr> </table> 6. Investigation on water-Hyacinth for the recovery of Potassium chloride. This scheme was dropped as no research was involved. The Chairman read out a letter from the Director, Pioneer, Magnesia Works, Bombay, stating that if the Governing Body could give certain facilities for the collection of bitterns, considerably large quantities of potassium salts could be manufactured at Khara-Ghoda. The Committee decided to request the Director of Scientific and Industrial Research to recommend to the Government to give the necessary facilities to the Pioneer Magnesia Works. 7. Utilisation of Oxygen obtained as a by-product in Electrolytic processes. The Committee decided that the new uses of oxygen obtained as a by-product in the electrolysis of water for hydrogen should be investigated by Sir J. C. Ghosh at Belagula, Mysore State; and this work should be secret in the first instance, Sir S.S. Bhatnagar and Sir J. C. Ghosh stated	Staff	Rs. 6,500	Contingencies	Rs. 1,500	Total ...	Rs. 8,000	1. Parts to be imported from abroad:		(a) Regulators metal Heavy Type Suction Fan with Motor	Rs. 1,500	(b) One complete driving unit for Hereshoff or Wedge Type of burners.	Rs. 5,000	2. Materials to be purchased and fabricated in India.	Rs. 8,000	Total ...	Rs. 14,500
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2. Materials to be purchased and fabricated in India.	Rs. 8,000																
Total ...	Rs. 14,500																

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 5. 4. The committee recommended that Sir J.C. Ghosh's scheme for the manufacture of Sulphur Compounds from coal be sanctioned with a grant of Rs. 8,000 as recommended by the Heavy Chemicals Committee. IV. 5. 5. The Committee recommended that D.S.I.R. be requested to investigate the matter before any grant is sanctioned for the scheme. IV. 5. 6. The Committee recommended that D.S.I.R. be requested to take the necessary action in the matter.	IV. 5. 4. The Board accepted the recommendations of its Committee. IV. 5. 5. The Board accepted the recommendations of its Committee. IV. 5. 6. The Board accepted the recommendations of its Committee.

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	that important work done elsewhere had completely solved the problem of utilisation of the enormous quantities of available oxygen.								
	8. Manufacture of Perchloron : The strength of bleaching powder made in India is low owing to the impurities contained in Indian limestone. It was therefore suggested to the Committee that efforts should be made to devise ways of either producing the impurities or finding out new substitutes for limestone with a view to increasing the percentage of available chlorine to 35-37% and that research should be conducted in the manufacture of perchloron, which has a high percentage of chlorine. The Committee referred the matter to the Director of Scientific and Industrial Research, who agreed to conduct the investigations in his laboratories.								
	9. Manufacture of sodium sulfide from Sodium sulfate using water-gas, as a reducing agent. In a discussion on the subject it was pointed out that at about 700°C, Carbon monoxide and hydrogen go over to carbon and water; this water causes the reconversion of sodium sulfide to sodium sulfate. This method of reduction was not feasible. The Director of Scientific and Industrial Research, however, undertook to carry out an experiment in his laboratories and to communicate the results to the Committee.								
	10. Manufacture of methanol from carbon monoxide and hydrogen: The Committee recommended that the grant for the scheme on the manufacture of methanol be continued for another year. It was pointed out to the Committee that the possibility of obtaining formaldehyde directly from carbon monoxide and hydrogen instead of first obtaining methanol and then converting it into formaldehyde was worth investigating. After a thorough discussion of this proposition, the Committee recommended that a grant of Rs. 2,000 made up as below, be made to Sir J. C. Ghosh to carry out the investigations :								
	<table> <tr> <td>1 Research Assistant</td><td>Rs. 1,500</td></tr> <tr> <td>Laboratory Attendant</td><td>Rs. 480</td></tr> <tr> <td>Extra</td><td>Rs. 20</td></tr> <tr> <td></td><td> Rs. 2,000 </td></tr> </table>	1 Research Assistant	Rs. 1,500	Laboratory Attendant	Rs. 480	Extra	Rs. 20		Rs. 2,000
1 Research Assistant	Rs. 1,500								
Laboratory Attendant	Rs. 480								
Extra	Rs. 20								
	Rs. 2,000								
	11. Utilisation of Sewage gases for the manufacture of formaldehyde by Dr. G.P. Kane: The Committee decided to drop the scheme as no research was necessary.								
	12. Manufacture of phosphorous pent oxide from rock phosphates : The Committee requested Sir J. C. Ghosh to submit a scheme on the manufacture of phosphorous pent oxide directly in rock phosphates and the conversion of phosphorous pent oxide into a suitable phosphate or phosphoric acid.								

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 5. 8. The Committee recommended that D.S.I.R. be requested to prepare a note on the subject.	IV. 5. 8. The Board recommended that the Director of Scientific and Industrial Research be requested to investigate the problems in his Laboratories.
IV. 5. 9. The Committee noted the observations made by the Heavy Chemicals Committee.	IV. 5. 9. The Board noted the observations of the Heavy Chemicals Committee.
IV. 5. 10. The Committee recommended that Sir J. C. Ghosh's scheme on the manufacture of methanol from carbon monoxide and hydrogen be sanctioned with a grant of Rs. 2,000 as recommended by the Heavy Chemicals Research Committee.	IV. 5. 10. The Board accepted the recommendation of its Committee.
IV. 5. 11. The Committee recommended that the scheme be dropped as proposed by the Heavy Chemicals Committee.	IV. 5. 11. The Board accepted the recommendations of its Committee.
IV. 5. 12. The Committee recommended that Sir J.C. Ghosh be requested to submit a scheme on the manufacture of phosphorous pentoxide from rock phosphates directly.	IV. 5. 12. The Board accepted the recommendations of its Committee.

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Item No.	Particulars.
	13. Manufacture of Photographic materials. The Committee discussed several schemes but felt that there was no research involved in any of them. 14. Manufacture of Industrial catalysts. The Committee resolved that a survey of industrial catalysts should be made and the possibilities of preparing them from Indian raw materials should be investigated. 15. Manufacture of Benzoic acid from phthalic anhydride by Dr R.C. Shah. Dr. Shah had submitted a scheme of research on the manufacture of Benzoic acid by the catalytic oxidation of Phthalic anhydride. The Committee decided that more details on the scheme should be obtained from Dr. Shah. 16. Manufacture of Sulphuric acid from gypsum : It was suggested to the Committee that the extraction of sulphur from gypsum in connection with cement manufacture should be investigated and that pilot plant experiments on the Thylok process should be conducted. And also, that sulphur dioxide which is obtained as a by-product in the process should be converted partly into sulphuric acid and partly into sulphur. The Committee passed the following resolution : ‘The Committee recommends that investigations on the conversion of gypsum into cement and the by-product sulphur dioxide partly in sulphuric acid and sulphur for which the process recommended may be considered and the economies of the problem be worked out.’ Mr. S.G. Sastry gave an account of the various solvents used for the absorption of sulphur dioxide and stated that if proper equipment were made available he would take up the scheme. The Committee recommended that a block grant of Rs. 10,000 be made to Mr. Sastry for this scheme. 17. Manufacture of Freon. The Committee was of the opinion that the manufacture of Freon was a war-time emergency and was not urgent now. It was felt that the scheme be referred to some university. 18. Conversion of Power alcohol into Formaldehyde. The Committee considered a note prepared by the late Dr. H. K. Sen and passed the following resolution : ‘The Committee is of the opinion that it is desirable that a thorough investigation of the possibility of the conversion of power alcohol to formaldehyde should be undertaken.’ The resolution was forwarded to the Plastics Committee for its consideration. 19. Sodium Chloride for industrial uses : It was suggested to the Committee that the question of devising a method of solar evaporation of brine which would yield pure salt was important; and that salt without undesirable impurities and of a purity of about 99.2% was required for the electrolytic manufacture of caustic soda. The Committee recommended that a block grant of Rs. 2,000 (for one Research Assistant on Rs. 150/- per month and contingencies) be made to Dr. Mata Prasad to carry out investigations on the manufacture of Sodium Chloride by the

Recommendations of the Committee of the Board.

Recommendations of the Board

IV. 5. 14. The Committee recommended that the proposal be referred to Sir J. C. Ghosh for suitable action.

IV. 5. 14. The Board accepted the recommendations of its Committee.

IV. 5. 16. The Committee recommended that Mr. S.G. Sastry's scheme on the manufacture of Sulphuric acid from gypsum be not sanctioned in view of the fact that no research is necessary. The Committee further recommended that the Governing Body should approach the Government of India to arrange to put up a pilot plant for the manufacture of sulphuric acid from gypsum.

IV. 5. 16. The Board accepted the recommendations of its Committee. The Board further recommended that the Government of India should try to get on a priority basis, a full scale plant for the manufacture of Sulphuric Acid from Gypsum from abroad at Government expenses.

IV. 5. 17. The Committee recommended that the manufacture of Freon be referred to some University which could undertake this work.

IV. 5. 17. The Board accepted the recommendations of its Committee.

IV. 5. 19. The Committee recommended that a grant of Rs. 2,000 be sanctioned to Dr. Mata Prasad as recommended by the Heavy Chemicals Committee.

IV. 5. 19. The Board accepted the recommendations of its Committee.

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solar evaporation brine. The Director of Scientific and Industrial Research consented to request the Excise Department to give Dr. Mata Prasad the necessary facilities.

20. Calcium carbonate It was pointed out to the Committee that the Calcium carbonate content of sea shells was almost 100%, and that experiments should be conducted on the burnability of the shells with a view to obtaining lime of 98-100% purity. The Committee agreed to the suggestion that the matter be referred to the Director of Scientific and Industrial Research.

21. Investigation of Reh Deposits : The advisability of investigating utilisation of the vast reh deposits of U. P. and other provinces for the manufacture of sodium carbonate was explained to the Committee. The Committee considered the suggestion important and worth investigating as also the uses of sodium sulfate, which is obtained during fractional separation.

22. Titania from Ilmenite. It was pointed out that the ilmenite resources of India should be utilised for the manufacture of titanium dioxide and that the large deposits of ilmenite occurring on the Orissa coast were being exported by Messrs Bird & Co. The Committee recommended that the Geological Survey of India be requested to obtain information on the latter.

It was also pointed out that research on the manufacture of titanium dioxide from Indian Bauxite had been sent to the Utilisation Branch of the Council. The Committee recommended that the Director of Scientific and Industrial Research should undertake in his laboratory investigations on the improvement of the spreading quality and of the use of titanium dioxide as a pigment. Sir J. C. Ghosh promised to send samples of titanium dioxide for this work.

23. Monazite deposits . It was pointed out to the Committee that the Geological Survey of India should investigate the common origin of the radio active substances like monazite and thorium, which are found in Travancore. The Committee resolved that 'the Government of India should be requested to stop export of monazite'.

24. Manufacture of Calcium Carbide. Sir S. S. Bhatnagar stated that Mr. E. F. G. Gilmore had already made exhaustive investigations regarding the starting of calcium carbide industry in India. The Birlas who had spent much money on the investigations were prepared to start this industry but the plant required could not be obtained due to war conditions. Dr. P. K. Ghosh suggested that research be undertaken to utilise the calcium carbonate obtained as a by-product in the manufacture of ammonium sulphate from gypsum. So that the by-product limestone could be utilised for calcium carbide manufacture in the neighbourhood of the coal-fields. It was also suggested that investigations should be undertaken with a view to finding out limestone of better quality or reducing impurities in limestones or finding substitutes for limestones. Sir S. S. Bhatnagar said that he would call for a final report from Mr. Gilmore and place it at the next meeting of the Committee so that the correct situation about this method may be known to the Committee.

25. Fertilisers

It was held that bones could not serve as economic raw materials for the manufacture of superphosphates. Trichinopoly rock phosphates were considered suitable. Regarding the

Recommendations of the Committee of the Board.

Recommendations of the Board

IV. 5. 20. The Board recommended that the Director of Scientific and Industrial Research should investigate the problems in his Laboratories.

IV. 5. 21. The Board accepted the recommendations of its Committee.

IV. 5. 22. The Board noted that the work on the subject was being done in the Laboratories of the Council of Scientific and Industrial Research.

IV. 5. 23. The Board accepted the recommendations of its Committee.

IV. 5. 24. The Board accepted the recommendations of its Committee.

IV. 5. 21. The Committee recommended that investigations on the utilisation of Reh deposits be referred to the National Chemical Laboratory.

IV. 5. 22. The Committee noted that work on the subject was already being done in the laboratories of the Council.

IV. 5. 23. The Committee recommended that the Government of India be requested to stop export of Monazite.

IV. 5. 24. The Committee recommended that the Government of India be requested to arrange for obtaining and setting up in India one of the Calcium Carbide plants from the enemy countries (Germany or Japan) which may be either made available to the industrialist or run by Government themselves.

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	deposits of apatite magnesite rocks in Singhbhum, Dr. P.K. Ghosh pointed out that the Geology of the belt was well known and that about 3¼ million tons of the ore are available within a depth of about 100 ft. It was pointed out to the Committee that mixtures of bone-meal and ammonium sulfate could be used in preference to superphosphate as fertilisers. Sir J. C. Ghosh pointed out that in view of the fact that bone-meal could be easily converted into a form which the phosphates could be easily assimilated by plants and that sulfuric acid is a very costly material for this country, the manufacture of bone superphosphate should be specially considered. It was also suggested that bone superphosphate has special features and its manufacture should, therefore, in no account be discouraged. By treatment with sulfuric acid the phosphate in the bone is converted into monocalcium phosphate, which is most easily assimilated by plants. Sir J.C. Ghosh circulated a pamphlet on the use of urea as a fertiliser in the U.S.A. to the members and stated that the cost of production of urea in the U.S.A. was only 45 dollars/tons. After discussion, the Committee passed the following resolution : 'In view of the difficulties relating to the manufacture of ammonium sulfate as a fertiliser, because of the location of coal and gypsum deposits at a distance from each other in India, the use and manufacture of urea is suggested.' 26. The Committee passed the following resolution : 'The Committee is of the opinion that a Chemical Engineer should be co-opted by the Committee for a period of six months in the first instance.'

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Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 5. 26. The Committee recommended that Dr. M.D. Parekh, Chemical Engineer of the Delhi Cloth and General Mills, be co-opted a member of the Heavy Chemicals Committee.	IV. 5. 26. The Board accepted the recommendations of its Committee.

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Item No.	Particulars.												
	NOTE ON PHOTOGRAPHIC CHEMICALS, HIGH GRADE LIMESTONE AND PYRITES. The Chairman of the Heavy Chemicals and Chemical Industries Research Committee has forwarded the following three Notes to the Board of Scientific and Industrial Research: 1. Photographic Chemicals—by Mr. L. Gupta 2. High Grade Limestone in India—by Dr. A. K. Dey. 3. Pyrites in India—by Dr. E.L.G. Clegg. A summary of the above Notes is given below: 1. Photographic Chemicals: The most important photographic chemicals are Sodium thiosulfate, Sodium Sulfate, Sodium bisulfite, Sodium meta bisulfite and hydroquinone. There are others, however, such as Silver nitrate, Refined Alum, Iron Alum, Gold and Platinum Chloride, which are of minor importance and are produced in the country to some extent. Hydroquinone production was tried on a laboratory scale but no serious attempt has been made to produce it commercially. Sodium thiosulfate and Sodium Sulfite are produced in the country in sufficient quantities to meet the demand. As regards Sodium bisulfite and meta bisulfite attempts have been made but production has not reached the stage of self-sufficiency. The production capacity of Indian plants for Sodium thiosulfate is about 600 tons and that for the sulfite 200 tons. The prewar consumption figures were as under: <table><tr><td>Sodium thiosulfate</td><td>500 tons.</td></tr><tr><td>Sodium sulfite</td><td>200 tons</td></tr><tr><td>Sodium Bisulfite and metabisulfite</td><td>25 tons</td></tr></table> As regards hydroquinone there is no separate import figure and as such consumption of this chemical cannot be estimated. The above-mentioned salts are of importance not only in photography but also in numerous other industries. A safe estimate of the consumption of the chemicals for the next 5 years will be as under: <table><tr><td>Sodium thiosulfate</td><td>800-1000 tons year.</td></tr><tr><td>Sodium sulfite</td><td>400-500 tons per year.</td></tr><tr><td>Sodium Bisulfite and metabisulfite</td><td>About 150 tons per year.</td></tr></table>	Sodium thiosulfate	500 tons.	Sodium sulfite	200 tons	Sodium Bisulfite and metabisulfite	25 tons	Sodium thiosulfate	800-1000 tons year.	Sodium sulfite	400-500 tons per year.	Sodium Bisulfite and metabisulfite	About 150 tons per year.
Sodium thiosulfate	500 tons.												
Sodium sulfite	200 tons												
Sodium Bisulfite and metabisulfite	25 tons												
Sodium thiosulfate	800-1000 tons year.												
Sodium sulfite	400-500 tons per year.												
Sodium Bisulfite and metabisulfite	About 150 tons per year.												

Recommendations of the Committee of the Board.

The Committee noted the information contained in pages 82 to 98 on the following subjects:—

1. Photographic Chemicals.
2. High Grade Limestone in India.
3. Pyrites in India.

Recommendations of the Board.

The Board noted the information contained in the notes on- (1) Photographic Chemicals; (2) High Grade Limestone in India; (3) Pyrites in India.

The Committee noted the information contained in pages 82 to 98 on the following subjects:

1. Photographic Chemicals.
2. High Grade Limestone in India.
3. Pyrites in India.

Item No.	Particulars.																												
	<i>Raw Materials :</i> The raw materials required in the manufacture are Soda Ash and Sulphur. Soda Ash is being produced in the country in sufficient quantities to meet the normal demand. Sulfur is the only raw material we have to import. Considering from the practical point of view of manufacture the amount of Soda Ash and sulfur required for the production of all the salts are not considerable and in all about 1000-1200 tons of Soda Ash and 500-600 tons of sulphur are required. <i>Manufacture :</i> From the consideration of plant equipment there are many parts common in the manufacture of the three chemicals. It is, therefore, expected that the manufacturer who specialises in one ought to produce the other two. The equipment consists of the following:— Generator, Absorbers; sulfur Burners; Coke Filters; Centrifuge; Dryer; Screens; etc. In the case of thiosulfate a crystallising unit is necessary in addition to the above. An account of the several methods employed in the manufacture of the three salts is given. For details, reference may be made to the Report. <i>Conclusion :</i> It appears that no special research is called for in the production of salts. Any commercial firm interested in the manufacture can standardise the methods, provided the right type of equipment is used under proper technical guidance. Failure is generally due to the wrong choice of plants and machinery and lack of knowledge of process details. It is indicated that the manufacture of these chemicals may require protection by the Government in some form or other, during initial stages. Encouragement may be given to any research worker who intends developing a proper process for the manufacture of hydroquinone in India. But the position of the raw materials required is not very encouraging. II High Grade Limestone in India by Dr. A. K. Dey, Geologist, Geological Survey of India. NORTH WESTERN FRONTIER PROVINCE Limestones of good quality occur in the Bannu, Dera Ismail Khan districts and North & South Waziristan. They are generally available in inexhaustible quantities and locally they contain materials of very high quality as shown by the following analysis:— <table><tr><td></td><td>(a)</td><td>(b)</td><td>(c)</td></tr><tr><td>SiO₂</td><td>0. 26</td><td>1. 70</td><td>1. 20</td></tr><tr><td>Fe₂O₃ & Al₂O₃</td><td>0. 75</td><td>0. 40</td><td>0. 52</td></tr><tr><td>CaO</td><td>55. 50</td><td>54. 60</td><td>55. 02</td></tr><tr><td>MgO</td><td>0. 09</td><td>trace</td><td>0. 06</td></tr><tr><td>Loss on ignition</td><td>43. 46</td><td>42. 54</td><td>43. 27</td></tr><tr><td>TOTAL</td><td>100. 06</td><td>99. 24</td><td>100. 07</td></tr></table>		(a)	(b)	(c)	SiO ₂	0. 26	1. 70	1. 20	Fe ₂ O ₃ & Al ₂ O ₃	0. 75	0. 40	0. 52	CaO	55. 50	54. 60	55. 02	MgO	0. 09	trace	0. 06	Loss on ignition	43. 46	42. 54	43. 27	TOTAL	100. 06	99. 24	100. 07
	(a)	(b)	(c)																										
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Recommendations of the Committee of the Board.	Recommendations of the Board.

