FOUR DECADES OF

NATIONAL SCIENCE EXHIBITION

FOR CHILDREN

विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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OFFICES OF THE PUBLICATION DIVISION, NCERT

NCERT Campus
Sri Aurobindo Marg
New Delhi 110 016 — **Phone : 011-26562708**

108, 100 Feet Road
Hosdakere Halli Extension
Banashankari III Stage
Bangalore 560 085 — **Phone : 080-26725740**

Navjivan Trust Building
P.O. Navjivan
Ahmedabad 380 014 — **Phone : 079-27541446**

CWC Campus
Opp. Dhankal Bus Stop
Panihati
Kolkata 700 114 — **Phone : 033-25530454**

CWC Complex
Maligaon
Guwahati 781 021 — **Phone : 0361-2674869**

Publication Team

Head, Publication Division	:	*Ashok Srivastava*
Chief Production Officer	:	*Shiv Kumar*
Chief Editor (Incharge)	:	*Naresh Yadav*
Chief Business Manager	:	*Gautam Ganguly*
Editor	:	*S. Pervaiz Ahmad*

Foreword

The Jawaharlal Nehru National Science Exhibition for Children, earlier named 'Science Exhibition for Children' is one of the oldest programmes of the National Council of Educational Research and Training. The exhibition took its root from the recommendation of the Education Commission constituted in 1964 under the Chairmanship of late *Professor* D.S. Kothari. The Commission realising the fact that knowledge of science and scientific attitude are the fundamentals for development recommended that science education be made compulsory for all students as part of general education. It also recommended out of school activities in science as one of the ways to popularise science amongst the children and adults alike. Science Exhibition for Children was probably the first organised platform where children could present their innovative scientific ideas in the form of working or static models and other presentable forms and also interact with visitors who are keen to learn more about their exhibits.

The first Science Exhibition for Children was held in Delhi in 1971, though with limited participation. However, over time the exhibition has grown to encompass in its ambit nearly all the states and Union Territories. The Jawaharlal Nehru National Science Exhibition for Children marks the culmination of the exercise carried out over two years. In the first year, it starts at a school-level activity where children identify scientific concepts along with the theme and sub-themes, applying their innovative ideas and ultimately come out with models, charts, reports, etc. to represent their exhibits. These exhibits are displayed at the District-level and State-level exhibitions, some of them are selected by competent experts. In the subsequent year, selected exhibits are finally screened at the NCERT and displayed in the Jawaharlal Nehru National Science Exhibition for Children. This programme has thus been able to bring out the innovative ideas of a child even from the remotest school of the country.

The Jawaharlal Nehru National Science Exhibition for Children has seen a sea of change over the years in terms of quality and innovations in the exhibits, number of participants, themes and sub-themes, collaboration with states and UTs, etc. I hope this volume brought out on the occasion of Golden Jubilee Celebration of the Council depicting the glorious four

decades of the National Science Exhibition for Children along with the brief descriptions of some of the interesting exhibits displayed in different years will be a prized possession of many. The vision as laid down in the final chapter 'Science Exhibition – Future Perspectives' may take the Jawaharlal Nehru National Science Exhibition for Children to greater heights.

The Council acknowledges the efforts of *Professor* Hukum Singh(Head), *Professor* Jaishree Sharma and faculty members of the Department of Education in Science and Mathematics for the overall contribution and in bringing out this volume in its final form.

New Delhi
September 2011

Director
National Council of Educational Research and Training

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The National Council of Educational Research and Training (NCERT) acknowledges the invaluable contribution of different individuals and other administrative functionaries in various stages of the development of this exclusive volume.

The Council is indebted to R. Joshi, *Associate Professor* (Retd.), DESM, NCERT for coming out with the idea of the development of this monograph and also for giving his valuable inputs in its successful completion. The Council also acknowledges the contribution of R.C. Dass, Cameraman of the Council for painstakingly screening relevant photographs for the monograph from his collection.

The contributions of *Professor* J.S. Gill (Retd.), NCERT; Kamlesh Mittal, Reader (Retd.), NCERT; and Kalyan Banerjee, Production Officer, Publication Division, NCERT in reviewing the draft monograph and providing their invaluable suggestions towards its improvement are highly acknowledged.

The Council is indebted to all those students who have participated in the exhibitions during the past four decades, teachers or parents who had accompanied the students to the exhibitions, and Principals of all the schools who had encouraged the students to take part in the exhibitions. The Council is also grateful to Jawaharlal Nehru Memorial Fund for extending support to the exhibition during the first decade. The Council is also grateful to all the state/UT authorities and functionaries for their role in collaboration and organisation of the exhibitions.

The Council also acknowledges the contribution of Naresh Yadav, *Chief Editor* (Incharge) and D.K. Shende, *Art Officer*, Publication Department, NCERT in finalising and preparing the Grid of the monograph. The contribution of Iqbal Hassan for his meticulous and incredible DTP work including designing of the cover page is highly acknowledged. The Council also acknowledges the contribution of the following staff of the Department of Education in Science and Mathematics, NCERT — R.R. Koireng, *Assistant Professor*; Sunita L. Varte, *Assistant Professor*; C.V. Shimray, *Assistant Professor*; Shib Datt, *Office Assistant*; Rohini Sharma, *Computer Operator*; Poornima Sood, *JPF*; and Amit Akoijam, JPF.

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Jaishree Sharma
Coordinator

The scientific approach and temper are, or should be a way of life, a process of thinking, a method of acting and associating with our fellowmen.....

The scientific temper points out the way along which man should travel. It is the temper of a free man.....

The Discovery of India
Pt. Jawaharlal Nehru

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Introduction

1. Science Exhibition for Children—Beginning of a Movement

Exhibitions have always fascinated young and old alike. The exhibitions held at national to district levels, from time to time, particularly after independence, usually had a science component in them which mainly focussed on health and childcare. As early as the end of the nineteenth century, the Indian Association for Cultivation of Science, Calcutta (now Kolkata), did pioneering work for popularisation of science. The late nineteenth century also saw the popularisation of science through demonstrations/lectures and popular science writings by S. N. Bose, J. S. B. Haldane, M. N. Saha and their eminent contemporaries. A number of science movements — notable amongst them were the Prasharan Movement of the then state of Mysore and the Nav Jeevan Samaj Movement of Gujarat— focussed on promotion of non-formal teaching of science. But, it was only in the early twentieth century that science clubs and science exhibitions became common in certain colleges of West Bengal and Karnataka. The annual conference of the Indian National Science Congress also included science exhibition as one of the components for the conference.

The above mentioned National and Institutional Exhibitions, however, were planned, organised, participated and visited by adults only. The exhibitions were not open to the school going children. The 'All India Student's Science Fair' held in New Delhi in 1970 was perhaps the first science exhibition which involved children. Nowadays many schools, districts, states and other governmental and non-governmental institutions hold their own science fairs/exhibitions with children as participants. Even in certain remote villages, science exhibitions are being organised in which enthusiastic children participate and attract a large number of villagers as visitors. The organisation of science exhibition is often observed as an annual festival. A large number of people from all walks of life visit and interact during these annual festivals. Thus, what was a sporadic effort nearly four decades earlier has now turned into a Science Exhibition Movement with maximum student participation.

The National Council of Educational Research and Training (NCERT) has played a major role in institutionalising Science Exhibition for Children (SEC). The NCERT organised its first National Science Exhibition for Children (NSEC) in 1971 and has been continuing this annual event for the last four decades. The exhibition was renamed as Jawaharlal Nehru National Science Exhibition for Children (JNNSEC) in 1989 to coincide with birth centenary celebration of Pandit Jawaharlal Nehru.

It is proposed to again rename the exhibition as Jawaharlal Nehru National Exhibition for Science and Environment Education for Children from 2011, to bring the environmental issues and concerns in the forefront.

The exhibition was renamed as Jawaharlal Nehru National Science Exhibition for Children (JNNSEC) in 1989 to coincide with birth centenary celebration of Pandit Jawaharlal Nehru.

The reasons for the popularity of Science Exhibitions are quite obvious. The product of science, the technology, has always fascinated the masses. The general public is delighted by the wonders of science and the intricacies of modern technology which get unfolded before their eyes through the medium of exhibitions. The science exhibition is also a place where people correlate the age old indigenous knowledge and practices with the scientific principles underlying them. That is why the science exhibitions attract large crowds even in remote areas.

The 10+2+3 pattern of education, introduced in 1975, to implement recommendations of National Policy on Education (NPE) – 1968 envisaged general education for all up to Class X. It implied compulsory teaching of science and mathematics to all for the first ten years of schooling. But the introduction of compulsory study of science and mathematics in schools was not enough to arouse interest of children in these two subjects and encourage them to investigate on their own. This was perhaps due to lack of opportunities for children to participate in demonstrations, hands-on activities and experiments in teaching – learning processes which were often dominated by rigidly structured examination systems. As a result there were practically no opportunities to satiate curiosity of the children that would lead them to indulge in joys and fun of scientific investigations. Lack of laboratory facility had been a further deterrent. The solution therefore was to make the teaching–learning of science interesting and attractive so that it aroused and sustained the curiosity of the child. SEC probably could provide one such platform.

SEC may also provide the answer to certain problems which are inherent in the formal system of science education. It may provide one of the plausible answers to the question like:

1. How can science be made an outlet for creative activity for children and teachers?
2. How can the methods of science be popularised?
3. How can the team spirit be inculcated?
4. How can the scientific knowledge be made functional in solving socio-economic problems?

5. How can the spirit of science be communicated to the masses?

Studies show that the preparation for a science exhibition excites a child. The process of preparation gives vent to her/his creative tendencies. It teaches stepwise the methods of science. It caters to her/his inquisitive nature. The child not only indulges in creativity but also sharpens her/his own problem-solving ability. She/he learns about the value of teamwork and cooperation. The success gives pleasure, emotional stability and satisfaction. SEC in this perspective provides the biggest opportunity. It caters to the curiosity and creativity of the children. In other words, it nurtures the future scientists and technologists.

The parents who visit the exhibitions get enlightened and encourage their children to participate. SEC is an alternate interesting mode of attaining the objectives of formal science education.

2. Objectives

The SEC is not merely a fair for fun. It has many social and educational objectives. Such exhibitions are not only the means of popularising scientific activities among students but are also good media for propagation of science among the masses. The objectives of the exhibition are broad-based:

1. To expose and encourage scientific talent in children.
2. To make children realise the relevance of science to society, as well as their responsibilities as scientists of tomorrow.
3. To give a fillip to the habit of exploration and promote manipulative skills through self-devised models or simple apparatus.
4. To stimulate interest in science and inculcate scientific spirit.
5. To encourage problem-solving approach and develop appropriate technology, especially for the rural areas, integrating scientific ideas related to daily life situations.
6. To inculcate aesthetic sense and team spirit.
7. To popularise science among the masses and create an awareness about the role of science in the socio-economic growth of the country.
8. To develop appropriate techniques for communication of science.

With these objectives in mind, the NCERT along with the Jawaharlal Nehru Memorial Fund (JNMF) had sponsored National and State Level Science Exhibitions (SLSEs) from 1972 to 1980. Even today after 40 long years, each year adds a step towards achieving the stated objectives.

3. Exhibition Over the Years

The earlier attempts to organise science exhibitions were mainly the efforts of adults. Early efforts of organising National level Science fairs for school children are not recorded. No doubt, some efforts were made

to get together students from different States. The first All India Science Exhibition for students was organised by the Indian Association for Extra-curricular Science Activities in 1970, in collaboration with the Indian Science Congress Association, at Delhi.

3.1. Collaborating Partners

In December 1971, the first NSEC was organised by the NCERT and University Grants Commission (UGC) in New Delhi at Bal Bhavan and National Physical Laboratory. The exhibits prepared by school children were displayed at Bal Bhavan whereas exhibits from institutions including the NCERT were displayed at National Physical Laboratory (NPL). The NSEC from 1972 to 1978 and 1980 was held in the lawns of Teen Murti Bhawan, New Delhi. JNMF had collaborated with the NCERT in its efforts to popularise SEC. They also jointly sponsored SLSEs from 1975 to 1979. Thereafter the NCERT has been sponsoring SLSEs by providing catalytic grant to States/UTs.

From 1981 onwards the National Level Science Exhibition for Children is being organised in rotation in different States/UTs in collaboration with the host State. It has so far been held in collaboration with the Government of the respective States/UTs in the following cities:

City	Year
Bombay (Mumbai)	1979
Bangalore (Bengaluru)	1981
Calcutta (Kolkata)	1982
Lucknow	1983
Udaipur	1985*
Guwahati	1986
Jabalpur	1987
Jammu	1988
Hyderabad	1989
Patna	1990
Kochi	1991
Madras (Chennai)	1993*
New Delhi	1995*
Bhubaneswar	1996
Gurgaon	1997
Amritsar	1998
Rajkot	1999
Goa	2000
Allahabad	2001
Hyderabad	2002
Dehradun	2003
Ranchi	2004
Raipur	2005
Pune	2006
Puducherry	2007
Solan	2008
Kolkata	2009
Jaipur	2010

* In these years, the exhibition included participants selected for the preceding year also.

3.2. Scheduling the Exhibition

The exhibition usually coincides with the celebration of *Bal Diwas* that is 14th November, the birthday of Pandit Jawaharlal Nehru. His love for, and interest in children is reflected in his saying,

> *"When I look at you and peer into your innocent eyes, I see the India of tomorrow, for after all you are the future masters of this country..."*

Nehruji was an ardent supporter of modern science and technology.

> *"I do believe firmly that the only right approach to the world problems and to our national problems is the approach of science, that is to say, of the spirit of science and method of science...."*

He felt that children and science together hold the key to India's development. The duration of exhibition usually varies from 6 to 8 days. The participants are school children and a few agencies/institutions/ public sector organisations. From 1981 onwards the NSECs/JNNSECs is being organised in rotation in any State/UT in collaboration with the State/UT for 7–8 days and participants are primarily school children.

3.3. Children Meet Scientists

The Advisory Committee of JNNSEC suggested another programme, *Children Meet Scientists* to provide an opportunity to the students to visit and interact with the scientists working in different national laboratories and science departments of universities. Initially a one-day programme was conceived. The programme was designed to involve Class X students. The first Children Meet Scientist programme was organised in January 1991 in the Department of Physics, University of Allahabad.

The objectives of the programme were to

- bring students face to face with the scientists;
- have first-hand information about the ongoing researches in India;
- create a situation that promotes the curiosity and interest so that the students may develop an urge to pursue higher studies in science; and
- enable students to discuss their own ideas.

The other institutions where the programme was held were, namely, Veterinary Science and Animal Husbandry Bhubaneswar, Orissa; National Dairy Research Institute Karnal, Haryana; Central Fuel Research Institute, Dhanbad, Bihar. The last Children Meet Scientists programme was held in the National Aerospace Laboratories Bangalore, Karnataka on 14 December 1994.

3.4. Focus on Environment

Environmental issues have always been the focus of JNNSEC from its inception either as a main theme or as one of the sub themes. However, a special effort has been initiated to create environmental awareness amongst the children since the JNNSEC-2006 held in Pune. During the Pune exhibition, renowned

Environmentalist Professor Madhav Gadgil along with his students and environmental team of the NCERT had introduced the different aspects of biodiversity of India through the medium of Information Technology. In the next exhibition at Puducherry the focus was on the assessment and reduction of carbon footprint. In the subsequent exhibitions the problems of global warming, pollution, effects of greenhouse gases were addressed by the participating and visiting children through the medium of essay writing, slogan writing, painting, film shows, etc.

4. The Role of the JNNSEC in National Integration

The JNNSEC plays a very important role towards national integration. The participants are provided with a platform where they stay, work and have their meals together for 7–8 days. The theme-wise display of exhibits provides mixing of state-wise groups. The children of one state spend the day with children from other states. Thus, the initial formality gradually gives way to close friendship. The situation is further improved as the participants live and eat together. Cultural programmes are organised during the exhibitions by the participants, leading to highly entertaining evenings. The participants thus learn first hand about their peers and their ways of living and the cultural heritage of the country.

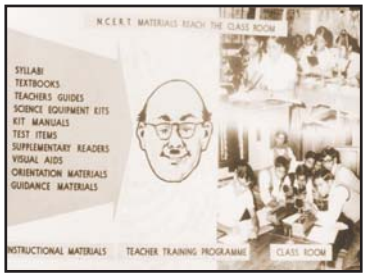
5. Organisational Aspects of JNNSEC

JNNSEC has become an annual event with a large number of students and teachers participating in it from all over the country. The preparation for JNNSEC every year starts earlier with the selection of the main theme alongwith 5 – 6 sub themes. The main theme, sub theme guidelines for preparation and evaluation of exhibits are developed by the Department of Education in Science and Mathematics (DESM), NCERT and provided to all states/UTs and school systems like Kendriya Vidhalaya Sangathan (KVS); Jawahar Navodaya Vidhalaya Samiti (JNVS), and private/public schools affiliated to Central Board of Secondary Education (CBSE). Nowadays most State/UT first organise district level science exhibition based on the main theme decided for a particular year. This is followed by organisation of State/UT level science exhibition in which best exhibits displayed at district level exhibits are selected for display. The best exhibits displayed at State/UT level exhibition are then forwarded to the NCERT for consideration. The NCERT screens and selects the exhibits to be displayed at the JNNSEC in the following year. Thus, though the duration of JNNSEC is about 6–8 days, the preparation for it involves year-round activity. The role play by the various departments and actual organisational aspects are outlined below.

5.1. The Advisory Committee of the JNNSEC

Even though the JNNSEC is organised by the NCERT, New Delhi, the major policies are decided by an Advisory Committee of NSEC/JNNSEC. Till 1988 the Advisory Committee was chaired by the Union Minister for Education, who is also the ex-officio President of the NCERT. Now, the Advisory Committee is chaired by an eminent Scientist. The Committee has as its members, a number of important well-known personalities from the field of science and technology. The Director, Joint-Director, Secretary, NCERT, the Head DESM (NCERT), and the coordinator JNNSEC are ex-officio members of the Advisory Committee. The Committee reviews the expenditure incurred during the proceeding year and approves the budget for the JNNSEC. It also approves the catalytic grants to be given to different states/ UTs by the NCERT for conducting the State Level Science Exhibitions for Children (SLSEC). It also scrutinises and approves the theme and sub themes for the State level and National level Science Exhibitions. From time to time, suggestions have been received for the improvement of the quality of the exhibits and the general organisation of the exhibition. The Advisory Committee was first set up in 1971 and members were for three years. The committee meets at least once a year, usually a few months before the JNNSEC. Every year 1/3 of the members are replaced.

5.2. The Role of DESM and Other Departments



DESM is responsible for coordinating the organisational aspects of the JNNSEC. It acts as the liaison between the State/Union Territories and the NCERT, regarding funding and other administrative affairs and sometimes also acts in the advisory capacity. The NIE Workshop Department, the Publication Department, the Central Institute of Educational Technology (CIET), and the Accounts Department are some of the other constituents of the Council that are also actively involved in the organisation of JNNSEC. The NIE Workshop Department extends help in the setting up of the exhibition, and also displays various items such as model exhibits and science kits in the NCERT pavilion. The Publication Department puts up a special stall for the display and sale of NCERT publications. The CIET documents the whole event besides displaying science-related audio-video materials developed by it. The Accounts Section provides logistic support for the programme.

5.3. The Role of JNMF and States/UTs

The JNMF was established as a National Trust in 1964. Some of its activities relate directly to science education in general and an out-of-school activity in particular. The JNMF had collaborated between 1972 to 1980 with the NCERT in the organisation of both the NSEC as well as the SLSEC. It provided a part of the funds for the two activities. Besides, it also extended help in

various matters related to setting up of the NSEC at Teen Murti House, New Delhi.

The National Level Science Exhibitions since 1981 are being held in collaboration with the Government of State or UT which provide the venue and other logistic support for the event. The coordinator of the programme at the NCERT is in continuous touch with the host State/UT for the successful organisation of the exhibition as per the norms and the guidelines approved by the Advisory Committee. The Jawaharlal Nehru National Science Exhibition for Children has received appreciation and patronage from the highest functionary in the country. The exhibitions have been inaugurated by the Honourable President of India on many occasions.

5.4. Participation

Schools, colleges, universities and many national laboratories participated in the first All India Students' Science Fair held in 1970 in New Delhi. Therefore, the first NSEC had as its participants the national laboratories, universities, colleges and schools. Gradually, the participation of school students increased and participation by other organisation got reduced.

The method of selection of student participants for the NSEC/JNNSEC has evolved over the time. During the initial years, the State education departments, individual schools and other organisations were invited to submit write-ups of the exhibits to the NCERT. At the NCERT the exhibits were classified area wise (not discipline wise). The NCERT constituted area wise selection committee with members drawn from universities, IITs and research institutions. The exhibits recommended by the selection committees were invited to participate.

The major drawbacks of this system of selection were that many of the educationally backward States/UTs remained unrepresented. The write-ups often did not present a true picture of the exhibits, hence led to the poor quality of the display.

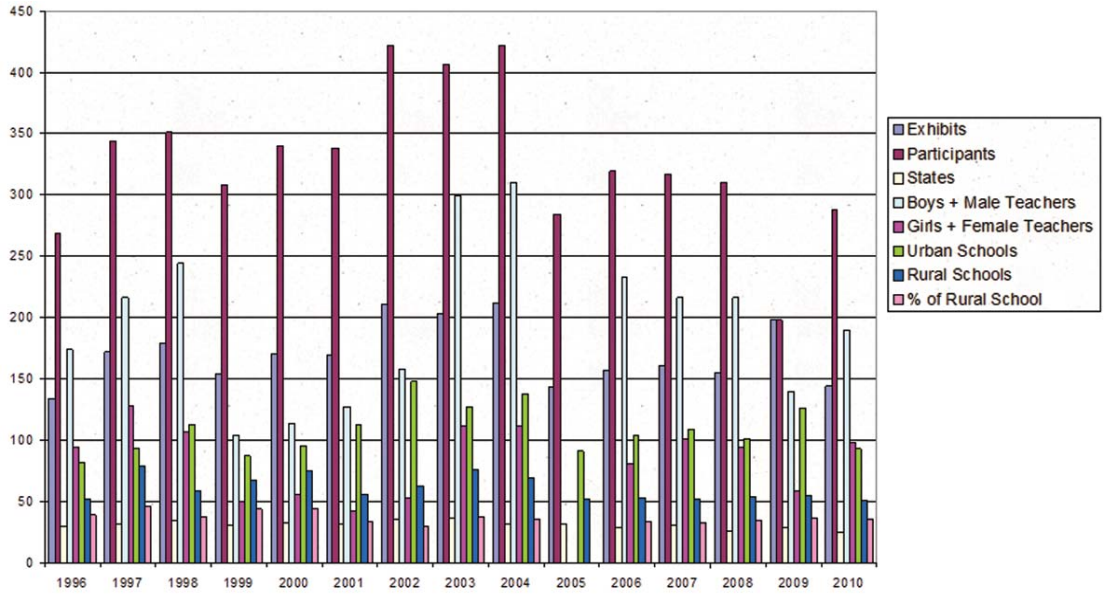
The Advisory Committee of National Science Exhibition for Children suggested holding of State level exhibitions to ensure participation from all States. The launching of SLSEC partially solved the problems. The first SLSEC was organised in 1975. The direct selection was discontinued in a phased manner. Now every year the States are invited to send the write-ups of exhibits on the merit basis from the SLSEC from which, after final screening, entries are selected for the NSEC/JNNSEC. This procedure necessitates organisation of a SLSEC. On the same footing, a district level exhibition and regional level exhibition are also held.

Therefore, now it is mandatory for each state to hold a state level exhibition based on the selected exhibits from the districts. The number of states holding the SLSEC has shown gradual increase. In 1975, only ten SLSEC were held; by 1978 the figure had gone

up to 28 States/UTs, and in 2009 to twenty-nine. At the National level, the number of participating States/Union Territories has risen from 13 in 1976 to 28 in 1988 and 29 in 2009. Almost all the States/Union Territories are now holding their own science exhibitions for children; the procedure for selection of participants has thus been simplified. Each State/UT is requested to send the write-ups of the best exhibits in each sub theme. From these, a maximum of ten exhibits from a state/UT are chosen for display at the JNNSEC. As the participants of the different SLSECs are in most cases the winners of District-level Exhibitions, so are the participants of the JNNSEC. Thus JNNSEC has assumed the character of an apex exhibition. It may be noted that the Advisory Committee of JNNSEC approves the theme and sub theme of the National Exhibition two years in advance so that States/UTs can take appropriate steps for the improvement of exhibits and the quality of exhibitions. This has had the expected result of improving the quality of the exhibits as well as achieving the All-India representation.

S. No	Year	No. of Exhibits	Participants	States	Boys + Male Teachers	Girls + Female Teachers	Urban Schools	Rural Schools	% of Rural School
	I	II	III	IV	V	VI	VII	VIII	IX
1.	1996	134	268	30	174	94	82	52	38.8
2.	1997	172	344	32	216	128	93	79	46
3.	1998	179	351	34	244	107	113	59	36.9
4.	1999	154	308	31	104*	50*	87	67	43.6
5.	2000	170	340	33	114*	56*	95	75	44.2
6.	2001	169	338	32	127*	42*	113	56	33.2
7.	2002	211	422	35	158*	53*	148	63	29.9
8.	2003	203	406	36	299	112	127	76	37.5
9.	2004	212	422	32	310	112	138	69	35.0
10.	2005	143	284	32	**	**	91	52	**
11.	2006	157	319	29	233*	81*	104	53	33.8
12.	2007	161	317	31	216*	101*	109	52	32.3
13.	2008	155	310	26	216*	94*	101	54	34.9
14.	2009	198	198	29	139*	59*	126	55	36.4
15.	2010	144	288	25	190*	98*	93	51	35.5

*Data for Student Participants only
** Data not available



Participation During 1996–2010

The selection committee reviews the write-ups of the exhibits forwarded by each State/UT individually and identifies exhibits for display during the JNNSEC. The table below gives a trend of participation during 1996–2010. The higher number of exhibits during the year 2002, 2003, 2004, and 2009 therefore is the index of the quality of the exhibits received. The numbers marked in star in column 6 and 7 identify the number of male and female students only. For the year 2005, no data are available for male and female participation. Except for the years 1997, 1999 and 2000 there is around 34% rural school participation.

5.5. Special Pavilions

In 1979, when the NSEC was held in Bombay (now Mumbai) in collaboration with the State of Maharashtra, the Bombay schools were given a separate representation and students exhibited their models under the banner of the Bombay Association for Science Education. Except for exhibits from Bombay schools, the other exhibits from the State of Maharashtra were displayed in the theme pavilions. Since then, schools of the city which host the exhibition gets a separate pavilion representing the efforts of the local schools. The children of the local schools also act as local guides for the visiting participants from rest of the country.

The school systems like the KVs, NVs and subsequently CBSE affiliated private schools; Demonstration Multipurpose Schools (DMSs) of Regional Institute of Education (RIEs) are also provided a special status on the similar lines. Their exhibits too are displayed under different sub themes. Besides this, certain science clubs and organisation are also provided special status. In spite of the best efforts, overlapping in selection of participants by the state and above-mentioned organisations often becomes a challenging task.

6. Themes

Till 1976, there were no specific themes for the NSEC. With the adoption of a common theme and sub themes from 1977, a theme was supplied for the SLSEC and the same theme was adopted for NSEC/JNNSEC for the following year, as the best of the exhibits from the former exhibitions participate in the latter. The themes for NSEC/JNNSEC from the year 1977 are as follows:

Themes for NSEC/JNNSEC

Year	Themes
1971	Exhibits classified according to specific areas
1972	Exhibits classified according to specific areas
1973	Exhibits classified according to specific areas
1974	Exhibits classified according to specific areas
1975	Exhibits classified according to specific areas
1976	Exhibits classified according to specific areas
1977	Man and the Environment
1978	Technology and Rural Development
1979	Science in the Service of the Man
1980	Science in the Service of the Man
1981	Science and Village
1982	Science and Community Development
1983	Science and Technology for Productivity
1984*	Indigenous Technology in Development
1985	Indigenous Technology in Development
1986	Science and Home
1987	Science and Quality of Life
1988	Water and Man
1989	Science and Man
1990	Nehru and Science
1991	Science and Village
1992*	Science in A.D. 2001
1993	Science and Technology for National Development
1994*	Science and Conservation of National Resources
1995	Science and Health for All

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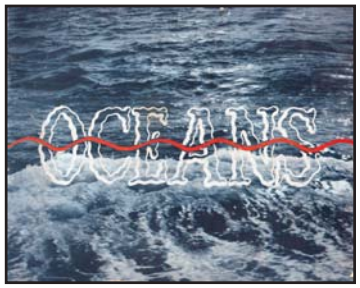

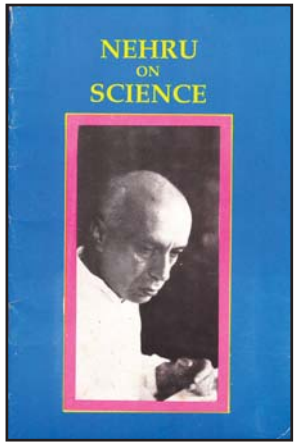

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1996	Science and low cost Technology for Development
1997	Science and Technology for Quality of Life
1998	Science and Technology in the Information Age
1999	Science, Technology and Environment
2000	Science and Technology to meet the Challenges of life
2001	Science and Technology for Development
2002	Science and Technology for Society
2003	Science, Indigenous Technology and Sustainable Development
2004	Science and Technology in the Changing World
2005	Recent Trends in Science and Technology
2006	Science and Technology for Rural Development
2007	Science and Technology for Sustainable Development
2008	Science, Technology and Planet Earth
2009	Science and Technology for Global Sustainability
2010	Science, Technology and Society

** The exhibition combined with that held in the following year.*

7. Publication

A brochure on National Science Exhibition for Children that was held from 14 to 22 November 1971, was published and circulated among the participants and visitors. The exhibition was inaugurated by the then Prime Minister of India, Shrimati Indira Gandhi. The brochure published for the second National Science Exhibition for Children in 1972 included details about exhibits, the names of the institutions that participated from 16 States and a brief description of some of the exhibits. This brochure was also widely appreciated. The publication in the year 1973 was about the details of the inaugural function of NSEC held in Teen Murti House, New Delhi from 10 to19 November. The exhibition was inaugurated by the then President of India, Shri V.V. Giri. Smt. Indira Gandhi, the then Prime Minister of India graced the inaugural function as President of JNMF. Professor D.S. Kothari the eminent educationist and physicists gave the welcome address. In his address he thanked the respected *Rashtrapathiji* and Prime Minister Smt. Indira Gandhi for showing keen interest and inspiring the children.

A study that was conducted during 1975 to evaluate the response of participants revealed that a majority of the students desired to have a booklet containing a

detailed account of each exhibit. Such a booklet was brought out in 1976 with the objective of improving the quality of exhibits. 50 per cent of the write-ups with good illustrations and photographs received that year were selected for the booklet. To maintain the originality of the write-ups minimum editing was done and the same trend is observed even today. The write-ups were mostly of the interesting exhibits. Such a booklet was intended to provide guidance and help the students to prepare new exhibits and improve previous models. This publication was titled, Structure and Working of Science Models. It is now an annual feature to publish, Structure and Working of Science Models, based on the selected exhibits. Another booklet titled 'List of Exhibits' is a compilation of all exhibits selected for display at JNNSEC. The exhibits are arranged according to the sub themes and are brought out every year since 1980 with the purpose of providing guidance to the visitors.

This booklet provides information about the displayed exhibits and acquaints the visitors about recent developments in science. Further a publicity brochure is brought out every year since 1988. This includes objectives of the exhibition, themes and sub themes for the next SLSEC, and details about participation. In the year 1989, NCERT brought out a commemorative issue 'Nehru on Science' to celebrate the birth centenary of Pandit Nehru. Besides the three publications, guidelines for preparation of exhibits, models and organising SLSEC are also published every year and the copies are made available to the State personnel involved in the organisation of district/State level exhibitions for perusal and use.

8. Exposure to New Scientific Ideas

During the JNNSEC eminent scientists are invited to address and interact with the participants. The participants are thus provided an opportunity of listening to famous scientists. This is an attempt to bring them in contact with the best scientific minds of the country, so that they may be encouraged to follow their lead. Two or three lectures are arranged each year at the venue. Visits to places of interest, film shows, etc. are also arranged.

9. Board and Lodging

The participants are lodged at a convenient place arranged by the host State/UT. The participants take breakfast and dinner at a common place. Lunch, evening tea and snacks are usually provided at the exhibition ground.

10. Steps for Improvement

The quality of the models exhibited at the SLSEC and JNNSEC has shown gradual

improvement over the years. However, much remains to be done in this aspect.

As mentioned earlier, in an attempt to produce some exemplary material from which both the organisers and the participants may draw ideas 'Structure and Working of Science Models' was produced. The write-ups selected for the booklet are basically for guidance. They encourage creativity in children, as pupils feel that they too can create similar or better models. The booklet is always in high demand.

The participants for the JNNSEC are selected based on the write-ups forwarded by the States/UTs after their respective State/UT level exhibition. The qualities of the exhibits, however, vary from State to State depending on the resources available and educational status of the children. It was felt that a major reason for the wide disparity in the quality of exhibits may be the lack in uniformity of criteria of evaluation. Therefore, the Advisory Committee of JNNSEC has suggested that 70 per cent of the weightage be given to creative-ability/originality/ innovation/scientific-principle, thought and approach/ technical skill/craftsmanship; and 30 per cent to utility/educational value for layman and children/cost of production/ portability/durability and presentation.

11. Future of JNNSEC

It is true that the Children Science Exhibition Movement has gained much ground and has gone a long way to achieve the stated objectives. The organisation of a fruitful science exhibition is a difficult job. To the common man the word 'scientists' means men and women wearing white coats and engaged in working with sophisticated equipment, much beyond their reach. 'Exhibition', on the other hand, implies a social gathering where all enjoy and understand what they see. The synthesis of these two is obviously difficult. The science exhibitions, therefore on one hand, must open doors to the mysteries of science so that it can bring them within the grasp of the common man, project the social relevance of science and impart the awareness of methods of science to the participants and the public alike. On the other hand, it must have the appeal of a fair where people come because they find it interesting and enjoyable, and mix freely to quench the desire for learning.

The question, therefore is, what sort of exhibits would fulfill both these requirements? There are basically two distinct types of exhibits. The first are those exhibits which are kept in museums, static or working models which explain scientific concepts, or prototypes of equipment already in use. They are normally highly finished and have visual appeal. But how far do such exhibits fulfill the stated objectives? To build such an exhibit a child does not need to have any creative ability or much of a problem-

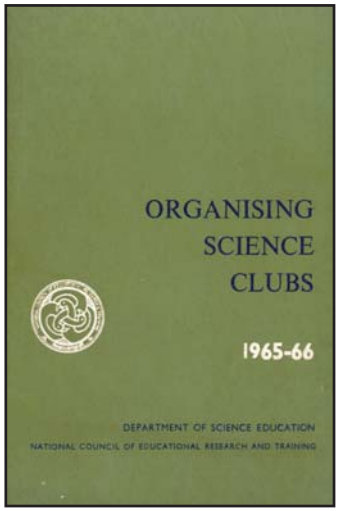
solving approach. The only decision one has to take is what is to be made and the materials she/he is going to use.

Such exhibits can easily be made during the school timetable. These exhibits have a public appeal, only if they are highly presentable. They do not test the scientific attitude and aptitude of the spectators. But normally the exhibits are made in a hurry by students; therefore usually lack the required finish and hence the public appeal. Most apparent benefit of such an effort is that the students definitely develop certain technical skills like carpentry, soldering, handling of semi-conductor devices, etc.

The second type of exhibits, of which very few come up for selection for the JNNSEC, are the outcome of project activities over a certain period of time. In such cases, the participant has tried to identify problems in her/his immediate environment or has looked into other types of scientific problems and has tried to solve them. This may include problems of improvement in existing equipment or instruments also.

These type of exhibits fulfill a large number of the stated objectives. They really encourage curiosity and creativity. Often, such projects are the work of two or more students and thus foster team spirit. Such projects also highlight, in many cases, the social relevance of science, and in all cases, teach the developer as well as the viewer the method of science. Unfortunately, the presentation of such projects finds difficulty in display. For a project to have a visual appeal, it should be well illustrated through photographs and charts, and other evidences. Perhaps, this is one of the reasons that a very few such projects get selected for the JNNSEC. The proposed renaming of the exhibition from 2011 is to encourage children to undertake project work. Such studies are not possible within the restricted framework of the school system, and therefore, must form a part of out-of-school activities.

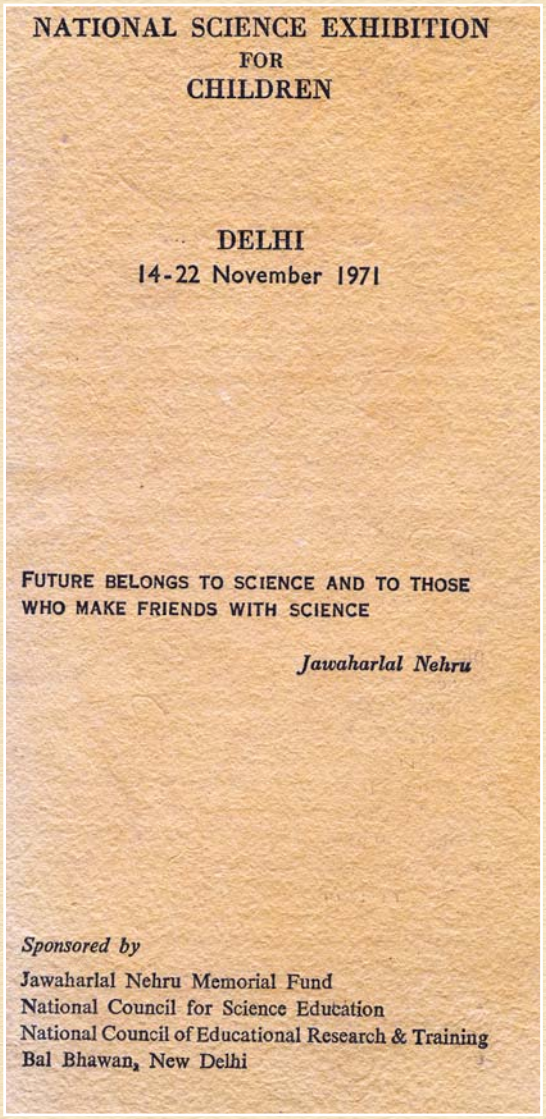
Promotion of out-of-school activities such as science clubs, hobby centres, etc. was spearheaded by the NCERT in 1966. It brought out a booklet on how to organise a science club and for some years it also gave financial support for such clubs. The National Council of Science Museums (NCSM) has also been trying to promote this activity through its creative centres. Indeed, they have gone a step further and organised training courses for teachers. Apart from NCSM a lot of work has also been done for the promotion of out-of-school activities by the National Council for Science and Technology Communication (NCSTC) which organises National Children Science Congress as an annual event. Many other initiatives by private/commercial organisation also provide children the



opportunity to nurture their creative talent. But all this is a drop in the ocean considering the vast number of children in schools and places where no such facilities exist, especially the rural areas. It is time we take a fresh look as how to activate science clubs, nature clubs, eco-clubs, and hobby centres to promote on a large scale, activity of this type in all the States and UTs. Only then can we hope to improve the quality of future science exhibitions and reap the real benefits that are to nurture scientific talent amongst members of the young generation both from rural and urban regions.

The future holds great promise for the Children Science Exhibition Movement in general, and the Jawaharlal Nehru National Science Exhibition for Children in particular. Continuous efforts are made to monitor, evaluate, and modify the organisation and contents of science exhibitions at all levels throughout the country.

1971-1980

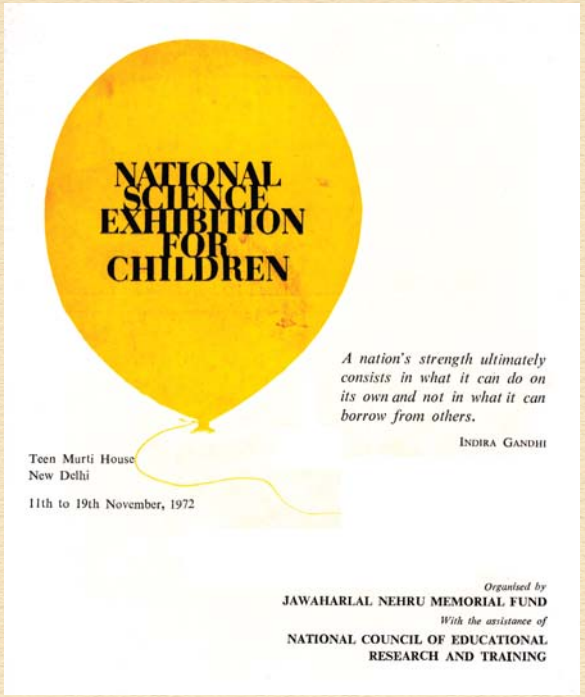

NATIONAL SCIENCE EXHIBITION
FOR
CHILDREN

DELHI
14-22 November 1971

FUTURE BELONGS TO SCIENCE AND TO THOSE WHO MAKE FRIENDS WITH SCIENCE

Jawaharlal Nehru

Sponsored by
Jawaharlal Nehru Memorial Fund
National Council for Science Education
National Council of Educational Research & Training
Bal Bhawan, New Delhi



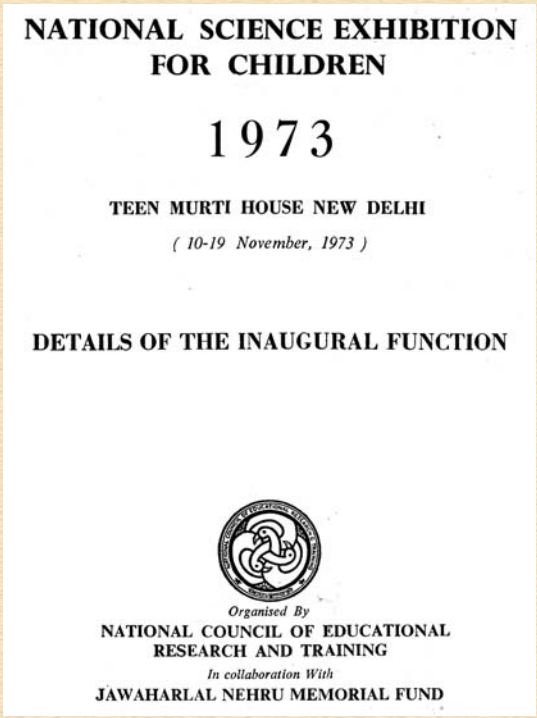
A nation's strength ultimately consists in what it can do on its own and not in what it can borrow from others.

INDIRA GANDHI

Teen Murti House
New Delhi

11th to 19th November, 1972

Organised by
JAWAHARLAL NEHRU MEMORIAL FUND
With the assistance of
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING


NATIONAL SCIENCE EXHIBITION FOR CHILDREN

1973

TEEN MURTI HOUSE NEW DELHI

(10-19 November, 1973)

DETAILS OF THE INAUGURAL FUNCTION

Organised By
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
In collaboration With
JAWAHARLAL NEHRU MEMORIAL FUND


NATIONAL SCIENCE EXHIBITION
FOR CHILDREN
1974

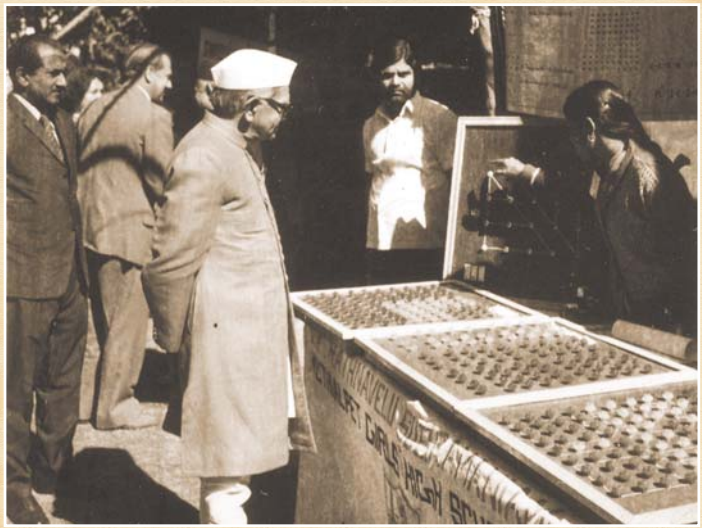

NATIONAL COUNCIL OF SCIENCE MUSEUMS
BIRLA INDUSTRIAL & TECHNOLOGICAL MUSEUM, CALCUTTA
VISVESVARAYA INDUSTRIAL & TECHNOLOGICAL MUSEUM, BANGALORE
NEHRU SCIENCE CENTRE, BOMBAY
BIRLA SCIENCE CENTRE, HYDERABAD
BIRLA SCIENCE CENTRE, PATNA


राष्ट्रीय बाल-विज्ञान प्रदर्शनी
NATIONAL SCIENCE EXHIBITION FOR CHILDREN
1975

Inaugural Sessions

Dignitaries Interacting with Children

Dignitaries Interacting with Children



Dignitaries Interacting with Children

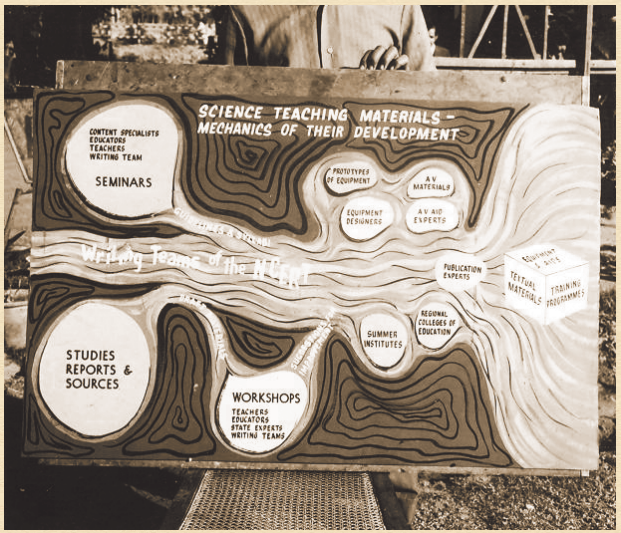
Dignitaries Interacting with Children

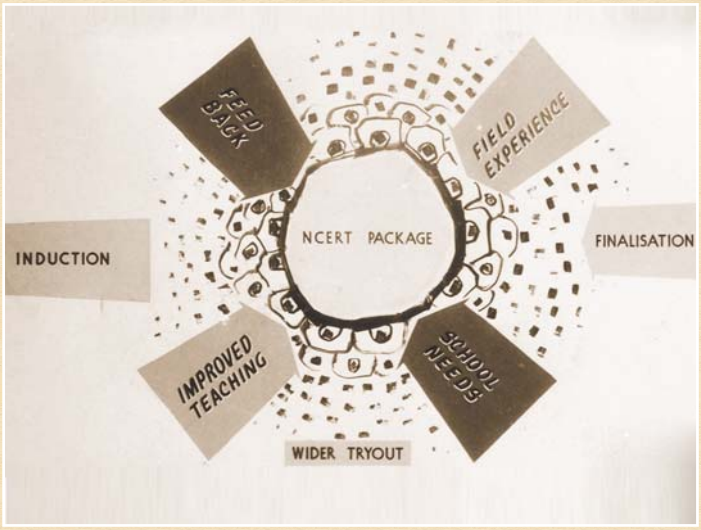
Dignitaries Interacting with Children

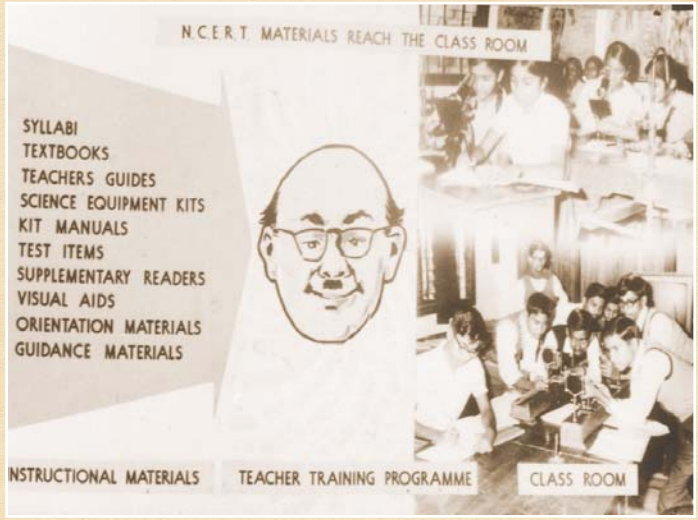
Participants Enthusiastically Presenting Their Exhibits

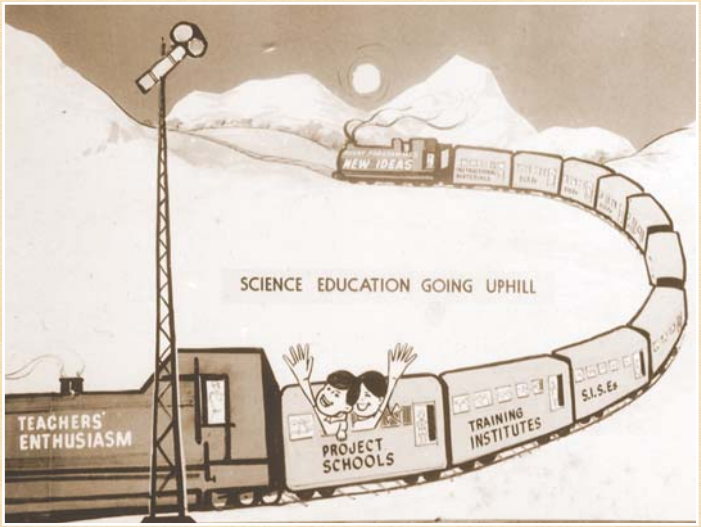
Visitors Interacting with Participants

Displays at the NCERT Pavilions









Displays at the NCERT Pavilions

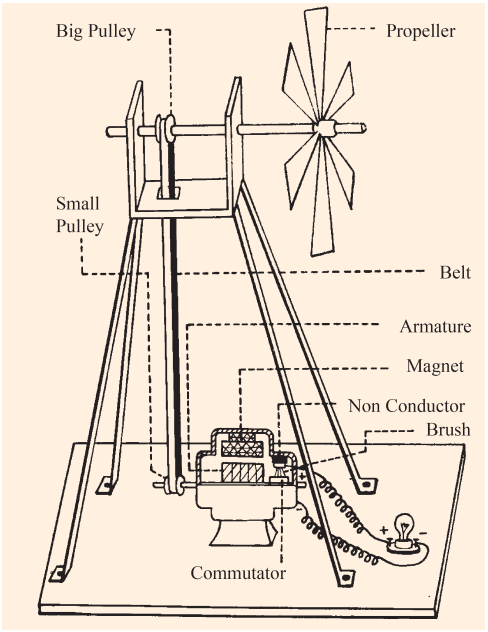
1971–1980

1. 1976

I. Energy and Fuels

Wind Electricity

Construction and Working: The instrument consists of a propeller with a big pulley fixed at one end of the axis. Wind rotates the propeller causing the rotation of the pulley that is transferred to the armature of the dynamo with the help of a belt. Two halves of a commutator insulated from one another are introduced to induce alternating current in a D.C. generator. Thus, a direct current is delivered by the commutator through the brushes to the external circuit to light a torch bulb.



Uses: *This model can be used to run pumps for irrigation, power-looms, and small-scale cottage industries.*

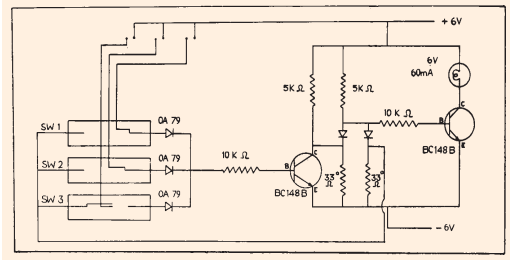
II. Innovations in Teaching

Computer Examiner

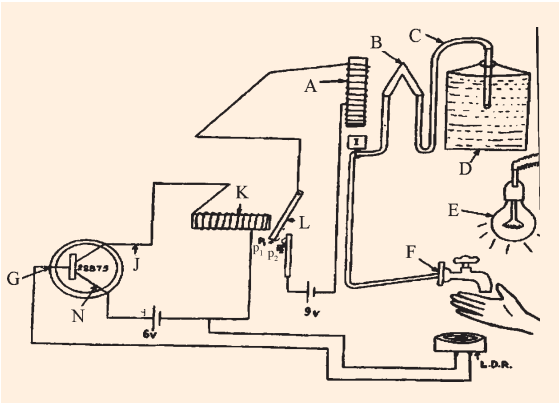
Construction and Working: The main principle behind the project is the mechanism of 'Logic gates'. These gates are represented by an electronic circuit, which uses the properties of semiconductors such as diodes and transistors. The circuit is fixed on printed circuit board and fitted to the face of a large rectangular wooden box. The lighting of the bulbs indicates the right answer. Therefore inside the box are fitted the same number of circuits as the number of questions. The main function of the little device is to examine the answer papers.

Corresponding to the correct answers in the question paper, the circuits are developed. The examinee is advised to mark the light answer with a soft pencil. The answer sheet is kept inverted on the specially provided space on the board.

When the main switch is switched on, you get your answer paper checked automatically; since the circuit gets completed because of graphite



Uses: *The device should find a very useful application in examining answer papers of examinations. This method saves considerable time if used on a large scale.*



Uses: *It can be used for automatic supply of water when in need therefore ensuring flow of water any time .*

pencil mark. The number of lighted bulbs indicates the number of correct answers. But in case of two answers to the same question, the circuit is such that no bulb will glow as it gets disconnected.

2. 1978

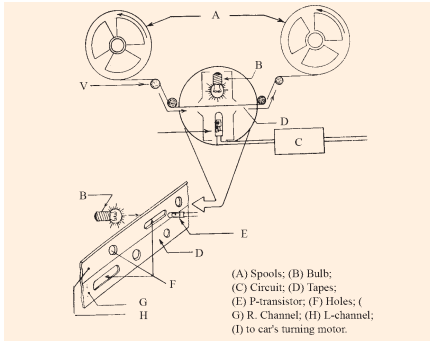
I. Man and Machine

A. Auto Water Tap

Construction and Working: The instrument consists of a transistor connected to a 6V battery. These two are connected on one side to a LDR and on other side to an electromagnet relay. p1 and p2 are two contact points controlled by the relay. S is a strong electromagnet connected to a 9V battery through the points p1 and p2. The rubber tube with soft rubber tubing in the middle stops the flow of water. To make bending, a piece of soft iron is tied with the rubber tube and kept just below the strong magnet. A 60W electric lamp is kept above the water tap. When light falls on the LDR and its resistance decreases the base (G) of the transistor gets negative voltage. A current flows from the emitter to the collector through relay. The relay is magnetised and attracts a lever in front, making a gap between p1 and p2. The strong magnet is demagnetised releasing the iron piece, and the flow of water is stopped. If we place our hand below the water tap the shadow falls on the LDR increasing its resistance. So the negative voltage supply through the LDR to the base is stopped. The current flow through the relay is cut off. Thus, p1 is released to make contact with p2 and the strong electromagnet circuit is closed. And the iron piece is uplifted, allowing the water in the pot to come to the tap and fall on the hand.

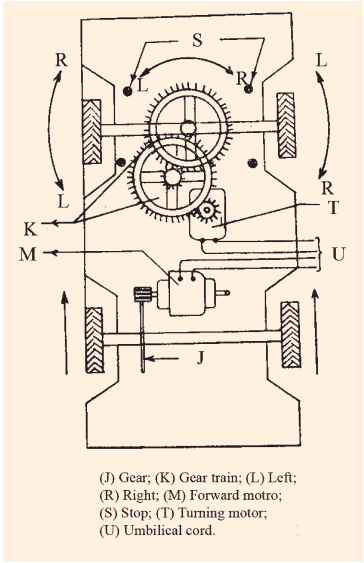
B. Computer Controlled Car

Construction and Working: In this project a car is controlled by a pre-programmed computer. The computer consists mainly of two spools rotating with a paper tape (with pre-arranged holes) wound between them. The paper tape passes between a bulb and a photo-transistor to make the car turn in both directions; the tape is divided into two parts lengthwise, i.e. L-channel and R-channel. When the holes come to the bulb, light can pass through them and the p-transistor conducts it to a relay. The relay in turn closes contacts for the turning motor of the car. The car is linked to the computer by an umbilical cord (pair of wires). The light from headlamps of our car, if reflected, will fall into the transistor placed between the headlamps. The p-transistor conducts a relay associated, which switches off the forward drive motor and also stops the spool drive computer motor which stops collision.



(A) Spools; (B) Bulb; (C) Circuit; (D) Tapes; (E) P-transistor; (F) Holes; (G) R. Channel; (H) L-channel; (I) to car's turning motor.

Uses: *To protect our car from collisions and also from overshooting the red light.*

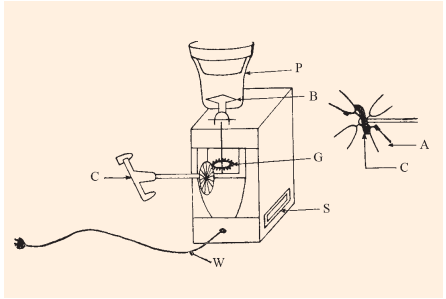


(J) Gear; (K) Gear train; (L) Left; (R) Right; (M) Forward motro; (S) Stop; (T) Turning motor; (U) Umbilical cord.

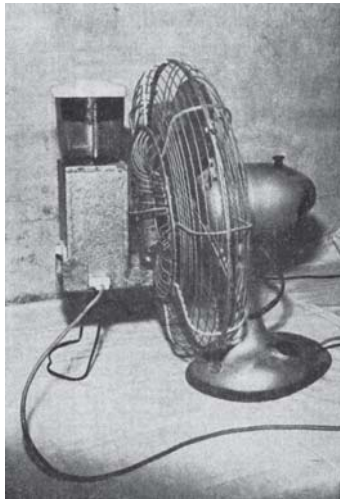
C. Mixer Attachment to a Table Fan

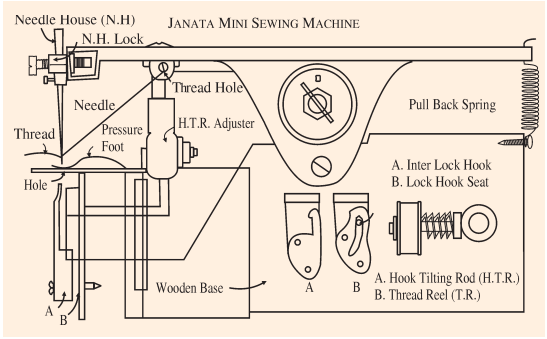
Construction and Working: The materials used for making the mixer attachment are:

Wooden box: size $3^{1/3}$" × $3^{1/2}$" × 7", two gears, switch, two pots for liquid and solid or grains, clip for fixing it to the fan and stand. Two gears are joint so that one gear moves vertically and the other horizontally. The vertical gear is attached to the table fan by a rod. The mixing pot is kept on the horizontal gear. There are two pots, one for solids and the other for liquids. When the fan moves, the rod attached to it starts moving. This rotates the vertical gear, which in turn rotates the horizontal gear. One rotation of the fan makes four rotations of the gears. Before using the mixer, the table fan should be fixed in one position.