IV. Proceedings of Research Committees.

Item No.	Particulars.			
	<i>Kohat District.</i> To the west of the Potwar, in the Kohat district, Numulitic limestones of excellent quality are extensively developed, whilst to the north of the district in the tribal territory, Jurassic limestones cover wide areas. Specimens of typical Upper Numulitic limestone of the Kohat district yielded on analysis: SiO_2 — 1.02%, Fe_2O_3 Al_2O_3 — 1.24%, CaO — 55.74%, MgO — 0.28% less on ignition 42.10% Deposits of marble which occur in the Khyber Agency in Mardan district and in the Ghundal Tarako ridge on the border of Swat and the Mardan district contain materials of great purity as will be seen from the following analysis :			
	(a)	(b)	(c)	(d)
	%	%	%	%
SiO_2	0.06	0.04	0.52	0.02
Fe_2O_3 Al_2O_3	0.18	0.05	0.40	0.10
CaO	54.40	55.86	54.57	54.60
MgO	0.88	0.33	0.58	1.61
Loss on ignition	43.69	42.58	43.31	43.86
H_2O	...	...	0.23	
S	...	...	0.02	
	PUNJAB			
	<i>Salt Range Area :</i> (1) Eocene limestone known as the "Sakeswar" limestones occur in vast quantities along the top of the scrap to the north of Baghanwala ($32^{\circ}43'$: $73^{\circ}14'$) and continue westwards as far as the Jaba Nala north east of Daud Khel ($32^{\circ}53'$: $71^{\circ}34'$)—a distance of 110 miles, the maximum thickness being about 700 feet. Beneath the coal-shale stage, there is a thick limestone bed, called the Khairabad limestone. It is very thin or absent in the eastern part of the salt Range, but near Nurpur its thickness is about 75 feet, west of Sakesar ($32^{\circ}32'$: $76^{\circ}56'$) its thickness rises, to 160 feet at Nammal ($32^{\circ}40'$: $71^{\circ}49'$) and over 1,000 feet east to Daud Khel ($32^{\circ}53'$: $71^{\circ}34'$). Analysis of the typical limestones containing highest quantity of CaO is quoted below.			
	(a)	(c)	(c)	
	%	%	%	
SiO_2	1.10	1.84	0.30	
Fe_2O_3 Al_2O_3	0.80	0.76	0.36	
CaO	54.42	54.40	55.25	
MgO	0.38	0.15	0.42	
Loss on ignition	43.13	43.38	42.88	
TOTAL	99.83	99.53	99.21	

Recommendations of the Committee of the Board.

Recommendations of the Board.

Item No.

Particulars.

(ii) The "Cliff" Limestones" of the Middle products state which occur within the scrap slopes of the salt Range from Katha ($32^{\circ}31' : 72^{\circ}25'$) westwards to near Daud Khel rapidly thickens to at least 300 feet and cover very large areas between Nali ($32^{\circ}20' : 72^{\circ}20'$) and Sakesar and further west around Chhidru ($32^{\circ}33' : 71^{\circ}46'$). These limestones are found in the principal gorges of the Tredian hills and at the base of the scrap just south of Khairabad ($32^{\circ}53' : 71^{\circ}36'$), only $1\frac{1}{2}$ miles east of Daud Khel Railway Station. In the Nammal gorge and further north they are 450-500 feet thick. On analysis, typical specimens yield the following results:—

		(a)	(b)	(c)	(d)
		%	%	%	%
SiO ₂		1.98	1.20	1.40	0.22
Fe ₂ O ₃ and Al ₂ O ₃		0.78	0.70	0.40	0.66
CaO		50.88	54.42	54.68	55.00
MgO		0.22	0.18	0.04	0.76
Loss on ignition		42.70	43.02	43.20	43.80
TOTAL		99.56	99.52	99.72	100.44

ASSAM

The Nummulitic limestones of Eocene age occur as discontinuous bands along the foot of the Garo, Khasi, Jaintia and Mikir hills. In the Khasi hills, the best known localities for these limestones are Therriaghat ($25^{\circ}11' : 91^{\circ}45'$) and Cherrapunji ($25^{\circ}17' : 91^{\circ}44'$).

In the neighbourhood of Therriaghat, the limestone bands extend westward from north of Lagaon ($25^{\circ}10' : 91^{\circ}50'$) through Therriaghat to the "Shella river". The average width of the outcrops between Therriaghat and the Shella river is about two miles and between Therriaghat and Lamgaon about $\frac{4}{5}$ th of a mile. Outcrops of the limestones have also been reported from Mawsynram and Langrim areas west of the Shella river. At Therriaghat, the limestones are interbedded with sandstones and attain a total thickness of over 1,000 feet, the individual beds being 20 to 400 feet in thickness. The uppermost band contains material of great purity. Analysis of the Nummulitic limestones from different localities in the Khasi Hills are given below :

(1) Shell limestone, mouth of Bogapani river, Khasi hills.

CaCO₃ 98.61%

MgCO₃ 0.55 ..

(2) Sylhet limestone:

SiO₂ 0.58 ..

Fe₂O₃ & Al₂O₃ 1.72 ..

CaCO₃ 95.40 ..

MgCO₃ 1.81 ..

Other constituents 0.49 ..

Recommendations of the Committee of the Board.	Recommendations of the Board

Item No.	Particulars.			
	At Bistara (23°58' : 80°28') Messrs. N. M. Dubas' Quarry has limestone assaying :			
	Insoluble Residue...	...	...	1.02%
	Fe ₂ O ₃ & Al ₂ O ₃ ...	...	...	0.22 „
	CaO ...	...	...	54.10 „
	CaCO ₃ (calculated)	..	...	96.61 „
	MgO ...	...	..	1.16 „
	MgCO ₃ (calculated)	...	..	2.40 „
	The total area of the lease-hold is 36.9 acres but the reserves have not been estimated.			
	At Ametha (24°00' : 80°35½'), Ramchandra Badriprasad Gour's limestone concession is estimated to yield 1,200,000 tons of good quality material. The limestones exposed in the quarry have a total thickness of about 20 feet of which the upper 12 feet is interlaminated with earthy matter. An average sample cleaned of earthy matter gave on analysis :			
	Insoluble residue	.	.	1.02%
	Fe ₂ O ₃ and Al ₂ O ₃	.	.	0.20 „
	CaO	.	.	54.10 „
	CaCO ₃ (calculated) ,	.	.	96.60 „
	MgO ,	.	.	1.20 „
	MgCO ₃ (calculated)	.	.	2.50 „
	The lower 8 feet of limestone is solid and yielded.			
	Insoluble residue			1.23%
	Fe ₂ O ₃ and Al ₂ O ₃			0.31 „
	CaO			54.24 „
	CaCO ₃ (calculated)			96.88 „
	MgO			0.72 „
	MgCO ₃ (calculated)			1.50 „
	The area of the lease is 33.07 acres.			
	MAIHAR STATE			
	In Maihar state, Messrs. Maihar Stone Lime Co.'s quarries at Amelia (Emlia, 24°15' : 80°50') and Girgita (24°15' ; 80°51') contain some limestone of the following composition:			
	Insoluble residue	1.19	—	1.58%
	Fe ₂ O ₃ and Al ₂ O ₃	0.40	—	0.46 „
	CaO	53.13	—	53. 4 „
	CaCO ₃ (calculated)	94.87	—	95. 4 „
	MgO	1.39	—	1.44 „
	MgCO ³	2.91	—	3.00 „

Recommendations of the Committee of the Board.

Recommendations of the Board.

Item No.

Particulars.

Messrs. Dewan Lime Co., 2, Keeling Road, New Delhi have limestone quarries in Amelha, scattered over length of half a mile along the banks of the Ton river, 3 miles from Maihar Railway Station. Average annual production is 72,000 tons.

Samples of limestone from quarries Nos. 2 and 4 give:

Insoluble residue	1.24%	—	1.44%
Fe ₂ O ₃ and Al ₂ O ₃	0.36 „	—	0.38 „
CaO	53.65 „	—	54.05 „
CaCO ₃ (calculated)	95.81 „	—	96.52 „
MgO	0.9 „	—	1.14 „
MgCO ₃ (calculated)	1.9 „	—	2.39 „

UNITED PROVINCES

In the hilly country south and west of Mussoorie, a band of marble of great purity has been traced intermittently for a distance of about 5.74 miles from near west of Cloud End (30°28' : 78°00' 30") eastwards to the Rajpur-Mussoorie bridle path. The marble is microcrystalline and varies in colour from pure white to grey white and pale grey, and is heavily jointed. The minimum quantity of marble available from this area will be of the order of 34,000,000 tons. An average analysis of 12 samples has given the following results:

SiO ₂	: 0.09
R ₂ O ₃	: 0.115
CaO	: 52.2
MgO	: 2.48
Loss	: 44.2
S	: 0.045
P	: 0.017
P ₂ O ₅	: 0.042

A sample of calc-tufa from West Chunakhan (29°19' : 79°15') about 2 furlongs north of the abandoned village of Madan Bhel in western Nainital yielded 1.20% insoluble residue 0.40% R₂O₃, 54.16% CaO & 0.87% MgO on analysis. The reserves are of the order of 55,000 tons.

MADRAS

Tinnevely District :—(1) The crystalline limestones which occur as bands in the granitic gneisses near Ramayyanpatti, 6 miles north of Tinnevely town generally contain a very high percentage of CaO. Out of a total of 33 analysis of Ramayanpatti limestone, 19 analysis showed 53.9—55.49% CaO, 18 contained 0.31-0.99% MgO, there were 16 analysis in which the percentage of R₂O₃ was 0.6 or under and 20 in which the percentage of the insoluble residue was between 1.14 and 1.06. Six analysis containing 0.41-0.51% insoluble residue upto 0.55% R₂O₃, 54.70—55.49% CaO and 0.36-0.91% M.G.O. are of samples from a band with estimated reserves of 184, 600 tons.

Item No.

Particulars.

(2) Some of the coral limestones which occur below the sealevel and form islands along the coasts of Tinnevely and Ramnad for a distance of 80-90 miles contain 0.15-1.36% insoluble residue, 0.08-0.53%, R_2O_3 , 51.92-54.10% CaO and 0.09-0.59% MgO. presumably some alkalises may be present in the limestones absorbed salts but these can be removed and the purity improved.

Sale District : The crystalline limestones in the Iveli-Annadanapatti area (Annadanapatti is locally known by the name Unianur) near Sankaridrug ($11^{\circ}20'$: $77^{\circ}52'$) contain a high proportion of CaO was between 54 and 56.49 analysis in which the percentage of R_2O_3 was under 0.6, 36 analyses in which the percentage of insoluble residue was below one and 27 analysis in which the percentage of MgO was less than 0.9. The total quantity of limestone expected from this area is around 100,000 tons, within a depth of 10 feet from the surface and probably about half of this amount will be of suitable purposes.

RAJAPUTANA

Jodhpure State : The celebrated marble of Makrana ($27^{\circ}02'$: $74^{\circ}45'$) yields excellent lime. The quarries are scattered over a distance of five miles. The analyses of marble show:—

Insoluble residue	0.89	—	0.98%
Fe_2O_3	0.16	—	0.28 „
$CaCO_3$	97.74	—	98.50 „
$MgCO_3$	0.82	—	1.22 „
H_3PO_4	0.03	—	0.04 „

Western India States Agency.

Jamnagar State : Good quality limestones carrying 97-100% $CaCO_3$ said to occur near Jamnagar, have been utilised by certain paint firms in Calcutta.

PYRITE IN INDIA

by Dr. E. L. G. Clegg,
GEOLOGICAL SURVEY OF INDIA.

Although there are several small occurrences of pyrite in India only two have prospects of being workable, but even these could sustain only a relatively small sulphuric acid industry.

BIHAR

Shahabad District: Amjhor (Amjhora), 3 miles N. N. W. of Ranjari railway station on the Delhi-Rohtas Light Railway. According to the information available in 1941, a horizontal bed of pyrite 18"—36" in thicknes (averaging 2 feet) is exposed for 157 feet along the cliff face in a northeast—southwest direction and by a quarry and drift for 79 feet in a westward direction. The average grade is 35—40 per cent sulphur. The reserves available are not known but assuming maximum limits of only 500 feet by 500 equal to 55,000 tons with 50 per cent ore extraction.

Up to 1941, 700 tons of ore had been mined. The owners are the Kuchwar Lime and Stone Co., Proprietor—S. C. Bose, Esq., Room 11, 22 Canning Street, Calcutta.

<i>Recommendations of the Committee of the Board.</i>	<i>Recommendations of the Board.</i>

Item No.	Particulars.
	PUNJAB HILL STATES <i>Keonthal State:</i> In Keonthal State, east of Tara Devi to the south of Simla, several seams of pyrite in slates are scattered over an area of about one square mile and are known as the Mulraj Pyrites Mines, seams are lenticular and vary rapidly in thickness. Mining entails much dead work as about 5 feet of overburden has to be removed to get the ore. The ore, as now despatched to Tara Devi railway station, contains much slate. Picked specimens yielded upto 50 per cent sulphur but the average sulphur content of the material despatched to the railway station ranges between 35 and 45 per cent. There is about 0.02 per cent As_2O_3. The minimum mining costs would be about Rs. 10 per ton of ore. During 1941 and 1942, 914.5 tons of pyrite were raised and were utilised mainly in the manufacture of sulphuric acid at Agra. Proprietor: Dr. Kedar Nath, Ayrecliff, Simla, W. C. PUNJAB STATES In the same area as the Mulraj mines, Pyrite has been reported to occur in Patiala State near Tara Devi. The occurrence is said to be promising but has not been investigated. Messrs. Shamhu Nath & Sons Ltd., are interested in the deposit. MADRAS <i>Malabar District:</i> In the Pandalur ($11^{\circ}29'$: $76^{\circ}21'$)—Devala ($11^{\circ}28'$: $76^{\circ}23'$)—Nadghani ($11^{\circ}28'$; $76^{\circ}25'$) region iron pyrite is frequently found associated with gold. Rich occurrences of such pyrite have been noted at Nadghani, Harewood, Richmond and Rosedal Mines. It is reported that some pyrite which is now obtained as a by-product in gold mining, is utilised by the Mettur Chemical and Industrial Corporation Ltd., to manufacture sulphuric acid, after slight concentration of the ore. The sulphur content of the pyrite is about 50 per cent with a trace of arsenic. The reserves of the deposits are not known; evidently they can only be worked along with the extraction of gold.

Recommendations of the Committee of the Board.	Recommendations of the Board.

IV. Proceedings of Research Committees.

Item No.	Particulars.
VI.	<i>Subject:—</i> Proceedings of the Fifth Annual Meeting of the Metals Committee. <i>Synopsis:—</i> The Fifth Annual Meeting of the Metals Committee was held in Jamshedpur on the 3rd 4th and 5th December 1945. 1. Points arising from the previous meeting The Chairman, in taking up for consideration, the points arising from the previous meeting, observed that although more than 12 months had elapsed since a long term research programme had been prepared and submitted by the Metals Committee on the instructions of the Department of Scientific and Industrial Research, it had only been possible to start research work on a few of the subjects and a considerable amount of time had been lost in correspondence. He pointed out that while most of the research scheme recommended by the Committee were of a nature suitable for being carried out in their advanced stages at the National Metallurgical Laboratory, when it came into being, yet if they were initiated now at various centres it would considerably facilitate the training of research workers to staff the proposed Laboratory. It was emphasised that though the Committee's recommendations had been approved by the Board, they could not be fully and satisfactorily implemented due to the lack of an executive body. It was therefore of the utmost importance that such a body be set up without any further delay. As a step in this direction he also suggested that the Director of the National Metallurgical Laboratory should be appointed immediately who would not only take over direct responsibility for the planning of the proposed Laboratory but would also organise and co-ordinate metallurgical research work at the various centres. As it would take some time for the Director, who in all probability would be coming to this country for the first time to understand and acquaint himself with the Indian conditions it was felt that the appointment of a Director should no longer be delayed. The question of the appointment of the Director was discussed by the Committee later on (Ref. to p. 114 of the Agenda.). (i) Development of High Purity Manganese and the study of its effects as an alloying element with other Non-Ferrous Metals. The Committee noted that Sir J.C. Ghosh, who was to undertake the research work, has been reminded in the matter by the Council of Scientific and Industrial Research. It was AGREED that, in view of the industrial possibilities of High Purity Manganese as an alloying element, both in ferrous and non-ferrous metallurgy, the Board be requested to write to Sir J. C. Ghosh once again and obtain his reply at an early date.

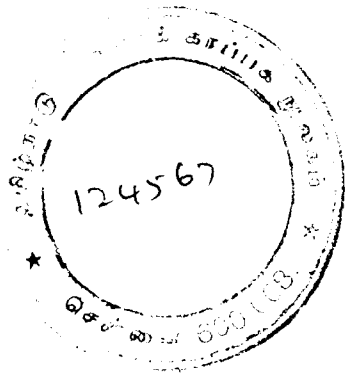
Recommendations of the Committee of the Board.

Recommendations of the Board.

IV. 6. 1. The Committee were unable to recommend the appointment of an executive body for the organisation and co-ordination of Metallurgical research at the various centres.

The question of the appointment of a Director for the National Metallurgical Laboratory has been dealt with under para 5 (a) page 114.

IV. 6. 1 (i). The Committee noted that Sir J.C. Ghosh had already written to say that work on Non-ferrous metals should be taken up at the Indian Institute of Science, Bangalore.



IV. 6. 1. The Board approved of the observations of its Committee.

The President observed that work of the nature suggested in paragraph 1 of the Metals Committee's report should be one of the functions of the D.S.I.R. but he was aware that D.S.I.R. had not the sufficient technical staff to enable him to carry on this work.

IV. 6. 1 (i). The Board noted the observations of its Committee.

IV. Proceedings of Research Committees.

Item No.	Particulars.
	The Committee noted with satisfaction the very valuable work being carried out at the Indian Standard Metals Co., Ltd., Bombay on the production of Electrolytic Manganese and wished to place on record its appreciation of the keen interest taken by Mr. A. Schwarz of that Company in conducting this research work. (ii) Aluminium and other derived Binary and Ternary Alloys of Aluminium—in connection with the possibilities of light metal industries. The Chairman pointed out that India was a natural home for a light metal industry as all the important raw materials such as bauxite for aluminium production and magnesite and dolomite for magnesium production occur in abundance. It was therefore of considerable importance that a detailed study of the various light alloy systems should be made and it was with this objective that the Metals Committee were pressing for the institution of research on the subject at various centres. It was noted that the Benares Hindu University were conducting valuable research work on Aluminium-Titanium alloys, and it was suggested that research on light alloys should be placed on a much broader basis and the investigation carried out at various centres should cover the entire range of light metal alloys. Dr. Malhotra pointed out that the Non-ferrous Metal Panel had figured out a target production of 30,000 tons of aluminium per year. (iii) Wear of Metals. It was noted that the Assistant Director (Planning) of the National Metallurgical Laboratory had prepared a Bibliography of the scientific information on the Wear of Metals. He would undertake experimental research work as and when his main duties permitted. Further work on the indexing and abstracting of scientific and technical information would be undertaken by the Technical Assistant to be appointed for this work. (iv) Recovery of Ferro-Chrome and Chromium Metal from low grade chrome ores. Dr. Crookshank informed the Committee that the Geological Department were carrying out some work on the beneficiation of chrome ores at Ghatsila and that they would be in a position to publish the information in the near future. Mr. Viswanath suggested that the up-grading of chrome ores should be considered from two aspects. The beneficiation of ores which was purely an ore dressing problem could be undertaken at a Bureau of Mines or at any other suitable place, but the metallurgical use of chrome ores should be the concern of the Metallurgical Laboratory. It was AGREED that the report on chrome ores to be published by the Director, Geological Survey of India, be awaited and that for the present due to inadequate facilities further work on the up-grading of chrome ores could not be undertaken to any considerable extent.