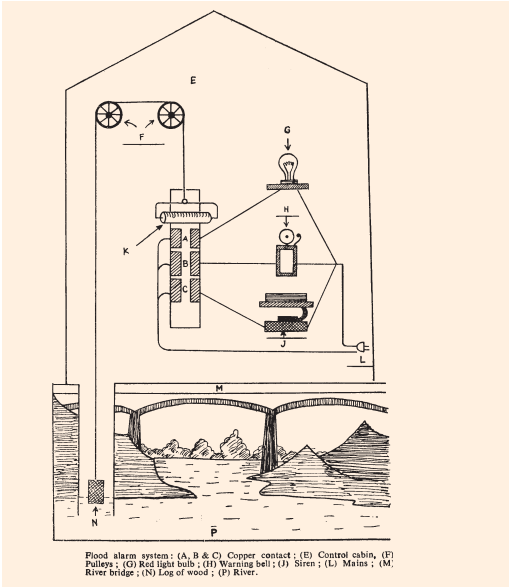


Uses: *It can be used for grinding, churning and mixing purposes.*





Uses: *This machine is useful for fastening buttons, stitching, embroidery, etc.*



Flood alarm system : (A, B & C) Copper contact ; (E) Control cabin, (F) Pulleys ; (G) Red light bulb ; (H) Warning bell ; (J) Siren ; (L) Mains ; (M) River bridge ; (N) Log of wood ; (P) River.

Uses: *It will be useful for the flood control department of the government to warn people against heavy floods.*

D. Janata Mini Sewing Machine

Construction and Working: This machine consists of: Interlock hook, Lock hook seat, Hook Tilting Rod (HTR), Thread reel key, Pull back spring, HTR adjuster, Needle house, Needle house lock, Pressure foot, Needle, Wooden base, Thread hole, Hole,and Thread Reel. Pass the thread through the thread hole and then through the needle hole from the right to the left. Keep the cloth under the pressure foot. This machine is held between the thumb and the other four fingers of the right hand. Press downwards the upper portion of the machine so that the HTR moves along with groove and tilts the lock hook seat. As the interlock hook is connected to the lock hook seat, the lock hook seat tilts towards its right. The needle with the thread comes through the hole and the hook which is at the top of the interlock hook forms a loop of the thread. Now, release the pressure on the upper portion with the help of the pull back spring. The interlock hook tilts back to its original position leaving back the loop formed, and this loop comes through the first loop. Hence, a stitch is formed.

II. Man and Environment

E. Save Yourself from the Floods

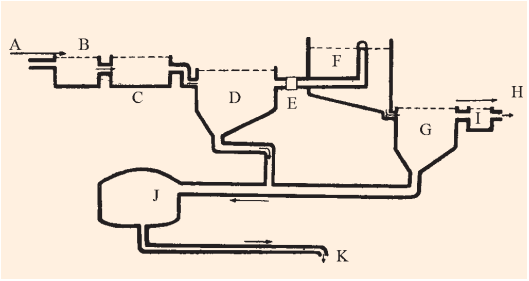
Construction and Working: A hollow pipe touching the surface of the water is kept at the river bank or near the bridge. A piece of wooden log of proper size is hung inside this hollow pipe. The string with which the wooden log is hung on one side passes through a pulley and other side carries a roller made up of metal. This roller is kept in such a way so that it can pass over the copper contacts A, B and C linked with red-light bulb, a warning bell and a siren respectively. When water level rises, it pushes the log of wood upwards, so that the roller slips towards the copper contact. At the danger level, the metal roller touches the contact A and the red light bulb is on. If contact B is touched by the metal roller, the warning bell starts ringing. At last when the water level crosses the danger mark, the roller touches the contact C and with that the siren starts operating automatically.

3. 1979

I. Conservation of the Environment

Control of Water Pollution

Construction and Working: The domestic sewage is first passed through a series of screens for removing large objects like rats, grape fruits, etc. and then it passes through a grinding mechanism that reduces any remaining object into fine particles. The next stage is a series of settling chambers designed to remove the particles like sand, other suspended solids including organic nutrients, etc. If the sewage is now discharged it won't look bad but it will carry pathogenic bacteria. The next step is to reduce the dissolved or finely suspended organic matter by a form of accelerated biological action. Long pipes rotate slowly over a bed of stones distributing polluted water in continuous spray. As the water trickles over and around the stones, it offers its nutrients in the presence of air to an abundance of rather unappetising form of life. A fast moving food chain sets into operation. Bacteria consume molecules of proteins and fats. Protozoa consume bacteria, further come worms, snails, flies and spiders. Each life form plays its part in converting high energy chemicals to low energy ones. The final step is the disinfection of water. This is achieved by chlorinating the water.

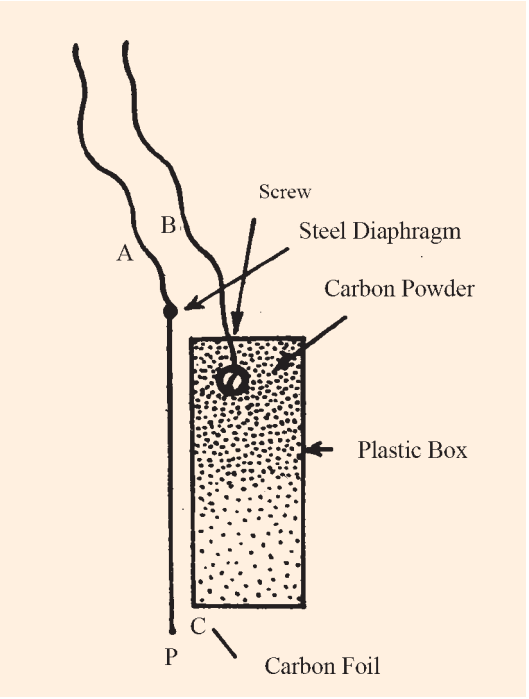


Uses: *It can be used to purify the water from the domestic sewage.*

II. Applied Science

Carbon Microphone

Construction and Working: A plastic box containing carbon powder is taken as shown in the figure. P is a steel diaphragm which is fitted in the mouth of the plastic box tightly. A and B are two flexible wires, A is connected with steel diaphragm and B is connected with carbon powder with the help of a screw. The other ends of A and B are connected with the battery operated received set.



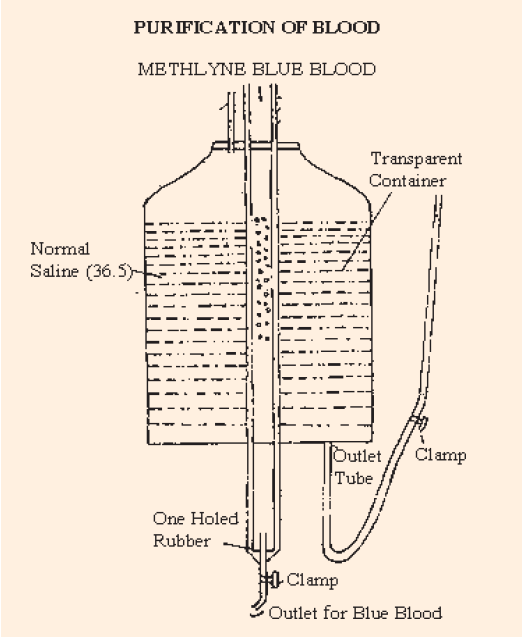
When one speaks in front of the carbon microphone the diaphragm starts vibrating. As a result of which the carbon foil alternately presses over the carbon particles. This helps to transmit the sound in the receiver set loudspeaker.

4. 1980

I. Purification of Blood

Health

Construction and Working: Dialyser is an instrument which performs the function of a kidney when the kidney fails. Exhibit is a model of the dialyser. The model of a dialysis instrument, exhibits the working of a single nephron of the kidney. There are millions of such nephrons in our kidney functioning to purify our blood. The model consists of a plastic bottle with a lid. A plastic tube of about twelve inches is perforated in the middle with tiny holes. An opening is made in the bottle and the tube is fitted to it and sealed. Two thin coils of blotting paper are made and introduced — one inside and the other outside the perforated tube. A small hole is made in the lid and a side tube is introduced into it. The bottle is also provided with an exit tube at the bottom. The perforated tube is closed by means of a cork. In four litres of blood, 36.5 grams of sodium citrate is put in so as to prevent it from clotting. A saline solution is formed by mixing the same amount of sodium citrate with water. This is done so as to maintain the osmotic balance equally inside and outside the tube. A small amount of methylene blue is mixed with water and a solution of it is formed in a beaker. All the fittings of the bottle are made air tight. The saline solution is poured into the bottle through the side tube. Blood is poured into the perforated tube. A very small amount of methylene blue solution is also poured in the mix with the blood in the tube. After a few minutes methylene blue is alone seen making its way through the blotting paper into the saline solution. The pure blood passes through the tube and can be seen dripping through the capillary tube fitted to the cork. This is collected in a small beaker for use again. When, all the methylene blue has entered into the saline solution,



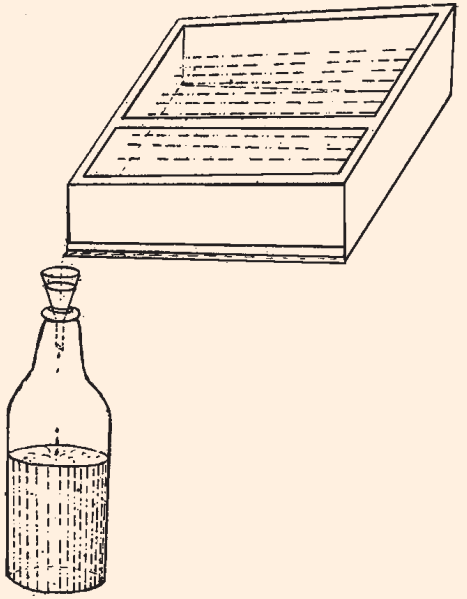
the stopper which closes the tube is removed and the solution is emptied into a basin. Fresh solution is prepared and used.

Exhibit as an anology to dialyser; The perforated tube represents the coil of the dialysing instrument. The blotting paper represents the semipermeable membrane tubes. The methylene blue represents the toxic substance in the blood. The saline solution represents the dialysing fluid circulating outside the coil.

II. Energy Generation and Needs

Solar Distillation Plant

Construction and Working: In modern times we are facing the difficulty of fuel. But the supply of solar energy is unending and if harnessed in a proper manner can be helpful to mankind. The biggest problem in getting this energy is that it is received in scattered form on the earth. But India is fortunate in this respect as this energy remains visible on its surface for a long spell. Therefore realising the importance of this source of energy our students had a idea to prepare this model. It is simply a wooden box having two compartments. One for muddy water and the other for distilled water. A glass pan is put on the upper side. Compartment for muddy water is blackened to make it a good absorber of heat radiation. In the front wall there are holes so that the distilled water may pass out and may be stored in a vessel. The whole apparatus is put in the Sun. With the help of solar energy the water evaporates from the muddy water leaving behind the mud or any other dissolved substance and tilts to the next compartment along the inner surface of the glass pan which helps in condensation and avoids radiation of heat. In this way with this model we can get at least two litres of distilled water in a day, without spending anything on fuel.



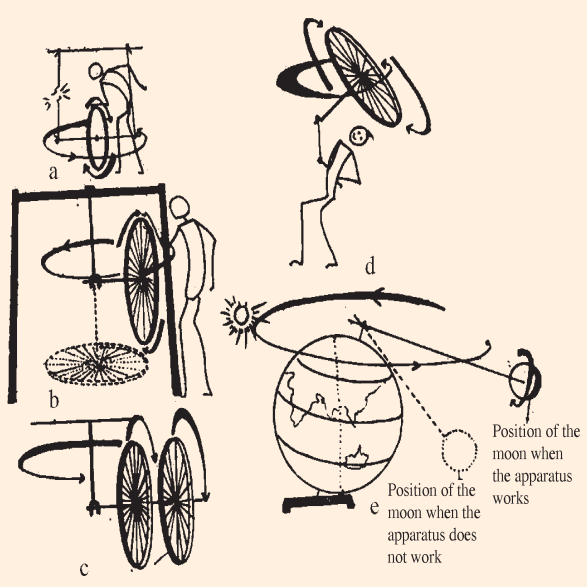
Uses: *It can be used to make distilled water and to get sweet water from sea water.*

III. Astronomy

Astronomical Wonder

Construction and Working: A wheel was suspended by means of two strings on its horizontal axis and rotated with high speed. At that time one of the strings was broken, but the wheel continued to rotate in the same

position instead of falling down. At the same time one more wonder was noted. The wheel revolved round the unbroken string too. Also when the rotation of the wheel was clockwise the revolution was anticlockwise and vice versa. In the actual construction the wheel is suspended with the help of an iron rod on a wooden stand. The axis of the wheel can freely rotate round the rod. When the wheel is held horizontally and rotated, it remained with position and revolved around the iron rod. When the direction of rotation is changed, the wheel revolved in the opposite direction. When two wheels are used and rotated in the same direction the working was more efficient, but when rotated in the opposite direction the wheels fell down.



Conclusion of the Scientific Reasons and Principles

1. **Why the wheel does not fall down while it rotates?**
   While the wheel is rotating a force which can withstand the gravitational force of the earth is created, i.e. the angular momentum ($1/2\ MV^2/r$) here is greater than the gravitational force (Mg).
2. **Why does the wheel revolve round the pivot?**
   While the wheel rotates a force is exerted towards the axis. It is called centripetal force. It makes the axis move horizontally and this movement of the axis makes the wheel revolve.
3. **How these principles can be applied to the movement of the satellite?**
   The angular momentum plays a very important part in the movement of satellites.

The following apparatus clearly illustrates the movement of the moon around the earth. A big globe of three diameter is improvised with reeds and pulp. It can rotate on its axis. The small globe represents the moon. It is pivoted on the axis of the earth with the help of a long rod. When the small globe is rotated holding the axis horizontally it goes round the big globe just like the moon revolves round the earth.

1981-1990

State Level Science Exhibition
1989-90 and
Jawaharlal Nehru National
Science Exhibition for
Children 1990

Guidelines for Students and Teachers

Theme

Nehru and Science

Department of Education in Science and Mathematics
National Council of Educational Research and Training
Sri Aurobindo Marg, New Delhi-110016

प्रदर्शों तथा माडलों को बनाने के लिए तथा बच्चों के लिए

राज्य स्तरीय विज्ञान प्रदर्शनियाँ–2010-2011

एवं

38वीं जवाहरलाल नेहरू राष्ट्रीय विज्ञान प्रदर्शनी–2011

आयोजित करने हेतु

दिशानिर्देश

Guidelines

For the Preparation of Exhibits and Models and Organising

State level Science Exhibitions for Children- 2010-2011

and

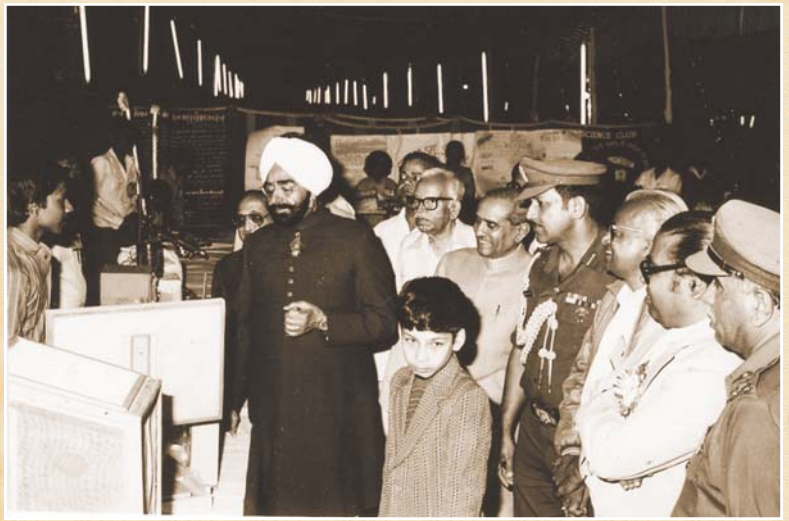
38th Jawaharlal Nehru National Science Exhibition-2011

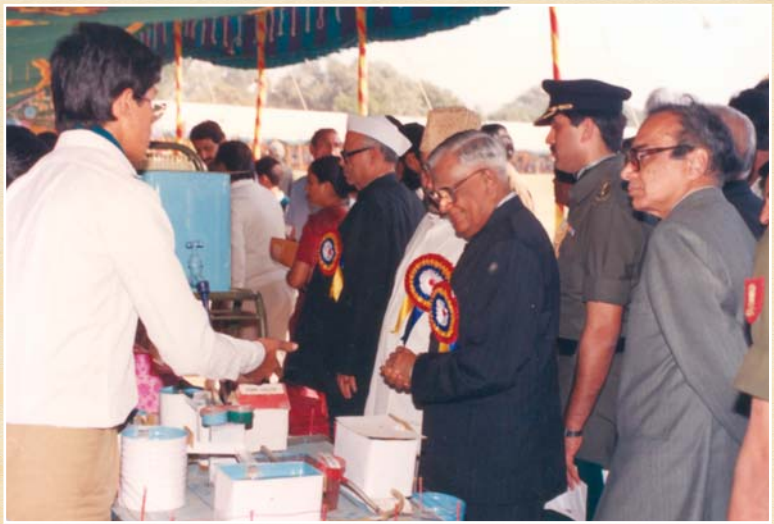

XVI NATIONAL
SCIENCE EXHIBITION


14th NATIONAL SCIENCE EXHIBITION FOR CHILDREN
1985


1985

Dignitaries Interacting with Children





Dignitaries Interacting with Children

Patiently Waiting for their Turn to Visit the Stalls


विज्ञान एवं जीवन की गुणवत्ता
SCIENCE & QUALITY OF LIFE


BIOMETER
ब्रायोमीटर


राष्ट्रीय विज्ञान प्रदर्शनी
गोहाटी (आसाम)
महात्मा गांधी विद्यालय
प्रयोग - रास्वसे बिजली
YAIPHOU SHARANG
CHILDREN'S IDEAL HIGH SCHOOL
O.ROMESHOR.
MANIPUR


WATER FROM SEE-SAW
PUMP
PUMP
LEVEL OF THE EARTH
PISTON


WATER LENS TELESCOPE

Learning Through Experience

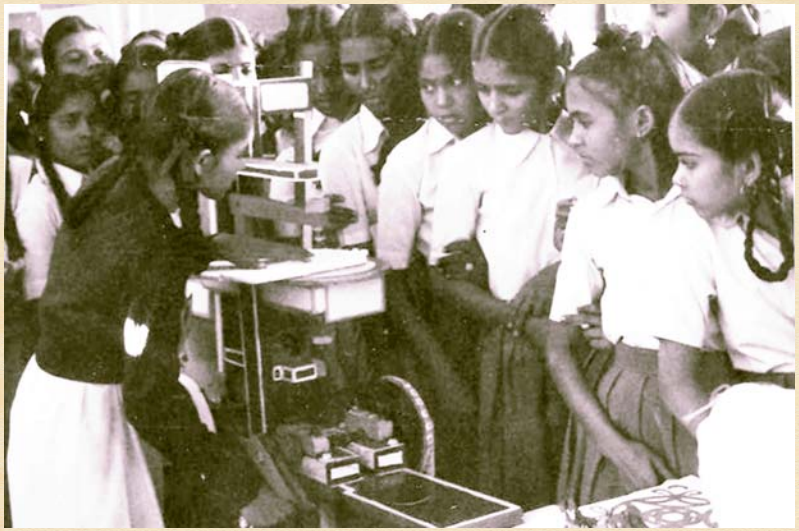
Sharing of Ideas

Sharing of Ideas

1981–1990


MANIPUR
INDUSTRIAL TRAINING INSTITUTE

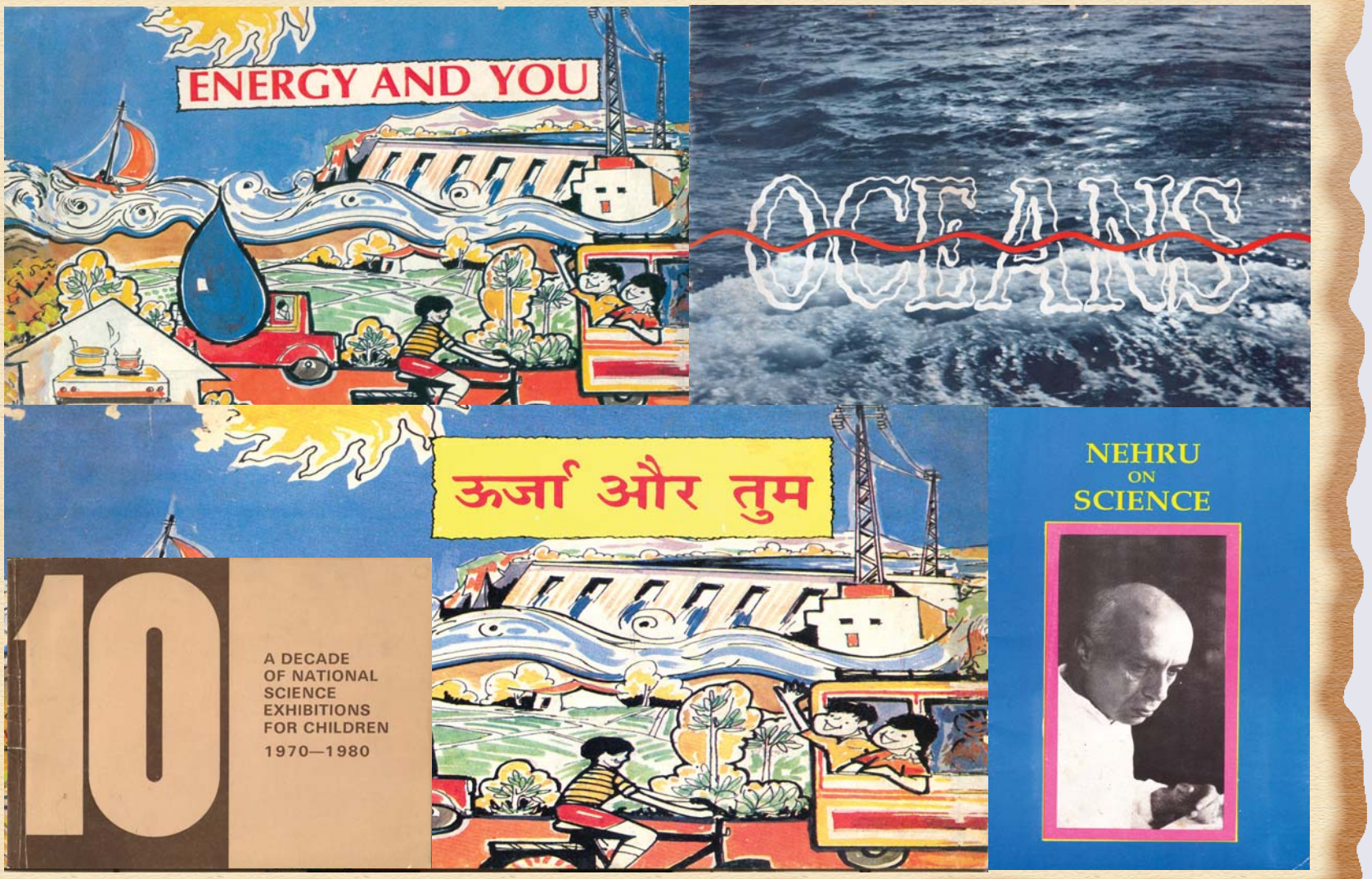

SOLAR COOKER
PARABOLIC TYPE
SCRL HIGH SCHOOL




Happy
Children's
Day...
बाल दिवस


XVI NATIONAL
SCIENCE EXHIBITION
for
CHILDREN

Readings published by the NCERT for JNNSEC



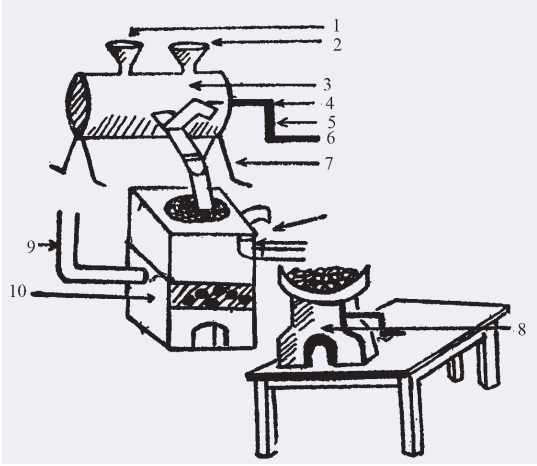
1. 1981

I. Agriculture, Horticulture, Farming and Animal Husbandry

Manufacturing of Cement from Paddy Husk and Sugar Mill Waste

Construction and Working: Many new techniques to manufacture cement are being developed without using the usual raw materials. Here is a new technique to manufacture cement on a small scale using waste materials which are commonly available in rural areas. Sugar mill waste (lime) and paddy husk have been suggested as the raw materials to be used. Mix 1:1 of 1:2 (as required) paddy husk and sugar mill waste (lime) by weight in a mixing box. Rotate the rotator till the mixture becomes homogeneous. Now open the slit to allow the homogeneous mixture to fall into the furnace.

The furnace has two chambers separated by removable partitions. In the ignition chamber there is a chimney to excrete gases produced during burning of the fuel, i.e. coal. The above prepared homogeneous mixture is completely burnt to ashes in action chamber. Slanting door is opened to send the burnt material to the grinder in order to grind it finally. Cement is obtained from the grinder in the form of fine powder.



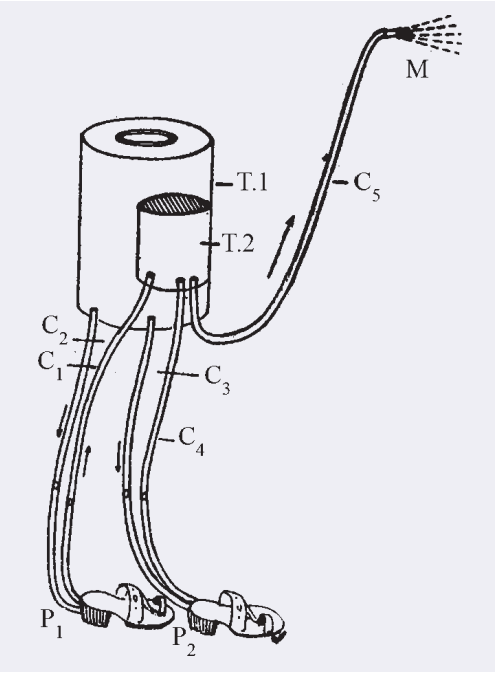
Cement manufacturing plant:
(1) Sugar mill waste (2) Paddy husk
(3) Mixing box (4) Slit (5) Rotator
(6) Stand (7) Door to reaction chamber
(8) Grinder (9) Chimney (10) Ignition Chamber.

II. Applied Science

Photo Balance

Construction and Working: This model is based on lever action and the principle of reflection. On one side of the fulcrum of a lever of first kind a mirror is attached and the other side has a plate attached for placing weight. A current of 5 amp. from a battery of 3 Volts would be required for operating the light assembly of the photo balance. A ray of light falls on the mirror in such a way that when a weight is placed on the plate, the light after reflection at the mirror falls on a scale which is placed in front of the

mirror. From this scale the precise weight of objects can be known. The position of the reflected ray on the scale depends on the weight of the object placed on the plate. The weight can be measured directly by caliberating the scale.



Uses: *It can be used in agriculture to spray pesticides on crops and vegetables.*

2. 1983

I. Man and Machine

Endless Energy Product Power Sprayer

Construction and Working: It is constructed by installing a pressure tank T_2 in the liquid tank T_1. Two polythene tubes C_3 and C_2 of uniform diameter 0.5 cm carry liquid up to the compression pumps P_1 and P_2 at the feet. Tubes C_1 and C_4 carry a compressed liquid to a pressure tank T_2. Tube C_5 fixed to a pressure tank is connected to spray nozzle M. A handmade compression pump P_1 is made by a P.V.C. pipe.An elastic spring of suitable size is inserted through a bicycle tube in a P.V.C pipe. A metallic cap is placed on the spring so as to maintain a smooth vertical movement of spring. This assembly is made air-tight. It is arranged in the left shoe. Similar compression pump P_2 is also fixed in the right shoe carrying polythene tubes C_3 and C_4. Tank T_1 is filled with liquid and tank T_2 contains air at atmospheric pressure. Assembly is mounted on the back of a person who wears shoes containing compression pumps P_1 and P_2. While walking, weight of a person compresses and releases the spring in compression pumps alternately. It creates extra pressure on a liquid in compression pumps, to spray it through nozzle M.

II. Recycling of Waste and Control of Pollution

Utilisation of Coir Dust

Construction and Working:

(a) Make a solution of coir dust by putting it in 1:1 dilute HCl for 24 hours and neutralise it with NaOH. Filter it to get a clear solution. Take 5mL of this solution in a test tube and add equal volume of

Fehling's solutions A and B. A red precipitate confirms the presence of glucose in the solution.

(b) Add few drops of concentrated HNO_3 to another sample of the coir dust solution. Then add a few drops of ammonia solution along the side of the test tube. Red ring formation confirms the presence of protein.

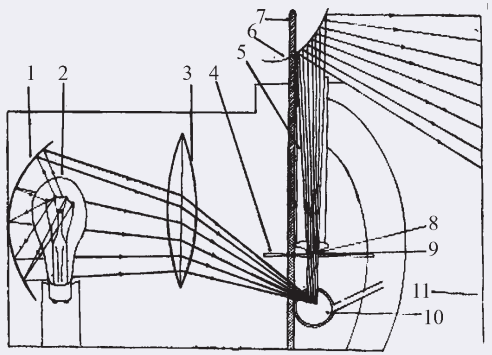
(c) Add few drops of alcohol to fresh sample of coir dust solution and pour it into a few drops of cold water. A slightly colloidal solution proves the presence of fat.

Glucose, protein and fat which are the components of coir dust can be utilised by preparing poultry feed (coconut cake, sea shell powder, bran and coir dust) and cattle feed (rice bran, powdered corn with coir dust).

III. Any other Innovations

Improvised Micro Projector

Construction and Working: A strong bulb is needed for the exhibit. A concave mirror is kept behind to focus a distinct light on the reflecting mirror of the microscope. The mirror is so adjusted that the light falling from the source is made to pass through the barrel of the microscope. A convex mirror which is kept at the tip of the barrel at 45° angle converges the rays towards the screen which is kept in front of the model. The whole model except the screen and the convex mirror is kept inside a box to avoid light for obtaining a distinct view of the image of the slide.



Improvised microprojector (1) concave mirror (2) bulb (3) convex lens (4) stage (5) barrel of the microscope (6) convex mirror (7) stand (8) optic lens (9) slide (10) reflecting mirror (11) screen

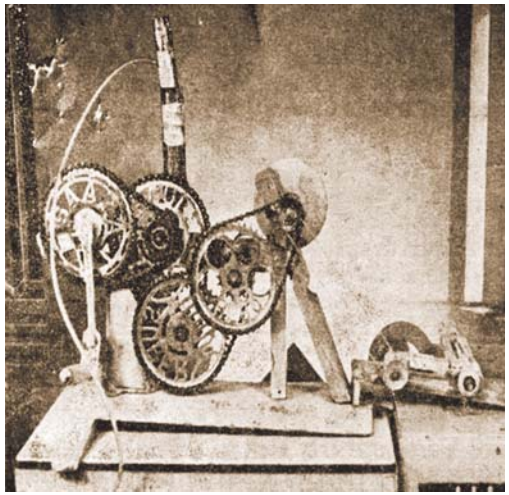
Uses: *It can be used for classroom teaching purpose as a boon to the schools which are financially weak.*

3. 1985

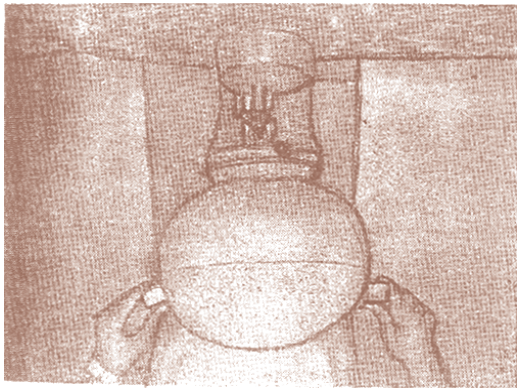
I. Cottage Industry

A. Speed Wheel

Construction and Working: Four used cycle paddle wheels of different diameters, three freewheels, nuts, bolts, bearing, axles, cycle chains, wooden blocks, 2 dozen 7.5 cm nuts 2 dozen, piece of cycle tube (15 cm



Uses: *It can be used for wood cutting, turning, grinding and suction pumping simultaneously with very little effort.*



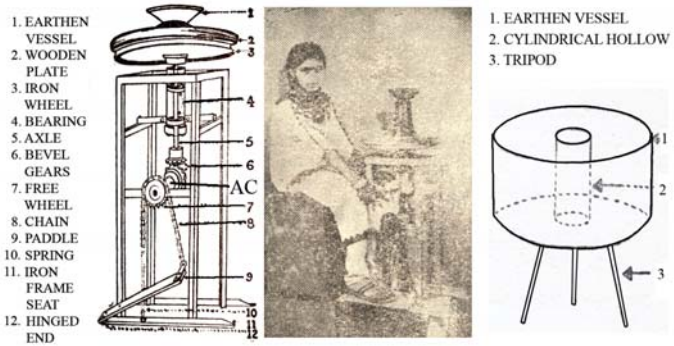
length), polythene tube 1.25 cm in diameter and 3 metre in length, steel strips, two cylindrical steel containers of diameter 4 cm and 5 cm, respectively; circular tin cutter, grinding stone, etc, are the materials required. Cycle paddle wheel 1 is fitted on a wooden block by means of ball bearing and it is comparatively larger in diameter compared to all other wheels. It is connected by cycle chain with another paddle wheel by means of free-wheel with diameters in decreasing order. All these four wheels are mounted on a wooden block by means of axles, tubes and ball bearings and axles are firmly fixed with nuts and bolts and fused with tin. The 4th wheel is connected by means of a leather belt and pulleys with wood cutter, grinder and the turning machine.

B. Energy Saving Oven for Village Bakery

Construction and Working: Proper arrangement is done to guard the outflow of heat from the oven by all possible means such as conduction, convection, and radiation and to store the heat energy inside the layer containing particles of high specific heat. Aluminium hemispherical tubes, two tin sheets, non-conducting packing, one conical iron piece, sand, glass and clay earth are the materials required. The oven is double-walled and made of two aluminium sheets. Outer surface of the inner wall and the inner surface of the outer wall are polished to minimise the loss of heat due to radiation. Inside layer is made by the mixture of sand, glass dust and clay earth to store heat energy. Through a hole the space between the wall is made vacuum with the help of an exhaust pump to minimise the loss of heat due to convection. Non-conducting packing is used to minimise the loss of heat due to conduction. A conical iron piece is suspended at the entrance of the chimney in such a way that only smoke during burning of the fuel can go out through the chimney by the open space around the iron piece and reflect the direct heat rays which are proceeding towards the chimney. This conical shaped iron piece thus prevents heat rays from going out straight through the chimney. Thus conduction, convection and radiation, the three possible modes of exchange of heat are being guarded, the oven remains almost in a state of thermal isolation and maintains its own temperature for a pretty long time. Thus, it saves energy.

II. Indigenous Technology and Industrial Development

Leg-operated Potter's Wheel



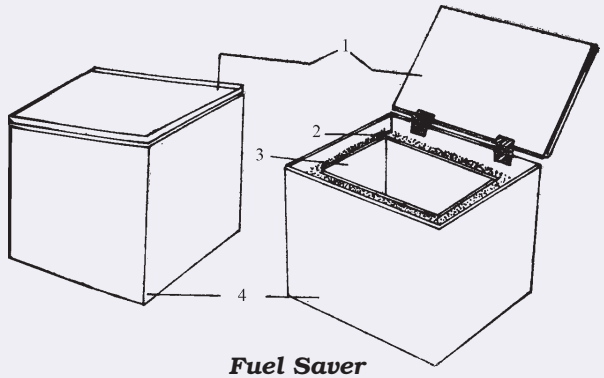
Construction and Working: The leg-operated potter's wheel is steady and fast in movement, less tiring to operate and less time-consuming. As compared to the traditional one, it is an erected cuboid frame of iron angles with 60 cm height, 30 cm width and 30 cm length. In the centre of the frame an axle with two bearings is vertically fixed. On this axle, an iron wheel of about 20 kg with a wooden plate is fixed at the top. A rights-angled gear is fixed at the lower end of the axle. Another axle with right-angled gear is horizontally placed in such a way that the right-angled gears function easily. This axle has free wheel with a chain at the other end. The one end of the chain is fixed with the paddle below and the other end is connected with the spring which pulls the chain to its original position while working. When we press the paddle, the chain is pulled and the free wheel starts moving. In turn the right-angled gears move and ultimately the vertical axle on which the Potter's wheel rests starts turning with a different project speed of 300 rpm.

III. Cooking : Fuel Saver

Construction and Working: This project gives the idea of reduction in fuel consumption in domestic cooking.

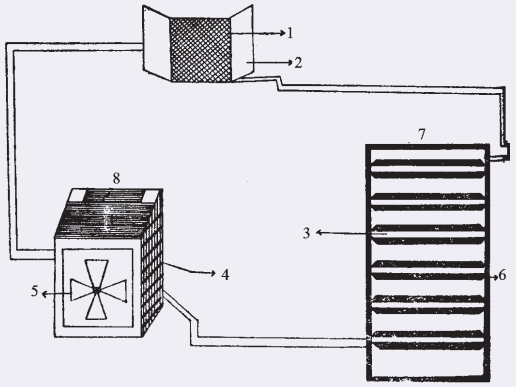
Box I (25 cm Length, 22 cm Width, 24 cm Height)
Box II (32 cm Length, 29 cm Width, 31 cm Height)
Cover (29, 26, —)

Box I is kept inside Box II with a 1.25 cm gap on all sides filled with saw dust (non-contracting material). The top is sealed with wooden plates. The space inside the chamber cover is also filled with the same material. Boil rice/wheat/vegetables in a vessel for about half the time normally needed for complete cooking. The vessel is then removed from the stove, put inside the inner box and closed with the cover. Keep a weight over the cover so that there is no air gap. Open the cover after about



Fuel Saver

same time the contents were boiled and take out the vessel from the box. the content would be completely cooked, ready for consumption. The fuel saver thus reduces fuel consumption approximately by half.



1. Aluminium water storage tank, 2. Tin reflector, 3. Air blower, 4. Side lined with pipe, 5. Aluminium pipe, 6. Mirror strip, 7. Solar collector, 8. Solar room heater.

IV. Domestic Solar Water Heater Cum Room Heater

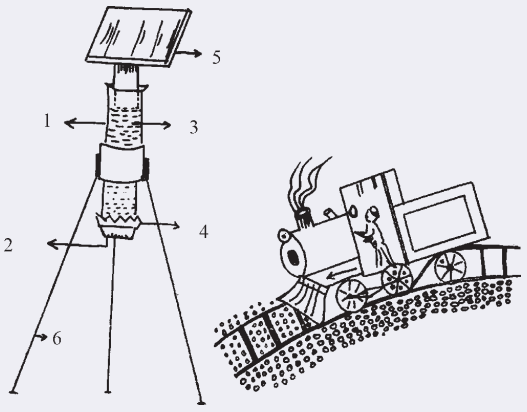
Construction and Working: Domestic solar water heater (geyser) cum room heater in used to harness solar energy to cater to domestic needs of water and room heating. The storage tank is a cubical container, whose sides are made of aluminium. We have used aluminium metal because it is cheaper and has very low specific heat than other metals. The whole apparatus is kept in the sun for 20–30 minutes to allow the pipes of the solar collector and the room heater to warm up. After 20 minutes, cold water is poured into the storage tank where it gets heated to a certain extent. When the outlet of the storage tank is opened, the water flows into the solar collector where it absorbs heat from the aluminium pipes. Water from the collector flows to the pipes of the room heater. As the water passes through the sides of the room heater, the blower sucks in air from the atmosphere and blows it into the room. The air is sucked while passing through the heated pipes and becomes hot. After flowing through all the five sides of the room heater, water goes back to the storage tank.

4. 1986

I. Testing of Household Materials

Load Carrying Property of Sand

Construction and Working: A cylinder open at both ends stands on three iron rod supports. At the bottom of the cylinder, a paper support is fixed by using a rubber band. About 1 kg of sand is taken in it. Then a wooden socket with a platform for carrying load is immersed inside the cylinder so that it touches the top of the sand. More than 50 kg of weight can be placed on the top of the socket. The paper support won't come out. This demonstrates the load carrying property of sand.



Load Carrying Property of Sand 1. Iron cylinder, 2. rubber band, 3. sand, 4. paper support, 5. wooder socket, 6. tripode.

II. Science and Superstitions

Science behind Magic Shows

Curse of the Sage 'Durbasha': When chromic anhydride and ethyl alcohol react with each other, a lot of heat is produced as the reaction (exothermic) sets fire to ethyl alcohol. Spread some chromic anhydride on a tin board beforehand. Nobody should be aware of this. Then at the time of demonstration, act like angry Durbasha, take some ethyl alcohol inside the mouth and spray it on the tin board. All observers would be surprised to see that the board catches fire immediately. 1g potassium chlorate and 1g sugar are mixed and a small quantity of water is added to this mixture. Then, a piece of black thread is dipped in the mixture and dried. Now, tie with this black thread the wicks of a line of candles fixed on a table. The room should be dark, so that the thread is not visible. Now light one candle and one by one all the candles automatically will get lighted up.

Colour Changing Magic: With this demonstration one can change the colour of water contained in a colourless flask at will. Hold the flask and shake it slowly saying — 'Change your colour'. Few seconds later, water inside the flask changes its colour to blue. After a few more shakes the blue colour changes to pink. Then as directed, the pink colour changes to the original state, i.e. colourless. Methylene blue changes its colour in water in the presence of some substances, for example, glucose/KOH.

Magic Stick: A thin glass rod can be shown to act like a magic stick to light a fire on the water.

Initially, carbondisulphide is poured into the glass bowl, then one end of the glass rod is heated strongly. When the red hot side of the glass rod is brought in contact with the CS_2, fire would be produced, since it has low ignition temperature.

Water cannot wet my hand: In this demonstration one dips his hand in water to pick up a coin. The hand remains dry when it is taken out of water. Before dipping the hand into the water, some lycopodium powder is applied on the hand and as this powder makes a thin waterproof layer on the hand it does not get wet.

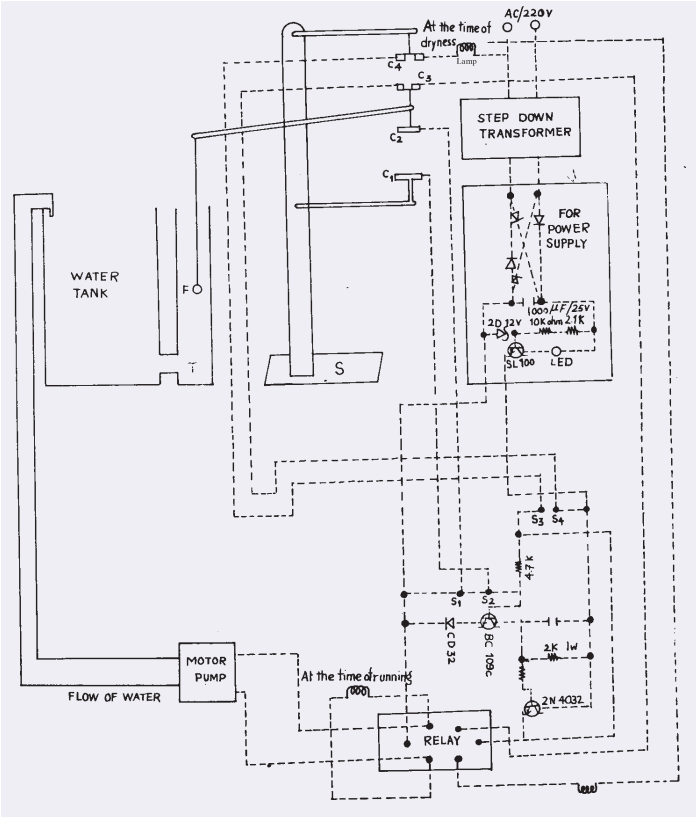
Vanishing colour: Phenolphthalein and ammonia are mixed together. A bright red colour is produced. The stains of these colours on white cloth vanish automatically after some time. A chemical change takes place in the presence of ammonia due to which red colour is produced. In

free state, ammonia vaporises and vanishes into the air. Slowly, the red colour of phenolphthalein decreases and ultimately vanishes.

5. 1987

I. Science, Technology and Industry

Automatic Water Supply



Uses: *The model can be used to check out the overflow of water supply in domestic as well as commercial public services.*

Construction and Working: S is a wooden stand to which a wooden stick is attached and floatable material F is hung which will float in the tank T. The contact points C_3–C_4 are connected to the points S_3–S_4 in the circuit whereas the contact points C_1–C_2 are conected to the points S_1 –S_2. The power supply is taken from 220V line by a 12V stepdown transformer and it is properly rectified to supply power to the latch-up circuit. The indicator lamp for indicating a dry tank is connected to C_3 – C_4 by a two-way relay to the main line. Due to continuous use of water, the water level in the tank will gradually fall and, therefore, the floatable material F will get down and the indicator lamp will show a red glow when the contact points C_3 – C_4 touch each other.

In the latch-up circuit once the DC voltage is applied at the input contacting C_3 – C_4, the T gets base drive and conducts. A relay is set in output load which will conduct the main line to motor pump. When the water level will reach a certain pre-assigned mark, the contact points C_1 – C_2 will touch and latch-up circuit will be taken in the reset position by grounding the input supply. During the lowering of water level in the tank due to continuous use of water the float will gradually get down and the contact points (C_1 – C_2) will open but the motor will not start as C_3 – C_4 is yet to get in contact. Transistors T_1 and T_2 are cut off and the output voltage is zero. The same will repeat when C_3 – C_4 will contact and the motor pump will start.

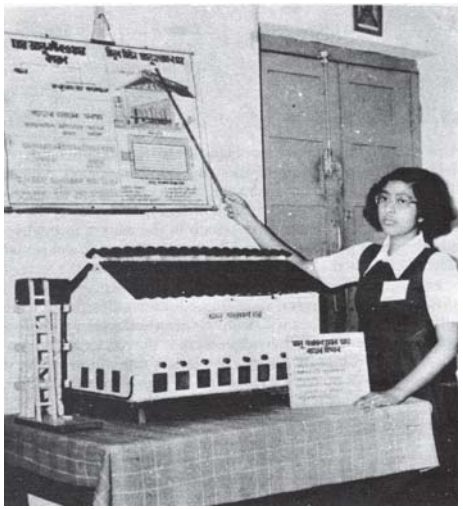
II. Food, Clothing and Shelter

A. Potato Preservation House without Electricity

Construction and Working: In order to save potato from decomposition, the temperature in a cold storage is maintained at about 20°C – 24°C and the relative humidity at about 80 per cent – 90 per cent.Besides,it is envisaged that the potatoes are treated with Choloro isopropyl phenyl carbamate at the rate of 25mg/kg by weight before putting them in gunny bags.

In this model, the wall along the length of the cold storage has a double-wall structure. Each wall of the double wall has a small gap in between and is filled with husk to prevent the heat flow from outside into the house. The two side walls are of single-wall structure. The outer wall of the long wall has eight ventilators while the short wall on one side has three ventilators at the bottom of the walls. Each ventilator has two wire meshes, one at the front and another at the back end, and the space between them is packed with wood wool. This wood wool is kept moistened by sprinkling water from a pipe. The roof of the house is made of galvanised sheets of iron. The ceiling of the house is made of perforated plywood. The platform is made in such a way that there is sufficient space for ventilation, though the gunny bag can be stacked in tiers. The house is otherwise airtight.

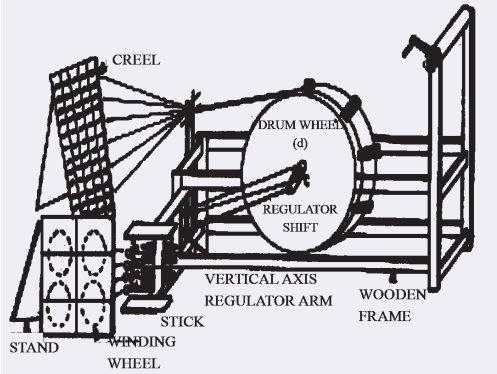
During the day the roof gets heated which in turn heats the air between the roof and the ceiling. The hot air finds its way through the wire mesh at the top. A vacuum is thus created here. So air from outside tries to rush inside the house. While passing through the ventilators the air vaporises the water of the wood wool of the ventilator and gets cooled. This cool air passes through the platform and the space between the gunny bags to the partial vacuum area in between the ceiling and the roof. This air is again heated by the hot roof. This hot air leaves this space through the wire-mesh at the top of the house, and the process is repeated. So the temperature of the room remains 20°C–24° C and the relative humidity becomes 80 per cent - 90 per cent.



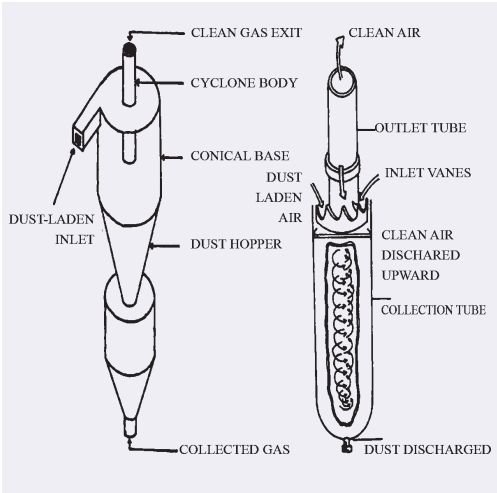
Uses: *It can be used not only to store potatoes but also other dry crops and is a good way of earning money during the off-season.*

B. Two in One Warping Drum

Construction and Working: Making bobbins and winding them with thread is a time-consuming process. Motion is transferred from the main



Uses: *This model is meant to help housewives in making bobbins for further use. It is simple and efficient, and we hope that it can be popularised.*



rotating drum of the conventional machine wheel by means of belt and wheels. A number of bobbins can be fed with thread at a time. Conventional warping drum consists of a large drum (d) rotated with a handle. Threads from several bobbins in creel are gradually wound over the drum to be unwound and wound again on shaft of loom. This portion of the machine is kept unchanged. Circular disc of about 11cm in radius is fitted to the drum, and a belt is connected with another shaft. A number of bearings in a fixed frame to the common shafts are connected with belts. In our model four such shafts are used.

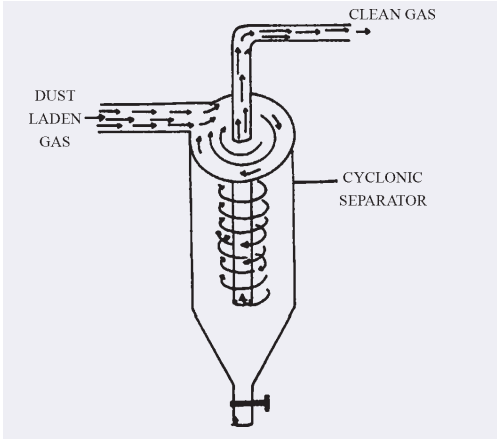
III. Science, Technology and Industry

Combat of Dust Pollution

Construction and Working: It works on the principle of the cyclonic separator which collects particulate matter from a gas stream by the action of centrifugal force. The three forces acting on individual dust particles are gravitational, centrifugal and frictional drag. The dust laden gases enter the collection tube axially through the inlet vanes, which impart a swirling motion to their travel. The dust particles are forced towards the wall of this tube by the centrifugal force. As they collide with the wall they lose their horizontal momentum and are carried downwards by gravity and the continuous swirling action of the carrier. The dust is continuously removed from the bottom of the tube. The clean gas reverses its flow and goes out through the outlet tube.

The wet scrubber is the only particulate control design device that introduces an additional process stream into the contaminated gaseous effluent to accomplish dust collection. Besides the collection of solid and gaseous pollutants from an effluent gas stream, the wet scrubber can perform a number of additional processing such as heat transfer, chemical reaction, evaporation and distillation.

The principle mechanism utilised by wet scrubber to accomplish dust collection is to condition the individual particles so as to increase their size and thus permit them to be removed from the gas stream more easily. Therefore all the scrubbers comprise a liquid/gas contacting section followed by an entertainment chamber using water, where the wetted particles are removed by making use of inertial properties.



Uses: *It is used for the purification of contaminated air in the surroundings.*

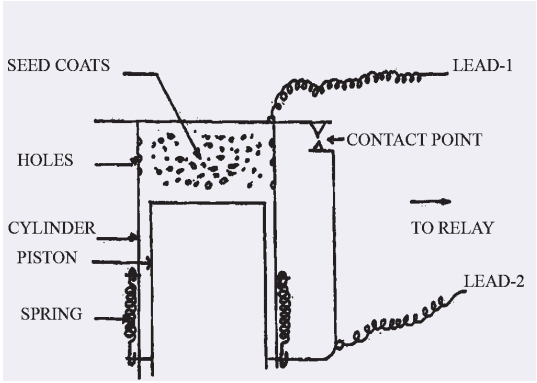
6. 1988

I. Water Management

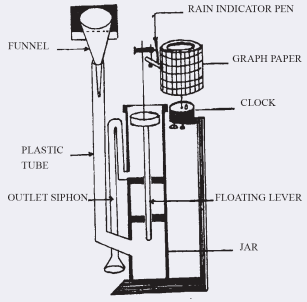
A. Bionic Regulator for Drip Irrigation

Construction and Working: The potted plant is watered through a delivery pipe.The pipe has a drip nozzle and across it there is a regulator valve (not shown). The valve is operated by an electrically controlled relay which is controlled by the sensor mechanism of the bionic regulator (not shown in the diagram as it is embedded in the soil). The bionic regulator sensor is buried in the soil in the root zone of the plant after filling it with the dried plant materials.

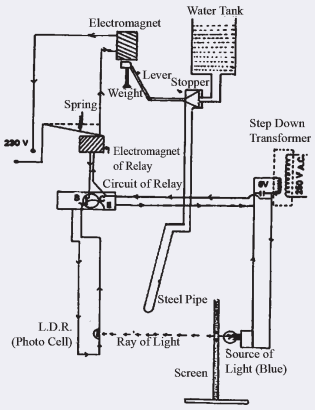
When the pot is watered, the plant absorbs water through its root system. When the soil is wet, the plant materials put in the regulator sensor in turn also imbibe water. This creates 'Imbibition pressure', which in turn operates the relay to close the delivery when the pipe is closed. Hence the flow of water is stopped. When the soil loses water, it becomes dry, the 'Imbibition Pressure' inside the sensor also decreases. This operates the relay to open the valve again.



Uses: *It can be used to improve the irrigation system and provide optimum requirement of water.*



Uses: *It can be used to measure the rainfall and the time indicated is of vital importance for the various steps involved in agriculture.*



Uses: *It is an automatic system which requires no physical handling and stops the flow of water after one has drawn water in desired amount.*

B. Automatic Rain Gauge with Time Indicator

Construction and Working: A jar or a tumbler having an outlet at the lower portion is fitted with a tube having a funnel, as shown in the diagram. Another outlet near the mouth of the jar is provided to discharge the excessive water in case of heavy rainfall. The floating indicator will indicate the range of rainfall in the graph. The graph is attached to a clock to ascertain the time also. The circumference of the mouth of the funnel is so made as to measure the rainfall in terms of mm.

C. Automatic Hygienic Water Tap

Construction and Working: A beam of light from a source on one side of the tap falls on the photo cell kept on the other side. The source of light and the photo cell are so adjusted that the beam of light passes just below the tap, whenever someone places his hands or an opaque container below the tap, the path of the light beam gets interrupted. As a result, the resistance of the LDR increases. This in turn triggers the relay circuit to complete that circuit of the electromagnet which pulls up a lever connected to the valve of water tap. The tap opens up to release the water. As soon as the hands are removed, the beam of light again falls on the LDR and its resistance decreases which breaks the circuit of the electromagnet through the relay circuit. The lever comes back to its initial position and closes the tap. This stops the flow of water.

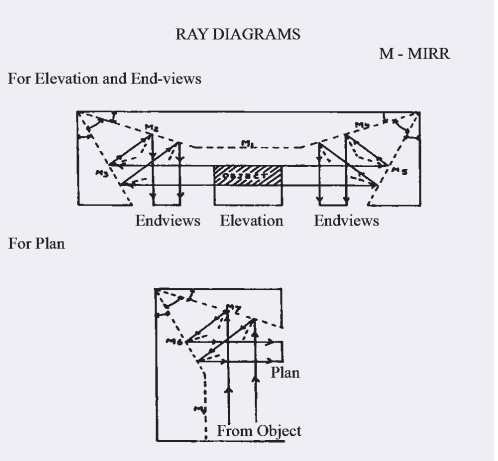
7. 1989

I. Educational Aids

A. Mirror View

Construction and Working: In this model a wooden box with all the seven mirrors are fitted in pairs as shown in the diagram. The mirror M_1 is fixed parallel to the non-reflecting back face to the wooden box. The mirror M_2 is inclined at 22°30' to the horizantal face of the box with non –reflecting side

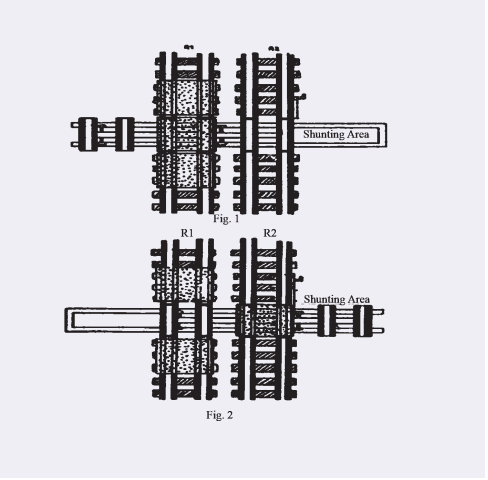
making the angle. While observing, the object is placed in front of the mirror M_1. The elevation of the objects is directly obtained by looking at the object. For the left hand view, the rays from the object first fall on mirror M_3. Then they are reflected on to the mirror M_2 after reflection the rays enter our eyes as shown in the ray diagram. For the right hand and end view, the rays from the object first fall on mirror M_5. Then they are reflected on to the mirror M_4. After reflection of M_4 the rays enter our eyes as shown in the ray diagram. For plane to top view, the rays from the object first fall on mirror M_7 and then they are reflected on to the mirror M_5 and then to the mirror M_6. After reflection at M_6 they enter our eyes as shown in ray diagram. The angles of the mirror with horizontal and vertical plane are such that by standing in one position we will get all the views, i.e. elevation, plan left and right side views of the object. For getting only one view, the pairs of the mirrors are used because there is double reflection and no lateral inversion occurs.