Recommendations of the Committee of the Board.	Recommendations of the Board

IV. Proceedings of Research Committees.

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Item No.	Particulars.								
	In the general discussion that followed on the beneficiation of metallic ores, Dr. Crookshank was of the opinion that such work was not, strictly speaking that of the Geological Survey and in the absence of any suitable body this work of beneficiation not only of metallic ores, but also of minerals in general, should be undertaken at the Metallurgical Laboratory, where suitable provisions were being made. Mr. Parkinson, however, pointed out that by far the greater work of this type would be required on those minerals of little or no metallurgical interest. In his opinion, there appeared to be a "missing link" in the form of a Bureau of Mines working in parallel with the Geological Survey. Dr. Crookshank, however, felt that a considerable time would elapse before any such Bureau of Mines could be established and therefore beneficiation work on minerals as well as of metallic ores should be undertaken in the proposed Metallurgical Laboratory. Here again, Mr. Parkinson stated that it would be unwise to saddle the staff of the Metallurgical Laboratory with the responsibility for work on minerals. Mr. Wadia stated that he had made suggestions to the Government for the establishment of such a Bureau of Mines and until such time that the Bureau of Mines came into operation, he was of the opinion that beneficiation of minerals and of metallic ores might be temporarily carried out together, using the facilities of the Metallurgical Laboratory. (v) Study of the Magnetic Properties of Metallic Crystals. The Committee understood that the Secretary, Council of Scientific and Industrial Research had written to Prof. Krishan and Prof. M.N. Saha whose replies were awaited. The Committee next considered the scheme on X-Ray Studies of Metals and Alloys submitted by Prof. K. Bannerji of the Indian Association for the cultivation of Sciences, Calcutta and recommended to the Board that the scheme be approved and the grant asked for be sanctioned. Details of the scheme. Study of the internal structures of metals and alloys after various mechanical and heat treatments by X-Ray diffraction methods, Monochromatic beams and photometry of the diffraction photographs have been much used by other workers, but it is expected to lead to much clearer understanding of the structural changes due to cold working in metals and alloys. The present knowledge about these structures are mostly obtained from quantitative X-Ray studies and hence are incomplete. But still that has led to much useful knowledge about properties of alloys. Most of the equipment required for these investigations are available in the laboratories of the Association. Grant Required : <table><tr><td>Equipment :</td><td>Rs. 1,000</td></tr><tr><td>(for constructing a suitable camera)</td><td></td></tr><tr><td>Staff :</td><td>Rs. 3,600</td></tr><tr><td>(Two Research Assistants on Rs. 150 p. m. each plus d. a.)</td><td></td></tr></table>	Equipment :	Rs. 1,000	(for constructing a suitable camera)		Staff :	Rs. 3,600	(Two Research Assistants on Rs. 150 p. m. each plus d. a.)	
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(for constructing a suitable camera)									
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Recommendations of the Committee of the Board.	Recommendations of the Board

IV. Proceedings of Research Committees.

Item No.	Particulars.
	Contingencies : Rs. 5,000 (X-Ray film and replacements for X-Ray apparatus) Total. Rs. 9,600 for 1 year
	(vi) Investigations on 'Fatigue in Metals'. It was noted that the Punjab University had agreed to undertake the investigation on the Fatigue of Metals in collaboration with the N.W. Railway. The Punjab University had been requested to give the details of the grant required and the nature of the co-operation that the N.W. Railway had to provide and on receipt of this information further recommendation would be made.
	(vii) Manufacture of Mixed Metals. It was observed that as the investigation on "Mixed Metals" as suggested by Mr. G.C. Mitter was not sufficiently explicit and that further clarification of the problem be sought after his return from abroad. As Powder Metallurgy was considered as a major subject in this proposed investigation and to be of immediate and future industrial importance, it was RESOLVED to recommend to the Board that the Scheme on Powder Metallurgy, submitted by Dr. Lal C. Verman put forward by the Metals Committee in September 1944 but had not been approved by the Board, be referred to them once again for reconsideration in view of the growing industrial importance of Powder Metallurgy.
	(viii) Reclamation of Metals from Mixed Swarf. Dr. Malhotra explained that research on the Reclamation of Metals from Mixed Swarf was of direct concern to the Railways and that the N.W. Railway had obtained a licence for working a patent of a relatively simple process at a cost of £ 10,000. Mr. MacGregor observed that the problem had been solved so far as the Railways were concerned but if they felt that further research work to evolve a cheaper method of separation of bronze and metal from mixed swarf was considered necessary, the Railway Board could refer to the problem to the National Metallurgical Laboratory, when it came into being.
	(ix) A Study of Sprayed Metal Bearings. It was noted that the subject would be considered at the next meeting of the Chemists and Metallurgists Sub Committee of the I.R.C.A., to be held in February, 1946 and it was AGREED that further information from the Railway Board be awaited.
	(x) A Study of Surface Hardening of Metals. The appointment of a Technical Assistant for Classifying and Cataloguing Scientific and Technical literature was under consideration by the Metals Committee and the Assistant when appointed would be instructed to undertake the indexing and abstracting of technical and scientific information on the Surface Hardening of Metals.

Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 6. 1 (v). The Committee recommended that Dr. K. Banerjee's scheme on X-ray studies of metals and alloys be sanctioned with a grant of Rs. 7,100 made up of Rs. 1,000 for equipment, Rs. 2,500 for contingencies and Rs. 3,600 for staff.	IV. 6. 1 (v). The Board accepted the recommendations of its Committee.
IV. 6. 1 (vii) Dr. Verman's scheme has been dealt with under paragraph 4 on page 112 of the Agenda.	IV. 6. 1 (vii). The Board noted the observations of its Committee.

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	(xi) Study of 'Grain Size' Control. The research scheme sent by the Controller of Inspection (Metallurgical) had been circulated to all the Members of the Committee. Mr. MacGregor felt that the estimate for the cost of apparatus for carrying out this research work had been prepared without adequate study having been made of the lines on which the research would probably develop. This he felt could only be done after a study of available literature on the subject. Further, the estimate of expenditure appeared to have been arbitrarily determined and not on firm prices: equipment of the type required would also be difficult to obtain at present. He proposed that the technical assistant be appointed, who should first make the very necessary survey of the technical information available on the subject. This work would have to be done in any case as the foundation of the research. In the meantime firm quotations and delivery time of apparatus etc, could be obtained. The detailed selection of the equipment could then be made and the lines of the proposed research formulated on the basis of the technical survey. The technical survey alone, if published would be of greatest help to Engineers etc. The Committee AGREED that this was a correct approach to the problem and that the Controller of Inspection be advised in the matter accordingly. (xii) Experiment on the replacement of Babbit Metals by Cheaper Substitute bearing Metals It was noted that Dr. Malhotra's memorandum had been forwarded to the Railway Board by the Council of Scientific and Industrial Research and it was AGREED that the reply from the Railway Board be awaited. The Chairman pointed out that though the problem was of vital importance during the war when the supply of tin was difficult, it was necessary that research work on the conservation of tin and even for the development of bearing metals containing no tin should be pursued as there were no resources of tin in the country. (xiii) (a) Extensive and detailed Geological Exploration of Non-ferrous ores. (b) Improvement in the technique of Processing Non-ferrous Metals. (c) Collection and classification of information available in foreign countries on various metal working industries. (d) Preparation of pamphlets or directives to the various industries regarding the latest practice followed in foreign countries. Dr. Crookshank explained that the Geological Survey of India were publishing periodically full informative bulletins on various ores and minerals. Mr. Parkinson felt that the information published by the Geological Survey on Indian minerals and ores did not get sufficient publicity among the industrialists. He therefore suggested that attention should be drawn to the existence of the extensive information in the Bulletins

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	of the Geological Survey by advertisements in the technical press including the Journal of Scientific and Industrial Research. Dr. Crookshank said he would welcome the idea of bringing the available data to the notice of industrialists and others interested. It was RESOLVED that it be recommended to the Board that the Director, Geological Survey of India arrange for the regular advertising of the Geological Survey bulletins etc. in the technical press including the Journal of Scientific and Industrial Research. (xiv) Appointment of Technical Assistant for Classifying and Cataloguing of Technical and Scientific Data. The Committee understood that the interview of the candidates, who applied for the post would be held at Bangalore, at the time of the Indian Science Congress session. Dr. Crookshank offered necessary accommodation in the Geological Survey office at Calcutta and to take care of the administrative functions during the Assistants' working period in Calcutta. The Assistant would start his work at Jamshedpur and visit other centres in the course of his duties. 2. Review of current researches. (i) Production of High Purity Manganese. The progress of work on the production of High Purity Manganese by the Electrolytic Process at the Indian Standard Metal Co., Bombay was considered satisfactory. (ii) Extraction of Beryllium from Indian Beryl. It was noted the research work had been transferred from Mr. G. C. Mitter to Sir J. C. Ghosh, Director, Indian Institute of Science, Bangalore on account of the former's absence from the country on deputation. (iii) Production of Aluminium-Titanium Alloys. The Committee noted the satisfactory progress made of the research on the production of Aluminium-Titanium Alloys at the Benares Hindu University. (iv) Manufacture of Electrical Resistance Alloys. The Committee noted the progress of work on the manufacture of Electrical Resistance Alloys at the Mysore Iron and Steel Works, Bhadravati and particularly the overcoming of the difficulties in forging these special alloys. (v) Manufacture of Silicon-Copper Bronzes. The satisfactory progress of work done at the B. B. & C. I. Railway Laboratory, Ajmer was noted. It was AGREED that so far as the metallurgical side was concerned, the investigation be considered to have been successfully concluded.

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 6. 1 (xiii) The Committee recommended that the Director, Geological Survey of India be requested to arrange for the regular advertising of the Geological Survey bulletins etc. in the technical press including the Journal of Scientific and Industrial Research.	IV. 6. 1 (xiii). The Board accepted the recommendations of its Committee.

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	NEW SUBJECTS.
	3. Electro-polishing of Metals.
	The Chairman explained that Electro-Polishing of Metals was a new technique developed primarily for the polishing of samples for microscopic examination, but was now being employed on an industrial scale for polishing and finishing of metallic articles particularly those of intricate design. The polishing of stainless steels by this method, it was stated, had received great attention.
	Mr. MacGregor explained that the subject was of considerable industrial importance and the problem covered firstly, the chemical side dealing with the selection of suitable electrolytes and the determination of cell characteristics, and secondly the metallurgical side, dealing with the suitability of various alloy compositions and the surface finishes obtained. He suggested that the subject, in the first instance, should be referred to the Electro-Chemical Research Committee for investigating the chemical side of the problem and on receipt of their report research on associated metallurgical problems could be considered by the Metals Committee.
	It was RESOLVED that it be recommended to the Board that investigation on the Electro-Polishing of Metals and Alloys be referred to the Electro-Chemical Research Committee in the first instance.
	4. Preparation of Metal Powders:
	The Chairman stated that the subject of Powder Metallurgy was receiving considerable attention and the process had unique advantages in the manufacture of cemented carbides for cutting tools, Alnico type magnets, self lubricatings and such other articles.
	The preparation of metallic powders is the first step for the development of a powder metallurgical industry. As research on the manufacture of permanent magnets had been initiated by the Metals Committee and as the establishment of a cemented carbide industry was of considerable industrial importance, the Director of Scientific and Industrial Research should be requested to carry out the investigation on the production of Metal Powders in his laboratories at Delhi.
	The Committee had recommended to the Board the reconsideration of the scheme submitted by Dr. Lal C. Verman, on "Powder Metallurgy Technique with special reference to the manufacture of Lubricated Bearings and Composite Metal Graphite Brushes". The two research schemes should be conducted concurrently.
	It was RESOLVED that it be recommended to the Board that research on the preparation of Metal Powders be instituted at the laboratories of the Department of Scientific and Industrial Research.
	Dr. Verman's scheme was considered by the Board at their 10th meeting on 12-7-43. The Board understood at this meeting that suitable equipment for work on powder metallurgy was available with the Tatas, at Jamshedpur. They recommended the scheme for sanction only if the equipment was made available by the Tatas as it was not found possible to duplicate the

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 6. 3. The Committee agreed to the recommendations of the Metals Committee.	IV. 6. 3. The Board accepted the recommendations of its Committee.

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	equipment at that time. On enquiry, it was learnt that the necessary equipment was not available with the Tatas. The Board reconsidered the scheme in the light of the above at their 11th meeting held on 29th November 1943 and did not recommend the scheme for sanction as the necessary equipment was not available. Later on, Dr. Verman stated that sufficient equipment was available in his laboratories to justify a good beginning to be made; and that whatever equipment was not available in the beginning, was essential only in the later stages of the work. The Board reconsidered this at their 12th meeting held on 6th March 1944 and decided to postpone sanction of the scheme till such time as all the equipment required for the investigations was available or the National Metallurgical Research Laboratory came into being. Dr. Verman had originally asked for the following grant : <table> <tr> <td>Equipment :</td> <td>0,500</td> </tr> <tr> <td>100 ton press</td> <td>5000</td> </tr> <tr> <td>Hydraulic equipment</td> <td>1000</td> </tr> <tr> <td>Dies & Pressing Tools</td> <td>1000</td> </tr> <tr> <td>Metallurgical Microscope</td> <td>2000</td> </tr> <tr> <td>Contingencies</td> <td>500</td> </tr> <tr> <td>Staff :</td> <td>3,840</td> </tr> <tr> <td>1 Metallurgist on Rs. 250 p. m.</td> <td rowspan="3">}</td> </tr> <tr> <td>1 Mistri on Rs. 50 p. m.</td> </tr> <tr> <td>1 Bearer on Rs. 20 p. m.</td> </tr> <tr> <td></td> <td>Total Rs. 13,340</td> </tr> </table> In the modified request, he asked for a grant of Rs. 3,500 for equipment, as the 100 ton press and hydraulic equipment was required only in the later stages of the work and a 50 ton press was available for the earlier stages of the work. 5. Review of the Progress of the Planning work of the National Metallurgical Laboratory. The Committee noted the progress of work done by the Planning Committee. With regard to the planning of the National Metallurgical Laboratory it was noted that the planning work had come to a stage when it should be referred to the Director, who would be appointed to be incharge of the laboratory. The particulars of the duties of the Director were debated and it was agreed that the Chairman be requested to address a special letter to Sir S.S. Bhatnager, pointing out the urgent necessity of having an executive body to implement and supervise the research schemes recommended by the various Advisory Committees and to the need for the immediate appointment of a Director for the Metallurgical Laboratory. It was resolved that the following recommendations be made : - that the Director for the proposed National Metallurgical Laboratory should be appointed immediately, - that Mr. MacGregor be invited to act for a period of 2-3 months on behalf of the Metals Committee as an Executive Officer for the purpose of organising and implementing the research schemes recommended by the Metals Committee and that a grant be made for the purpose.	Equipment :	0,500	100 ton press	5000	Hydraulic equipment	1000	Dies & Pressing Tools	1000	Metallurgical Microscope	2000	Contingencies	500	Staff :	3,840	1 Metallurgist on Rs. 250 p. m.	}	1 Mistri on Rs. 50 p. m.	1 Bearer on Rs. 20 p. m.		Total Rs. 13,340
Equipment :	0,500																				
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1 Mistri on Rs. 50 p. m.																					
1 Bearer on Rs. 20 p. m.																					
	Total Rs. 13,340																				

Recommendations of the Committee of the Board.

Recommendations of the Board.

IV. 6. 4. The Committee recommended that Dr. Verman's scheme on powder metallurgy be sanctioned with a grant of Rs. 7,340 made up of Rs. 3,500 for Equipment and Rs. 3,840 for staff, provided that the necessary equipment can be obtained by Dr. Verman.

IV. 6. 4. The Board accepted the recommendations of its Committee.

IV. 6. 5 (a). The Committee recommended that the Director of the proposed National Metallurgical Laboratory be appointed immediately.

IV. 6. 5 (a). The Board accepted the recommendations of its Committee.

IV. 6. 5 (b). The Committee regretted their inability to recommend the appointment of Mr. MacGregor as an Executive Officer for the purpose of organising and implementing the research schemes recommended by the Metals Committee. But they recommended that Mr. MacGregor's services may be utilised for two or three months in connection with the planning of the National Metallurgical Laboratory and preparing a list of equipment required for the laboratory.

IV. 6. 5 (b). The Board recommended that pending the arrival of the Director of the National Metallurgical Laboratory, Mr. MacGregor's services may be utilised for the planning of the National Metallurgical Laboratory, and preparing a list of equipment required for the Laboratory. The salary to be offered to Mr. MacGregor for this purpose be left to the discretion of the Hon'ble President.

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	(c) Mr. Parkinson and Mr. MacGregor be invited to act as U.K. Corresponding Members of both the Laboratory Planning and Metals Committees, so making available to these committees their continued invaluable advice and assistance. (Mr. Parkinson and Mr. MacGregor are leaving the country in the near future). 6. It was resolved that the nomination of Dr. F. Adcock, Head of the Department of Metallurgy, Indian Institute of Science, Bangalore and Mr. G.F. Gillot, Superintendent, Ambarnath Ammunition Factory, for the membership of the Metals Committee be considered by the Board in place of Messrs. Parkinson and MacGregor, who would be relinquishing their memberships by the end of March 1946. 7. The Committee recommended that a review of Mr. Raju's (Stenographer, Metals Committee) scale of pay be made and he be appointed Assistant in the scale of pay of Rs. 135-200 as he was carrying out the general office work in addition to his work as a stenographer. 8. Mr. D.N. Wadia stated that there were very high grade Bauxite deposits in Kashmir State which were not amenable to treatment as other Bauxite ores owing to its refractoriness and that investigation should be carried out to develop processes for the utilisation of this mineral. Mr. Wadia agreed to furnish a scheme of research for investigating the development of the high grade Bauxite ores for the further consideration of the Metals Committee. With a vote of thanks to the Chairman the Meeting terminated. <i>Subject :—</i> Proceedings of the Meeting of the Radio Research Committee. <i>Synopsis :—</i> A meeting of the Radio Research Committee was held on the 6th December 1945 at Calcutta. 1 (a) The Committee reviewed the progress of research schemes in operation under its auspices. It was understood that the essential equipment required for Laboratory Production and Repair of Radio valves is expected to arrive shortly from U.S.A.; and that Dr. G.R. Toshniwal who had been conducting investigations on 'Manufacture of Cheap Radio sets and volume controls' (now termed 'Investigations on the production of Radio components') at Allahabad had left to take up an appointment in the India Meteorological Dept. and no report had been received from him. The Committee resolved that henceforward the Secretary of the Committee should send abstracts of the reports obtained from the various investigators to all members of the committee soon after they are received in the office. (b) It was agreed to arrange for regular publication of the data obtained in the scheme on 'Ionospheric Investigations' in some Indian Scientific Journal e.g. in the Indian Journal of

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Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 6. 5 (c). The Committee recommended that Mr. Parkinson and Mr. MacGregor be appointed in an honorary capacity as U. K. Corresponding Members of both the Laboratory Planning and Metals Committees. IV. 6. 6. The Committee recommended that Dr. Adcock and Mr. G. F. Gillot be appointed members of the Metals Committee. It was further recommended that Dr. K.S. Krishnan be also appointed a member of the Metals Committee. IV. 6. 7. The Committee recommended that the D.S.I.R. may take the necessary action in the case of Mr. Raju, Stenographer.	IV. 6. 5(c). The Board accepted the recommendations of its Committee. IV. 6. 6. The Board accepted the recommendations of its Committee. IV. 6. 7. The Board accepted the recommendations of its Committee.

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	Physics after obtaining permission from the Council of Scientific and Industrial Research for such publication. (c) It was resolved that the daily observations of atmospherics at each of the five stations be made according to the following schedule : 06-45 to 07-00, 08-45 to 09-00, 11-45 to 12-00 14-45 to 15-00, 17-45 to 18-00, 21-45 to 22-00 Hours I.S.T. (d) It was resolved that Mr. Srivastava be requested to give suggestions regarding the best method by which warnings from Poona might be transmitted for making observations of atmospherics, and that the final arrangement be made by the Chairman in consultation with Mr. Srivastava and Dr. Banerji. (e) It was resolved that the Secretary of the Committee might in consultation with Dr. Banerji and Mr. Srivastava ascertain if any of the 20,000-metre sets available in their respective Departments would suit the purpose for a direction finding equipment for atmospherics work. (f) It was resolved that Dr. G.R. Toshniwal and Mr. S.K. Chatterji, both of the India Meteorological Department be deputed for testing and standardising atmospherics sets at the five stations—Bangalore, Poona, Guntur, Delhi and Dacca. 2. The Chairman placed before the Committee a draft scheme for the proposed Radio-Electronics Research Laboratory for discussion. The scheme with the Committees' modifications are placed before the Board of Scientific and Industrial Research separately. (a) The question whether the Radio-Electronics Research Laboratory will form part of the proposed National Physical Laboratory or will be established as a separate Institute was discussed. It was resolved that the proposed Radio-Electronics Research Laboratory be established as a separate institute independent of the National Physical Laboratory. The Committee was of the opinion that the question of location of the Laboratory be taken up later. (b) It was resolved that the Testing and Standardisation of Radio Components should be included as a Section of the Radio-Electronics Research Laboratory. (c) The Committee discussed in detail the draft scheme and decided upon certain modifications to be made therein. (The modifications are placed before the Board of Scientific and Industrial Research separately). In this connection, the proceedings of the 6th meeting of the National Physical Laboratory Planning Committee are given below for the consideration of the Board of Scientific and Industrial Research :

Recommendations of the Committee of the Board.	Recommendations of the Board.
IV. 7. 2. The Committee discussed Dr. Mitra's scheme on Radio-Electronics Research Laboratory and also the resolution of the National Physical Laboratory Planning Committee. The Committee was in full agreement with the views of the National Physical Laboratory Planning Committee and reiterated the previous resolution of the Governing Body of the Council of Scientific and Industrial Research in this matter. The Committee, however, felt that Radio Electronics Research as recommended by the Radio Research Committee may at present be carried out in the National Physical Laboratory; and later on, when more funds are available, a separate Radio-Electronics Research Laboratory be established.	IV. 7. 2. Professor Saha raised the question of the establishment of a separate Radio Electronics Research Institute. The President ruled that in view of the limited finances available to the Council at the present moment, the work of the proposed Radio Electronics Research should be carried out in the proposed National Physical Laboratory. The Board accepted the D.S.I.R.'s suggestion that Prof. Mitra's scheme for a Radio Electronics Research Laboratory be referred to the National Physical Laboratory Planning Committee for incorporating Radio Electronics Research in the National Physical Laboratory.