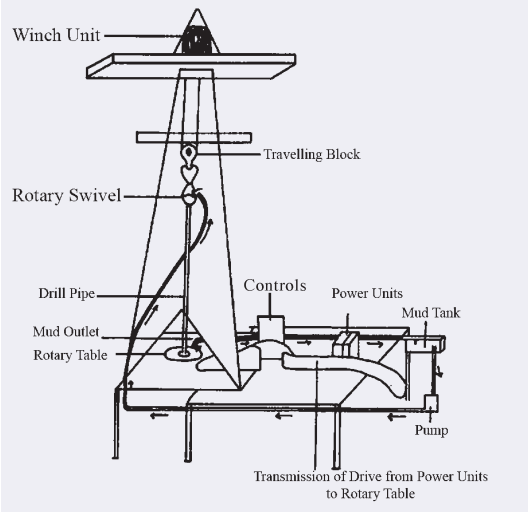
Uses: *It can be used to explain technical and engineering students to study the third angle by projection method.*

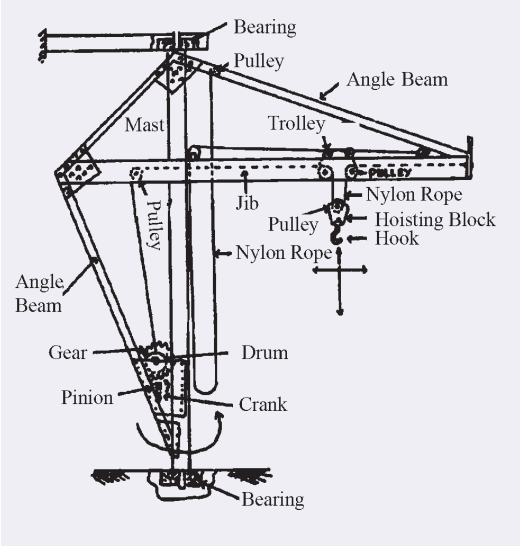
B. Easy Shunting Device

Construction and Working: In big railway stations where shunting has to be done, a special area called shunting area is provided for transferring coaches from one track to another. In our prototype, we have designed a special area called shunting area where that part of the rail on which the compartment is to be transferred is shifted along a movable rail which is capable of moving along the horizontal, perpendicular to the main track. Thus, a lot of space could also be saved. The shifting can easily be done with the help of an electric motor of 1.5 H.P. We have used 1.5 cm iron bars, a small piece of circular iron rod, an iron spring and four wooden blocks for constructing the model. The tracks and shunting area were made by welding the iron rods. Then a few wheels were cut from the iron rod and fixed on the wooden blocks for making the compartments. A locking system was provided with a spring loaded iron rod. Thus we could move the shunting area along the perpendicular rail.



Uses: *This system can be employed in big railway stations, especially where the existing method of shunting creates a lot of traffic problems.*





Uses: *It can be used for lifting, lowering and shifting of load.*

II. Harnessing Energy

Oil Drilling Rig

Construction and Working: A drilling pipe called Kelly rotates and enters the earth by digging it with its drilling bit. When the pipe comes to the rotary table level, then another pipe is joined and the drilling is continued. The drilling bit is the end of drilling pipe which penetrates the rocks by cutting them. Sometimes, the drill bit it made of diamond to cut very hard rocks. As the bit digs by a rotatory motion, friction between the bit and the rocks generates heat. To keep the bit cool, the drilling mud is forced to the cutting surface of drill bit through the drill pipe.

The drill mud thus cools off the drill bit and at the same time it brings rock cuttings to the surface along with it. The drilling mud is forced to the earth surface again and collected in the mud tank. On the way to the mud tank, the mud is cleaned by a cleaning machine and after this it is reused by pumping it with the help of the pumping machine. In the oil well, natural gas is also found. Underground, this gas occurs at a very high pressure. When the pipe reaches this level, the oil automatically comes up readily due to the high pressure exerted on it by the gas. In this way, petroleum from inside the earth is pushed up to the surface of the earth. The whole model rests on a wooden board.

The derrick is made by welding some iron rods. Actually, the drilling pipe has been made by a pencil, by forcing a knitting needle through it after removing its lead. The rotation of the rotary table and the drilling pipe is helped by a motor. The outlets for mud have been made by cycle valves, tubes and straws.

III. Transport and Communication

Jib Crane

Construction and Working: We place the Jib (2 beams) parallel and fix it with two masts which are fixed to each other by bolts and nuts. These are then fastened by an angle beam. By rotating the crank shaft by hand, the nylon rope winds up on the drum and then the hoisting block is lifted to a required position. Sometimes a large torque will be required to raise the

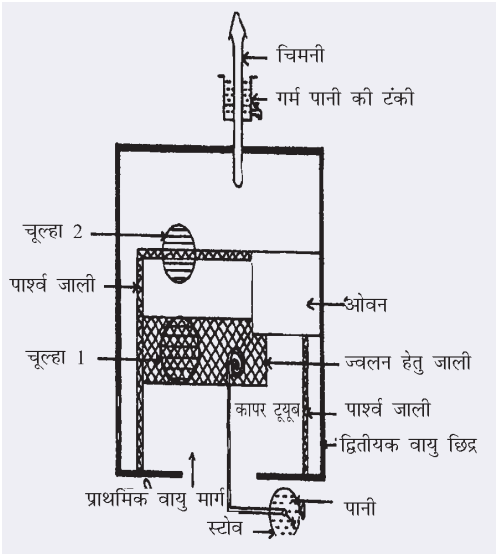
load which can be provided by using gear train. The speed of rotation is reduced but on the other hand the torque is increased. By rotating the crank shaft, the pinion will rotate. The pinion which is a mesh with gear will rotate. As the teeth on pinion are less than the gear, the speed is reduced and the torque is increased. This gear shaft is attached to the drum. Thus, rotating the gear, the drum also rotates and nylon rope unwinds itself. The load is thus lowered to a required position. By pulling the rope that is attached to the trolley, the hoisting block can be shifted to and fro. By rotating the whole structure, we can shift the load within minimum and maximum radii of rotation.

I. बहु-उद्देशीय चूल्हा

चूल्हे का निर्माण

यह एस वर्गाकार चूल्हा है जिसकी प्रत्येक भुजा 61 सेंटी मीटर के बराबर है। इस चूल्हे के मुख की ओर पृथ्वी के तल से लगभग 8 सेंटीमीटर ऊपर की ओर एक जाली लगी रहती है। इसमें ईंधन के रूप में लकड़ी जलाई जाती है। चूल्हे की छत पर चूल्हा नं.1 व चूल्हा नं.2 है जिनमें खाना बनाया जाता है (देखिए चित्र)। जहाँ ईंधन जलाया जाता है उसके पार्श्व सतह पर ओवन लगाया गया है जो लगभग 30 सेंटीमीटर लम्बा व लगभग 2.5 सेंटीमीटर चौड़ा है। इस ओवन की गहराई लगभग 15 सेंटीमीटर है। चूल्हे के दूसरे छोर पर धुँआ निकलने के लिए चिमनी लगी है जिसमें पानी गर्म करने के लिए पात्र लगा हुआ है।

यह पूर्ण उपकरण रेत तथा सीमेंट से बनाया जा सकता है जिसकी कुल लागत लगभग 75 से 80 रूपये है। इस चूल्हे से ऊपरी सिरे पर किसी भी टूटी सुराही या घड़े के निचले हिस्से को रखकर उसमें रेत तथा साधारण नमक के किसी मिश्रण को डालकर मूंगफली या चने भून सकते हैं। इस चूल्हे का प्रयोग घड़े को हटाकर उसकी जगह तवे को रखकर रोटी बनाने में भी कर सकते हैं।



चूल्हे की कार्यविधि

इस बहुउद्देशीय चूल्हे में ईंधन को एक छिद्रदार जाली के ऊपर रखकर जलाया जाता है। यह जाली गर्म ताजी हवा को आग की लपटों व लकड़ी में पूरी तरह मिला देती है। इस कारण बाहर व्यर्थ जानेवाले ज्वलनशील पदार्थ भी जल जाते हैं। पार्श्व में जो छिद्रदार जाली होती है वह न जलने वाले कार्बन के कणों को रोक देती हैं तथा गर्म होने पर गैस में बदल देती है जिसके कारण कार्बन के कण गैस के रूप में बन जाते हैं। पार्श्व सतह में जो ओवन लगाया गया है उतने ही ईंधन में उसमें बिस्कूट केक, डबलरोटी, नान खटाई आदि "बेक" की जा सकती है। इस तरह पार्श्व में होनेवाली ऊर्जा का भी उपयोग करके उसे व्यर्थ होने से बचा लिया जाता है।

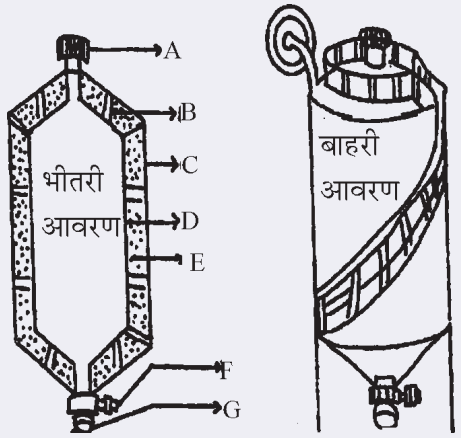
बाहर निकलने वाली गर्म गैसों को धातु के बने पाइप से प्रवाहित किया जाता है जो धातु को गर्म करती है जिसके कारण उसमें लगे पात्र में रखा पानी गर्म हो जाता है। इस प्रकार उस ऊर्जा को भी उपयोग कर लिया जाता है जो व्यर्थ जाती है।

चूल्हे के मुख की ऊपरी सतह को लगभग 10 सेंटीमीटर बंद कर दिया गया है जो रोधक का कार्य करती है। इसके फलस्वरूप गर्म गैसें चूल्हे के मुख से बाहर कम मात्रा में निकलती है। इस कारण नीचे खुले स्थान में निकलती है। इस कारण नीचे खुले स्थान में ईंधन के ज्वलन हेतु ठंडी प्राथमिक वायु प्राप्त होती है। ावयु की मात्रा द्वितीयक छिद्र (जो चूल्हे की पार्श्व सतह् पर स्थित है।) से भी ईंधन की प्राप्त होती है जो उसके ज्वलन के लिए पर्याप्त होती है।

लकड़ी के जलने के कुछ समय बाद कोयला बनता है। इस रक्त-तप्त कोक पर समय-समय पर भाप प्रवाहित करते हैं जिससे अर्धभाप अंगार गैस बनती है। यह गैस कार्बन मोनोऑक्साइड, कार्बनडाईऑक्साइड का मिश्रण होती है तथा इसमें लगभग 26,000 कैलोरी ऊष्मा विमुक्त होती है। इसका कैलोरीमान 160-180 बी.टी.यू. प्रति इकाई होत है जो ईंधन की दहन ऊर्जा को बढ़ाता है।

II. शीत, ताप एवम् आर्द्रता नियंत्रित अन्न संचायक

प्रदर्शन की संरचना



(A) प्रवेश (B) लोहे की चादरों के बीच खाली स्थान (C) बाहरी दीवाल (D) भीतरी दीवाल (E) धान की भूसी या काष्ठ बुरादा (F) बल्ब (G) निकास

सबसे पहले 205 सेमी × 90 सेमी साइज की लोहे की एक चादर लेकर उसको एक बेलनाकार रूप दिया जाता है। उसके बाद दोनों किनारों को वेल्ड कर देते हैं। तत्पश्चात् लोहे की चादर की एक शंक्वाकार आकृति बनाकर उसे पूर्व निर्मित बेलन के ऊपर और नीचे वैल्डिंग करके जोड़ देते हैं।

इस प्रकार बनी आकृति के बाहर 5 सेमी × 2.5 सेमी आकार की लोहे की पट्टियों को वेल्डिंग द्वारा जोड़ा जाता है। पुन: दूसरे चदरे को इस पट्टी के ऊपर से इस भांति वेल्डिंग किया जाता है ताकि आंतरिक बेलन पूर्णतया दूसरे बेलन को ढक ले और सभी जगह दोनों बेलनों के बीच 5 सेमी लम्बान का रिक्त स्थान बचा रहे। अब इस प्रकार तैयार आकृति के ऊपर और नीचे क्रमश: अनाज डालने और निकालने वे लिए दो सोंकेट ढक्कन सहित वेल्डिंग करके जोड़ दिये जाते हैं। फिर बाहरी बेलन के निचले हिस्से में शंक्वाकार ढक्कन को बेल्डिंग करवे जोड़ दिया जाता है। इसका सम्पर्क जमीन से पृथक कने के लिए इसके आधार में तीन लोहे के स्तम्भों की व्यव्सथा की गई है। अब दोनों बेलनों के बीच में छोड़े गए रिक्त स्थान को धान की भूसी या काष्ठ-बुरादा से भर दिया जाता है। इसके बाद शंक्वाकार हिस्से में भी धान की भूसी भरकर उसके ऊपर तक पहुंचाने के लिए सीढ़ी या घिरनी की व्यवस्था की गई है। पूरे उपकरण को सफेद रोगन से पेंट कर देते हैं।

कार्य प्रणाली

सर्वप्रथम अन्न धारक को अन्न रखने के पहले सल्फर जलाकर अथवा गैमेक्सिन पाउडर द्वारा या अन्य किसी कीटनाशक दवाओं से छिड़काव के कीटाणु-मुक्त कर लेते हैं। धारक की दोनों चादरों के बीच रिक्त स्थान में धान की भूसी भरे रहने

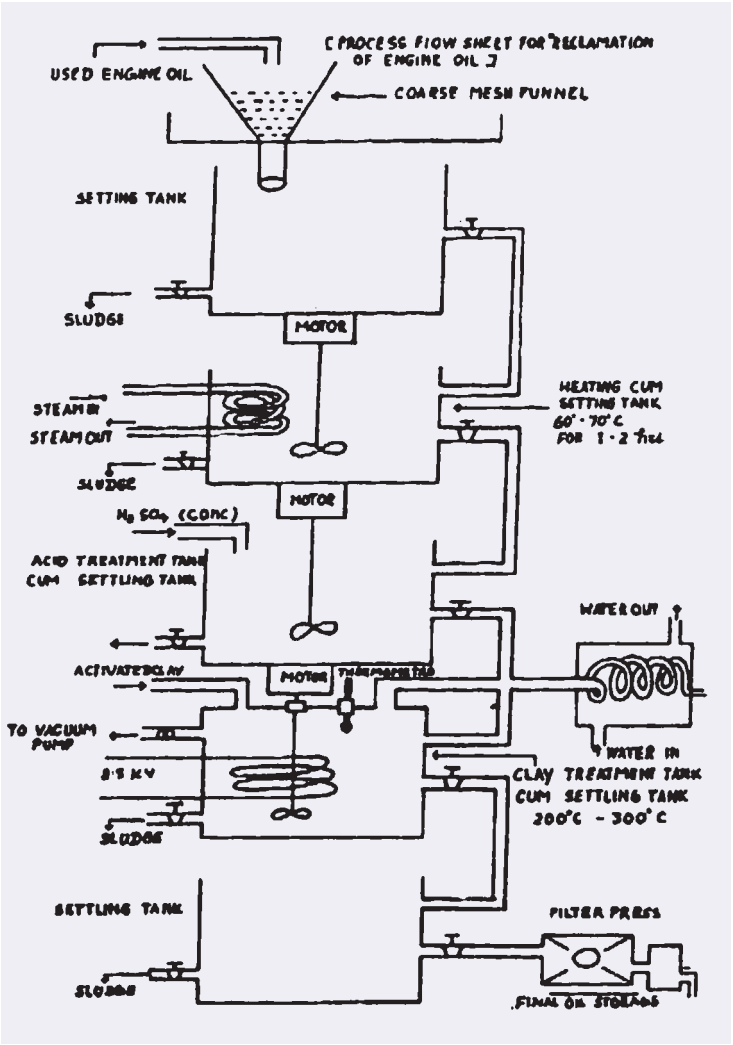
के कारण धारक की दीवार की ऊष्मा-कुचालकता इतनी बढ़ जाती है कि न तो बाहर से ऊष्मा का गमन अन्दर की ओर हो पाता है और न ही अन्दर से ऊष्मा का बहिर्गमन। चादरों की वेल्डिंग और दोनों चादरों के बीच रिक्त स्थान में धान की भूसी अथवा काष्ठ-बुरादा भरे रहने के कारण वायु का आवागमन अवरुद्ध हो जाता है जिससे बाहरी आर्द्रता का प्रभाव अनाज पर नहीं उड़ता। सफेद रोगन के कारण सूर्य की रोशनी (ताप) का शोषण भी कम होता है।

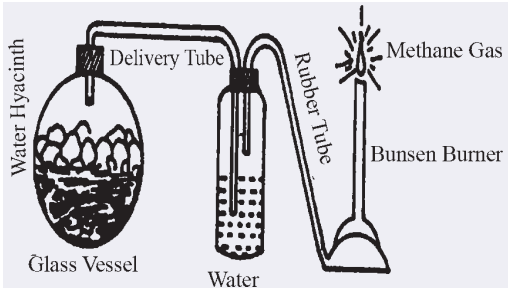
8. 1990

I. Energy

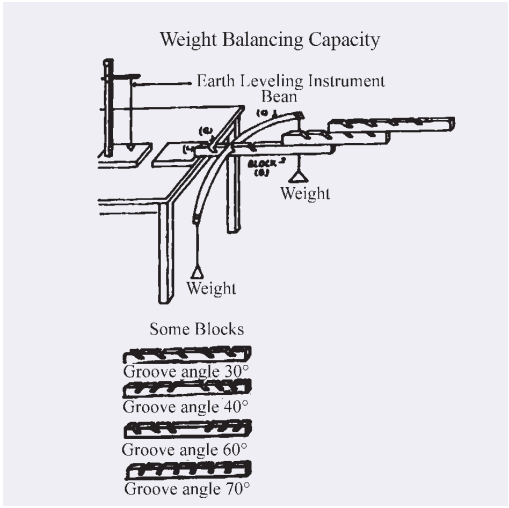
A. Reclamation of used Engine Oil

Construction and Working: The process of reclamation involves the following steps: (i) Setting (ii) Acid treatment (iii) Clay treatment (iv) Filtration. About 1.5 tons used oil is required to obtain 1 ton of reclaimed oil. This oil is stored in the main storage tank. The stored oil is filtered through course meshed funnel to remove large particles of sludge in the oil. About 0.75 ton of stored oil is heated at 70°–80° C for 1–2 hours and allowed to settle for 6 hours in jacketed mild steel kettle. Water and solid sludge is drained off after the setting and the oil is transferred to an acid treatment tank which is also a mild steel vessel. This vessel is lined with lead to improve its durability. This oil is treated with 98 per cent H_2SO_4 (2–5% by weight of the oil). The contents of the vessel are agitated for about one hour. During this period concentrated sulphuric acid is continuously fed from an intermediated tank at intervals of 15 minutes. This oil is again settled after acid treatment in the same tank for 6–7 hours. After settling the sludge at the bottom water is drained off and the oil is sent to the clay treatment tank fitted with a vaccum unit. The clay treatment tank is fitted with an electric heating coil of 25 KW and heating in vaccum is started. The temperature inside the tank is maintained at 200°–300° C by switching on and off





Uses: *It can be used for solving energy problem.*



Uses: *It can be used at the time of construction of bridge, balcony of a stadium or hall, etc. It will remove the use of heavy machinery parts and solve the space problem in big cities.*

the heaters. The vapour liberated is condensed in a condenser and is collected in a condenser tank. The oil clay slurry is cooled before filtration to a temperature below 100°C to avoid oxidation. The oil from the vaccum tank is filtered through filter press.

B. Biogas from Water Hyacinth

Construction and Working: Water hyacinth; the aquatic weed; is common and abundant in lakes, ponds and tanks. It can help in solving the fuel crisis to some extent in our country. One of the glass vessels is filled with water hyacinth weed and is closed with rubber stopper to make it airtight and kept for about one month. The plants decompose and liberate Methane and Carbon dioxide gases. These gases are passed through water in another vessel with the help of delivery tube. Carbon dioxide gas dissolves in water and the methane gas coming out from the vessel is used to burn in the Bunsen burner.

II. Teaching Aids and Innovations

Weight Balancing Capacity

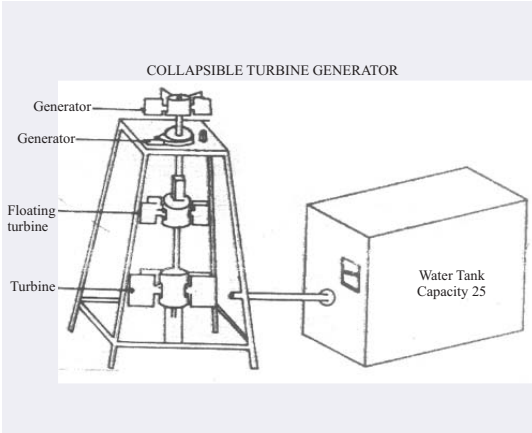
Construction and Working: When a beam (metallic or bamboo) in which weights are suspended equally from the two ends (4kg each) is balanced by the mid point from a groove the block can support a good amount of load. If the beam is balanced from the groove nearby the last end, the block can support more amount of load and set itself from the rough end of the supporting sand miracle which is otherwise not possible. It is experimentally observed that when the weights are suspended from the ends of the beam and the beam is balanced by its mid-point from a groove of the block, the beam tries to twist the block over and the block experiences a twisting force which acts in the upward direction against the attraction due to gravity. Normally it is observed that a twisting force producing couple is more than the gravitational force. As a result the actual centre of gravity of the block moves backwards to a point where it stands in equilibrium position. Moreover it is observed that with the backward removal of groove position, the centre of gravity of the block moves backwards. Besides this, it is also

observed that the more weight is increased, the more it bends the beam and more the centre of gravity of the block moves backwards.

III. Science, Technology and Industry

A. Collapsible Turbine Generator

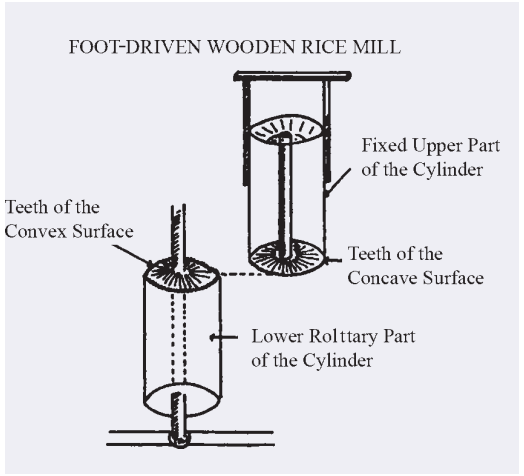
Construction and Working: This is a model for producing electricity from non-conventional sources using collapsible vertical shaft turbine. The problem of varying frequency of waves, and the corresponding intermittent current can be eliminated by the side tank. The water that is stored in the side tank during the rising of waves can be used for supplying water jet to the turbine when the waves are not present. The shutter which is attached by hinges open when the waves hit against it and with the help of the electronic control device the shutter behind the penstock opens when there are no waves. The water in the tank can be used for the continuous rotation of the turbine. This can be used as a multi-collapsible turbine system. The lower turbine is fixed and rotates with the help of waves; the second is a floating turbine which is always on the surface of water. So,during both high tide and low tide we don't have to move this system from place to place depending on tidal differences. The third turbine rotates with the help of wind. Though the wind is blowing from other direction the turbine rotates only in one direction due to the presence of the hinged leaves.



Uses: *It can be used to produce continous electricity at a cheaper cost.*

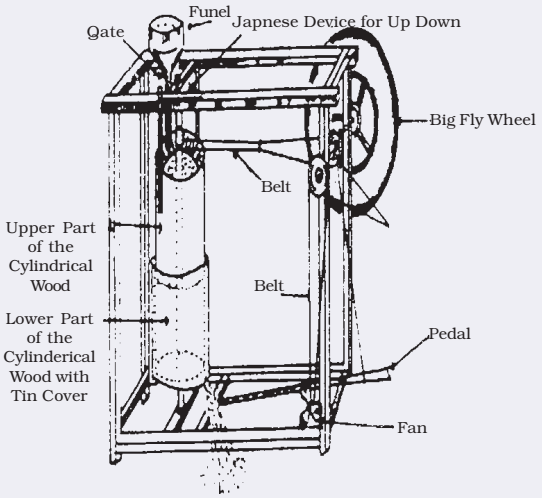
B. Foot –driven Wooden Rice Mill

Construction and Working: The two cylinders are fixed upright in such a way that one is above another. The upper one is fixed in such a way that it can be moved up and down by means of a spring device but it has got no rotatory motion. The lower end of this cylinder is of conical shape inside. The concave and convex surfaces of the cylinders are toothed by making a number of grooves. The lower cylinder is fixed so that it can have a rotatory motion about a shaft which passes through the centre of the upper cylinder. The end of the shaft is projected just above the upper end of the upper cylinder. A pedal is connected with a flywheel by means of a belt. The pedal



Uses: *It can be used for husking paddy grain without the use of fuel, saving money and creating no air pollution.*

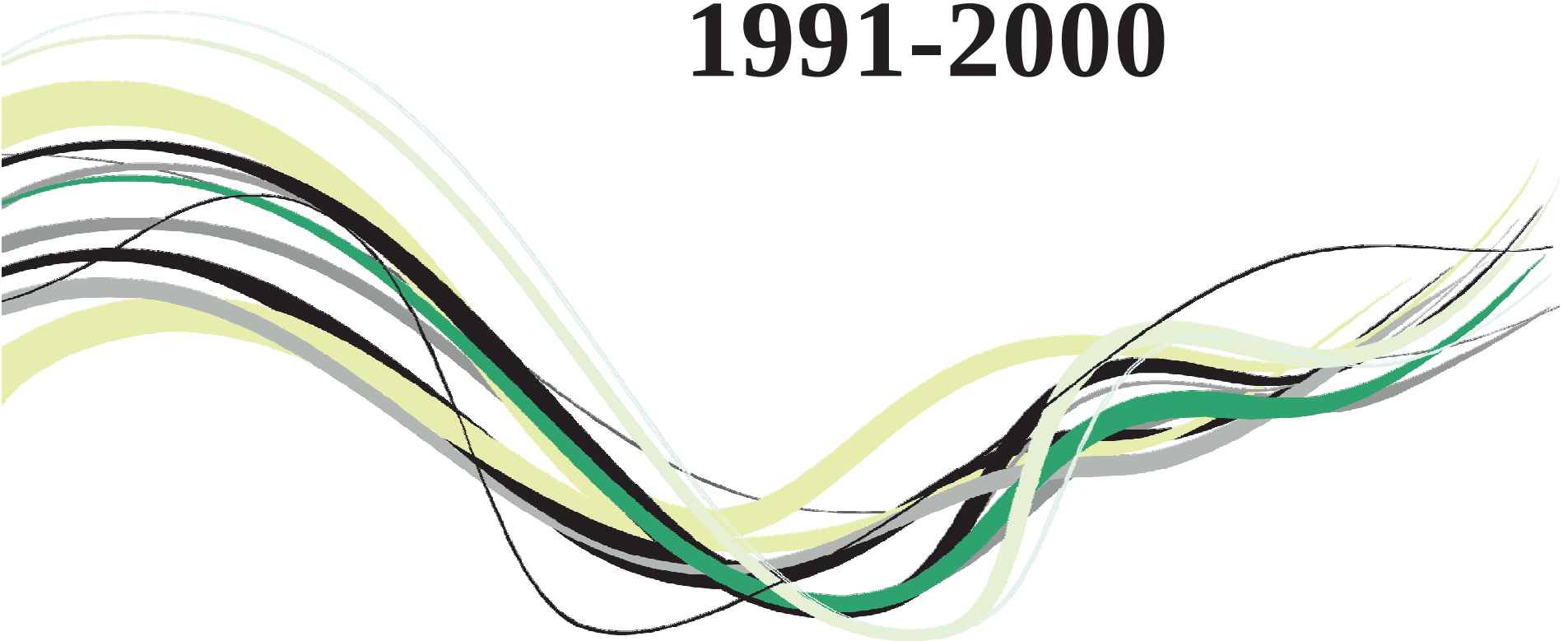
FOOT-DRIVEN WOODEN RICE MILL

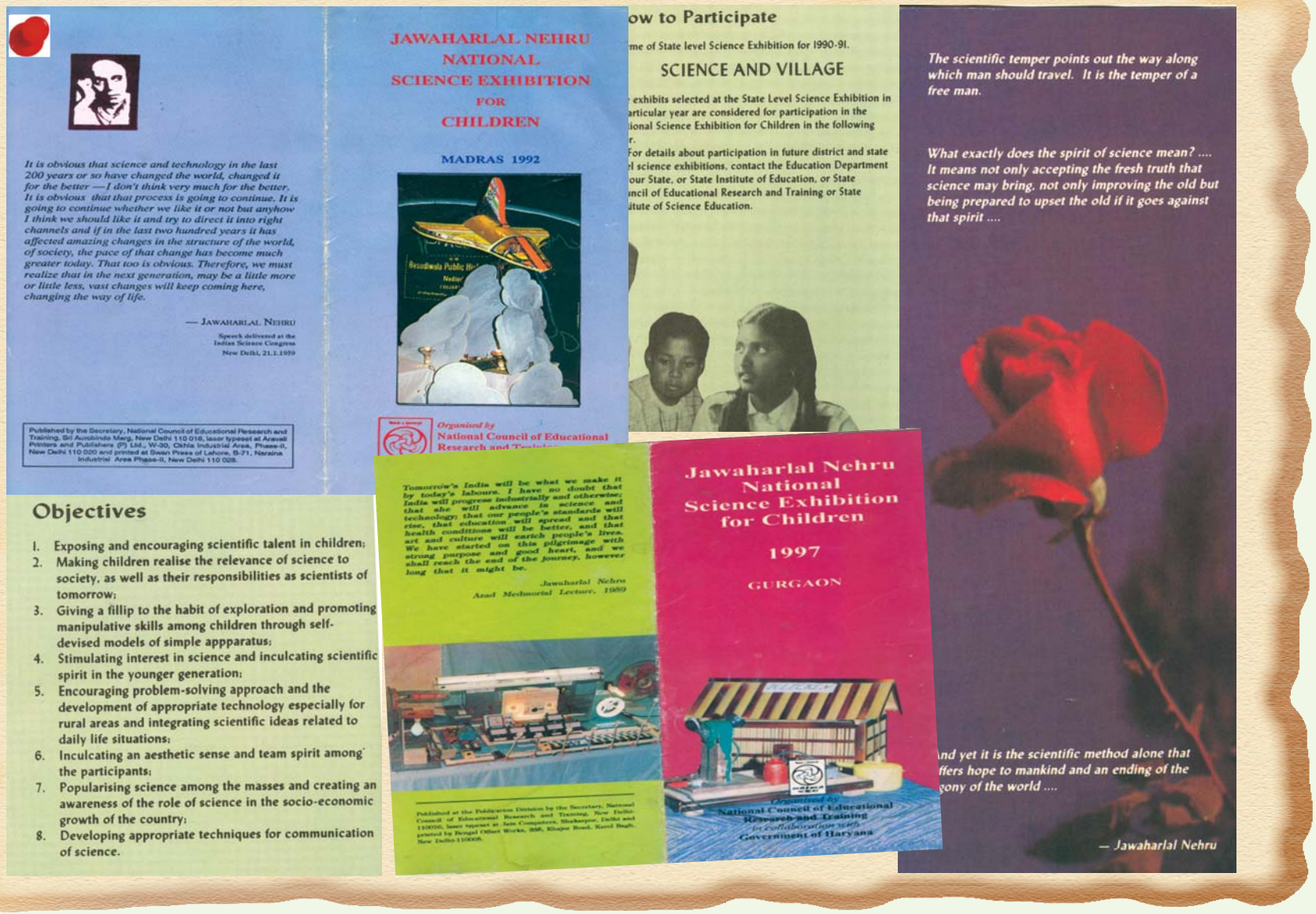


is connected with a crank on the shaft of the big flywheel. For setting the machine in motion, the big flywheel is given a strong rotatory motion, so that the pedalling can be started smoothly. There is a small regulating gate in the stem of the funnel. If the gate is open, there will be a free passage of grain down to the frictional surface. The lower cylinder is covered with tin plate. The husked grain and the husk are collected beneath the lower cylinder near a fan which is connected with a flywheel. This fan winnows away the husk and thereby separates the grain from the husk. When the teeth of the curve surfaces are worn away, they will be repaired again by removing the upper part of the cylinder.

DECADE III

1991-2000




It is obvious that science and technology in the last 200 years or so have changed the world, changed it for the better — I don't think very much for the better. It is obvious that that process is going to continue. It is going to continue whether we like it or not but anyhow I think we should like it and try to direct it into right channels and if in the last two hundred years it has affected amazing changes in the structure of the world, of society, the pace of that change has become much greater today. That too is obvious. Therefore, we must realize that in the next generation, may be a little more or little less, vast changes will keep coming here, changing the way of life.
— Jawaharlal Nehru
Speech delivered at the Indian Science Congress New Delhi, 21.1.1959
Published by the Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110 016, laser typeset at Aravali Printers and Publishers (P) Ltd., W-30, Okhla Industrial Area, Phase-II, New Delhi 110 020 and printed at Swan Press of Lahore, B-71, Naraina Industrial Area Phase-II, New Delhi 110 028.
JAWAHARLAL NEHRU NATIONAL SCIENCE EXHIBITION FOR CHILDREN
MADRAS 1992
Organised by National Council of Educational
Objectives
1. Exposing and encouraging scientific talent in children;
2. Making children realise the relevance of science to society, as well as their responsibilities as scientists of tomorrow;
3. Giving a fillip to the habit of exploration and promoting manipulative skills among children through self-devised models of simple appparatus;
4. Stimulating interest in science and inculcating scientific spirit in the younger generation;
5. Encouraging problem-solving approach and the development of appropriate technology especially for rural areas and integrating scientific ideas related to daily life situations;
6. Inculcating an aesthetic sense and team spirit among the participants;
7. Popularising science among the masses and creating an awareness of the role of science in the socio-economic growth of the country;
8. Developing appropriate techniques for communication of science.
ow to Participate
me of State level Science Exhibition for 1990-91.
SCIENCE AND VILLAGE
exhibits selected at the State Level Science Exhibition in rticular year are considered for participation in the ional Science Exhibition for Children in the following r.
For details about participation in future district and state l science exhibitions, contact the Education Department our State, or State Institute of Education, or State ncil of Educational Research and Training or State itute of Science Education.
The scientific temper points out the way along which man should travel. It is the temper of a free man.
What exactly does the spirit of science mean? .... It means not only accepting the fresh truth that science may bring, not only improving the old but being prepared to upset the old if it goes against that spirit ....
nd yet it is the scientific method alone that ffers hope to mankind and an ending of the gony of the world ....
— Jawaharlal Nehru
Tomorrow's India will be what we make it by today's labours. I have no doubt that India will progress industrially and otherwise; that she will advance in science and technology; that our people's standards will rise, that education will spread and that health conditions will be better, and that art and culture will enrich people's lives. We have started on this pilgrimage with strong purpose and good heart, and we shall reach the end of the journey, however long that it might be.
Jawaharlal Nehru
Azad Memorial Lecture, 1989
Jawaharlal Nehru National Science Exhibition for Children
1997
GURGAON
Organised by National Council of Educational Research and Training in collaboration with Government of Haryana

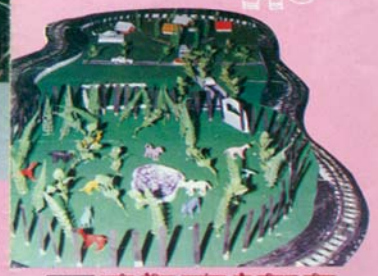
वैज्ञानिक मनःस्थिति मानव को वह दिशा प्रदान करती है। जिसका उसे अनुसरण करना चाहिए। यह स्वतंत्र मानव की मनःस्थिति है।

वैज्ञानिक भावना का वास्तव में अर्थ क्या है?... इसका अर्थ केवल विज्ञान द्वारा प्रस्तुत नवीन तथ्यों को मान्यता प्रदान करना ही नहीं है, यह उन पुरानी मान्यताओं को जड़ से उखाड़ देने के लिए तैयार रहना भी है जो इस भावना के प्रतिकूल है।

और फिर भी केवल वैज्ञानिक विधि ही मानव को तथा संसार की पीड़ा को समाप्त करने की आशा प्रदान करती है...

— जवाहरलाल नेहरू

बच्चों के लिए
26 वीं
जवाहरलाल नेहरू
राष्ट्रीय विज्ञान प्रदर्शनी
1999
राजकोट



राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
तथा
गुजरात सरकार
के सहयोग से आयोजित

A Brief History

The first science exhibition was organised under the banner of National Science Exhibition for Children in 1971 jointly by the National Council of Educational Research and Training (NCERT) and the University Grants Commission (UGC), partly at Bal Bhavan, New Delhi, and partly at the National Physical Laboratory, New Delhi. The subsequent National Science Exhibitions for Children have been organised by the NCERT. From 1972 to 1978, the Jawaharlal Nehru Memorial Fund had collaborated with the NCERT in its efforts to popularise science exhibitions by jointly sponsoring the state level science exhibitions.

In the past, National Science Exhibitions have been organised at Bombay (1979), Bangalore (1981), Calcutta (1982), Lucknow (1983), Udaipur (1985), Guwahati, (1986), Jabalpur (1987), Jammu (1988) and Hyderabad (1989) in collaboration with the respective State Governments.

To coincide with the birth centenary celebrations of Jawaharlal Nehru, which began in 1988, the science exhibition has been renamed Jawaharlal Nehru National Scince Exhibition for Children.

Theme

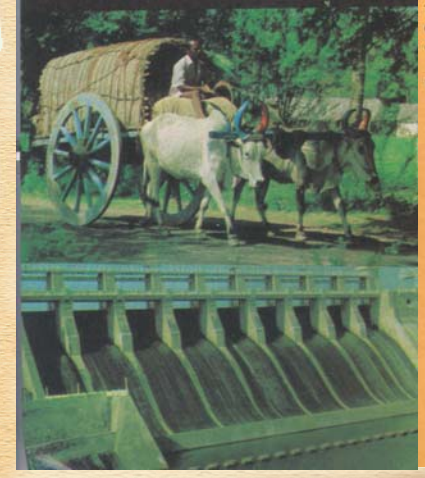
NEHRU AND SCIENCE

Sub-themes

I. AGRICULTURE
II. ENEGRY
III. FOOD, HEALTH AND NUTRITION
IV. SCIENCE, TECHNOLOGY AND INDUSTRY
V. TRANSPORT AND COMMUNICATION
VI. TEACHING AIDS AND INNOVATIONS

Theme of XX Jawaharlal Nehru National Science Exhibition for Children—1991.

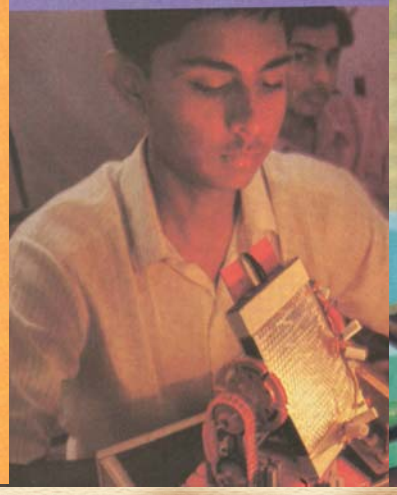
SCIENCE AND VILLAGE

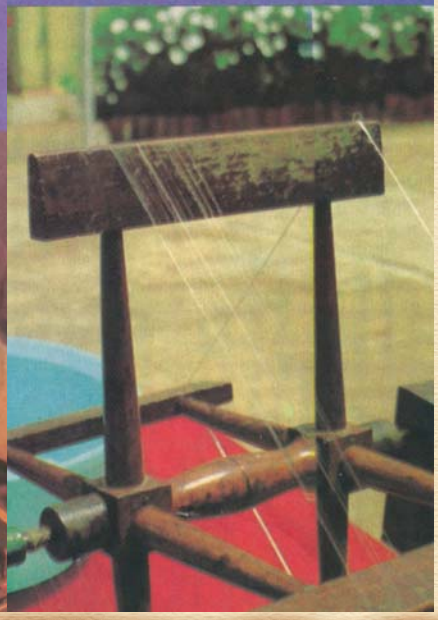


When and Where

The Jawaharlal Nehru National Science Exhibition for Children is organised every year in different States of the country by rotation.

This year, it is being organised at Patna in collaboration with Government of Bihar.





Inaugural Sessions

Inaugural Sessions

Dignitaries Interacting with Children

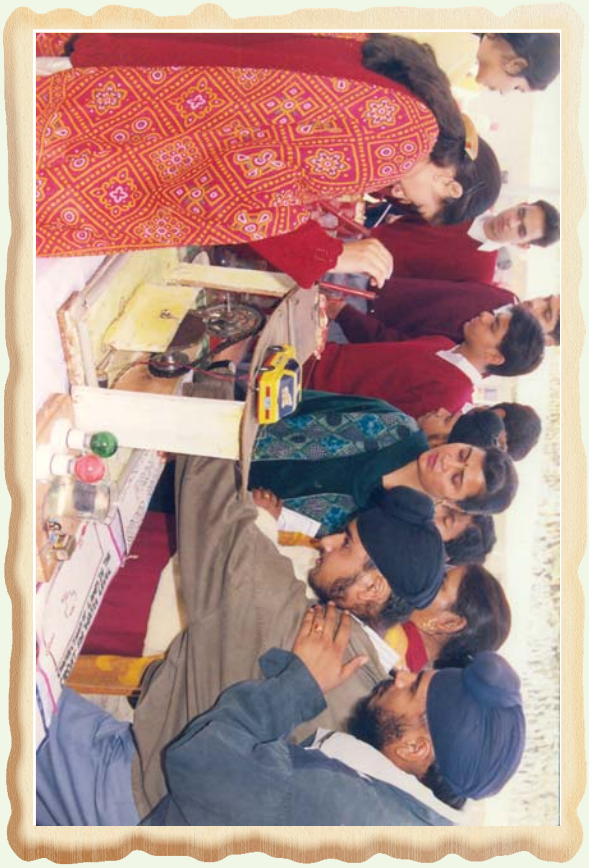
Dignitaries Interacting with Children

Dignitaries Interacting with Children

Children Showcasing their Innovations

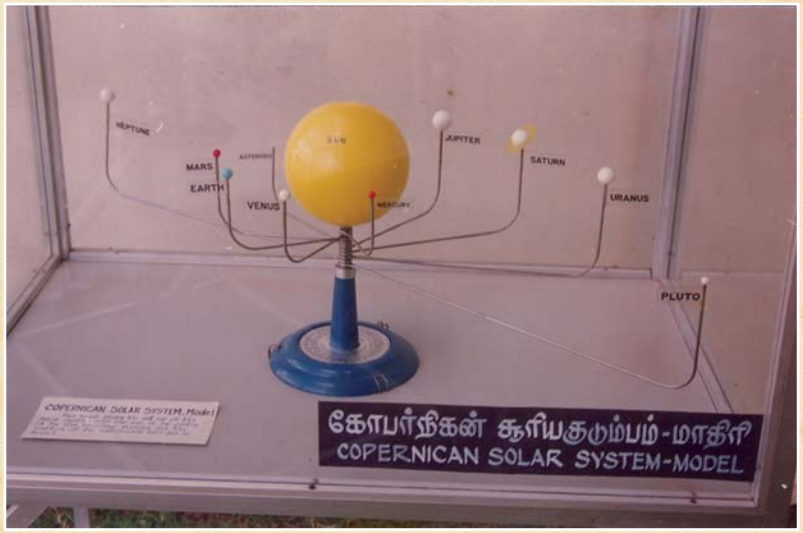
1991–2000

Visitors Interacting with Particpants



Visitors Interacting with Participants

Visitors Interacting with Participants

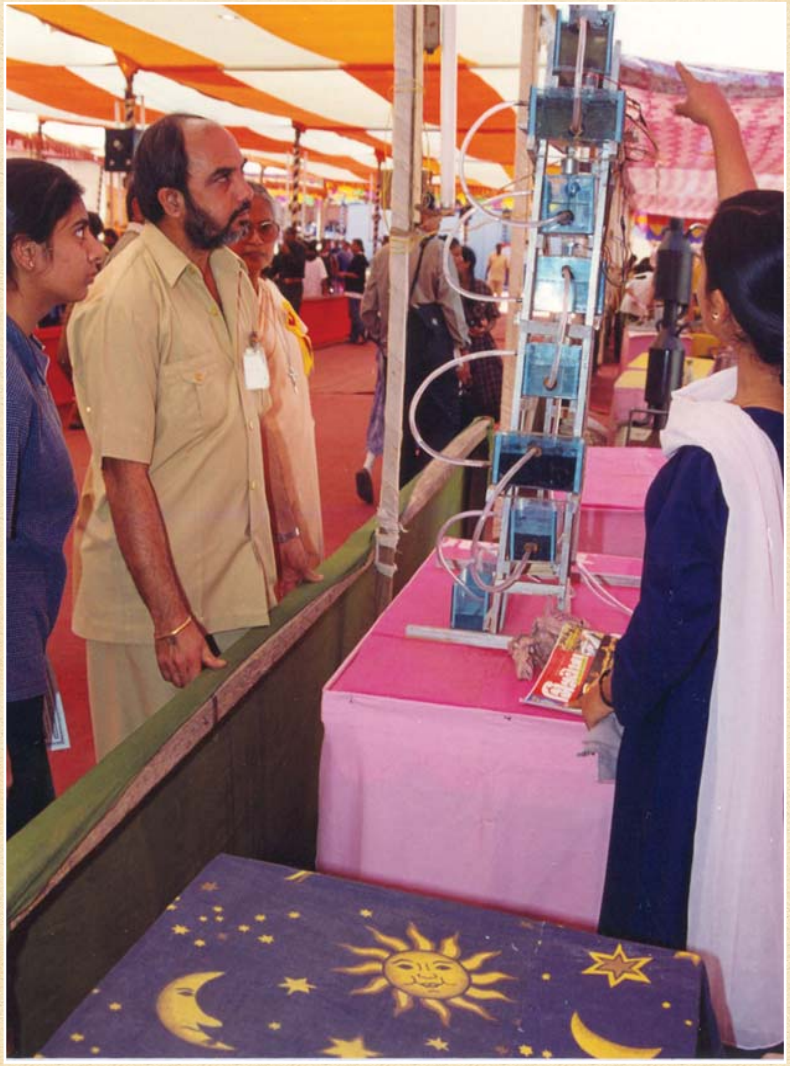

NEPTUNE
MARS
EARTH
VENUS
JUPITER
SATURN
URANUS
PLUTO
கோபர்நிகன் சூரியகுடும்பம்-மாதிரி
COPERNICAN SOLAR SYSTEM-MODEL


HARYANA
WATER
STOVE
KURUKSHETRA
HARYANA


GAS FROM WASTE WOOD
PROJECT BY:- M.SRINIVAS
TEACHER GUIDE:- A.RAGUNATHAN


RAILWAY SYSTEM
IN 21st
CENTURY


A CLEAN AND GREEN
ENVIRONMENT OUR CHOICE
ST. ANN'S HIGH SCHOOL
MANGALORE
AIR POLLUTION
INDUSTRIALISATION

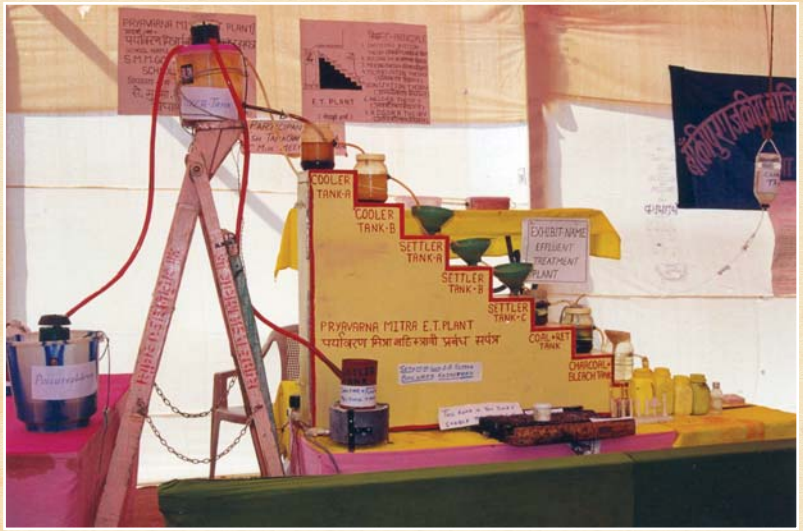


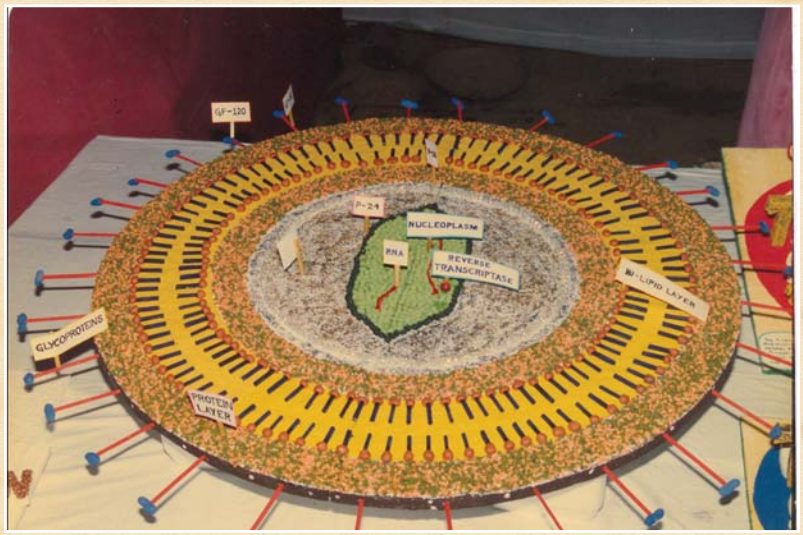
Providing Solutions for a Better Tomorrow

Children's Exhibits at Display

Children Interacting with Visitors

Children Interacting with Visitors






RADHABAI
GANGANE VIDYALAYA
MUMBAI
(MAHARASHTRA)
WRITING BOARD
अपंग के लिए
FOR HANDICAPPED
राय्टिंग बोर्ड

Bridging the Gap: Children Interacting with Scientists


NCERT-NAL CHILDREN MEET
SCIENTISTS PROGRAMME


NAL CHILDREN
TISTS PROGRAMM


CHILDREN MEET SCIENTISTS PROGRAMME
SPONSORED BY
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING, NEW DELHI
REGIONAL RESEARCH LABORATORY JORHA
22 NOVEMBER 1993

National Science Exhibition for Children

DAULAT SINGH KOTHARI (6 JULY 1906 – 4 FEBRUARY 1993)

Professor D.S. Kothari was born at Udaipur, Rajasthan and lived a graceful life with simplicity, tranquility, and humility of a saint. He earned highest degree of appreciation and reputation as an excellent teacher, an able administrator and thinker. His contribution to the fields of education, science and culture would certainly inspire many future generations. In recognition to his dedicated and valuable services to the nation, the President of India conferred on him Padma Bhusan in 1962 and Padma Vibhushan in 1973.

He was the first scientific advisor to the Ministry of Defence and was also the first Chairman of the Defence Research and Development Advisory Committee in independent India.

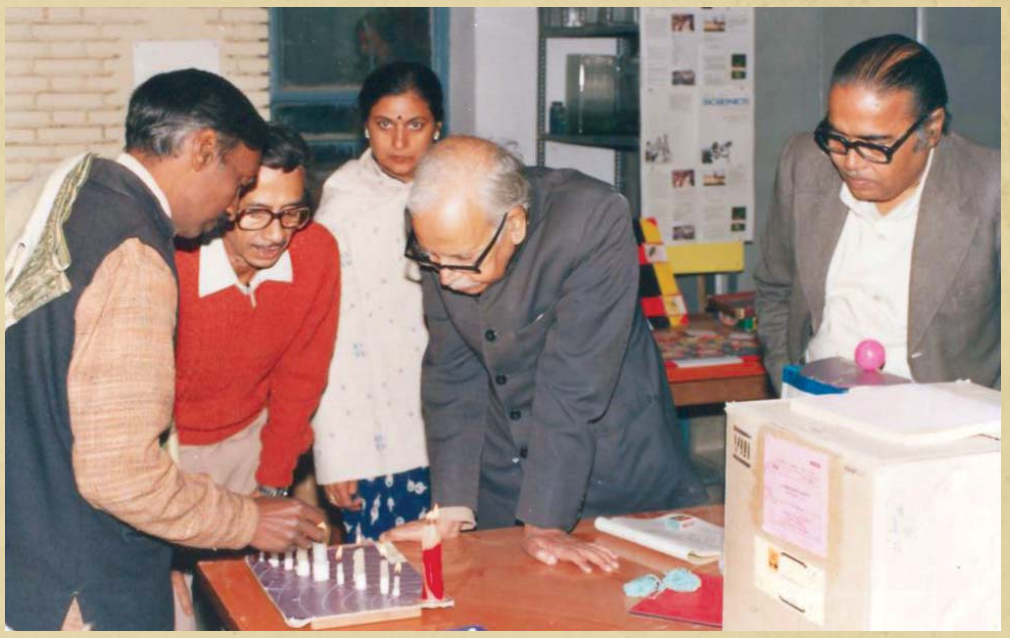
He was the chairman of University Grants Commission in 1961 and 1962. He also chaired Education Commission (1962–66). The Commission's report popularly known as Kothari Commission had provided its considered opinion for the policy formulation, planning and execution of educational reforms at all levels. The recommendations formed the basis of National Policy of Education (NPE-68) that was adopted by parliament in 1968.

He firmly believed that science and technology education is the key to make rapid progress in socio-economic, scientific

The Brain Child of Professor D.S.Kothari

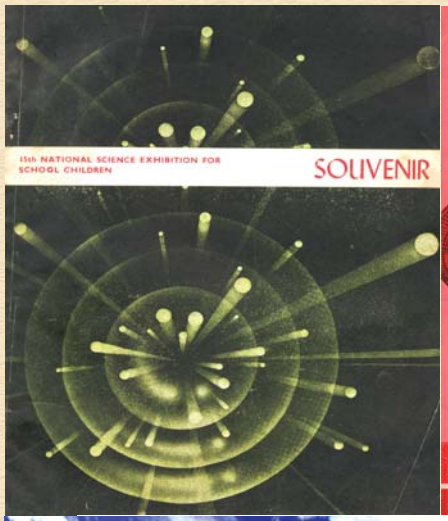
and technical development of any country. Through this education the challenges of the modern world in the new and emerging areas of industry and technology can be met.

To him science teaching was an exercise which actively engaged all sensory organs of the learners to become keen observers, honest experimentalists and seekers of truth without being prejudiced by any faith, belief or tradition. His efforts to improve the quality of science education continued throughout his life.

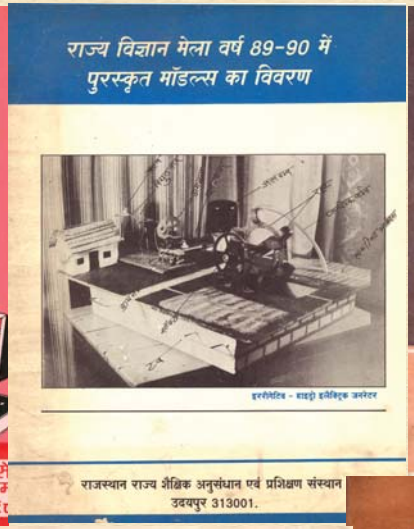


Many innovative schemes and programmes including JNNSEC and NSTS were conceived with his initiative in the NCERT. It gave him immense pleasure while interacting with young children demonstrating principles of science through crude yet innovative models developed by them during students' science exhibitions. He chaired the Advisory Committee of Science Exhibition for Children in the initial three years. Thereafter he was the member of the Advisory Committee till his health permitted.

National Integration: Living and Learning Together


15th NATIONAL SCIENCE EXHIBITION FOR SCHOOL CHILDREN
SOUVENIR


राष्ट्रीय शैक्षिक अनुसंधान एवं प्रशिक्षण परिषद् तथा जवाहर लाल नेहरू स्मारक निधि की सहायता से शिक्षा विभाग उ.प्र. द्वारा आयोजित
राज्य विज्ञान प्रदर्शनी
१९८६
भविष्य के वैज्ञानिक
राज्य विज्ञान शिक्षा संस्थान, उ.प्र., इलाहाबाद
राज्य शैक्षिक प्रशिक्षण एवं अनुसंधान परिषद्, उत्तर प्रदेश


राज्य विज्ञान मेला वर्ष 89-90 में
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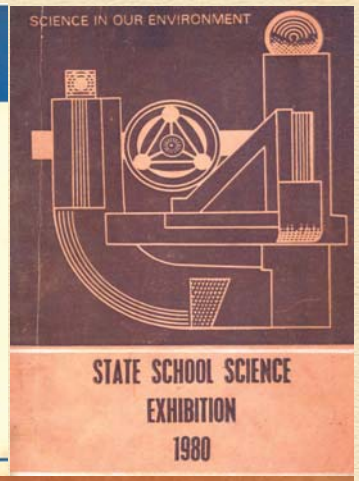
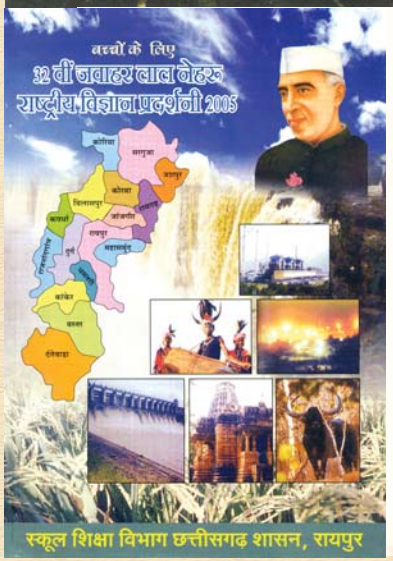
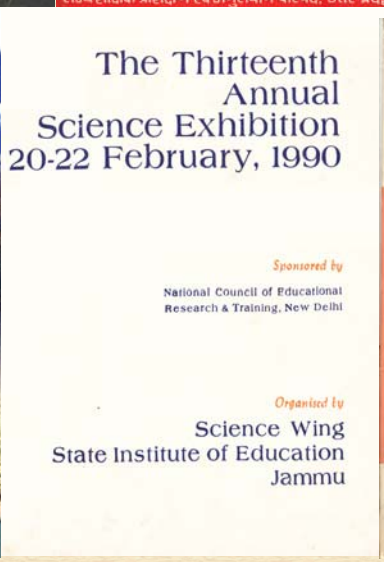
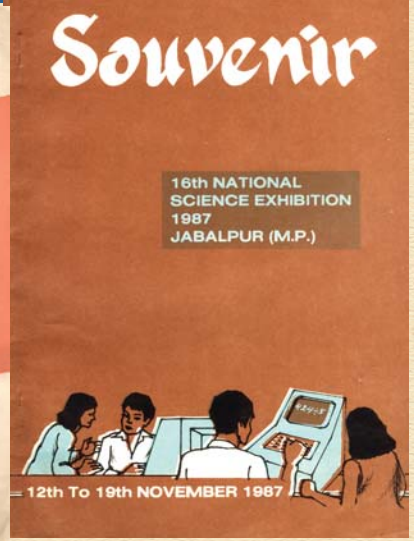
उदयपुर 313001.