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	5. Resolution III of the Governing Body meeting held on the 21st September 1945 which reads as follows was referred to the Committee for consideration: "While confirming the minutes of the 15th meeting of the Board of Scientific and Industrial Research held on 20.9.1945 (vide Annexure A) it was pointed out that the Board of Scientific and Industrial Research did not agree in principle to the setting up of a separate Central Radio Research Laboratory. The Board agreed that the details of work and the drawing up of plans and estimates be settled at a joint meeting of the Radio Research Committee and the National Physical Laboratory Planning Committee and that a joint report be submitted to the Board for consideration. The Governing Body, therefore, decided to delete the first paragraph of the recommendations of the Board of Scientific and Industrial Research under the heading "Central Radio Research Laboratory" of item III, 3". The Committee regrets that it has not been possible to arrange a joint meeting of this Committee with the Radio Research Committee of the Board of Scientific and Industrial Research. The Committee has, however, carefully considered Prof. Mitra's report and the conclusions which were arrived at unanimously, are stated below : (i) The Committee does not see adequate reasons to depart from the original view that Radio Research should, in the best interests of the country, form an integral part of the National Physical Laboratory. The Committee is confirmed in this view by the practice followed in this matter both at the National Physical Laboratory, Teddington and the National Bureau of Standards, Washington, where Radio Research forms an integral part of these organisations. (ii) The Committee has recommended two Assistant Directors and a larger scientific staff for the Division of Electronics & Sound than for the other Divisions in view of the importance and magnitude of the subject. (iii) The Committee also suggests the establishment of a number of field stations located at suitable places in the country. Great Britain with its much smaller area has two field stations and it is considered that India with its large variety of climatic and geographical conditions should have at least four stations to start with. These field stations should be under the National Physical Laboratory but their work should be subject to review by the Radio Research Board which has been proposed below. (iv) The Committee feels that it would serve a very useful purpose if a Radio Research Board of an advisory character is set up to co-ordinate research carried out in the Electronics Division of the National Physical Laboratory and its field stations on the one hand and in Universities, research institutes, and laboratories maintained by industry on the other. The two Assistant Directors of the Division of Electronics and Sound should, in the opinion of the Committee, be ex-officio members of this Board to ensure close co-ordination. (v) The Committee considered that the subjects comprising the Divisions B, C and D in Prof. Mitra's scheme are already adequately covered by the provision made in the Division of Electronics & Sound of the National Physical Laboratory. The subjects under Division A of

Recommendations of the Committee of the Board.	Recommendations of the Board

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	Prof. Mitra's scheme, would be covered by the National Physical Laboratory and its field stations. The Committee is also of the opinion that some of the research work on propagation of waves could, with advantage, be carried on at the Universities. (vi) The Committee reiterated the following resolution recorded at its last meeting held in August 1945, in reply to a letter from Dr. M. N. Saha disapproving of the inclusion of the Section of Electronics & Sound in the National Physical Laboratory. "The Committee after fully considering this question were definitely of the unanimous opinion that the National Physical Laboratory would be incomplete if a section dealing with Electronics, Acoustics and Radio Appliances were left out of its scope. The Committee, in this connection, noted that similar sections form integral parts of the National Physical Laboratory, Teddington and the National Bureau of Standards, Washington. The Committee further noted that radio technique and methods are so closely interlinked with the development of other electrical and acoustical instruments which would naturally form a part of the activities of the National Physical Laboratory that the exclusion of any work on methods appliances and instruments concerning electronics would seriously cripple its activities and stand in the way of the research and development work on electrical instruments in general. This view of the Committee is shared by Sir Charles Darwin, Director of the National Physical Laboratory, Teddington. The Committee were further informed by Dr. Nazir Ahmad that in his discussion with Dr. Lyman Briggs, Director of the National Bureau of Standards, Washington. Dr. Briggs was also of the opinion that the work on radio technique, appliances and instruments should form an integral part of the activities of the National Physical Laboratory in India." 3. The Committee considered the following schemes :— (1) Studies in Dielectric constants of liquids and solids by Dr. S. K. K. Jatkar, Indian Institute of Science, Bangalore. Grant required :— <table><tr><td>Staff :</td><td>...</td><td>...</td><td>...</td><td>Rs.</td><td>3,600</td></tr><tr><td></td><td colspan="5">2 Research assistants, 1 on Rs. 200 p.m. & the other on Rs. 100 p.m.)</td></tr><tr><td>Equipment</td><td>...</td><td>...</td><td>...</td><td>Rs.</td><td>1,000</td></tr><tr><td>Contingencies</td><td>...</td><td>...</td><td>...</td><td>Rs.</td><td>400</td></tr><tr><td></td><td>Total</td><td></td><td></td><td>Rs.</td><td>5,000 for 1 year.</td></tr></table> Under the scheme, it is intended to continue the work on dielectric studies of liquids and solids in all aspects ; theories of concentrated solutions, structure of liquids and solids, high polymers, molecular spectra, optical activity etc. The Committee resolved to recommend the scheme for sanction. It may be mentioned that the scheme has also been referred to the Applied Physics Committee for their opinion.	Staff :	...	...	...	Rs.	3,600		2 Research assistants, 1 on Rs. 200 p.m. & the other on Rs. 100 p.m.)					Equipment	...	...	...	Rs.	1,000	Contingencies	...	...	...	Rs.	400		Total			Rs.	5,000 for 1 year.
Staff :	...	...	...	Rs.	3,600																										
	2 Research assistants, 1 on Rs. 200 p.m. & the other on Rs. 100 p.m.)																														
Equipment	...	...	...	Rs.	1,000																										
Contingencies	...	...	...	Rs.	400																										
	Total			Rs.	5,000 for 1 year.																										

Recommendations of the Committee of the Board.

Recommendations of the Board.

IV. 7. 3(1) The Committee recommended that Dr. Jatkars scheme on studies in Dielectric constants of liquids and solids be sanctioned with a grant of Rs. 5,000 as recommended by the Radio Research Committee.

IV. 7. 3(1). The Board accepted the recommendations of its Committee.

Item No.	Particulars.
	(2) Propagation of ultra-short and microwaves by Prof. S. P. Chakravarti, Indian Institute of Science, Bangalore.
	Grant required :
	Initial equipment Rs. 25,000
	Staff Rs. 4,200
	1 research assistant on Rs. 200 p.m.
	1 tehcnical assistant on Rs. 150 p.m.
	Contingencies Rs. 1,000
	Total Rs. 30,200 for 1st year
	(3) Propagation of ultra-short and Micro-waves through soil and other media by Dr. S. S. Banerji, Assistant Professor of Communication Engineering, Benares Hiudu University.
	Grant required :
	Initial equipment — ... Rs. 25,000
	Staff :
	2 Research assistants on Rs. 125 p.m. } each Rs. 3,900
	1 mechanic on Rs. 75 p.m. }
	Contingencies Rs. 2,500
	Total Rs. 31,400 for 1st year.
	(4) Measurement of Interference in the V. H. F. Range and studies of cosmic Noise by Dr. H. Rakshit, Lecturer, Calcutta University.
	Grant required :
	Initial equipment Rs. 15,000
	Staff :
	1 research assistant on Rs. 150 p.m. }
	1 research assistant on Rs. 100 p.m. } Rs. 3,360
	1 bearer on Rs. 30 p.m. }
	Contingencies Rs. 1,000
	Total Rs. 19,360 for first year.

All the above 3 schemes are for a period of two years.

The Committee understood that all the 3 schemes formed part of the same wide field of investigation namely Ultra-short and Microwaves. The Chairman placed before the Committee a suggestion for the formation of a panel for ultrashort and microwave investigations. (This note is placed before the Board of Scientific and Industrial Research separately). The Committee discussed in detail the suggestions put forward by the Chairman and agreed to

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	the formation of an Ultrashort and Microwave Panel as suggested therein, with the following personnel : Chairman of the Radio Research Committee. Representative of the India Meteorological Dept. Representative of the Air Forces. Persons participating in research work (Not more than 3 in number) The Committee further resolved that a temporary Secretary be appointed for the above Panel on a salary of Rs. 250/- p.m. for one year in the first instance. The period may be extended if necessary. The Committee approved of the 3 schemes on Ultrashort and Microwaves and decided that before recommending them for sanction they should be modified in the light of the findings of the ultra-short and Microwave Panels. (5) Mass Production of Loud speakers by Mr. S. A. Wahid, Karachi. Grant required : <table><tr><td>Staff</td><td>...</td><td>...</td><td>Rs. 5,000</td></tr><tr><td>Equipment</td><td>...</td><td>...</td><td>Rs. 5,000</td></tr><tr><td>Contingencies</td><td>...</td><td>...</td><td>Rs. 5,000</td></tr><tr><td></td><td></td><td></td><td>Rs. 15,000</td></tr></table> The Committee resolved not to recommend the scheme for sanction as work on the subject has already been carried out under the auspices of the Council of Scientific and Industrial Research. (6) Design and construction of Loud Speakers by Mr. V. V. L. Rao, Radio Engineer, Madras. Grant required : <table><tr><td>Equipment</td><td>...</td><td>...</td><td>Rs. 4,000</td></tr><tr><td>Staff</td><td>...</td><td>...</td><td>Rs. 2,400</td></tr><tr><td>1 Research assistant on</td><td>Rs. 150 p.m.</td><td></td><td></td></tr><tr><td>1 workshop assistant on</td><td>Rs. 50 p.m.</td><td></td><td></td></tr><tr><td>Contingencies</td><td>...</td><td>...</td><td>Rs. 1,000</td></tr><tr><td></td><td></td><td>Total</td><td>Rs. 7,400 for 1 year</td></tr></table> The Committee resolved not to recommend the scheme for sanction as work on the subject has already been carried out, under the auspices of the Council of Scientific and Industrial Research.	Staff	...	...	Rs. 5,000	Equipment	...	...	Rs. 5,000	Contingencies	...	...	Rs. 5,000				Rs. 15,000	Equipment	...	...	Rs. 4,000	Staff	...	...	Rs. 2,400	1 Research assistant on	Rs. 150 p.m.			1 workshop assistant on	Rs. 50 p.m.			Contingencies	...	...	Rs. 1,000			Total	Rs. 7,400 for 1 year
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		Total	Rs. 7,400 for 1 year																																						

Recommendations of the Committee of the Board.

Recommendations of the Board.

IV. 7. 3 (2), 3 (3) and 3 (4). The Committee recommended that an ultrashort and micro-waves Panel as recommended by the Radio Research Committee be formed; but the Committee were unable to recommend the appointment of a Secretary for this Panel.

The Committee resolved that the recommendations of the Radio Research Committee regarding the three scheme on page 124 be awaited.

IV. 7. 3(5). The Committee did not recommend the scheme on Mass Production of Loud speakers for sanction.

IV. 7. 3(6). The Committee did not recommend the scheme on design and construction of loud speakers for sanction.

IV. 7. 3(2), 3(3) and 3(4). The Board accepted the recommendations of its Committee and decided that the Secretary of the Radio Research Committee should also attend to the work of the ultrashort and micro-wave panel.

The Board decided that the recommendations of the Radio Research Committee be awaited.

IV. 7. 3(5). The Board approved of the recommendations of its Committee.

IV. 7. 3(6). The Board approved of the recommendations of its Committee.

IV. Proceedings of Research Committees.

Item No.	Particulars.
	(7) Scheme on 'Design and construction of Volt-Ohm Ampere Meters' by Mr. V. V. L. Rao, Madras.
	Grant required :
	Equipment Rs 4,000
	Staff : Rs. 2,400
	1 Asstt. on Rs. 150 p m.
	1 Instrument mechanic on Rs. 50 p.m.
	Contingencies Rs. 1,000
	Total Rs. 7,400
	The Committee resolved not to recommend the scheme for sanction as no investigation is necessary on the design and construction of multitesters.
	(8) Design and construction of Radio Receivers by Mr. V.V.L. Rao, Madras
	Grant required :
	Equipment Rs. 9,500 to be spread over 2 years.
	Staff & contingencies Not stated.
	The Committee resolved that Mr. V.V.L. Rao be requested to state definitely the details of the investigations he intends carrying out in regard to his scheme.
	4. The Committee agreed that an ionospheric station should be established at Travancore and requested the Chairman to continue negotiations with Dr. K. L. Moudgil, Director of Research, Travancore University, in this connection.

Recommendations of the Committee of the Board.	Recommendations of the Board
IV. 7. 3 (7). The Committee did not recommend the scheme on design and construction of multitesters for sanction.	IV. 7. 3(7). The Board approved of the recommendations of its Committee.
IV. 7. 4. The Committee recommended that the results of negotiations between the Chairman of the Radio Research Committee and Dr. Moudgil be awaited.	IV. 7. 4. The Board accepted the recommendations of its Committee.

V. Proceedings of the Provincial & State Scientific & Industrial Research Committees.

Item No.	Particulars.
V. 1.	<i>Subject:—</i> Proceedings of the 14th Meeting of the Council of Research, Travancore <i>Synopsis:—</i> The 14th Meeting of the Council of Research, Travancore, was held on the 8th June 1945, at which the Vice Chairman presented the 14th report. The following summary of the report is placed before the Board of Scientific and Industrial Research for information. 1. The Government of Travancore have placed at the disposal of the Department of Research on lease an area of 15 acres in a very prominent part Trivandrum for the establishment of a Tapioca Research Farm to conduct investigations on tapioca. The construction of laboratory buildings is in progress. 2. The Government and the University of Travancore have sanctioned the starting of a Statistics Department in the Department of Research. The Statistics Department will start an M. Sc. course in Statistics for mathematics graduates to equip them for higher work in experimental statistics and will continue its present research activities with greater intensity. Also, a Statistical Bureau has been started to standardise the methods of collection and form of presentation of all types of statistical data in the State, to analyse these data so as to advise the Government, Heads of Departments and other organised quasi-official and private authorities on trends and to design and carry out sampling surveys to fill up the lacuna in the Statistics as at present collected. The University is contemplating the establishment of a Chair of Geology for Research. 3. (a) Proposals for the starting of a Model Salt Factory for the collection of data in regard to production of salt from sea brine by the University method, for propaganda work for the improvement of the quality of salt by the owners of salt pans with recovery of gypsum and other bye-products and for the experimental processing of the bye-products to produce marketable materials, which are not at present produced are under the consideration of the Government. (b) The research on Coconut Retting is in good progress. One of the important aspects on which investigations will be conducted is the preparation of furfural from pith. (c) Research investigations on the properties of charcoals obtained from the fuel trees commonly occurring in N. Travancore have been completed and the results have been made available to the Travancore Chemicals and Fertilizers. A Canadian Type of kiln has been constructed at Alwaye by the Firm and data on large scale production are being collected. (d) Work on the Standardisation of Charcoal and utilization of Travancore lignite is being conducted in the Industrial Research Laboratory.

Recommendations of the Committee of the Board.

Recommendations of the Board.

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V. Proceedings of the Provincial & State Scientific & Industrial Research Committees.

Item No.	Particulars.
	(e) A magnetic Survey of the mineral deposits of the State is being carried out. (f) Work on the phosphate portion of monazite has proved promising and the results are going to be verified soon on a large scale. Work on the production of meso-thorium and of the other components of monazite is in progress. Experimental work on ilmenite and the production of titanium white is in progress. (g) Chemical investigation of Fish liver oils is in good progress and an anti-oxidant possessing remarkable preservative properties for Shark liver oil has been found. Investigations on the Molecular Association of Shark liver oil are also being conducted. (h) Improvements in the design and construction of propeller pumps have been effected and over 100% increase in the efficiency of the existing pumps used for dewatering in Kuttanad has been attained. (i) Proposals have been made to the Government for the Standardisation of Ayurvedic preparations with a view to prescribing specifications and methods for testing their efficiency and purity. A 10-year scheme has also been drawn up for this work. These are under the consideration of Government. (j) Proposals have been drawn up for the publication of a Pharmacognosy of some 300 common medicinal plant materials in use in Ayurvedic practice. The scheme includes compilation of (i) Botanical name and classical Sanskrit names with common vernacular names wherever possible, (ii) Morphological features including technical description with drawings and plate, (iii) Anatomical including histological features of each plant with particular reference to plant parts of medicinal importance. (iv) Medicinal properties of each material based on Ayurvedic texts and modern pharmacological properties, if any. 4. The following research Schemes are in progress in the Applied Chemistry Laboratories of the Central Research Institute and in the University Laboratories:— (a) Soil Survey. (b) Active Principles of the roots of Camphrena decumbens, cyclo Burmanin (Padathali) and Croton Sparassiflora. (c) Resins from Sterculia urens and oil from the seeds of Sterculia Elata (Anathondi). (d) Sterols from the roots of Rotula aquatica (Kalloor-Vanchi) and sugars from the tubers of Holostemma (Adapothian). (e) Essential oils from the scrapings of ginger and the concentration of citral in lemon grass oil of commerce.

Recommendations of the Committee of the Board.	Recommendations of the Board

V. Proceedings of the Provincial & State Scientific & Industrial Research Committees.

Item No.	Particulars.
	(f) Glucoside from the whole plant, Pluttanthus Niruri (keezhanetki) sterol from the oil of the seeds of Amaranthus Cangeticus (Keera) and the active principles of Daemia Extensa (Velipouathy). (g) Oil from Entada Scandens. (h) Investigations on Cerebrum Odollam. (i) Water analysis and purification. (j) Solid fractions of the bye-products of salt industry. (k) Banana Flour. (l) Pyrethrum cultivation and Production of Pyrethrum extracts. (m) Preservation of Sweet Toddy. (n) Statistical analysis of rainfall data for Trivandrum; Design of clove cultivation; and statistical analysis of the physical standards of South Indian recruits to the Army. (being conducted in the Statistical Laboratory).
V. 2.	<i>Subject:—</i> Proceedings of the meetings of the Bengal Industrial Research Board. <i>Synopsis:—</i> The Bengal Industrial Research Board met on the 11th September 1945 at Calcutta. 1. The Board resolved that (a) the Board should function as an independent organisation directly under the Government with a wholetime Secretary; and the executive functions of the Board should vest in the Secretary under the direct guidance of the chairman or the Vice-Chairman; (b) the activities of the Board should comprise: (i) financing of existing Research Institutes, universities and their industrial organisations capable of carrying on research work. (ii) collection of industrial, commercial and other statistics useful to organisations or persons undertaking research work. This should also include collection of information regarding industries in different highly industrially developed countries abroad with reference to organisation, equipment, process of manufacture and other relevant factors. (iii) Maintenance of a library for comprehensive and effective information services regarding raw materials, manufacturing processes, basic scientific principles etc., as far as are available from publications. It should also maintain a register of the sources of modern industrial machinery, equipment etc.

Recommendations of the Committee of the Board.

Recommendations of the Board.

V. 1. The Committee noted the proceedings of the Council of Research, Travancore.

V. 1. The Board noted the proceedings of the Council of Research, Travancore.

V. Proceedings of the Provincial & State Scientific & Industrial Research Committees.

Item No.	Particulars.
	(c) For the working of the Research Board with its library, publicity organisation and financing of the existing Research Institutes universities and other Research Centres provision should be made for a grant of Rs. 2½ lacs for the first year 1945-46) and an annual recurring grant of Rs. 5 lacs for subsequent years. And that the Secretary be directed to approach Government for the provision of this sum of Rs. 2½ lacs without delay. 2. The Board resolved that its further objective should be to organise Research Institute of its own in order to be able to carry on researches of industrial importance with wholtime experienced workers and thus be in a position to make substantial contribution to the development of indigenous industries. The Board considered that a capital grant of Rs. 20 lacs would be required for the establishment of the proposed Research Institute spread over a period of four years. 3. The Board approved of the discontinuance of the schemes, (i) Scientific utilisation of Brass Scraps, (ii) Food and medicinal yeast and (iii) Industrial Ferments, pending further reports from the Sub-Committee. 4. The Board recommended the publication of Dr. Karim's final reports on (i) Study of the development of Gurjan Oil Industry in Bengal and (ii) Modern Electroplating, Part II. 5. The Board considered letter No. 134 Bd 1,44, dated the 29th June 1945 from the Council of Scientific and Industrial Research, Delhi on the subject of Extraction of Potassium Chloride from water Hyacinth. The consensus of opinion of the Board was that in view of the high moisture content the cost of collection of the product and other incidental expenses will not be commensurate with the results of experiments. The Board may, however, take up the work if the Council of Scientific and Industrial Research undertake to supply the raw material.
V. 3.	<i>Subject:—</i> Fifth meeting of the Board of Scientific and Industrial Research, Mysore. <i>Synopsis:—</i> The fifth meeting of the Board of Scientific and Industrial Research, Mysore was held on the 5th November 1945 at Bangalore. Mr. Morton S. Cressy of U. S. A. was present by special invitation and Sir J. C. Ghosh (the first non-official Chairman) presided. 1. The Board considered the establishment of a Central Industrial Research Institute, in the State and resolved unanimously "that the time was opportune for starting a Central Industrial Research Institute in the State with good equipment and expert personnel". The Institute should investigate problems of long range nature and of a magnitude beyond the scope of the research sections attached to the industrial concerns or departments. 2. The Board appointed a special committee to work out the details of the proposed Institute and to prepare a definite scheme for the consideration of Government. They further resolved that as an immediate measure it was necessary to appoint a whole time technical officer as the Executive Secretary of the Board.