SCIENCE IN OUR ENVIRONMENT
STATE SCHOOL SCIENCE EXHIBITION
1980


बच्चों के लिए
32 वीं जवाहर लाल नेहरू
राष्ट्रीय विज्ञान प्रदर्शनी 2015
स्कूल शिक्षा विभाग छत्तीसगढ़ शासन, रायपुर


The Thirteenth
Annual
Science Exhibition
20-22 February, 1990
Sponsored by
National Council of Educational Research & Training, New Delhi
Organised by
Science Wing
State Institute of Education
Jammu


Souvenir
16th STATE LEVEL SCIENCE EXHIBITION
NEHRU & SCIENCE
DEPT. OF SCIENCE AND MATHEMATICS EDUCATION, STATE COUNCIL OF EDUCATIONAL RESEARCH & TRAINING, ORISSA • BHUBANESWAR


Souvenir
16th NATIONAL SCIENCE EXHIBITION
1987
JABALPUR (M.P.)
12th To 19th NOVEMBER 1987

बच्चों के लिए राष्ट्रीय विज्ञान प्रदर्शनी 1985

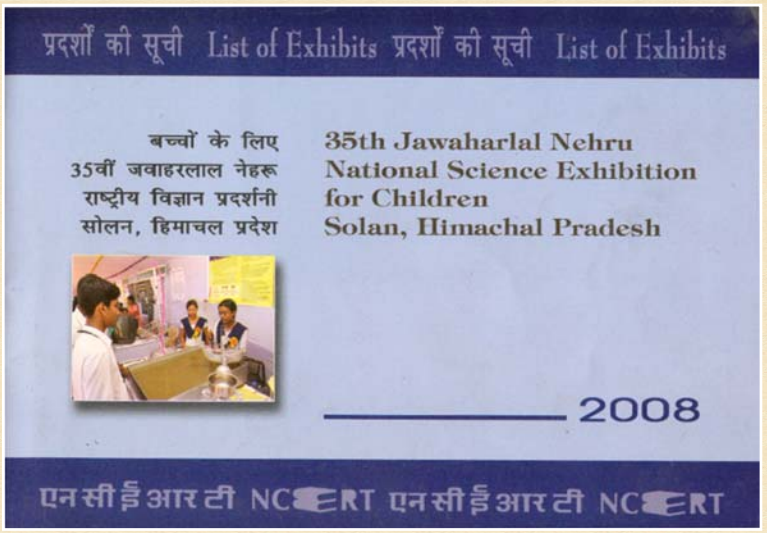
NATIONAL SCIENCE EXHIBITION FOR CHILDREN 1985

महाराणा भूपाल स्टेडियम, उदयपुर
16-22 नवम्बर 1985

MAHARANA BHUPAL STADIUM, UDAIPUR
16-22 NOVEMBER 1985

आयोजक
राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली
तथा
राजस्थान सरकार

Organised by
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING, NEW DELHI
AND
GOVERNMENT OF RAJASTHAN



बच्चों के लिए राष्ट्रीय विज्ञान प्रदर्शनी 1986

NATIONAL SCIENCE EXHIBITION FOR CHILDREN 1986

जजेज फील्ड, गुवाहाटी
17-24 नवम्बर 1986

JUDGES' FIELD, GUWAHATI
17-24 NOVEMBER 1986

आयोजक
राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली
तथा
असम सरकार

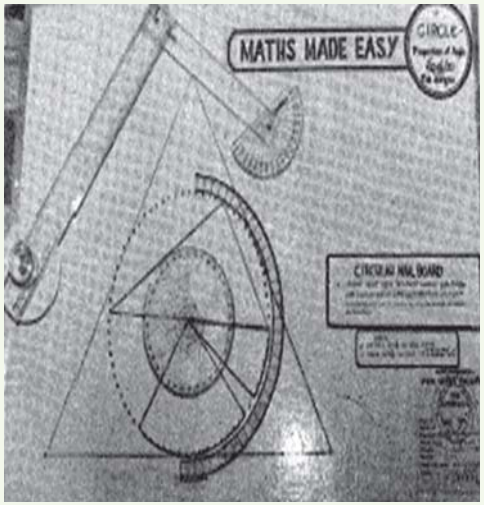
Organised by
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING, NEW DELHI
AND
GOVERNMENT OF ASSAM

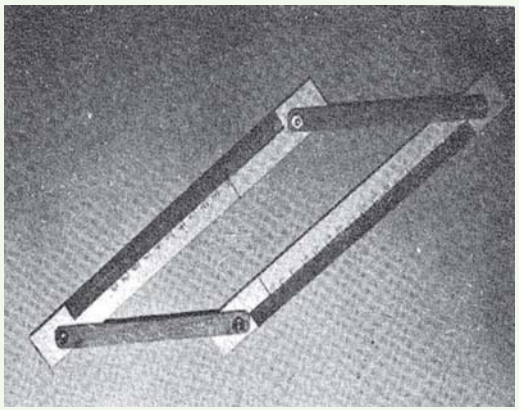
1. 1991

I. Innovative Teaching Aids

Maths Made Easy

Construction and Working: Draw a circle of 10 cm radius in the middle of the hardboard {50 cm × 40 cm}. Fix 1" size of nails along the circumference of a circle and see that the height of the nails should be 1 cm above the base. Arrange one circular protractor in the middle of the circle and see that it should be rotated freely on the centre nail axis. Take two scales (or metal strips) of lengths 12" and 9" and one semicircular protractor. Fix them with the help of screws as shown in the figure and see that these three parts are moved freely at the fixed points. Arrange this prepared semicircular protractor set in the left side middle of the hardboard and see that this so arranged set should be moved freely on the board. A semicircular paper scale should be pasted (1–32 cm) outside of the circle. It is useful for measuring the length of an area. Properties of angles related to the circles can be measured and verified with the help of practical observation book and the geo-circular nail board. Take a few rubber rings of big size. Place the rubber rings on the nails so that the different shapes of geo-fig. are formed. You can verify the angular properties of circles by measuring the angle at the centre by circular protractor and angle made on the circumference by semicircular protractor.



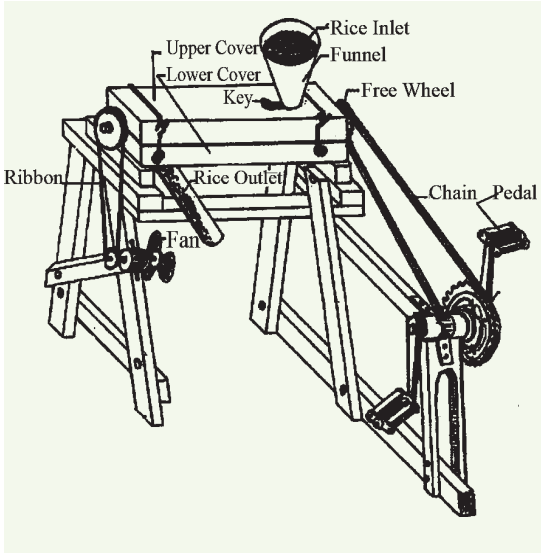


Uses: *Pupils acquire skill in handling the apparatus, and measuring the angle.*

II. Indigenous Technology and Cottage Industry

A. Pedaling Rice Mill

Construction and Working: It is a device for husking grain, especially the paddy grain. The lower cover is fixed on a stand; then the two free

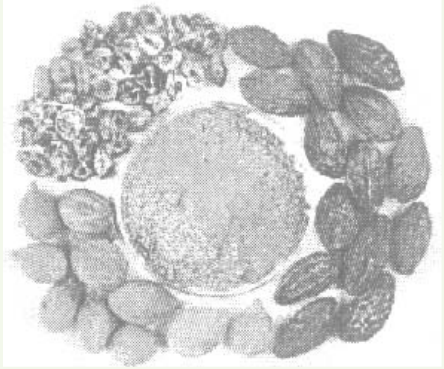


wheels fixing the axle are fixed inside the hollow rectangular lower cover. The upper cover is fixed on to the lower cover with the help of screws.

The axle should be penetrating horizontally and rotating freely inside the two covers. The chain should be joined in between the free wheel fixing at the right end of the axle and the crank, which stands on a base extended from the right leg of the stand. On the right side of the box there is a conical funnel as inlet and on the left side there is an outlet from the lower cover. There is a small regulating gate in the stem of the funnel. When the gate is opened, there is a free passage of grain down to the frictional box(not seen in the figure). The husked grain and the husk fall through the outlet near a fan which is connected to a fly wheel fixed on the other end of the axle. This fan winnows away the husk, thereby separating the grain from the husk. When the teeth of the axle are worn out, they can be repaired easily by opening the upper cover.

B. Dyeing and Ink Preparation

Construction and Working: The main purpose of this project is to dye the clothes out of locally available raw materials like myrobalan or myrobalania indica.



Mycobalania indica

Uses: *Fibres dyed in different colours*

Process of dyeing:

1. Collection of myrobalan fruit;
2. Crushing them into pieces and drying in the sunlight;
3. Keeping the dried pieces in water in a container and squeezing out the juice;
4. Boiling the juice obtained along with the crushed pieces for sometime to make it concentrated; and
5. Separation of the juice from the pieces with the help of a piece of cloth.

   To obtain different shades out of that juice, we use some other materials which are easily available like tea juice, iron oxide, alum solution, lime water, catechu solution, potassium dichromate solution, etc.

2. 1992

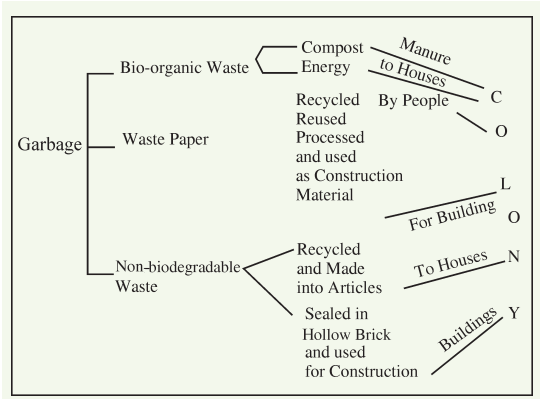
I. Environment

A. Utilisation and Disposal of Garbage

Construction and Working:
Biodegradable Waste: It can be made into compost and used as manure for agriculture. The other portion can be converted into energy and supplied to the houses. Plant wastes have a high cellulose content which produces heat energy on burning.

Waste Paper: The non-biodegradable waste like paper can be recycled and processed with certain polymers. This processed paper can be made tough and resistant to fire, weather, etc. This paper can be utilised for construction of roofs, doors and windows and other parts which require wood for their construction.

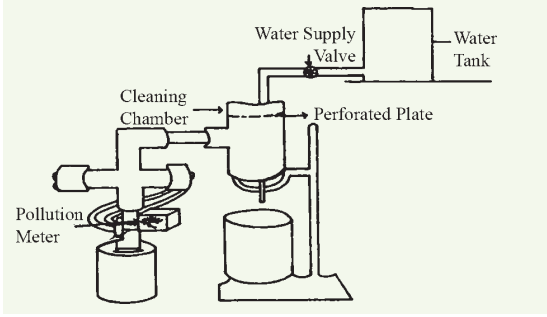
Non-biodegradable Waste: One way to dispose it of is to just seal it inside something so that it is not left free in the soil. As it is shown in the scheme, these materials are cleaned and crushed. The crushed materials are then sealed inside hollow clay bricks which are used for constructing houses.

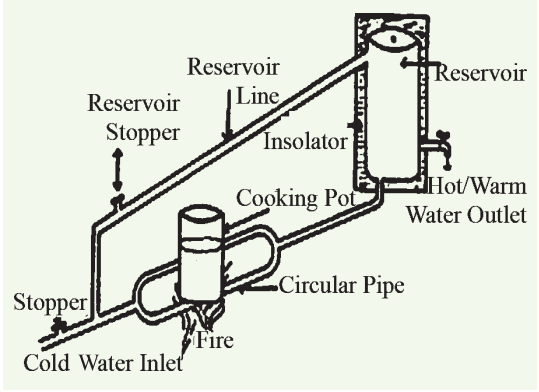


Uses: *It can solve the problem of disposal of garbage properly and can be used in different useful activities.*

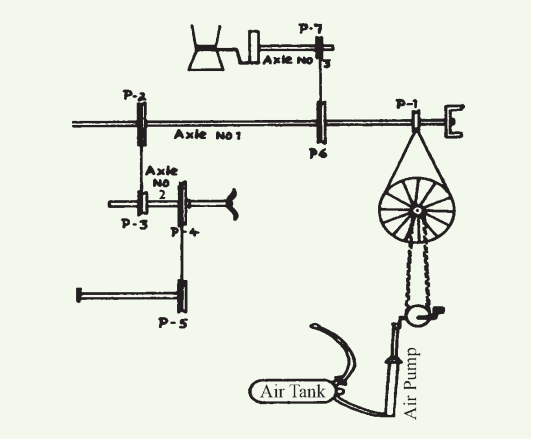
B. Air Pollution Detector and Eliminator

Construction and Working: The drop in electricity generation (voltage) indicates the degree of pollution. A chimney with a convex lens is used which collects light. On the opposite side of the lens a photo-electric cell is fitted. This photoelectric cell is connected to a pollution meter through a three-volt battery which increases the sensitivity of the pollution meter. Voltmeter serves as pollution meter. Voltmeter scale shows the percentage of smoke in the air. A bulb is used to get pure light. Adjust the pointer of pollution meter at 100 by allowing the light from the bulb to fall on the lens. Now produce smoke by burning piece of wood or kerosene lamp and pass it through the chimney. This smoke diminishes the intensity of light and hence the current in the photo-electric cell decreases. With this decrease in the current the pointer of the pollution meter shows the percentage of





Uses: *It can be used to get warm/ hot water without using extra fire-wood.*



Uses: *It can be used to perform many processes simultaneously and efficiently.*

smoke in the chimney. When the pollution goes beyond tolerable limit, then start spraying water in the cleaning chamber. Here the water soluble particles and water soluble gases will come down in the waste tank and clean air will escape out.

II. Technology for Future

A. Domestic Hot Water Tap

Construction and Working: Circular iron pipe is used to support the cooking pot. It is placed in a slightly inclined position. Lower part of the circular pipe is connected to cold water tap and the other part is connected to the bottom of a reservoir which is covered with a bad conductor of heat. One more pipe is connected between the reservoir and the lower end of the circular pipe. When the hearth is fired for cooking food, the reservoir tap provides warm water. However, to get hot water the cold water tap will have to be stopped for some time.

B. Multipurpose Simple Machine

Construction and Working: It is a non-pollutable machine. In this machine on a wooden frame the handle and the gear are connected with a chain to a cycle wheel. The bicycle wheel and pulley 1 are connected with a string. Pulleys 1, 6 and 2 are attached on a steel axle 1. On one end of this axle a coconut miner blade is attached and on its other end, a metal strip to spin the ropes is attached. Pulleys 2 and 3 are connected with each other with a string. Pulleys 3 and 4 and fruit juice blade are attached on a steel axle 2. Pulleys 4 and 5 are connected with each other by a string. Pulley 5 is connected with a churner blade to get butter milk. Pulleys 6 and 7 are also connected with a string on a steel axle 3. Pulley 7 and a simple vegetable slicer machine is attached. The main handle is connected with the handle of an air pump. The air pump is connected with the air tank by a one-way valve nozzle. On the other side of the air pump a nozzle for filling air is fixed. When the main gear is operated by hand, the big and small pulleys will rotate and thus, the axles connected with these pulleys and the attachments fixed on these axles too, will rotate and become functional. This simple machine can be utilised in many ways such as: 1. Collecting

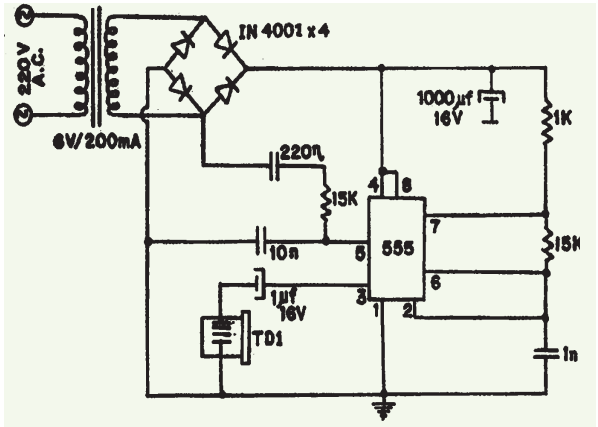
air into the air tank. 2. Spinning ropes .3. Mixing the coconut kernel. 4 Preparing fruit juice or milk shakes. 5. Slicing the vegetables required. 6. Preparing butter milk and also extracting butter from it.

3. 1993

I. Health for All

Mosquito-repellent

Construction and Working: The model is constructed on a piece of IC veroboard. Instead of soldering the IC-555 directly to PCB, an 8-pin IC base is used to avoid damage to the IC due to over-heating or leakage of current of the soldering iron. The mosquito-repellent is based upon the type 555 timer chip which is figured to produce a 20 kHs to 40 kHs output signal, swept at a 50 Hz rate. The late frequency is obtained from the mains by means of 200N (C4) and 15 K (R3) which pass the modulating signal to input pin 5. The output of the sweeping oscillator is connected directly to a high efficiency plezoceramic horm tweeter, which ensures a sufficiently high sound pressure level to keep mosquitoes out of reasonably sized areas. It works from 200 V AC source.

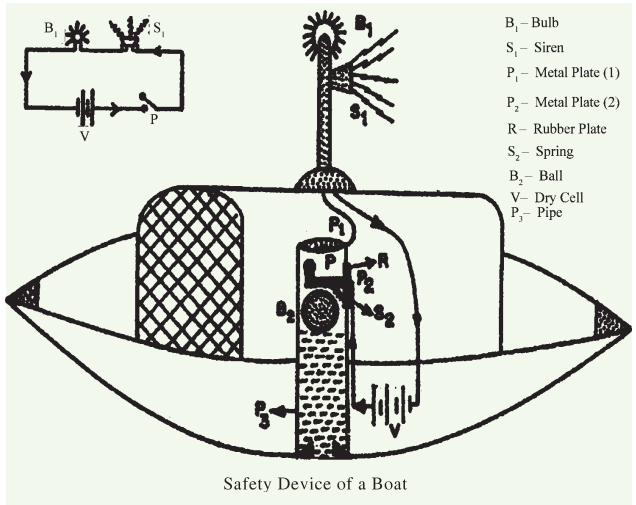


Uses: *It can be used to repel mosquitoes and also effective to ward off mice and rats from storerooms, godowns, etc.*

II. Transport and Communication

Safety Device of a Boat

Construction and Working: The upthrust of water is the main principle of this model. We find out the centre of gravity of a small wooden boat at the bottom and make a small hole there. We place a plastic pipe of half an inch radius at the hole and cut it off making it equal in height to the boat and then cut off 1 sq. inch from either end of the pipe. We take one electrode, the height of which is less than the diameter of the pipe and join it to a rubber strap by making a hole. Now the rubber strap is attached to the pipe with the help of the paste in such a way that it rests half inch below the nearer



Safety Device of a Boat

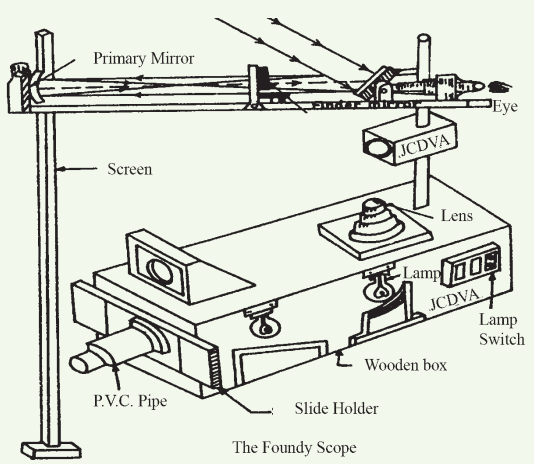
Uses: *It can be used as a safety device in a boat journey.*

end of the pipe. Another metal plate is attached to it. A small plastic ball is placed into the pipe which is fixed tightly on the hole in the boat with the plaster of paris. An electric bulb (3V) is attached at the top of the post with which the sails are tied with plastic wires. Since the siren is tied to the post, the dry cell batteries (6x1.5V) are placed in the battery container in which one end of the battery container is connected with the piece of metal attached to the rubber. The two wires — one is connected with the bulb and the other is tied with the siren — join the other end of the battery container. And then another wire connects the bulb with the siren. Thus the safe boat is constructed.

The safe boat is dropped in a tub filled with water. The water inside and outside the boat will remain at the same level. As more and more weight is placed on the boat the boat slowly tends to go into the water. There comes a moment when an addition of a little more weight makes the boat sink, the bulb flash and the siren ring. It happens so when the boat slowly goes down into the water and the ball inside the pipe rises up to the mouth of the pipe. At this time it pressurises the plate attached near this end. As a result it gets connected with the other plate and electrical energy is generated. It makes the bulb light up and rise a little and the ball goes down a little. The two plates are now disconnected and the electrical circuit is lost. The light goes off and the siren stops ringing.

III. Educational Technology

The Foundy Scope



The Foundy Scope

Uses: *It can be used to teach the process of reflection, refraction of light and focal length of any concave mirror.*

Construction and Working: The foundy scope is a teaching aid which can be useful in teaching about reflection and refraction of light as also to determine the focal length of any concave mirror. Besides, it can also be used as a telescope, a slide projector, an overhead projector, an epidio-scope and a microscope.

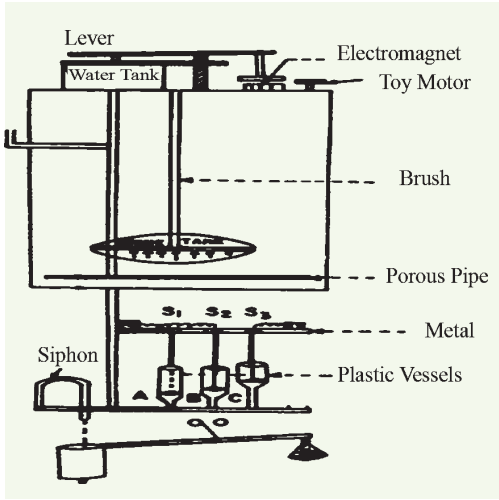
The foundy scope is assembled as shown in the figure with the help of the materials like 2 plywood boxes (15 × 15 × 15) and (15 × 15 × 60), P.V.C. pipes, a concave mirror, plane mirror, white screen, slide holder, 2 lamps, 4 lenses and a switchboard. To use it as a slide projector, a slide is first fixed in the slide holder. When the lamp is switched on, a large image is obtained on the screen. It can also be used as an epidio-scope for which a picture or

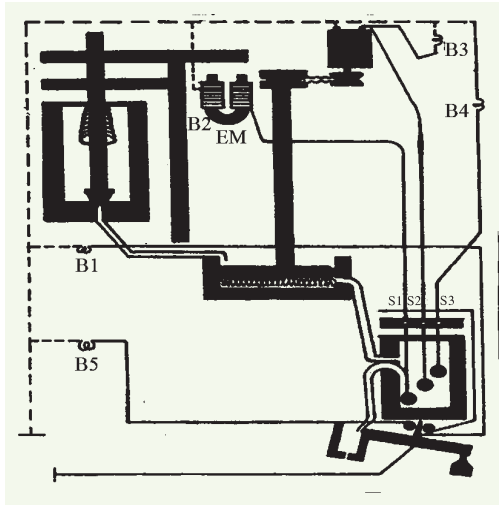
any printed matter of the text is fixed at an assigned place in the box. A large image of the same can then be projected on the screen by switching on an appropriate lamp. A magnified image of a tiny object or a small picture is obtained by first forming its real image by a lens which is then further magnified by a convex mirror. The convex mirror is so adjusted that the real image of the object can be magnified by adjusting the curvature. With the help of a slido-scope, a large image of a small slide can be observed. A pocket microscope is also provided to study details of any tiny object. The 'ease eye', a vision magnifier, has been provided to read small printed letters or figures.

IV. Technology and Environment

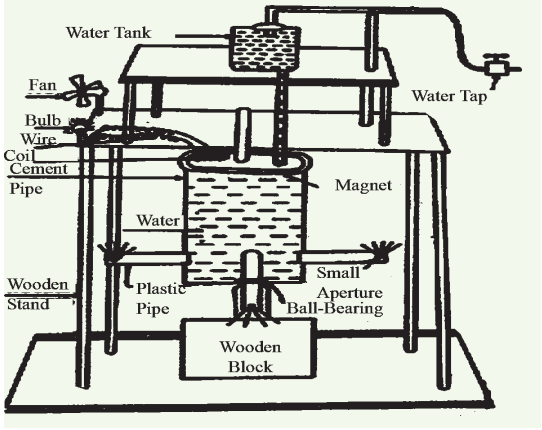
A New Device for Cleaning Urinals

Construction and Working: A table is made having length and width of 1 metres each and one and a half metres height. At the bottom of this, there is a tank for collecting urine. We fix three plastic vessels connected together with a pipe on the board. A cork made of thermocol is suspended in each vessel. An iron bar is pierced through this cork and connected with a spring to a metal. The vessels are fixed and each cork is lifted up only after a short interval. The first vessel is connected with an electromagnet and a bulb. The second vessel is connected with a toy motor and the third with another bulb. A tank is fixed on the table. At the bottom of the tank, there is a valve which is controlled by an iron bar fixed with a lever and then with an electromagnet. A pipe is fixed just below the valve. This is connected with the porous pipe around the urinal tank. From this tank, there is another pipe leading to the pipe which is connecting the vessels. There is a siphon fixed with this pipe. The brush is connected with the toy motor. The urine is collected in the urinal tank. It is passed to the plastic vessel by lifting the thermocol up. The bar touches S_1. The magnet attracts the metal lifting the valve up. The water from the tank is allowed to the urine tank through the porous pipes. At the same time, a red light is seen indicating that the urinal is being cleaned. Secondly, thermocol in the vessel is lifted up rotating the cleaning brush freely and finally the vessel also works in the same manner, lighting another bulb. When the water reaches at the level of the siphon in these three vessels it flows down to another vessel through the siphon. The

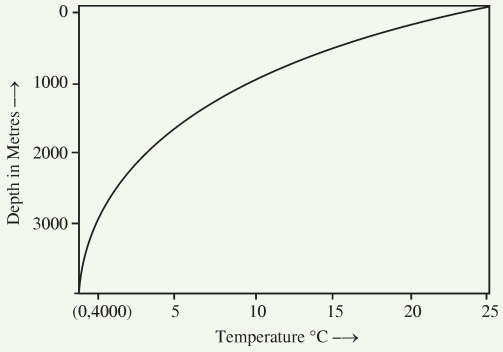




Uses: *The device is used for cleaning urinals*



Uses: *The device is used to produe electicity by the process of electromagnetic induction.*



water flows outside through a hole at the bottom. The vessel goes up after some time touching the pin with a needle on the bar. This results in the glowing of a green light. It shows that the urinal is ready for use again. The mechanism works only when urine is collected in the tank.

V. Energy

Production of Electricity by Electromagnetic Induction

Construction and Working: A thin metal tube (a cement pipe) 75 cm long and 10 cm in diameter with top end open and bottom end closed, is pivoted in a wooden block holding a ball-bearing. Four small metal tubes (plastic pipes) are fixed to a vertical tube (cement pipe) just above the closed side as shown in the figure. A circular metallic plate with a hole at the centre and four small slightly U-shaped magnets attached with it are fixed on the open end of the vertical tube. A coil is placed just above the magnet mounted on a wooden stand. Two wires connect the two terminals of the coil with a small electric fan. The vertical tube is filled up with water. The water exerts pressure in the tube and rushes out through the small pinholes in anti-clockwise direction. As a result of this action, the tube with magnets fixed on it moves clockwise with great speed. When the magnets move, the coil crosses the magnetic lines of force quickly. Electricity is generated in the coil and rotates the electric fan attached with it. This type of bigger units can be installed in remote areas in villages. No fuel is required as small streams, rivulets are sufficient for generation of considerable amount of power with the help of such mechanism.

4. 1994

I. Technological Innovations

Ocean Thermal Energy Conversion (OTEC) Model

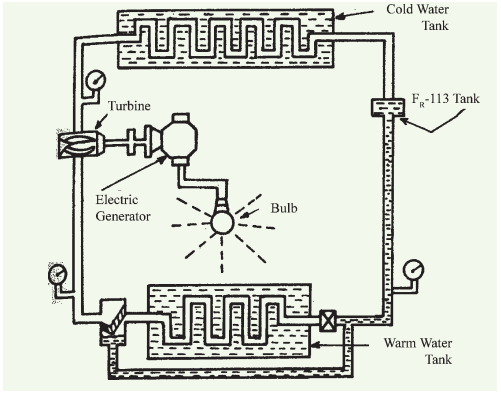
Construction and Working: The sun heats the ocean and its energy gets stored in the topmost layer of sea water. Below the surface, at a depth of about 1000 metres, the temperature is usually a few degrees above freezing

point. This temperature difference remains nearly the same from season to season. Ocean thermal energy can convert this continually renewable store of energy into electricity, fuels and chemicals.

Working: A fluid like ammonia or Freon, with a low boiling point, is pumped into evaporators, where the heat of the warm sea surface water vaporises it. This vapour is allowed to expand through a turbine. The expanding vapour drives the turbine which in turn, runs the electric generators. The exhaust vapour is condensed by the cold water lifted from great depth. This is a Rankin Closed Cycle.

Plant Arrangement: The power plant is housed on a floating platform located in the sea. A cold water pipe is suspended from the floating platform so as to reach water in the depth of the sea level that is at the desired temperature. The warm water is taken from the surface through screens around the periphery of the floating plant and is pumped through evaporators. The plant is generally located near the land.

Applications: India, in particular, is most suited to exploit the energy from OTEC and is geographically well placed. Tamil Nadu is found to be the most suitable place for OTEC and efforts are on by the State Government to set up the plant. Recently, a plant is set up at Kavaratti Island, Lakshadweep that provides electricity to people of the island.

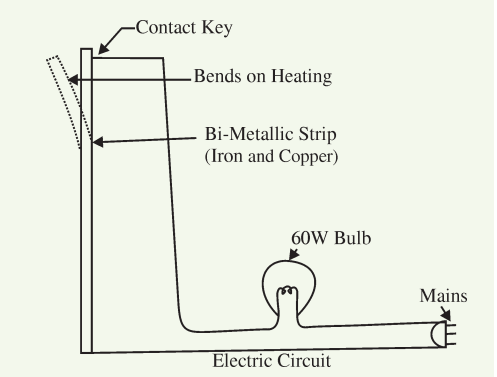


Uses: *The electricity so produced can be used in factories, industries and houses. It is a non-conventional source of energy.*

II. Agriculture and Animal Husbandry

Low Cost Portable Incubator

Construction and Working: A wooden box completely sealed with top lead opening is taken. Its walls are blackened. The electric circuit consisting of a bi-metallic strip made of iron and copper is connected to the A.C. mains through a 60 watt electric bulb and a contact key. When the circuit is on, the electric bulb glows and generates heat inside the wooden box and thereby the temperature of the chamber increases. When it crosses 40°C the circuit is disconnected at contact key due to the bending of the bi-metallic strip. On cooling, the strip regains its original position and the electric circuit is completed again making the electric bulb glow. This acts as auto-control device for maintaining temperature between 36°C to 40°C



Uses: *Due to its low power consumption, low cost, portability and automatic temperature control, this can be used as a small hatching device for 100 eggs at a time, by small poultry farms.*

which is ideal for hatching of eggs or for keeping the food warm. A mercury thermometer is inserted from the top of the box through a hole to indicate the temperature.