Recommendations of the Committee of the Board.	Recommendations of the Board
V. 2. The Committee noted the proceedings of the Bengal Industrial Research Board. V. 3. The Committee noted the proceedings of the Fifth meeting of the Board of Scientific and Industrial Research, Mysore.	V. 2. The Board noted the proceedings of the Bengal Industrial Research Board. V. 3. The Board noted the proceedings of the 5th meeting of the Board of Scientific and Industrial Research, Mysore.

VI. Suggestion from Dr. Nazir Ahmad, Bombay for undertaking research on the development and utilization of atomic energy for industrial purposes in India.

Item No.	Particulars.
	<i>Subject:—</i> Development and utilisation of atomic energy in India—Dr. Nazir Ahmad's suggestion. <i>Synopsis:—</i> Recent developments in atomic physics have shown that the time is not distant when atomic energy would be harnessed and utilised, on a very large scale, for locomotion, and industrial purposes, and would either replace or supplement the existing methods of power production for the operation of industrial plants. All the industrially advanced countries of the world are now devoting a great deal of attention to the vital problem of the harnessing of atomic energy. They have set up expert scientific boards to organise and direct researches on the production and utilisation of atomic energy, and are spending large sums of money to make the necessary surveys and establish laboratories in which research and development work may be carried out, on an adequate scale. India is now on the threshold of large scale industrialisation, and if the plans now before the Government and the public materialise, she will need vast quantities of energy to operate her industrial plants and expand her transport system. India does not unfortunately, possess large sources of petroleum and her hydro-electric and coal resources are only partially tapped and developed. Even if the latter were developed to a much larger extent, they cannot compete with atomic energy considering that one ton of active uranium is equivalent to fifteen million tons of coal in the matter of energy supply. Besides, the energy released from nuclear disruption cannot be substituted by that obtained from chemical reactions for several uses. Dr. Nazir Ahmad suggests that the question of development and utilisation of atomic energy in India be considered by the Board of Scientific and Industrial Research. He further suggests that a Committee be set up to organise a survey of the extent to which the materials required are available or can be produced in India, to work out the lines on which researches should be undertaken immediately and to suggest ways and means of securing collaboration with such of the countries as may be willing to work on the basis of International cooperation. It may be pointed out in this connection that at its last meeting the Board of Scientific and Industrial Research accepted the suggestion of the Director of Scientific and Industrial Research that investigations on uranium and other radio-active substances, in India should be undertaken immediately; and resolved that the attention of the Geological survey of India be drawn to the urgent necessity of investigating uranium-bearing minerals in India.

Recommendations of the Committee of the Board.	Recommendations of the Board
VI. The Committee recommended that Dr. Nazir Ahmad's suggestion be accepted and that the following Sub-Committee be appointed to prepare a detailed note on the subject which should be placed before the Board for consideration : 1. Prof. H.J. Bhabha 2. Prof. K.S. Krishnan 3. Prof. M.N. Saha 4. Mr. D.N. Wadia 5. Dr. Nazir Ahmad 6. Dr. Jivraj Mehta 7. D.S.I.R. (Convenor).	VI. The Board accepted the recommendations of its Committee and decided that the terms of reference of the Committee be as follows : (i) To explore the availability of raw materials capable of generating atomic energy. (ii) To suggest ways and means of harnessing the raw materials for the production of atomic energy. (iii) To keep in touch with similar organisations functioning in other countries and to make suggestions for the co-ordination of the work of this committee on an international basis.

VII. Proposal from Prof. M. N. Saha and Dr. D. N. Wadia for the formation of a research committee under the Council of Scientific & Industrial Research on the measurement of Geological time in India.

Item No.	Particulars.
VII.	<i>Subject:—</i> Proposed Committee for Investigations of the Measurement of Geological Time in India by Prof. Saha & D. N. Wadia. <i>Synopsis:—</i> 1. A systematic examination of the age of rocks by physical, especially radio active methods, is now regarded as a fundamental problem in geology. In India, with its vast rock-systems covering hundreds of thousands of square-miles, totally barren of determinable fossils with no criteria for fixing the geological age of large bodies of rocks, the importance of such investigations is inestimable. So much importance is attached to the subject, that the National Research Council of the U. S. A. appointed in 1931 a Sub-Committee with the veteran geologist, A. C. Lane, as Chairman, styled "The Committee on the Measurement of Geological Time". Scholars such as Urry (Harward), Nier (Minnesota), Evants, Rose and Stranathan (New York University) have been working in this body and have published valuable memoranda and reports in the well-known publications of the N. R. C., "Physics of the Earth". 2. They applied new methods of analysis, e.g. use of mass-spectrograph by Nier, the use of HFS method by Rose and Stranathan and the new ionisation-spectrometer by Dunbridge and Brown. These methods have resulted in fresh light being thrown on the ages of rocks in different parts of the U. S. A. and have been of great use to mineralogist and economic geologists in arriving at the proper geological structure of the vast American continent. 3. In the U. K., the need for radioactive determination of the age of rocks is not so much felt because of the rich fossil material present in the English rock-systems, which furnish the required data for their chronology. But, even in England, scholars like Prof. A. Holmes (Durham University) and Prof. Paneth (London) received grants from the DSIR for systematic study of this problem. 4. In India, though the importance of the work is great and was recognised by the Geological Survey of India, soon after the first World War, the work on this line has been only sporadic and confined to determinations of a few occasional specimens of minerals, without any collaboration between geologists and physicists. 5. The great crystalline massif of the Deccan is composed of a varied assemblage of ancient geological formations whose absolute age, relative position, unconformities and the order of succession, are yet very imperfectly known to geologists. Precise facts on these are perhaps not going to be ever knowable by purely geological methods, so far as they are at present developed; the only practical approach today to these problems is by physical, mainly radio-active, examination. It is superfluous to add that while this study will help in understanding the chronological order of the great undated rock-systems of the Deccan and the general geological lay-out of the Indian sub-continent, such knowledge will help mineralogists and prospectors in locating minerals and ores of economic value and in tracing the consanguinity of the

Recommendations of the Committee of the Board.

Recommendations of the Board.

VII. Proposal from Prof. M. N. Saha and Dr. D. N. Wadia for the formation of a research committee under the Council of Scientific & Industrial Research on the measurement of Geological time in India.

Item No.	Particulars.
	widely scattered mineral-bearing pegmatite veins and dykes through wide stretches of the country.
	6. We suggest the following plan of researches to be carried out :
	1. A systematic examination of the radio-active contents of minerals occurring in different rock-systems of India.
	2. Similar examination of rock specimens obtained from well-marked igneous intrusives traversing—rocks of doubtful ages.
	(3) Uranium, thorium and radium contents of granites and gneisses.
	(4) The correlation of the mica pegmatites of Gaya, Nellore and Mysore, bearing the minerals uranite, thorianite, torbernite, carnotite, gadolinite, samarskite, columbite etc.
	(5) The determination of the much-debated sequence of Archaean rocks in Chota Nagpur, Mysore and the Central Provinces; the age of the Himalayan central gneiss and of basic intrusive dykes.
	(6) Age levels of different horizons of the Deccan Trap lava pile.
	(7) Examination of radioactive content of Indian minerals by
	(i) Ionisation electrometer, (ii) Mass-spectrograph,
	(iii) Hyper-fine structure methods (HFS), (iv) Pleochroic haloes, and
	(v) Lead-uranium-ratio and (vi) helium-ratio.
	7. The work sketched in outline above can be carried out when the necessary equipment is provided at the following three centres: (i) The Palit Laboratory, Calcutta University, (ii) The Laboratory of the Geological Survey of India, and (iii) The Indian Institute of Science, Bangalore, and may be extended to other centres if desired, and other workers are forthcoming. The Palit Laboratory of the Calcutta University possesses the ionisation electrometer and a number of useful determinations on the radioactivity of Indian and Ceylon minerals have already been carried out since 1941. Some of the equipment for the study of the hyperfine structure already exists at the Palit Laboratory. The Geological Survey of India Laboratory is likewise equipped for radioactive work on thermal springs.
	8. The scheme proposed here is intended to be tried for five years in the first instance and the committee suggested below will allocate work, funds and apparatus etc. to the research bodies mentioned. The Committee will also provide full collaboration among the bodies for the purpose of interchange of views apparatus, specimen etc. and will, from time to time, review the work done and formulate plans for further researches.
	9. The funds needed for the work will include purchase of apparatus, emoluments of research assistants and contingent expenses and will depend on the number of research assistants and the fields of investigation being tackled.

Recommendations of the Committee of the Board.	Recommendations of the Board

VII. Proposal from Prof. M. N. Saha and Dr. D. N. Wadia for the formation of a research committee under the Council of Scientific & Industrial Research on the measurment of Geological time in India.

Item No.	Particulars.
	10. We suggest the following personnel for the proposed Committee with powers to add specialist research workers to their number :—
	(1) Mr. D. N. Wadia.
	(2) Prof. M. N. Saha,
	(3) Sir J. C. Ghosh.
	(4) Director, Geological Survey of India,
	(5) Prof. B. Sahni,
	(6) Dr. C. Mahadevan,
	(7) Dr. M. S. Krishnan,
	(8) Dr. P. B. Sarkar,
	(9) Dr. B. D. Nag Chowdhury.

Recommendations of the Committee of the Board.

VII. The Committee recommended that the proposal be discussed by the Board.

Recommendations of the Board.

VII. The Board approved of the suggestion of Prof. Saha and Dr. Wadia regarding the setting up of a Committee for the Measurement of Geological Time in India and approved of the constitution of the Committee as proposed in their note. It was further recommended that Dr. Wadia be appointed Chairman of this Committee and the programme of work proposed by the Committee be submitted to the Board.

VIII. Consideration of proposals for research on master alloys of beryllium.

Item No.	Particulars.
	<i>Subject:—</i> Consideration of proposals for research on master alloys of beryllium. <i>Synopsis:—</i> The D.S.I.R. has been consulted by the Labour and Planning & Development departments of the Government of India on the subject of beryl. As soon as he came to know of the great American interest in Indian beryl and the fact that England was not very advanced in beryl alloys (particularly the master alloys) the D.S.I.R. drew the attention of the Labour Deptt. that any monopolies that the Government of India gave to America in the name of war effort must be conditional on the American Government training some Indian and British scientists in the technique of master alloy formation. It would appear that the Telegraph Construction and Maintenance Co., London have not done much research on the master alloys of beryl and would desire to be associated with the Council of Scientific and Industrial Research in the development of master alloy, knowing full well that some work of this nature had already been done under the auspices of the Council in India. The secret of the master alloy of beryl is somewhat related to the development of the atomic bomb as it has come to our knowledge that in the early experiments the sources of neutron for bombardment of U235 were obtained from an alloy of radium and beryllium. A secret letter has been received from Mr. G.C. Mitter of the Bombay Mint which is of great interest as it gives an insight into the advanced stage in which the industry was in Germany and Italy. In India we are not in a position to prepare large scale quantities of beryllium oxide for want of proper equipment. The information available shows that beryllium oxide dust is very poisonous and it is risky to make large scale experiments without proper equipment. On the other hand the manufacture of beryllium oxide and master alloy beryl are problems which should be taken up as national problems Arrangements should be made to rig up a right kind of pilot plant. In the meanwhile Mr. G.C. Mitter who is now on deputation to England and U.S.A. has been requested to keep an eye on the developments in the manufacture of beryllium oxide or metal in America and to send information to us. As the manufacture of beryllium oxide and metal are very important from the point of view of our national welfare and at the same time these subjects are top secrets both in England and America, the D.S.I.R. feels that the industry should be brought into being in this country which may have to be state owned. The Government can also go into partnership with a firm in India whose bonafides must be well established and who should be able to keep secrets in case the uses of alloys become necessary for national defence at any future date. It is necessary that the B.S.I.R. should formulate a definite programme of research on beryllium oxide and on the development of the manufacture of master alloys of beryllium. The D.S.I.R. will furnish full information on the subject at the meeting.

Recommendations of the Committee of the Board.

Recommendations of the Board

VIII. The Committee recommended that the Government of India be requested to stop the export of beryllium from India. It was also recommended that a Committee consisting of the following be appointed to work out a programme of research on beryllium and its alloys:—

1. Mr. G.C. Mitter
2. Dr. Mata Prashad
3. Sir J.C. Ghosh
4. Dr. P.R. Roy.

VIII. The Board accepted the recommendations of its Committee, and appointed the D.S.I.R. as Convener of the proposed Committee.

IX. Appointment of Chairmen of the Applied Physics & Cellulose Research Committees vice Dr. Nazir Ahmad

Item No.	Particulars.
	<i>Subject:—</i> Appointment of the Chairmen of the Applied Physics and Cellulose Research Committees of the Board of Scientific and Industrial Research Vice Dr. Nazir Ahmad. <i>Synopsis:—</i> Dr. Nazir Ahmad, Chairman of the Applied Physics Committee of the Board of Scientific and Industrial Research has tendered his resignation of the chairmanship of that committee in view of his appointment as a member of the Tariff Board with effect from 15th November 1945. He has stated that he would find it difficult to attend to the work of many committees and sub-committees specially those which might involve absence from Bombay which is the headquarters of the Tariff Board. He has requested that another member of the Applied Physics Committee be appointed as Chairman of this Committee. The present personnel of this committee is as follows :— 1. Dr. Nazir Ahmad (Chairman) 2. Prof. P.K. Kichlu 3. Principal G.R. Paranjpe 4. Prof. K.S. Krishnan 5. Prof. S.K. Mitra 6. Mr. B. B. Bhowmik 7. Mr. K.P.P. Menon 8. Prof. M.N. Saha 9. Prof. P.N. Ghosh 10. Prof. Rafi Mohd, Chowdhury 11. Superintendent, Mathematical Instrument Office, Calcutta. 12. Director, Scientific and Industrial Research (ex-officio). Subsequently Dr. Nazir Ahmad also resigned from the Chairmanship of the Cellulose Research Committee of the B.S.I.R. the present personnel of the Cellulose Research Committee is as follows :— 1. Dr. Nazir Ahmad (chairman) 2. Sir Shri Ram 3. Dr. J.K. Choudhary. 4. Prof. N.N. Godbole. 5. Dr. L. Thoria. 6. D.S.I.R. The matter is placed before the Board for appointment of the chairman of the Cellulose Research Committee Vice Dr. Nazir Ahmad.

Recommendations of the Committee of the Board.

Recommendations of the Board.

IX. The Committee recommended that Dr. K.S. Krishnan be appointed Chairman of the Applied Physics Committee. The Committee recommended that Dr.S. Krishna of the Forest Research Institute, Dehra Dun be appointed a member and Chairman of the Cellulose Research Committee.

IX. The Board accepted the recommendations of its Committee.

X. Consideration of the Rules for the purchase of equipment from the grants-in-aid sanctioned by the Council of Scientific and Industrial Research, maintenance of inventory of equipment and apparatus and return of the equipment and apparatus on the termination of work on schemes.

Item No.	Particulars.
X.	<i>Subject :—</i> Draft rules for the purchase and return of equipment purchased out of the grants-in-aid sanctioned by the C.S.I.R. <i>Synopsis :—</i> Arising out of Prof. S. K. Mitra's request for permission to retain on loan for his own work some of the equipment purchased out of the grants made by the Council of Scientific and Industrial Research for his scheme on Design of Electro Acoustical and High Frequency Apparatus, the Board of Scientific and Industrial Research felt that since a request of this nature involved a question of principle a Sub-Committee consisting of the D.S.I.R., Dr. Sir J.C. Ghosh and Dr. Jivraj N. Mehta be appointed to frame rules and regulations regarding the disposal of equipment and apparatus purchased out of the grants of the C.S.I.R. The Governing Body accepted this recommendation of the Board. In accordance with this recommendation, the draft rules were framed and submitted to the committee for approval. In the light of the comments received from the members of the committee the draft rules have been amended and are now placed before the Board for consideration. Final Draft Rules for the purchase and return of equipment purchased out of the grants-in-aid sanctioned by the C.S.I.R. 1. Grants for equipment shall be utilised only for the purchase of any apparatus which is found to be absolutely necessary in addition to the facilities already available in the institutions receiving the grants. If a pilot plant occupying large floor space has to be put up temporary sheds may be erected and part of the cost of the shed be met from C.S.I.R. funds. 2. All equipment and apparatus purchased out of the grants-in-aid shall be the property of the Council of Scientific and Industrial Research and all non-perishable articles shall be returnable to the C.S.I.R. on the termination of any scheme to any institute or laboratory of the Council as may be directed by the D.S.I.R. For this purpose there shall be maintained an inventory of equipment etc. purchased out of the grants giving also particulars of the cost of each item. 3. A register of inventory of non-perishable articles shall be maintained by the head of institution receiving grants in respect of each scheme in the form prescribed by the C.S.I.R. and extracts from this register in the prescribed form shall be submitted to the Secretary, C.S.I.R. at the end of each half year i.e. 31st March and 30th September each year.

Recommendations of the Committee of the Board.

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X. Consideration of the Rules for the purchase of equipment from the grants-in-aid sanctioned by the Council of Scientific and Industrial Research, maintenance of inventory of equipment and apparatus and return of the equipment and apparatus on the termination of work on schemes.

Item No.	Particulars.
	Chemicals and working stores used in the course of research shall not be entered in the register of inventory. 4. The Secretary, C.S.I.R. shall have the half yearly extracts from the inventory register received from the Heads of Institutions checked up and entered in inventory registers maintained by the C.S.I.R. These registers shall be maintained in two parts (1) scheme-wise and (2) article-wise with an alphabetical index according to the articles. 5. All non-perishable articles of equipment of the value of Rs. 50 and above shall be suitably branded or marked in order to prevent their being replaced by others. 6. At the end of each financial year the Head of each institution receiving grant-in-aid shall submit a consolidated statement of grant received for the purchase of equipment in respect of each research scheme which was in operation in his institution during the course of the financial year and give against this amount details of the purchases of the various items of equipment showing the value of each item and the balance of the unexpended equipment grant carried over to the next financial year. Investigators in charge of schemes not attached to any recognised institution shall like-wise submit annual statements at the end of each financial year. 7. On the termination of a scheme the Head of the Institution or the investigator where he is not attached to any recognised institution, as the case may be, shall submit to the Secretary C.S.I.R. a complete list of all the items of non-perishable equipment purchased for work on the scheme in stock at the time of termination of the scheme. 8. On receipt of the final list at the termination of the scheme the D.S.I.R. may at his discretion authorise the Head of Institution or the investigator concerned to dispose of all non-consumable or non-perishable articles valued under Rs. 5 per article such as (a) glass or miscellaneous apparatus not included in the category of optical apparatus or instrument (b) miscellaneous bazar purchases (c) cloth articles such as dusters, towels, etc. and (2) articles whose value is under Rs. 10 per article such as (a) locally made articles (b) wooden cages for animals (c) shelves etc. In all such cases the sale proceeds shall be sent to the Secretary, C.S.I.R. through cheques on the Imperial Bank of India, Delhi. 8. (a) C.S.I.R. on the recommendation of D.S.I.R. may permit the institution to retain these articles at value between 15 to 50% of the cost price. 8. (b) In cases where the items of equipment are (i) too bulky or (ii) heavy that the cost of their packing and transport to the Head Office of the Council will cost an amount equal to the value of those articles and (iii) in all cases where the articles purchased have been utilised in fabricating special pilot plants or furnaces or special apparatus which will lose their value if dismantled and the pilot plants or furnaces cannot be bodily moved or where the equipment has been fabricated according to design and drawings supplied by the investigator

Recommendations of the Committee of the Board.	Recommendations of the Board

X. Consideration of the Rules for the purchase of equipment from the grants-in-aid sanctioned by the Council of Scientific and Industrial Research, maintenance of inventory of equipment and apparatus and return of the equipment and apparatus on the termination of work on schemes.

<i>Item No.</i>	<i>Particulars.</i>
	and under his supervision. Such articles may at the discretion of the D.S.I.R. be disposed to the Institution concerned at a value of 15% to 50% of the cost price of the equipment or apparatus depending upon the age, condition and serviceability of the equipment or apparatus concerned. The sale proceeds shall be sent to the Secretary, C.S.I.R. by cheques on the Imperial Bank of India, Delhi. In cases where less than 15% is charged, such cases shall be reported to the B.S.I.R. 9. If any non-perishable apparatus or equipment costing over Rs. 25 in value has been lost, damaged or become otherwise unserviceable for further use, a list of such items shall be furnished to the Secretary, C.S.I.R. by the Head of the institution or investigator as the case may be. The D.S.I.R. shall write off the value of such articles provided he is satisfied that the loss is not due to theft and that it has not disclosed a defect of system or negligence on the part of any individual, subject to a report to the Governing Body. 10. Except as provided for in rule 8 (a) and 8 (b) all serviceable articles of equipment and apparatus exceeding Rs. 50 in value shall be returned by the Head of Institution or the investigator as the case may be to such institute or laboratory of the Council as may be instructed by the D.S.I.R. well packed to obviate damage in transit, 'freight to pay' by passenger train. 11. Articles of equipment and apparatus purchased out of the grants made by the Council shall not be lent for use by the Institution or investigator as the case may be in any other scheme or work not sanctioned by the C.S.I.R. without the specific permission of the D.S.I.R. D.S.I.R. shall not ordinarily permit the loan of apparatus and equipment purchased out of the grant-in-aid from the C.S.I.R. unless such articles are required for use in any project sanctioned by the C.S.I.R. for which the institution or the investigator concerned is not able to obtain similar equipment from any other source.

Recommendations of the Committee of the Board.

Recommendations of the Board.

X. The Committee recommended that the draft rules prepared by the Director of Scientific and Industrial Research, Sir J.C. Ghosh and Dr. Jivraj N. Mehta be approved.

X. The Board accepted the recommendations of its Committee.

XI. Sanction to the continuation of the scheme on the compilation of the Dictionary of Economic Products and Industrial Resources of India.

Item No.	Particulars.				
	<i>Subject :</i>				
	Sanction to the continuation of the scheme on the compilation of the Dictionary of Economic Products and Industrial Resources of India.				
	<i>Synopsis :</i>				
	The compilation of the Dictionary of Economic Products and Industrial Resources of India has not yet been completed. Continuation of the following posts of officers and of the establishment is considered necessary for the year 1946-47 :				
	I OFFICERS				
S. No.	Designation	Present pay	Scale	No. of posts	Period for which sanction is required.
1.	Chief Editor	Rs. 1200	600-25-650-35-1000-50-1200	1	1-3-46 to 28-2-47
2.	Assistant Secretary	525	500-25-750	1	do
3.	Assistant Editor (Botany)	—	350-25-550-30-700	2	do
4.	Assistant Editor (Ind.)	350	do	1	do
5.	Assistant Editor (Geology)	150	(fixed)	1	do
6.	Assistant Editor (Zoology)		350-25-550-30-700	1	do
7.	Ledger Keeper		250-25-600	1	do
	II TECHNICAL STAFF.				
1.	Technical assistants		150-10-300	9	do
2.	Artist		150-10-300	1	do
	III ESTABLISHMENT.				
1.	Assistants		100-140-10-280-10		
			310-15-400.	2	do
2.	2nd Division Clerk		80-4-120-5-200	1	do
3.	3rd division clerks		60-5-100-E.B. 10-120	2	do
4.	Typist		do	1	do
5.	Stenoclerks		do plus Rs.20p.m. shorthand allowance		
				5	do
6.	Stenographers		125-5-180-10-300	3	do

Recommendations of the Committee of the Board.

Recommendations of the Board.

XI. Sanction to the continuation of the scheme on the compilation of the Dictionary of Economic Products and Industrial Resources of India.

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	IV INFERIOR ESTABLISHMENT				
1.	Daftari	30	20-1-30	1	1-3-46 to 28-2-47
2.	Dafadar	18	18	1	do
3.	Peons	14	14-18	7	do
4.	Chowkidar	14	14-18	1	do
5.	Farash	14	14-18	1	do
Provision for the continuation of these posts has been made in the budget estimates of the office of the C.E.D. for the year 1946-47.					

Recommendations of the Committee of the Board.	Recommendations of the Board
XI. The Committee recommended that the scheme of the Compilation of the Dictionary of Economic Products and Industrial Resources of India be continued. It was further recommended that continuance of the posts detailed on pages 156-158 of the Agenda be sanctioned for another year.	XI. The Board recommended that the scheme on the compilation of the Dictionary of Economic Products and Industrial Resources of India be continued for another year and that the services of the staff be extended for a similar period.

XII. Proceedings of the Joint-meeting of the Sub-Committee of the Council of Scientific and Industrial Research and the Representatives of the War Transport Department to consider the detailed plan for setting up a Road Research Institute.

Item No.	Particulars.																											
	<i>Subject:—</i> Proceeding of the Joint-meetings of the Sub-Committee of the Council of Scientific and Industrial Research and the Representatives of the War Transport Department to consider the detailed plan for setting up a Road Research Institute. <i>Synopsis:—</i> A joint meeting of the Sub-Committee appointed by the Governing Body of the Council of Scientific and Industrial Research to work out plans and estimates for the proposed Road Research Institute with the representatives of the War Transport Department was held in Committee Room No. 'B' North Block, Imperial Secretariat Buildings, New Delhi at 11 a.m. on Friday, the 9th November 1946. The following were present :— <table><tr><td>Sir Kenneth Mitchell</td><td>—</td><td>Representative of the War Transport Department, (in the chair)</td></tr><tr><td>Mr. G.M. McKelvie</td><td>—</td><td>Representative of the War Transport Department.</td></tr><tr><td>Dr. H.B. Dunnicliff</td><td>—</td><td>Representative of the War Transport Department.</td></tr><tr><td>Mr. Raghavachari</td><td>—</td><td>Representative of the War Transport Department.</td></tr><tr><td>Brigadier Jacques</td><td>—</td><td>Representative of the Engineer-in Chief Branch, G.H.Q.</td></tr><tr><td>Mr. Baskin</td><td>—</td><td>Representative of the Engineer in-Chief Branch, G.H.Q.</td></tr><tr><td>Sir S.S. Bhatnagar</td><td>—</td><td>Director of Scientific and Industrial Research, Representative of the Council of Scientific and Industrial Research.</td></tr><tr><td>Mr. Madan Gopal Sardana— Principal, Roorkee Engineering College</td><td>—</td><td>Representative of the Council of Scientific and Industrial Research.</td></tr><tr><td>Mr. R.P. Bahadur</td><td>—</td><td>Secretary, Council of Scientific and Industrial Research.</td></tr></table> Sir Teja Singh Malik and the Director, Government Test House, Alipore, Calcutta were unable to attend the meeting. In opening the proceedings Sir Kenneth Mitchell recalled that the Council of Scientific and Industrial Research were proposing to set up five National Laboratories at various centres in the country. In addition to these laboratories, the Industrial Research Planning Committee of the Council of Scientific and Industrial Research had recommended the establishment of a number of specialised research institutes and the Road Research Institute was one of them. The Indian Roads Congress had, in this connection, put up a plan for the establishment of a	Sir Kenneth Mitchell	—	Representative of the War Transport Department, (in the chair)	Mr. G.M. McKelvie	—	Representative of the War Transport Department.	Dr. H.B. Dunnicliff	—	Representative of the War Transport Department.	Mr. Raghavachari	—	Representative of the War Transport Department.	Brigadier Jacques	—	Representative of the Engineer-in Chief Branch, G.H.Q.	Mr. Baskin	—	Representative of the Engineer in-Chief Branch, G.H.Q.	Sir S.S. Bhatnagar	—	Director of Scientific and Industrial Research, Representative of the Council of Scientific and Industrial Research.	Mr. Madan Gopal Sardana— Principal, Roorkee Engineering College	—	Representative of the Council of Scientific and Industrial Research.	Mr. R.P. Bahadur	—	Secretary, Council of Scientific and Industrial Research.
Sir Kenneth Mitchell	—	Representative of the War Transport Department, (in the chair)																										
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Recommendations of the Committee of the Board.

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XII. Proceedings of the Joint-meeting of the Sub Committee of the Council of Scientific and Industrial Research and the Representatives of the War Transport Department to consider the detailed plan for setting up a Road Research Institute.

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	Road Research Institute for the consideration of the Industrial Research Planning Committee and the present proposals were based on the suggestions submitted to that Committee. Sir Kenneth stated that he was glad to learn that the Council of Scientific and Industrial Research had agreed in principle to the setting up of a Road Research Institute and that this meeting had therefore been called to make definite suggestions on the functions, scope, etc. of the proposed Road Research Institute. Sir S. S. Bhatnagar explained the idea of the Council in starting the five National Laboratories. He further added that the Council of Scientific and Industrial Research appreciated the importance of Road research and of collaboration with the War Transport Department in the post-war development of roads in India. Sir S. S. Bhatnagar said that the first point to be settled was to constitute a body which could be authorised to go into the question of the various details of the Institute. After some discussion in which several members took part, the scheme for the establishment of the Road Research Institute as put up by Mr. McKelvie was recommended for adoption. Mr. McKelvie stressed the importance of very early action in setting up the organisation for road research. He pointed out that in connection with the scheme for the post-war development of roads, the various provinces would be taking action almost immediately and he wanted a special body to help the various provincial authorities in immediate problems of road and bridge construction awaiting further research. Sir S.S. Bhatnagar informed the Committee that the Governing Body of the Council of Scientific and Industrial Research at their meeting held on the 21st September 1945 had already accepted the estimates prepared by the War Transport Department for the establishment of the Institute subject of course to the condition that the requisite funds for the purpose were placed at the disposal of the Council by the Government of India. The capital expenditure envisaged was Rs. 13.5 lakhs and in the first five years the annual recurring expenditure was estimated to be Rs. 4 lakhs making the total to Rs. 17.5 lakhs. As all this amount would not be required in the first year it was proposed by Sir S. S. Bhatnagar that Government of India may be approached to accept in principle this grant of Rs. 17.5 lakhs and to sanction for 1946-47 the first instalment of Rs. 7.5 lakhs made up as below : <table><tr><td colspan="2"><i>Capital</i></td></tr><tr><td>Building</td><td>— 1 lakh as against the proposed 3 lakhs</td></tr><tr><td>Equipment</td><td>— 3 lakhs as against the proposed 8 lakhs</td></tr><tr><td>Road test track equipment</td><td>— 1.5 lakhs as against 2.5 lakhs.</td></tr><tr><td colspan="2"><i>Recurring expenditure.</i></td></tr><tr><td>Staff</td><td>— 1 lakh as against the proposed 2.5 lakhs</td></tr><tr><td>Supplies & services</td><td>— 1 lakh as against 1.5 lakhs</td></tr><tr><td>Total</td><td>— 7.5 lakhs.</td></tr></table>	<i>Capital</i>		Building	— 1 lakh as against the proposed 3 lakhs	Equipment	— 3 lakhs as against the proposed 8 lakhs	Road test track equipment	— 1.5 lakhs as against 2.5 lakhs.	<i>Recurring expenditure.</i>		Staff	— 1 lakh as against the proposed 2.5 lakhs	Supplies & services	— 1 lakh as against 1.5 lakhs	Total	— 7.5 lakhs.
<i>Capital</i>																	
Building	— 1 lakh as against the proposed 3 lakhs																
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Total	— 7.5 lakhs.																

Recommendations of the Committee of the Board.

Recommendations of the Board.

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XII Proceedings of the Joint-meeting of the Sub Committee of the Council of Scientific and Industrial Research and the Representatives of the War Transport Department to consider the detailed plan for setting up a Road Research Institute.

Item No.	Particulars.
	The Committee agreed to the suggestion of Sir S. S. Bhatnagar but they felt that the provision of 1 lakh of rupees for the building as suggested would be inadequate. The Committee therefore decided to recommend that the provision for building be increased to 3 lakhs of rupees in view of the fact that the entire building will have to be constructed during the year 1946-47. It was therefore recommended that the Government of India be approached to sanction for 1946-47 a grant of Rs. 9.5 lakhs. The meeting next proceeded to consider the question of setting up a Road Research Advisory Committee. It was unanimously decided that the following Committee with power to co-opt be constituted to frame the initial constitution of the Institute : Sir Kenneth Mitchell (Chairman) Mr. G. M. McKelvie (Vice-Chairman) Dr. H. B. Dunnicliff —Representative of the War Transport Department. One representative of the Engineer-in-Chief. Two representatives of the C. S. I. R. The Director of Scientific and Industrial Research. 2. The Committee also made the following recommendations : 1. That in addition to the Road Research Advisory Committee a body to be called Road Research Assessors be constituted and that its personnel be as follows: Chairman — To be elected by the Body. — 1 Consulting Engineer (Roads) Ex-officio Vice-Chairman. Members — 11 Representatives of Provincial Chief Engineers (B & R) 1 Chief Engineer, C. P. W. D. or his Representative. 3 Representatives of the Council of Scientific and Industrial Research. 1 Director of Scientific & Industrial Research. Ex-officio. 1 Representative of E-in-C. 3 Representatives of States (Appointed by the Crown Representative) 1 Representative of Municipalities. 2 Elected by the Road Research Board. 1 President of Indian Road Congress (if not already on the Board).

Recommendations of the Committee of the Board.

Recommendations of the Board

XII. Proceedings of the Joint-meeting of the Sub-Committee of the Council of Scientific and Industrial Research and the Representatives of the War Transport Department to consider the detailed plan for setting up a Road Research Institute.

Item No.	Particulars.
	i Representative nominated by the President of Institution of Engineers (India) Secretary — i Director of Technical Coordination and Information. ii. That immediate steps should be taken by the Council of Scientific and Industrial Research to appoint a Director of Road Research on a salary in the neighbourhood of Rs. 3,000/- p. m., the incumbent to be appointed on 5 years' contract. iii. The post be advertised in U. S. A., England and India and in addition, the Bureau of Public Roads in Washington and the Roads Research Station, Harmondsworth be contacted to ascertain if they can suggest any suitable names for the post of Director of Road Research. iv. Selection to be made by a Committee to be constituted for the purpose and the final selection to be made by the Council of Scientific and Industrial Research in consultation with the War Transport Department. v. That immediate steps be taken by the War Transport Deptt to appoint a Director of Technical Co-ordination on approximately the same salary level and terms of service as the Director of Road Research. vi. That the other officers required be appointed in consultation with both the Director of Road Research and the Director of Technical Co-ordination. 3 The Committee next discussed the question of site for the proposed Road Research Institute. Mr. McKelvie was of the opinion that Delhi would be an ideal place for the reasons that (1) it is a central place, (2) that laboratories at Delhi would be readily visited by good engineering firms all over India who often had occasion to visit Delhi, and (3) it has arterial roads with heavy traffic on them which would be a special advantage for investigations of this nature. Sir S. S. Bhatnagar pointed out that the Council of Scientific and Industrial Research had already decided to establish a temporary building Research Unit under its auspices at the Thomason Civil Engineering College, Roorkee and he thought that Roorkee might be a better place for a building research institute than Delhi. He agreed, however, that the Buildings and Roads Research Institute should be sited close together if possible. It was finally agreed that Mr. McKelvie should send a note to the Director of Scientific and Industrial Research on the question of the site for the Road Research Institute and that the Director of Scientific and Industrial Research should place Mr. McKelvie's note before the next meeting of the Council of Scientific and Industrial Research with a note from him that the Committee was strongly in favour of the proposed Institute being established in Delhi. 4. The question of collaboration between the Director of Technical Co-ordination and the Scientific personnel engaged on road research was next discussed and it was decided that in order to obtain the best results, closest liaison between the two Directors should be established and maintained. The meeting terminated with a vote of thanks to the Chair.

Recommendations of the Committee of the Board.

Recommendations of the Board.

XII. The Committee recommended that the proceedings of the Joint meeting of the Sub-Committee of the Council of Scientific and Industrial Research and the representatives of the War Transport Department be approved.

XII. The Board accepted the recommendations of its Committee.

XII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

Item No.	Particulars.
XII.	<i>Subject :—</i> Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research. <i>Synopsis :—</i> In accordance with the decision of the Board of Scientific and Industrial Research dated the 18th March 1945 draft rules of procedure for the guidance of chairmen of research committees were prepared and placed before the Board for consideration at their 15th meeting held on the 20th September 1945. The Governing Body, on the recommendation of the Board, appointed a Sub-Committee consisting of Prof. M. N. Saha, Prof. K. S. Krishnan, Dr. Nazir Ahmad and Mr. R. P. Bahadur to examine the draft rules and to make recommendations to the Board. This Committee met on the 18th and 19th October 1945 at New Delhi and revised the draft rules. The draft rules as revised by the Committee are given below. Rule 1 of the Draft rules for the guidance of chairmen of research committees has been amended by the Hon'ble President in order to separate Scientific Research from Applied Research. The Rules are given in a tabular statement showing the rules as they were originally framed, the rules as they have been finally amended and the reasons for amendment and remarks. The rules are now placed before the Board for approval. A—Rules of Procedure for the guidance of Chairmen of Research Committees of the Board of Scientific & Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment & remarks.
I.	Research Committees may be appointed by the Council of Scientific and Industrial Research one for each subject or group of subjects, for the effective organisation and co-ordination of research work on different schemes. The Committee will be required to convey the progress made by the Industry or industries under its purview and formulate planned programmes of research for raising the standard of indus-	Research Committees may be appointed by the Council of Scientific and Industrial Research, one for each subject or group of subjects, for effective organisation and co-ordination of research work on different schemes relating to the subject. The Committee will be required to survey the existing position in the subject, take stock of the research work done in the country on it and formulate planned progress of	The reason for the change is to stress the fact that research committees are to consider scientific research of as much importance as industrial research. So far the Council of Scientific and Industrial Research has been financing schemes of applied nature of immediate importance and pure scientific research has not received so much consideration. A change has therefore been sugges-

Recommendations of the Committee of the Board.	Recommendations of the Board

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	try or for introducing a new industry for which the necessary raw materials and other facilities are available. It is not necessary for individual members of research committees to take up the execution of any research schemes themselves, but the committee as a whole will have to watch the progress of each scheme, formulate co-ordinated proposals of further schemes, and in general, assist the Director and the Council of Scientific and Industrial Research in ensuring that the grants are used to best advantage and that the work done by recipients is commensurate with the expenditure incurred.	research for the advancement of knowledge or the application of such knowledge to problems of national or industrial importance. In the case of industrial subjects, the Committee will examine the progress made by the industry or industries within its purview and formulate planned programmes of research for advancing the technical standard of the industry or industries, or for starting new industries where raw materials and other facilities are available. Members of research committees should be chosen on the basis of their knowledge and interest in the subject, but it is not necessary that they have to take up the execution of any research scheme themselves; but the committee as a whole will have to watch the progress of each scheme, formulate co-ordinated proposals of further schemes, and, in general, assist the Council of Scientific and Industrial Research in ensuring that the grants are used to the best advantage and that the work done by the recipients is commensurate with the expenditure incurred.	ted by the Committee in view of the fact that the Council's policy now is to encourage pure scientific research as well as industrial research.

<i>Recommendations of the Committee of the Board.</i>	<i>Recommendations of the Board</i>

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
2 (A)	Schemes received from investigators will be forwarded in the first instance to the chairman of the relevant research committee for opinion and comments. The Chairman of the Research Committee will circulate the schemes among the members of his committee to elicit their opinion. Whenever the information is not complete the Chairman of the Research committee will request the investigator to submit the full details of his technical programmes and proposals for expenditure. The proposals should show the estimated expenditure to be incurred separately for each financial year under the following headings : (a) Equipment (b) Contingencies. (c) Staff (including research scholars, if any) particulars of equipment should be furnished in support of the estimates.	Same as in previous column.	
2. (B)	The Council of Scientific and Industrial Research have laid down the following three grades of pay for research assistants for work on schemes of research financed by them : 1 Rs. 100-125-10-175 for persons with ordinary qualifications.	Same as in previous column.	

Recommendations of the Committee of the Board.

Recommendations of the Board.

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	2 Rs. 150-10-250 for persons with better qualifications and/or research experience.		
	3 Rs. 250-25-400 for persons with special qualifications and research experience.		
2 (C)	It is the special responsibility of the chairmen of the research committees in recommending schemes to see that the rates of pay proposed for the research assistants fall within one or the other of these grades with due regard to the criteria of qualifications and experience. Further he should also satisfy himself that the monthly remuneration proposed for research scholars is, as far as possible, not in excess of that allowed to other scholars doing similar work in the same institution.	Same as in previous column.	
2 (D)	On receipt of the recommendations of the Committee from its chairman, the scheme with the views of the Committee will be placed before the Board of Scientific and Industrial Research and the grants sanctioned by the Governing Body of the Council of Scientific and Industrial Research on the recommendations of the Board will be communi-	On receipt of the recommendations of the Committee from its chairman, the scheme with the views of the Committee will be placed before the Board of Scientific and Industrial Research and the grants sanctioned by the Council of Scientific and Industrial Research on the recommendations of the Board will be communicated to the investi-	The idea behind the amendment of this rule is to lay down definitely that sanctions to schemes given by the Council should be communicated to the parties concerned and arrangements should be made for also placing the funds for work on the schemes within one month of the date of the Governing Body meeting in which such sanctions were given.

Recommendations of the Committee of the Board.	Recommendations of the Board

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for ammendment and remarks.
	cated to the investigator, the head of his institution and the Chairman of the Committee concerned. Fund sanctioned for the scheme will be placed at the disposal of the Head of the Institution concerned.	gator, the head of his institu- tion and the chairman of the committee concerned within one month of the meeting of the Governing Body of the Council of Scientific and Industrial Research in which any particular scheme is sanctioned. Funds sanctioned for the scheme will be placed at the disposal of the head of the institution concerned within one month of its sanc- tion by the Council.	
3.	Periodical Reports about the progress of the schemes financed out of the grants-in-aid shall be submitted by each investigator to the Chairman of Research Committee on the subject at intervals of six months, in March and Sep-tember each year. The Chair- man of each Research Com- mittee shall obtain the half yearly progress reports from investigators of all research schemes sanctioned under the purview of the Committee, scrutinise the reports and sub- mit them with his comments on each report to reach the Director, Scientific and Indus- trial Research by the 31st March and 30th September each year.	Same as in previous column.	

Recommendations of the Committee of the Board.	Recommendations of the Board.

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under th Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
4.	The Chairmen of Research Oommittees will, as far as possible, perform their duties by correspondence. Facilities regarding staff will be given to the Chairman of any Research Committee on his making out a case for it. A whole-time paid Secretary with the requisite technical qualifications will be sanctioned for each research committee the nature of whose work need the service of a whole-time Secretary. The pay of the post will be fixed by the President, Vice-President or the Director, Scientific and Industrial Research according to powers delegated to them.	Same as in previous column.	
5.	The Chairmen of Research Committees shall submit to the Secretary, Council of Scientific and Industrial Research by the 1st November of each year their proposals for staff for the work of their committees for the succeeding year and also submit the annual budget for grant required to meet the expenditure of their committees for the ensuing financial year. The budget should show the number and designation of staff proposed, their scales of pay, their actual salaries and allowances and the amount	Same as in previous column.	

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of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	required for the contingent expenditure of committees like postage, stationery, office expenses and other charges. On receipt, the budget will be scrutinised by the Secretary, Council of Scientific and Industrial Research and included in the budget estimates of the Council of Scientific and Industrial Research for the ensuing year and placed before the Governing Body for approval. A copy of the sanctioned budget of each committee will be communicated by the Secretary to the Chairman of the Committee concerned at the commencement of each year.		
5.	Funds sanctioned for research committees will be placed at the disposal of the respective chairmen of the committees on receipt of the bills from them.	Funds sanctioned for the research committees will be placed at the disposal of the institution to which the chairman of the committee is attached on receipt of a bill from the chairman through the head of the institution. In case of the chairman who does not happen to belong to any recognised institution the money will be handled by the Central Office of the Council.	In the original draft rules it was provided that the funds sanctioned for the expenditure of the research committees should be placed with the chairmen of research committees. The committee was not in favour of the funds for the expenditure of research committees being placed with the chairmen of research committees. The rule has therefore been amended. According to the amended rule the funds for the expenditure of research committees will be placed only with the heads of institutions to which the chairmen are attached. In

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			the case of any chairmen who does not belong to any recognised institution, the money sanctioned for the expenditure of his committee will be handled by the Central Office of the Council.
7.	The chairmen of research committees will incur expenditure against the sanctioned grants from the amounts placed at their disposal. They will appoint the sanctioned staff in consultation with the Director of Scientific and Industrial Research against the sanctioned posts.	Same as in previous column.	
8.	The Chairmen of Research Committees shall maintain accounts of the money received and disbursed by them in forms 1, 2, and 3 printed in the appendix III of the byelaw of the Council of Scientific and Industrial Research. As soon as possible after the close of the financial year, the chairman of each research committee shall forward duly attested by him an extract from the accounts of the monies received from the Council of Scientific and Industrial Research and disbursed by them.	The institution to which the funds are paid shall maintain accounts of the monies received and disbursed by it in forms 1, 2 and 3 printed in Appendix III to the byelaws of the Council of Scientific and Industrial Research. As soon as possible after the close of the financial year the institutions concerned shall forward an extract from the accounts of the monies received from the Council of Scientific and Industrial Research and disbursed by it. The institution concerned shall maintain an inventory of all furniture, typewriters and other items of equipment purchased out of the grants for the committee and	According to the amended rule the responsibility of maintaining accounts and sending extracts from the accounts to the Secretary, Council of Scientific and Industrial Research has been fixed on the Heads of Institutions who receive the grants. Similarly the heads of institutions have also been required to maintain inventories of equipment purchased for the work of the committee and to submit extracts from the inventory register to the Secretary.

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No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
		send six monthly extracts from this inventory to the Secretary Council of Scientific and Industrial Research.	
9.	The Chairman of each research committee shall maintain an inventory of all furniture, typewriters and other items of equipment purchased out of the grants for his committee and send six monthly extracts from this inventory to the Secretary, Council of Scientific and Industrial Research.	In the case of a chairman of a Research Committee who is attached to a recognised institution an inventory of all furniture, typewriters, equipment etc. purchased out of the grant for the committee shall be maintained by the Institute concerned and extracts from this inventory shall be submitted six monthly to the Secretary, Council of Scientific and Industrial Research. In the case of chairmen of research committees who are not attached to any recognised institution the inventory of furniture, typewriters and other items of equipment purchased out of the grants made by the Council for the purchase shall be maintained by them. They shall send to the Secretary, Council of Scientific and Industrial Research six monthly extracts from the inventory.	The sub-paragraph to this rule added by the Committee provides that in the case of chairmen who are not attached to any recognised institutions the inventory will be maintained by them and they will be responsible to send extracts from the inventory to Secretary, Council of Scientific and Industrial Research.
10.	Investigators of Research schemes sanctioned by the Council, shall submit their applications for renewal of grants for the ensuing financial year to the Chairman of the Research Committee under	Same as in previous column.	

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No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	whose purview the scheme falls so as to reach him by the 5th October each year. A copy of the renewal application shall also be submitted by the investigator direct to the Secretary, Council of Scientific and Industrial Research. Where a scheme does not fall under the purview of any research committee the applications for renewal will be sent by the investigator direct to the Secretary, Council of Scientific and Industrial Research. On receipt of the renewal applications, the Chairman will place them before their respective committees. The Committee will review the progress of work made on the scheme and recommend the renewal of the scheme with or without any conditions about the further work to be done. In examining the renewal applications the Committee will scrutinise the necessity for grants for staff in the manner indicated in rule 2 (B) and (C) above. The renewal applications together with the recommendations of the Committee in each case will be submitted by the Chairman of research committees to the Secretary, Council of Scientific and Industrial Research so as to reach him by the 1st November each year for inclusion in		

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No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	the Council's budget for the ensuing year and for the consideration of the Board of Scientific and Industrial Research and the Governing Body of the Council of Scientific and Industrial Research.		
11.	For considering the applications for renewal of grants received from investigators and for preparing the budget, the annual meeting of research committee shall be held in the first week of October each year in consultation with the Director, Scientific and Industrial Research. Before sanction for convening meetings is accorded by the Director, Scientific & Industrial Research, the Secretary, Council of Scientific and Industrial Research shall submit to him a report on the availability of funds for paying travelling allowance to members.	For considering the application for renewal of grants received from investigators and for preparing the budget, the annual meeting of research committees shall be held towards the end of September each year, in consultation with the Director, Scientific and Industrial Research. Before sanction for convening meetings is accorded by the Director of Scientific and Industrial Research, the Secretary, Council of Scientific and Industrial Research shall submit to him a report on the availability of funds for paying travelling allowance to members.	The annual meetings of the research committees will be held towards the end of September each year according to the amended rule instead of in the first week of October as in the original draft. This procedure has been suggested to enable the research committees to review the progress of work on research schemes and to recommend the payment of the second instalment of the grant for the schemes which will fall due in the beginning of October.
12.	The Chairman of each Research Committee may, whenever it is considered essential for the expeditious and efficient performance of work, convene meetings of the Committee in consultation with the Director, Scientific and Industrial Research. On such occasions the Chairman and members will receive	Same as in previous column.	

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	travelling allowance in the following scales (vide rule 10 of the Rules of Procedure for the grant of financial assistance to schemes of Scientific and Industrial Research by the Council of Scientific and Industrial Research and the conditions to be observed by recipients of such grants.)		
	1 Travelling allowance from the place of residence to the place of meeting and back at the rate admissible to an officer of the First Grade under the Government of India Supplementary Rules.		
	2 Daily allowance at Rs. 10 a day for days of halt at the place of meeting. The allowance will be admissible for the day of arrival, if the Chairman or the member arrives in the forenoon, and for the day of the departure if he departs in the afternoon.		
	3 Road mileage under the Government of India Supplementary Rules.		

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B—Rules of Procedure for placing grants-in-aid for research schemes.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks
	The concluding sentence of the second sub-paragraph of rule 4 of the rules of procedure for the grant of financial assistance to scheme of scientific and industrial research by the Council of Scientific and Industrial Research reads as follows:— “The amount sanctioned will generally be placed at the disposal of the Head of the Institute or Laboratory in which the investigator proposes to conduct the research”. Rule 6 of these rules requires Institutions receiving the grants to submit to the Director, Scientific and Industrial Research (through the concerned research committee, if any) audited statements of the actual expenditure incurred out of the grants, duly certified by their auditors. In exceptional cases where there are no regular arrangements for audit, it is laid down that a statement of expenditure certified by the Head of the Institution might be accepted at the discretion of the Council of Scientific and Industrial Research. Such statements have to be submitted annually or at the termination of a scheme if it	Same as in previous column.	The first column contains only an explanatory note. The Committee had no remarks to offer.

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No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	is of less than one year's duration. Any unspent balance has to be refunded to the Council on the termination of a scheme. The Director, Scientific and Industrial Research has to take necessary action for the unspent balance from an Institution which had been given a grant. Rule 8 presupposes that Institutions receiving grants-in-aid will make available the facilities they have for promoting the research work for which the Council of Scientific and Industrial Research makes a grant. In other words, the grant sanctioned by the Council of Scientific and Industrial Research is for the purpose of special equipment and other materials not available at the Institution and which are specially required for work on the research scheme. It would appear from rules, 4, 6 and 8 of the rules governing grants-in-aid, that the Council of Scientific and Industrial Research finances schemes of research emanating from the professors of universities or the research staff of the various institutions which the universities or the institutions are not able to finance themselves completely		

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No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for ammendment and remarks.
	out of their own resources. According to the practice which has evolved, the uni-versities or research institu-tions where research schemes are worked out, offer their laboratory facilities, i.e. space, light, water, gas, electricity, ordinary chemicals etc. and permit their senior staff to devote their time to guiding the research. The Council of Scientific and Industrial Re-search on their part sanction grant-in-aid for the research scheme to meet the expendi-ture of special equipment to be purchased or erected for the conduct of the scheme, contingent charges and the salary of special research staff to be exclusively engaged on the research. The University or institution receiving grant-in-aid is required to get the accounts of the grant audited by their own auditors and to send extracts of the audit notes to the Director, Scientific and Industrial Research for record. On the successful completion of a scheme, the royalties or other sale proceeds accruing from the commercial exploitation of the process evolved are shared equally by the Council of Scientific and Industrial Research, the Uni.		

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versity or the Institute where the work was done and the research staff engaged on the scheme. This will show that the Council of Scientific and Industrial Research though they finance a scheme, do not meet its entire cost. Further, it has also to be borne in mind that the grants-in-aid paid by the Council of Scientific and Industrial Research to the various universities or institutions are of the nature of subventions on certain terms.

In the audit note on the accounts of the Council of Scientific and Industrial Research for the year 1942-43 the Accountant General, Central Revenues made the following observation on the practice of payment of grant for research schemes :—

"Payment of grant for research schemes":—The grant sanctioned for each research scheme is allocated under the head 'Staff', 'Equipment' and 'Contingencies'. The present procedure is that the amount sanctioned for such scheme is drawn in one lump sum and placed at the disposal of the investigator. The procedure violates the general principle that money

Same as in previous column.

The first column contains only an explanatory note. The Committee had no remarks to offer.

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should not be² drawn unless it is required for immediate disbursement as the whole expenditure on the scheme is approximately not to be incurred at once. The desirability of making payments in instalments as and when required is brought to notice. This will be manifest from the fact that large amounts of unspent balance are surrendered or transferred to other schemes on the completion of a scheme. A few instances are quoted below :

Name of scheme. *Amount surrendered*

1. Manufacture of refractory pots Rs. 2,966
2. Manufacture of graphite and carbon Rs. 2,218 electrodes
3. Preparation of nitro benzene and dime- Rs. 3,877 thyl aniline
4. Standardisation of dye extracts Rs. 1,794
5. High temperature refractory clay Rs. 1,826
6. Manufacture of optical glass Rs. 2,100

The procedure of placing grants was thoroughly examined and the following office note was placed before the 7th meeting of the Governing Body of the Council of Scientific and Industrial Research on the 1st August 1944 for their consideration.

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	<i>"Para II of the Audit Report"</i> It has already been pointed out in this office note dated 10th March 1944 that it is not practicable to place the funds with the hands of Institutions where research work is financed from the funds of the Council of Scientific and Industrial Research at intervals of 3 months as suggested in the audit report. The reasons may be summarised as below:— (1) Equipment cannot be purchased in instalments. It has to be ordered and purchased at the commencement of work on a scheme. Money for equipment has therefore to be placed with the investigator in one lump sum and not in instalments. Further, many items of equipment have to be fabricated, not being standardised items, from parts purchased locally and investigators require money at the outset for getting the equipment ready. If balances remain with investigators such balances are generally against commitments for equipment ordered. (2) As in the case of equipment, so the case of contingencies, money is required by investigators for chemicals and miscellaneous expenditure.		

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For these reasons it would be impracticable to place money with investigators every three months. Further such a course would not only impede the progress of research work but would also entail voluminous correspondence and a large staff in the Central office for this purpose.

If we have a very efficient system of disposing of the bills, say within 24 hours of the receipt thereof, then the suggestion made might be tried. It is said "tried", for the suggestion is not free from difficulties and it is one which cannot easily be followed.

If there is any objection at all to placing the funds with the investigators for a whole year, then we might adopt the following procedure. Ours could be the Central office and instead of giving lump sums for the year, we might ask the investigators to send us their monthly salary bills and also any other bills for equipment and contingencies to meet them. This is also defective, for work would be held up for want of money and our Accounts and Cash sections have to be greatly expanded.

It appears that the system that we are at present

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	following is the best under the present circumstances, The above office note was generally approved by the Governing Body and the following resolution was passed :— “Item VI.—The Governing Body approved of the statement of action taken on the Audit Report of the Accounts of the Council of Scientific and Industrial Research for the year 1942-43”. In the Audit Report for the year 1943-44, the Accountant General, Central Revenues has again drawn attention to the question of payment of grants to parties in instalments. An extract from the audit report is given below :— “No final decision has been arrived at on the suggestion of Audit and the orders of the Government of India thereon, viz. “large sums of Council’s money should not unnecessarily be allowed to remain in the hands of the investigators. A system of payment in instalments should be introduced. This may please be expedited.” The grant-in-aid sanctioned for research schemes under	Same as in previous column.	As regards payment of second instalment of the grant

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	the Council of Scientific and Industrial Research are divided into 3 main heads, (1) Equipment (2) Contingencies and (3) Staff. So far as the grant under the head 'Equipment' is concerned it cannot be placed in two instalments but in one lump in advance as the equipment will have to be purchased and installed as a whole and not in parts or piece-meal. This leaves the grants under the heads 'contingencies' and 'staff' for consideration. It is submitted that in order to meet the audit, the grants in respect of these may be made to the investigators in charge of research schemes in two instalments, the first instalment covering the entire equipment grant for the year and half of the grant for contingencies and staff. The second instalment will consist of the remaining half of the grant under 'contingencies' and 'staff'.		Please see remarks of the Committee below against the proposed time table of the meetings.
	If this procedure is to be adopted, a modification of the present system of making	The question of taking suitable security from individual investigators who are not scientists of standing be left to the discretion of the Director, Scientific and Industrial Research. Same as in previous column.	This clause has been added to safeguard the interests of the Council as suggested by the Finance Department Representative on the Governing Body.

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	grants-in-aid would be called for. There is always a time-lag between the date when a grant is sanctioned by the Governing Body and the date when a cheque for the amount of the grant is actually sent to the Head of the Institution concerned, since the necessary formalities of conveying sanctions, receiving bills for payment and preparation of cheques etc. have to be gone through. Consequently the research staff engaged for work on the various schemes do not get their salaries until cheques have been despatched and this often causes great hardship. The funds for the Council of Scientific and Industrial Research are voted annually by the Legislature. Till the demands for grants and the budget estimates are passed by the Legislature and approved by H. E. the Governor-General-in-Council, the Council of Scientific and Industrial Research would be officially without funds. The Research schemes financed by the Council of Scientific and Industrial Research are sanctioned by them on year to year basis as the		

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	Council themselves receive grants annually from the Government of India. The research schemes are sanctioned from 1st April to the succeeding 31st March. As the salaries of the staff for the month of March are paid on the 1st April, out of the budget grants for the succeeding financial year, in practice the grants are made from the 1st March to the 28th February of the succeeding year.		
	There is no statutory date for the meeting of the Governing Body of the Council of Scientific and Industrial Research for passing the budget estimates of the Council and for sanctioning renewal of grant for the continuance of Research schemes. Meetings of the Governing Body have been held in January, February or March according to exigencies. If the meeting of the Governing Body is held in March of a year, apart from the technical difficulty in incurring expenditure out of the new year's grant before the Government of India's grant to the Council is voted by the Legislature, it takes time to draft the proceedings of the meeting, obtain the Hon'ble President's approval commu-	Same as in previous column.	

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of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
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nicate the resolution, to the parties concerned, invite bills from them along with statements of expenditure out of the previous year's grants, the check accounts and pass the bills on to the Accountant, Council of Scientific and Industrial Research for audit and payment and for the Accountant to issue cheques to the parties concerned. All this takes from 1 to 2 months and more time also in cases where the parties delay the despatch of bills or accounts, should there be a discrepancy in the accounts, which have to be settled by correspondence.

The following procedure is suggested in order to expedite payment of the grants;—

1. In order to avoid the time-lag referred to above statutory dates should be fixed for the meeting of the Board of Scientific and Industrial Research and the Governing Body of the Council of Scientific and Industrial Research for recommending the annual grants-in-aid and for passing the budget of the Council for the ensuing financial year. This date has sufficiently to be early to permit of all the formalities enumerated in the previous paragraph to be gone into and the cheques for the

Same as in previous column.

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grants issued to be cashed on the 1st April by the receiving parties. In this connection it may be mentioned that in communicating the Governor-General's sanction to the grant of 25 lakhs to the C.S.I.R. for 1945-46, the Department of Planning and Development drew attention to the desirability of holding meetings of the Governing Body in February each year so that the budget of the C.S.I.R. may be approved earlier by G. G. in Council. If the meetings are held in the first week of February each year, sufficient time would be available to enable all arrangements to be made to send cheques for the grants to the parties to be cashed on the 1st April.

The time-table of meetings and other action would be as follows:—

- (1) **Meeting of Research Committees**— Between 15th and 25th of October for preparing and passing their budgets for each year the ensuing year and for scrutinising renewal applications for grants received from investigators and

With regard to the time-table of meetings suggested the committee felt that it would be difficult to stick to rigid time-table as proposed in the draft rules. It was therefore recommended that the Secretary, Council of Scientific and Industrial Research should prepare one year ahead a calendar of meetings to be held after consulting the list of holidays for the year and in accordance with

The rules as amended are self-explanatory.

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	forwarding them to the Secretary, Council of Scientific and Industrial Research with their remarks.	the requirements of Section. (1) & (7).	
	At this meetings the Research Committees will dispose of also other outstanding matters of technical nature.	In drawing up the calendar of meetings, meetings of the Research Committee should be arranged towards the end of September to enable them to review the progress of work on schemes and for recommending the payment of second instalment of grants-in-aid. At this meeting the Research Committees may also transact any other business outstanding.	
(2)	Date of receipt First of budget from November. Research Committees and applications for renewal of grants for the succeeding year by the Council of Scientific and Industrial Research.		
(3)	Scrutiny of renewal applications November. and budget of Research Committees.		
	Compilation of budget under heads Dictionary, grants-in-aid and Research Committees for 1st passing on to the December. Admin. Branch for incorporation in the budget		

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	estimates of the Council of Scientific & Industrial Research. Preparation and 15th issue of Agenda Decem-ber. for the Technical Committee of Board for consid-eration of renewal appli-cations.		
(4)	Meeting of the Technical Committee of the Board (consist- ing of the Scien- tist members of the Board) for the scrutiny of renewal applica- tions, reviewing the progress of work on schemes and for recom- men-ling grants for continuance of schemes.	1st week of Jan- uary (say 5th Jan- uary.)	
(5)	Preparation and issue of Agenda for Board and Governing Body meetings and sending out the Agenda papers to members.	On or before 10th Jan- uary.	
(6)	Meeting of the Committee of the Board of	5th Feb- ruary	It was recommended that since the Committee of the Board consider the entire

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	Scientific and Industrial Research for considering the Agenda for the meeting of the Board.		agenda for the meeting of the Board it would not be necessary to have the Technical Committee of the Board for the purpose of scrutinising renewal of applications for grants and renewing the progress of schemes etc. The Committee therefore suggested that the Technical Committee be abolished.
(7) Meeting of the Board of Scientific and Industrial Research.	7th Feb-ruary.		
(8) Meeting of the Governing Body of the Council of Scientific and Industrial Research.	9th Feb-ruary.		
(9) Drafting of the Minutes of the Board and Governing Body meetings, communication of sanction and resolutions to the parties concerned, calling for bills and accounts, checking them and passing for payment.	Feb-ruary-March.		
(10) Issue of cheques to the parties concerned for grants-in-aid for the ensuing	Between 20th & 25th March.		

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	financial year, encashable on or after the 1st April.		
	There will be more than one meeting of the Board and the Governing Body during the year, but the above time- table has been drawn up with a view to fixing the annual budget meeting and the date of sending of the cheques for grants may be covered up in such a way that the grants will reach the parties in time.		
	2. The first instalment covering the entire equipment grant for the year and half of the grant for contingencies and staff for each scheme may be sent to reach the Heads of Institutions by 1st April. Accounts for the expenditure against this instalment of the grant and bills for the second half of the contingent and staff grants will be called for from the Institution to reach the Secretary on or before the 1st September. These will be checked and passed on to the Accountant for audit and payment so that cheques may be issued by the 25th of September encashable on 1st October. In the case of Insti-	Same as in previous column.	

Recommendations of the Committee of the Board.

Recommendations of the Board.

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.																														
	tutions receiving grants-in-aid located in Calcutta or other places in Bengal, arrangements will have to be made for sending the cheques earlier if the first five days of October happen to be 'Puja Holidays'.																																
	3. The placing of funds in two instalments, and the imperative necessity of prompt action involve additional work for meeting which the present staff in the Council office, in the Board and Accounts Branches will have to be strengthened	Same as in previous column.																															
	In this connection attention is invited to the statement which shows the work which has to be done in the Board Branch. In order to cope up with the increased work in the Board and Accounts Branches, the following additional staff would be necessary : <i>Board Branch</i> Existing staff. <table><tr><td>Superintendents</td><td>...</td><td>2</td></tr><tr><td>Assistants</td><td>...</td><td>1+1</td></tr><tr><td>2nd Division Clerks</td><td></td><td>2</td></tr><tr><td>3rd Division Clerks</td><td></td><td>5+2</td></tr><tr><td></td><td></td><td> </td></tr><tr><td></td><td></td><td>10+3</td></tr></table> Additional staff <table><tr><td>Assistant</td><td>...</td><td>1</td></tr><tr><td>Second Division</td><td></td><td>2</td></tr><tr><td>Third Division</td><td></td><td>1</td></tr><tr><td></td><td></td><td> </td></tr></table>	Superintendents	...	2	Assistants	...	1+1	2nd Division Clerks		2	3rd Division Clerks		5+2						10+3	Assistant	...	1	Second Division		2	Third Division		1				In view of the large volume of work involved in placing grants-in-aid in instalments and communicating early sanction of the schemes to the investigators concerned as proposed in rule 2 (D) of rules of procedure for the guidance of Chairmen of Research Committees, the Committee considered it absolutely necessary to strengthen the Board and Accounts Branches by the following additional staff : Board Branch : 2 Assistants Accounts Branch: 1 Assistant and 1 3rd division clerk.	The change proposed by the committee is self-explanatory.
Superintendents	...	2																															
Assistants	...	1+1																															
2nd Division Clerks		2																															
3rd Division Clerks		5+2																															
		10+3																															
Assistant	...	1																															
Second Division		2																															
Third Division		1																															

Recommendations of the Committee of the Board.	Recommendations of the Board

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
<i>Accounts Branch</i>			
<i>Existing staff</i>			
	Accountant	1	
	Assistant	1	
	2nd Division Clerks	2	
	3rd Division Clerks	3	
		7	
<i>Additional staff.</i>			
	Assistant	1	
	Third Division	1	
		2	

Copy of un-official note No. 152 Bd. I/45 dt. 11. 8. 45 from the Director, Scientific and Industrial Research to Mr. R. S. Symons, Finance Dept. Representative on the Governing Body, the Council of Scientific and Industrial Research.

With reference to the correspondence resting with Mr. Symons' D. O. No. 7272-W-1/44 dated the 18th May 1945 to Sir Akbar Hydri, Vice-President, Council of Scientific and Industrial Research a note out-lining the procedure for the placing of grants-in aid sanctioned for research schemes at the disposal of investigators is placed below for the consideration of Finance Department's Representatives on the Govern-

Recommendations of the Committee of the Board.

Recommendations of the Board.

III. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	ing Body of the Council of Scientific and Industrial Research. The Director of Scientific and Industrial Research generally approves of the note on the question of grants-in-aid for research schemes. Copy of un-official note dated 29. 8. 45 from Mr. R. S. Symons to the Director, Scientific and Industrial Research. I am in general agreement with these proposals but think it necessary to invite special attention to the following points :— (1) The intention of Mr. Turner's letter dated the 21st December 1944 to Sir Akbar Hydary was that grants sanctioned by the Council should be related to the progress of the researches undertaken by the investigators concerned. The drafts rules do not make any provisions on this account. I would, therefore, suggest that the second and subsequent instalments should be contingent on satisfactory progress reports from Chairmen of Research Committees, both in the case of individual investigators and in case of investigators working in institutions.	1. This point has been already covered by the Sub-Committee that in drawing up the calendar of meetings, the meetings of Research Committees should be arranged towards the end of September to enable them to review the progress of work on schemes and for recommending payment of the second instalment of the grants-in-aid. It may however be pointed out that if for any reason the progress report from an investigator is delayed or the meeting of the Committee is delayed, payment of the second instalment of the grant would correspondingly also be delayed.	The remarks of the Committee are self-explanatory.

Recommendations of the Committee of the Board.

Recommendations of the Board

XIII. Consideration of rules of procedure for the guidance of chairmen of research committees under the Board of Scientific and Industrial Research.

No. of Rule.	Rule as originally drafted.	Rule as amended by the Sub-Committee.	Reasons for amendment and remarks.
	(2) The Director of Scientific and Industrial Research should take suitable security in such cases of individual investigators as he considers necessary. Obviously, from individual scientists of standing it will not be necessary to call for any security at all.	2. The question of taking suitable security from individual investigators who are not scientist of standing be left to the discretion of the Director of Scientific and Industrial Research.	The remarks of the Committee are self-explanatory.
	(3) The time-table proposed above will have to be much more flexible than the present proposals seem to envisage. The proposals to issue cheques to institutions and individual investigators between the 20th and the 25th March will only be feasible if the Council has funds other than those sanctioned by Govt. In the ordinary course, it can issue cheques for the new financial year only after the passing of the Finance Bill.	3. This point of Mr. Symons has been met by the Committee as the Secretary has been asked to prepare a calendar of meetings one year ahead.	The remarks of the Committee are self explanatory.
	(4) The staff proposed above in the draft is probably excessive. For the present it should be sufficient to add one Assistant and one third division clerk.	4. The Committee felt that it would definitely not possible to arrange for the payment of the grants in arrears as the majority of institutions and investigators require the grants in advance for meeting the salary of the staff, cost of apparatus and other expenses.	The remarks of the Committee are self explanatory.
	2. In the case of the larger institutions such as Universities, the Indian Institute of Science, etc., in principle it would be desirable that grants from the C. S. I. R. should be paid periodically (quarterly or half-yearly) in arrears on a statement of actual expenditure incurred. The basis to be aimed at should be rather one of recoupment of the expenditure incurred than of payment in advance.		

Recommendations of the Committee of the Board.

Recommendations of the Board.

XIII. The Committee recommended that the draft rules of Procedure for the guidance of the Chairmen of Research Committees as proposed in pages 168-232 of the Agenda be approved.

XIII. The Board accepted the recommendations of its Committee.

Applications for renewal of grants-in-aid for 1946-47.

Applications for the renewal of grants for the year 1946-47 have been received in respect of the following schemes of research in operation in various universities and other research Institutions and also carried out departmentally in the Laboratories of the Council of Scientific and Industrial Research. The names of the schemes and the amount of the grants required for 1946-47 are given below:—

(a) Non Departmental Grants required for 1946-47.

I. Heavy chemicals and chemical Industries Committee.

Item No	Schemes.	Equipment Rs.	Contingencies. Rs.	Staff. Rs.	Total. Rs.
1.	Extraction of sulphur compounds from coal by Dr. Sir J. C. Ghosh, Bangalore.	...	1500	2397	3897

II. Applied Physics Committee.

2.	Manufacture of Photographic materials in India by Dr. G.R. Paranjpe.	Nil.	Nil.	9,864	9,864
3.	Manufacture of gelatin by Dr. Mata Prasad.	Unspent balance of last years grant. (3,820)	Unspent balance of last years grant. (1894)	1,813+ Unspent balance of last years grant (947)	1813+ Unspent balance of last year grant. (Rs. 6661)

III. Drugs Committee

4.	Manufacture of Sorbose from Sorbitol. by Prof. M. Demodaran, Madras.	3,000	500	5,124	8,624
5.	Preparation of Novocaine by Dr. P. C. Guha.	3,000	1,000	2,256	6,256
6.	Manufacture of gland Products and commercial utilisation of shark wastes by Dr B. B. Dey.	2,500	4,000	9,124	15,624
7.	Scheme on the investigation of steroids by Dr. M. C. Nath.	2,500	500	5,316	8,316

IV. Glass and Refractories Committee.

8.	Seeger Cones by Prof. H. N. Roy, Benares.	3,000	2,000	3,000	8,000
9.	Manufacture of Chemical porcelain by Prof H. N. Roy, Benares.	Nil.	1,500	2,994	4,494

Recommendations of the Committee of the Board.

The Director of Scientific and Industrial Research informed the Committee that in view of the limited funds viz. Rs. 6,00,000 provided in the 1946-47 year's budget, for grants-in-aid to Research Schemes, expenditure under this head will have to be cut down considerably. The demands are as follows:

Renewal applications so far received :	6,18,354
Amount required for renewal of grants for schemes in respect of which applications are still awaited (calculated on the basis of the current year's grant).	2,53,372
New schemes and proposals considered at the present meeting of the B.S.I.R.	76,716
Provision to be made for new schemes which may be received later on during the year.	1,00,000
	10,48,442

In view of D.S.I.R.'s remarks above the Committee carefully scrutinised each renewal application received and recommended the grants as below:

1. E.	C.	S.	T.
—	1,000	2,397	3,397
2.	Discontinued.		
3.	No fresh grant sanctioned for 1946-47.		
4. E.	C.	S.	T.
—	500	5,124	5,624
5. E.	C.	S.	T.
1,000	500	2,256	3,756
6. E.	C.	S.	T.
1,500	1,000	9,124	11,624
7. E.	C.	S.	T.
1,000	500	5,316	6,816
—	—	3,000	3,000
9. —	500	2,994	3,494

Recommendations of the Board.

XIV. The Board accepted the recommendations of its Committee. There was a general discussion about the paucity of funds for financing the research activities. It was recommended that if more money was required for sanctioning new schemes in the course of the year, the Council should approach the Finance Department for a supplementary grant. With these remarks the grants as recommended by the Committee were recommended for approval.

V. Chemical and other Distillation Plants Committee.

10.	Rubber lined equipment for chemicals industries by Sir J. C. Ghosh, Bangalore.	Unspent balance plus 1,000	1,800	3,395	6,195+ unspent balance under equipment.
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VI.—Industrial Fermentation and Biological Products Committee.

		(1)	(2)	(3)	(4)
11	Fermentative Production of Butylx alcohol Acetone etc. and production of acids generally from molasses by Dr. B. N. Ghosh, Calcutta	Nil	2,500	10,505	13,005
12	National collection of type cultures by Mr. M. Sreenivasaya, Bangalore	3,000	3,000	7,893	13,893
13	Industrial enzymes by Mr. M. Sreenivasaya	2,500	1,200	3,340	8,040
14	Study of conditions favouring the increase of alcohol concentration in distillery washes by Mr. M. Sreenivasaya	2,500	1,200	3,240	6,940
15	Preparation of potent strains of yeast by Dr. Bashir Ahmad, New Delhi	6,000	2,000	4,440	12,440
16	Cytogenetics of yeast and fungi by Mr. M. Sreenivasaya... ..	3,000	Nil	4,236	7,236
17	Carbohydrate metabolism in organisms with special reference to citric and oxalic acid formation by Prof. M. Damodaran	2,000	500	5,268	7,768
18	Proteins and proteases by Prof. M. Damodaran	4,000	500	8,280	12,780

VII.—Vegetable Oils Committee.

19	Vegetable milks from oil seeds and related materials by Prof. V. Subrahmanyam, Bangalore ...	2,000	1,500	4,743	8,243
20	Preparation of pre-digested and concentrated food products from edible seed cakes by Prof. V. Subrahmanyam, Bangalore ...	1,500	1,000	2,530	5,030

Recommendations of the Committee of the Board.

Recommendations of the Board.

10.	**—	1,000	3,395	4,395**
11.	—	1,500	5,250	6,750
12.	1,000	2,000	7,893	10,893
13.	1,000	600	3,340	4,940
14.	—	1,000	3,240	4,240
15.	—	1,000	4,440	5,440
16.	—	500	4,236	4,736
17.	1,500	500	5,268	7,268
18.	—	500	8,280	8,780
19.	1,000	750	4,743	6,493
20.	750	500	2,530	3,780

VIII.—Electro-Chemical Industries Research Committee.

21	Purification of graphite ores by Dr. Sir J. C. Ghosh	2,000 plus unspent balance.	1,500	4,299	7,799+ unspent balance under equipment.
22	Pilot plant experiments on the manufacture of sodium and magnesium metals by Sir J. C. Ghosh	5,009 plus unspent balance.	8,320	19,128	32,448+ unspent balance under equipment

IX. Metals Committee

23	Resistance alloys by Mysore Iron & Steel Works, Bhadravati.	600 plus unspent balance	Nil	Nil	600 plus unspent balance
24	Manufacture of beryllium by Sir, J. C. Ghosh, Dr. Mata Prasad and Mr. G.C. Mitter.	Unspent balance of last years grants	2000	3,468	5,468+ unspent balance of last years grant under equipment

25	Classifying and cataloguing of scientific literature on Metals by Metals Committee	Nil	Nil	4200	4200
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X. Radio Research Committee.

26	Directional measurement of atmospheres by Radio Research Committee.	Nil	3000	Nil	3000
27	Ionospheric investigations by Prof. S.K. Mitra.	Nil	500	6591	7091

XI. Fuel Research Committee

28	Washability of Indian coals by Dr. C. Forrester.	3750	9530	12189	25469
29	De-sulfurising of coals by Dr J.K. Chaudhari.	4790	500	5271	10561
30	Low temperature carbonisation of coals by Dr. B.N. Ghosh.	Nil	1700	4553	6253
31	Spectroscopy of fuels and their combustion by Dr. W.M. Vaidya.	21625	1000	3432	26057

XII. Dyestuffs Committee

32	Synthetic dyes and modified shades from cutch by Dr. K. Venkataraman.	—	400	488 for four months from 1-3-46	288
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*Recommendations of the Committee of the Board.**Recommendations of the Board*

21. **—	1,000	4,299	5,299**
22. **—	5,000	19,128	24,128**
23. **600	—	—	600**
24. **—	2,000	3,468	5,468**
25. —	—	4,200	4,200
26. —	2,500	—	2,500
27. —	500	6,591	7,091
28. 3,000	5,000	12,189	20,189
29. 2,000	500	5,271	7,771
30. —	1,200	4,553	5,753
31. *	1,000	3,432	4,432
32. —	400	488	888

33	Constitution of commercial dyes by Dr. K. Venkataraman.	—	2400	3883	6283
34	Preparation of vat dyes by Dr. K. Venkataraman.	25000	4800	6819	36619
35	Manufacture of direct cotton colours incorporating the electrolytic production of benzidine by Dr. B. B. Dey.	2000	2000	8952	12952

XIII. Essential Oil Committee.

36	Investigation on Jasmines of India by Mr. S.N. Bal, Calcutta.	—	700	3900	4600
37	Extraction of essential oil from bitter oranges by Dr. B.K. Malviya, Lucknow.	Unspent balance of 1945-46.			
38	Rose cultivation (chemical aspect) by Dr. N K. Sen and Dr. K. Biswas, Calcutta.	1000	400	4021	5421
39	Rose cultivation (Botanical aspect) by Dr. K. Biswas.	Nil	Bil	2800	2800
40	Utilisation of lemon grass oil as a disinfectant by Prof. V Subrahmanyan.	1000	1200	5589	7789
41	Preparation of aromatic chemicals by Dr. P.C. Guha.	3000	1000	2397	6397

XIV. Plastics Committee

42	Production of synthetic methanol by Sir J.C. Ghosh.	6000 plus unspent balance	2500	10026 plus unspent balance under equipment	18526 plus unspent balance under equipment
43	Preparation of Butadien by Sir J.C. Ghosh.	2000 plus unspent balance	1800	5883 plus unspent balance under equipment	9683 plus unspent balance under equipment

XV. Miscellaneous.

44	Manufacture of hydrogen peroxide by Sir J.C. Ghosh.	12000 + unspent balance	3500	7416 plus unspent balance under equipment	22916 plus unspent balance under equipment
45	Extraction of monazite sands by Dr. P.B. Sarkar, Calcutta.	2600	1500	7660	11760
46	Vegetable rennet by Prof. Subrahmanyam, Bangalore.	2000	1500	3369	6869
45	Treatment and utilisation of industrial wastes with special reference to textile mill wastes of Ahmedabad by Prof. V. Subrahmanyam...	2,000	2,000	5,286	9,286

Recommendations of the Committee of the Board.				Recommendations of the Board.			
33.	—	1,200	3,883	5.083			
34.	—	4,000	6,819	10.819			
35.	1,000	1,000	8,952	10,952			
36.	—	500	3,900	4,400			
37.	Unspent balance of 1945-46.						
38.	800	400	4,021	5,221			
39.	—	—	2,800	2,800			
40.	—	1,000	5,589	6,589			
41.	—	800	2,397	3,197			
42.	6,000+						
	*6,000	2,500	8,000	15,500			
	already sanctioned						
43.	*1,000	1,500	5,883	8,383			
44.	*	2,000	4,000	6,000			
45.	2,000	1,000	7,660	10,660			
46.	—	1,000	3,369	4,369			
47.	1,000	1,000	5,286	7,286			

46	Development of air-driven ultra-centrifuge for physical, chemical and biological work by Mr. P. C. Bhattacharya. ...	2,800	600	6,561	9,561
47	Design of moving iron ammeters and volt meters of commercial grade by Dr. P. C. Mahanti. ...	Nil	1,000	3,280	4,280

(b) Departmental.

48	Investigation on anti-malarial Drugs by Dr. S. Siddiqui. ...	Nil	Nil	6,823	6,828
49	Investigation on neem oil by Dr. S. Siddique. ...	Nil	Nil	8682	8682
50	Investigation on Pyrethrum and Pyrethrum substitutes by Dr. S. Siddiqui ...	Nil	Nil	4944	4944
51	Surpentina alkaloid and Kurch Bark by Dr. S. Siddiqi ...	Nil	Nil	10644	10644
52	Investigation on semi-synthetic Tanning materials by Dr. S. Siddiqui. ...	Nil	Nil	7414	7414
53	Industrial utilisation of resins obtained from Latexes on euphorbiaceae by Dr. Karimullah & Sir S.S. Bhatnagar. ...	1500	1000	6761	9261
54	Plastics in general by Dr. Sir S.S. Bhatnagar, Drs. L.C. Verman and Karimullah. ...	22000	1500	11629	35129
55	Polyhydric alcohols by Dr. L. C. Verman and Dr. Karimullah ...	1000	1000	2921	4921
56	Investigation on ebonite substitutes and allied products by Dr. S. Siddiqui. ...	Nil	Nil	3264	3264
57	Synthetic wool from ground nut cakes by Dr. L.C. Verman & DSIR. ...	27750	650	6295	34595
58	Carbon electrodes for arc purposes by Dr. L.C. Verman. ...	11500	1000	6738	19238

Recommendations of the Committee of the Board.				Recommendations of the Board	
48.	2,800	600	6,561	9,961	
49.	—	1,000	3,280	4,280	
50.	—	—	6,828	6,828	
51.	—	—	8,682	8,682	
52.	—	—	4,944	4,944	
53.	—	—	10,644	10,644	
54.	—	—	7,414	7,414	
55.	—	—	6,761	6,761	
56.	—	—	9,200	9,200	
57.	—	—	2,921	2,921	
58.	—	—	3,264	3,264	
59.	Discontinued.				
60.	—	—	4,540	4,540	
28,450				52,450	2,94,043
					3,75,443

The amount under Equipment to be obtained from the funds of the National Chemical Laboratory. Such Equipment as has been bought out of the National Chemical Laboratory funds to be returned to the National Chemical Laboratory after the investigation is over.

தவணைத்தாள்.

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41. எண் :

[illegible]

S.F. 259A- 1,00,000-30-1-84.

Sir Akbar Hydari thanked Sir Ardeshir Dāfal and the members of the Board for their appreciation of his services.