III. Conservation of Natural Resources

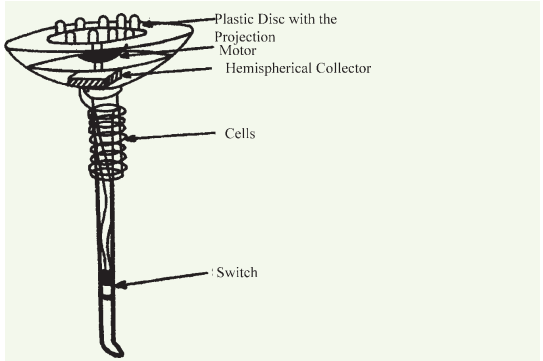
Production of Electricity from Ocean Currents

Construction and Working: The model is based on the conversion of mechanical energy into electrical energy. There is a pulley at the bottom of the model. It is fitted with a ball bearing. Above it a shaft is fitted. There is a magnetic field at the end of the shaft. In the middle of the shaft there is a fly wheel. Ocean currents rotate the pulley which in turn rotates the shaft. Due to this rotation, the magnetic field produces current. The electric current is transmitted to the main transformer for increasing the intensity of the current. Fly wheel keeps the pulley in motion continuously; as a result e.m.f is produced continuously in the magnetic field.

5. 1995

I. Environment and Health

A Scientific Broom for Cleaning Spider Webs



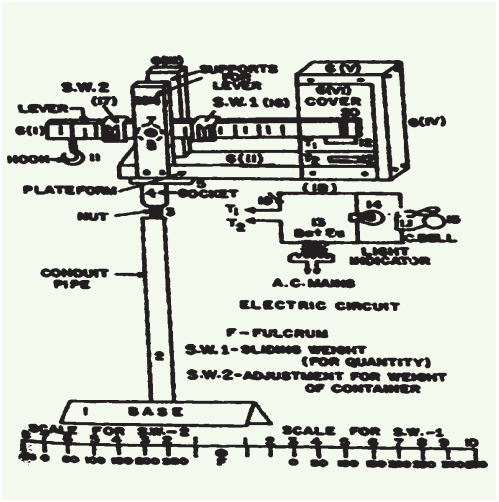
Uses: *This device is used for cleaning spider webs*

Construction and Working: The model is a scientific, low cost broom for cleaning the spider web. It works on the principle of conversion of electrical energy into mechanical energy. A small (6 cm by 6 cm) plywood/cardboard is fixed at the top of the bamboo of the desired length (say 6 feet). A D.C. motor is fixed at the centre of the plywood. The spindle of the motor gets fixed with a circular plywood/cardboard (8 cm dia) disc. About 10 to 12 members of thin and round wooden projections of 8 cm long and with 1 cm diameter are fixed on circular disc. A hemispherical plastic basket (without holes) is fixed in the manner as shown in the diagram. The motor is connected to four dry cells (15 V each) and a switch. The working is very

simple. When the switch is on, the circular disc having finger-like projections rotates. The spider webs get twined round the finger-like projections. The person operating the broom can hold the broom at a convenient place of the bamboo. The dust particles are collected in the hemispherical plastic basket. The finger-like projections loaded with spider webs need to be cleaned from time to time when the broom is under use.

II. Aids for the Handicapped

Modern Electronic Stick for the Blind



Construction and Working: This electronic stick is having a circuit with LDR and a push button. With the help of potentiometer of 100K, resistance in the circuit is adjusted. This circuit operates on 6 volt D.C battery. Relay used is of 6 volt. When LDR is exposed to light, its resistance decreases and current through it increases. Due to this, base of the transistor SL 100 receives more current which passes from base to emitter. That is why the relays get on and relay terminals two and three get connected. This causes the bell circuits on and it gives the signal. Diode is used in the circuit to stop the back current from the emitter to the base.

III. Health Electronics

Set Stand with Alarm

Construction and Working: Intravenous injection of medicine is most common for its immediate results and optimum utilisation. Nutrients such as glucose, when administered in large doses take ten minutes to two hours to enter the body. And therefore turns out to be time-consuming. It is not possible for a medical attendant to attend a single patient for such a long time. If the process of infusion completes and I.V. set is not removed then the process of back flow of blood starts. To avoid this mishappening a special type of I.V. set stand equipped with electric alarm has been designed.

The model can be divided into three parts:

(1) **Base:** Lowermost part of the stand, made from heavy angle iron piece, weighing to give the system a stability 3 kg.

(2) **Vertical:** A conduit pipe of 2.5 cm diameter and 1.5 m length is welded vertically upward on the angle iron base. Two holes, one at upper and other at lower end are made for electric wire. A nut with its head downwards is welded on the top of the conduit pipe. A socket is welded on the iron plate, latter having two holes for screws. The socket is tightened on the nut with plate upwards.

(3) **Hanger:** It is meant for hanging glucose or medicine bottles. We can further divide it into two parts:

(a) Platform: It is the fixed part meant for supporting the lever as shown in the diagram. Platform is screwed over the plate welded on the socket.

(b) Lever: It is the heart of the model. It is made from a wooden piece. It is free to move clockwise and anticlockwise on a shaft. To make movement free, a bush is inserted in the lever hole. The shaft acts as a fulcrum with shorter weight arm on left and longer power arm on right hand side. A hook is stuck to the under surface of the lever, on the weight arm, 6 cm off the fulcrum. Length of the weight arm is 8.3 cm, whereas the power arm measures 19.5cm on Power arm. A copper piece is fixed at the right lower portion of the lever. It acts as Terminal T_1. Another piece is fixed on the platform at a place where T_1 rests while not in use. This is terminal T_2. When at rest, T_1 touches T_2. Two sliding weights SW_1 and SW_2 are placed on power and weight arm, respectively. Marking of scale is at every centimetre from fulcrum. SW_1 is adjusted on this scale at the quantity of medicine we want to keep back in the bottle. Electric circuit with battery eliminator, electric bell, on-off switch, Terminal T_1 and T_2 all in series is prepared. Electric bulb is put in parallel to electric bell. On-off switch is fixed at the platform. Battery eliminator is connected to the main supply. To start with, medicine bottle is hung on the hook. I.V. set is inserted in bottle on one side and vein on the other side. SW_2 is adjusted at the point on the scale equal to the total weight of the medicine and container minus net weight of the medicine. SW_1 is adjusted at the point equal to total quantity of the medicine minus the quantity we want to infuse. Circuit is switched on and I.V. set

lock is opened. Infusion starts. When requisite quantity of medicine is, used so that 50 ml remains in the bottle; the power arm terminal T_1 touches the platform terminal T_2. It closes the circuit. The bell starts ringing. It gives a warning to the attendant to rush to the patient, and to remove the I.V. set and switch off the on-off switch.

6. 1996

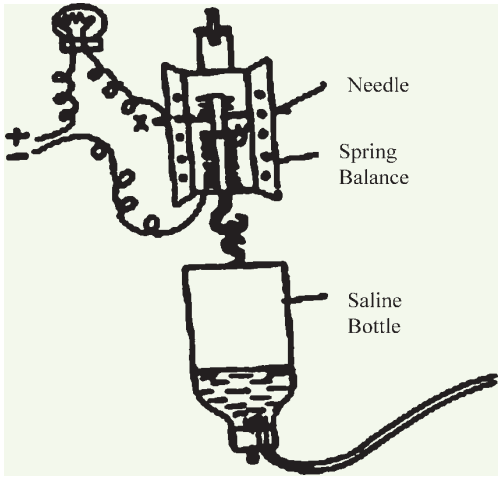
I. Technological Innovations

A. Call Indicators-Saline Indicator

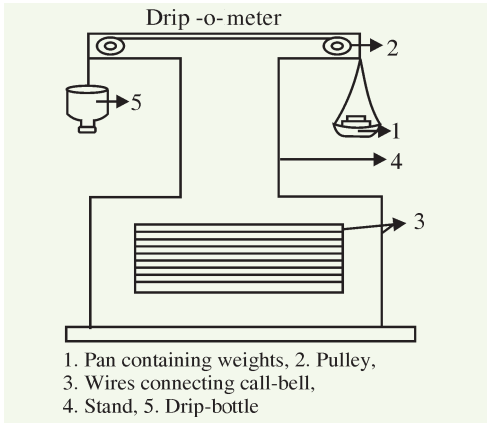
Construction and Working: The call indicator works on make and break of a simple electrical circuit. The positive and negative terminals of the battery are connected through a load (bulb or bell). We provide a gap in the circuit at points X and Y, they join together and the circuit is completed and the current flows to either illuminate the bulb or ring the bell. Saline indicator will alert the nurse or doctor when the saline bottle is emptied, so that remedial action is initiated at once. X terminal of the circuit is connected to a needle and Y terminal is connected to the spring balance. We should hang the saline bottle to the spring balance and keep the needle on spring balance at the weight of empty bottle. When saline flows out the spring contracts, the terminals X and Y come into contact and the bulb glows.

B. Drip-o-meter

Construction and Working: This device works as a simple balance. A rope with a drip bottle on one side and a pan with equal weights of the bottle on the other (they are on the same line). As the level of water in the bottle goes on decreasing. Rope is on a pulley, the bottle goes up as the weight (on the pan) moves down. A speaker with a non-completed circuit is kept just below the pan. When the bottle is almost empty, it touches the uncompleted circuit. The pan being a good conductor completes the circuit producing noise in the speaker.

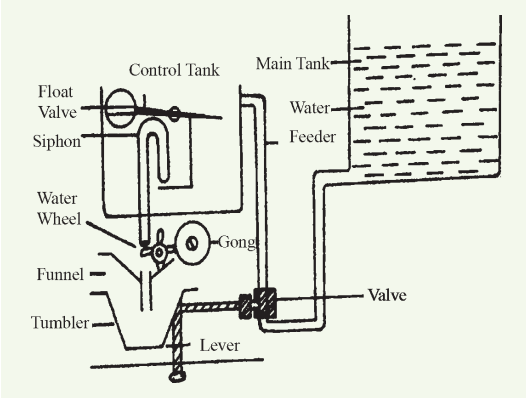


Uses: *The call indicator devices are low cost, low in power consumption and have high utility in day-to-day work.*



1. Pan containing weights, 2. Pulley,
3. Wires connecting call-bell,
4. Stand, 5. Drip-bottle

Uses: *This can be utilised in hospitals as the patients are increasing in number and the number of nurses attending them has become less.*



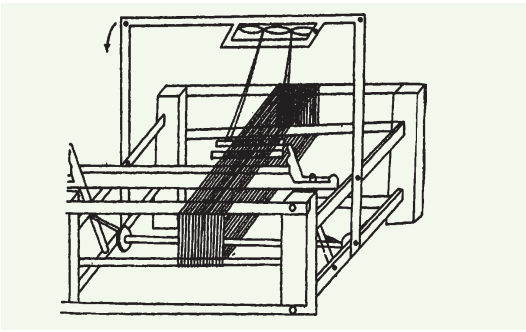
Uses: *It is used to dispense a pre-determined quantity of water without spilling by blind persons.*

C. Liquid Dispenser for the Blind

Construction and Working: The exhibit has a main tank and a control container. The control container has a siphon in it. To get liquid from the main tank, we place a tumbler in the proper position (see figure). This operates the lever and opens the valve of the main tank. This allows the flow of water to the control container and fills the siphon with it. Once the siphon is filled with water, it empties the container, pouring the water into the tumbler. Further filling up of the container needs a further specific time.

Meanwhile, the user (a blind person) can take away the tumbler filled with liquid. The force exerted by falling water rings a bell to show the process.

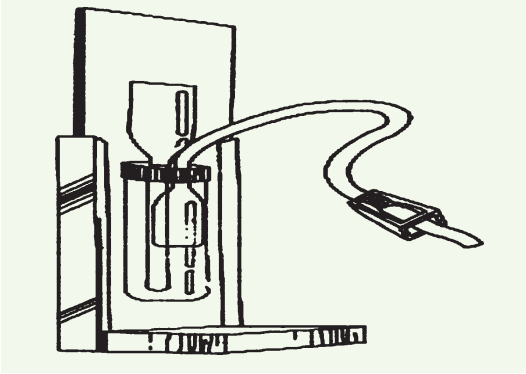
II. Industry



Non-spindle Handloom

Construction and Working: Handloom machine is a device with which village womenfolk weave clothes of various kinds and designs by using both hands and legs. This non-spindle handloom machine consists of two iron wheels, two pulling iron springs and a wooden roller. The other remaining parts are the same, as that of our traditional handloom machine. This new model of low cost can be associated with weaving by a handicapped person (legless) in every home and in industries for higher production and greater income. Also it may help in the development of industries.

III. Educational Technology



Low Cost Kipp's Apparatus

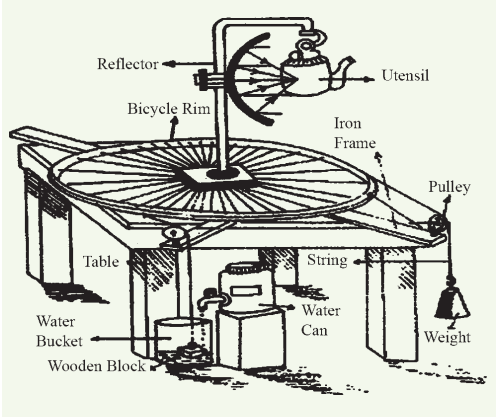
Construction and Working: Kipp's apparatus is an instrument widely used in chemistry laboratory to produce gases which require only simple contact of chemical elements. Hydrogen Sulphide (H_2S), a familiar reducing agent, is one such gas which is frequently produced using Kipp's device. Two simple plastic containers are set on a piece of hard cardboard, the former being used as the main chamber in which the reaction takes place.

Two-way outs are made out of plastic tubes used in saline bottle. The stop cock is also collected from saline tubes. The working procedure is like original Kipp's apparatus. The apparatus, in this modified form, does not require use of glass so that the danger of handling it can be avoided.

7. 1997

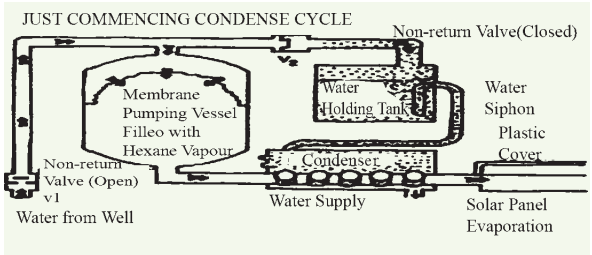
I. Energy

A. Revolving Concave Reflector Type Solar Cooker

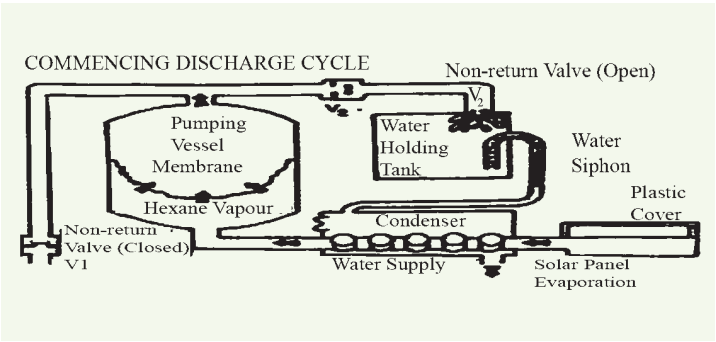


Construction and Working: The concave reflector is designed by arranging a number of small sized plane mirrors on a curved (concave) surface. A bicycle rim is fixed horizontally on an iron stand which is kept on a wooden table. The reflector is fitted on a vertical stand fixed along the axis of the rim through its centre such that the reflector moves along with the rotating rim. A thin string is passed around the rim. One end of this string is passed through a pulley and then attached to a piece of wood. This wooden piece is made to float in water, kept in a bucket. The other end of the string is passed over another pulley with a weight suspended from it. A can of water with a tap is placed adjacent to the bucket of water as shown in the figure. The solar cooker is kept in the sunlight. The utensil for cooking food is kept at the focus of concave reflector. The light rays get concentrated by the concave reflector and heat up the utensil to a high temperature sufficient for cooking or frying. Now the tap fixed on the can is opened, such that drops of water fall in the bucket of water placed below. The piece of wood floating in water experiences an upward force due to buoyancy of water. The weight attached to the other end of the string moves down due to the force of gravity. This movement of the string rotates the rim and the reflector rotates with the same speed as the apparent position of the sun changes in the sky. Thus, the reflector is always directed towards the sun. In this way the reflector automatically moves in a manner that it always faces the sun to collect maximum amount of solar energy.

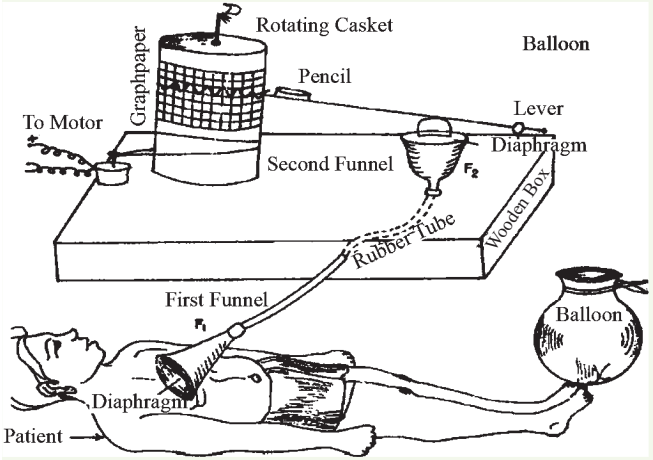
B. Solar Powered Pump



Construction and Working: The solar panel of $2m^2$ contains liquid hexane, the boiling point of which is 68–69°C. It is alternatively heated up to its



boiling point by the sun and it changes into vapour. The vapour is then cooled by the water being pumped so that it changes into liquid. Due to the vaporisation of hexane, the pressure increases. It allows a special type of membrane to push water in the pipe to the tank. At the same time, the vapour condenses in the condenser tank. Hence, the pressure decreases and the water is pulled out of the well. The liquid hexane in the solar panel is heated by the sun to become gas. This produces pressure in the pumping vessel and the special membrane is pulled upwards. Water in the connected pipe goes to the intermediate tank through the one way value V_2. It passes to the condenser and finally to the storage tank through the condenser; gaseous hexane gets condensed to liquid form. Consequently, volume and pressure decrease and the special membrane comes downwards. This produces a sucking force at the valve V_1 and water is lifted. The liquid hexane again changes to vapour at the solar panel and the process goes on. This system can be used to pump 1000 gallons of water a day under average tropical condition from the depth of up to 8 metres.

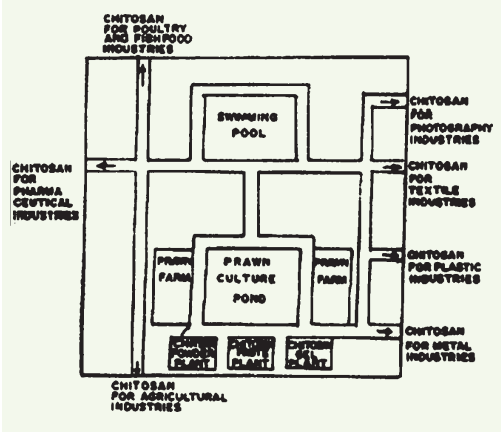


II. Science, Technology and Industry

A. Rural Cardiograph

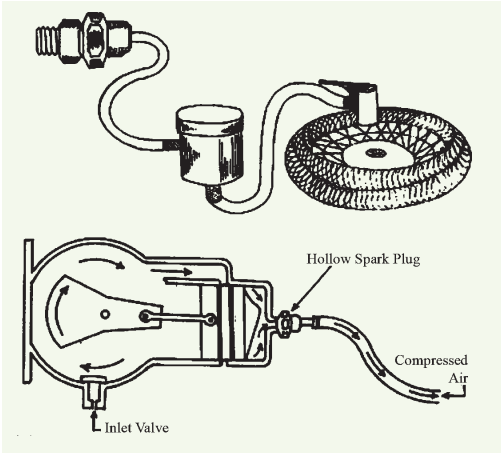
Construction and Working: A low cost cardiograph is a device for recording undulations of heartbeats for the poor villagers, who have no scope for getting facility of E.C.G. A portable wooden box (30 cm × 20 cm × 10 cm) is constructed with two/three holes on the upper surface at suitable distances. The ends of the two funnels are connected tightly with the two ends of a rubber tube (of 2 or 3 metres). Two sheets of balloon are then stretched over the mouths of the two funnels. One funnel (F_2) is placed on one hole and the second funnel connected with F_2 by rubber tube will be

pressed on the chest of a patient. Two holes are made in the central parts of the two flat surfaces of a cylindrical basket (Amul spray type). A hard metal stick is vertically fitted on the upper surface of the wooden box with nut-bolt arrangement. The cylinder is placed on the box (at the second hole) vertically with the hard metal stick (as its vertical axis) about which the cylinder may rotate. A small electric motor is duly connected with a belt to the cylinders. A pillar of small size is kept vertical on the upper surface of the wooden box to the right hand corner. A metal wire taken from umbrella will be fitted with a small pillar to make the metal wire as lever. The metal wire lever ends with a pointed pencil which will touch the curved surface of the rotating cylinder covered with rolls of graph papers. The lever rests on the diaphragm of the second funnel lightly with proper sensitivity to move up and down with the vibration of the diaphragm connected with the first funnel. When the first funnel is pressed on the chest of a human being, the heartbeats are transmitted through the connecting pipes and will move the pointed pencil at the tip of the lever up and down. It makes traces of undulations on the graph paper.



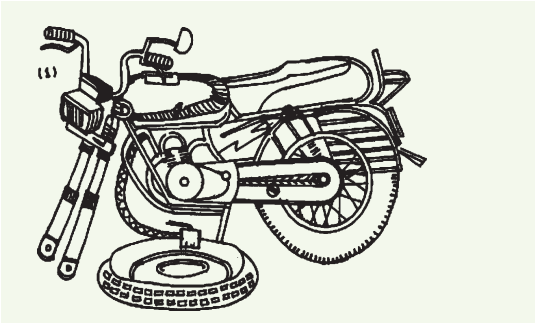
B. Chitosan–The Versatile Waste

Construction and Working: The exhibit is a miniature model of a chitosan manufacturing plant. The model displays a Prawn Farm where prawn culture is done and prawns are processed as well as packed. The processed prawns are sent to the market while the disposal of waste left behind in the form of chitin creates environmental problems. The exhibit shows how this waste can be converted into a useful product in a chitosan synthesis plant. The waste is broken down to chitosan with the help of enzymes. Chitosan so obtained is collected in the form of powder, paste and gel.



C. Spark Plug as an Air Filling Device

Construction and Working: Take an old spark plug of a two wheeler which is not in use. Break the ceramic body and the central electrode of the spark plug and make its metallic socket free. Insert a rubber pipe in the socket and attach an air filling valve at the other end of the pipe with a filter inside the pipe. Make all the joints leak proof by means of some adhesive

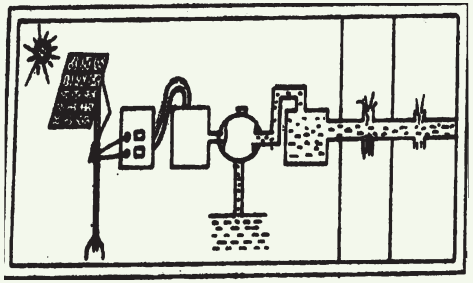


like M-Seal and the device is ready for use. Close the petrol cock of the vehicle. Run the engine for some time till all the petrol left in the carburettor is burnt completely. Remove the original spark plug from the engine. Fit the hollow spark plug socket (i.e. our exhibit) in the cylinder head. Tighten the air-filter tap with the valve of the tube. Gradually kick up the vehicle. With every kick the highly compressed air available during the compression and exhaust stroke is filled in the pneumatic tube of the tyre which gets inflated. Thus, with very little effort suitable inflation pressure can be maintained in the tyre.

8. 1998

I. Agriculture

A. Solar Pump for Irrigation



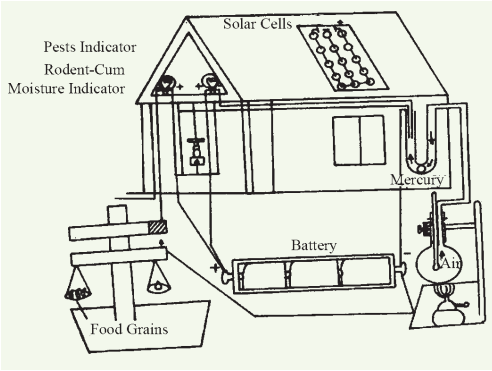
Uses: *This attachment can be used for spray painting by adding an air tank in the system. It can also be used to spray fungicides or pesticides in the fields.*

Construction and Working: Agriculture is the main occupation in India and water is one of the essential substances for agriculture. Water pump irrigation is carried out extensively. There are three types of water pumps: (a) centrifugal, (b) piston type and (c) airlift pump. Centrifugal pumps are extensively used in India. To lift water with this pump, a motor is required to run the blades. Non-conventional sources of energy like sun, wind, etc. are used to run water pumps. Solar cell panel produces electricity when light falls on it. Solar cell panel is connected with a motor through which the electric current is passed. The motor rotates the shaft to which blades are attached. The blades rotate the water pump. The water pump is connected to the source of water like well, river, and pond, etc. A net is fixed on the other end so that unwanted material with water does not enter into the pump. There is a valve fitted above the net which does not allow the water to flow backwards. When the blades are rotated by the motor, water is drawn by the pump. Water is forced to the top of the box continuously. Water is supplied in a controlled manner through a drain to the crop field where it is required.

B. Safe Storage

Construction and Working: To ensure the prevention from attack of moisture, rodents and pests, this exhibit depicts a safe storage (granary)

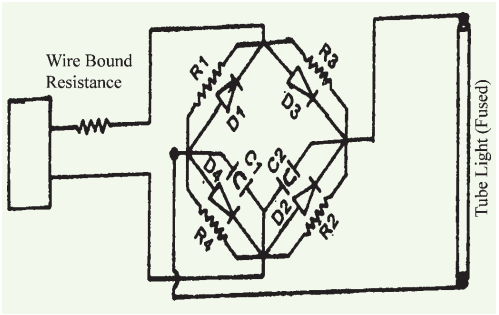
built with very low cost materials. The rodent-cum-moisture indicator can alarm the farmers in time, to save the food grains. Some grains are kept in a pan of a balance placed inside the granary. When the moisture content increases, the grains kept in the pan absorb moisture, due to which the weight of the food grains increases and the pan moves in the downward direction. The other end of the pan then touches a horizontal piece of wood by which the electric connection gets switched on and a bulb/alarm gives information about the increase of the moisture content in the granary. Sometimes, rodents enter a granary and spoil food grains. When a rodent disturbs the pan of the balance, a bulb glows intermittently indicating the entry of a rodent in the granary. The farmers can save their grains by killing these rodents. When the moisture content increases in the granary, the temperature of food grains rises. Therefore, the growth rate of most species of insects also increases. Thus increase of temperature expands the air present in the flask which pushes the mercury column. Consequently, the mercury column completes the circuit and the bulb (indicator) glows. The glowing of this bulb indicates the presence of pests in the granary.



II. Educational Technology

Low Cost Tube Light

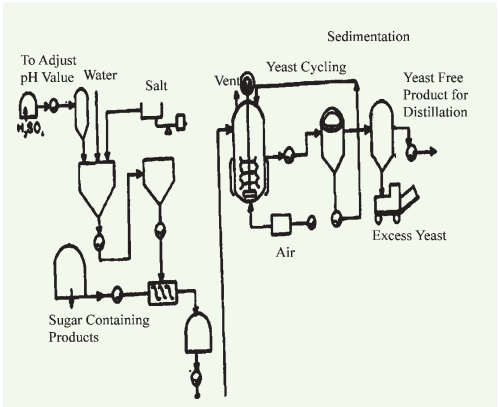
Construction and Working: This circuit consists of four junction diodes, four carbon resistances, and two capacitors. This whole arrangement forms the rectifier (including filter circuits) which converts A.C. power into D.C. power. The wire bound resistance acts as the choke coil, which provides the discharging potential to the rod by lowering the current. This causes the power loss which appears in the form of heat and hence wires bound resistance becomes hot.

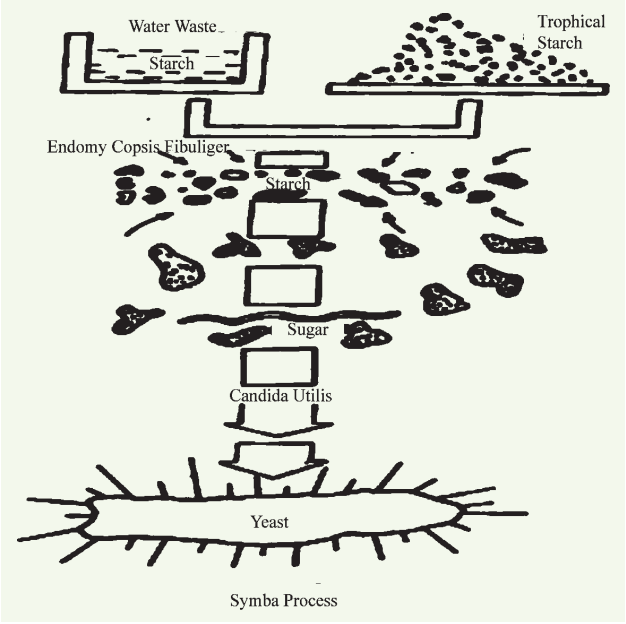


III. Industries

Symba Process

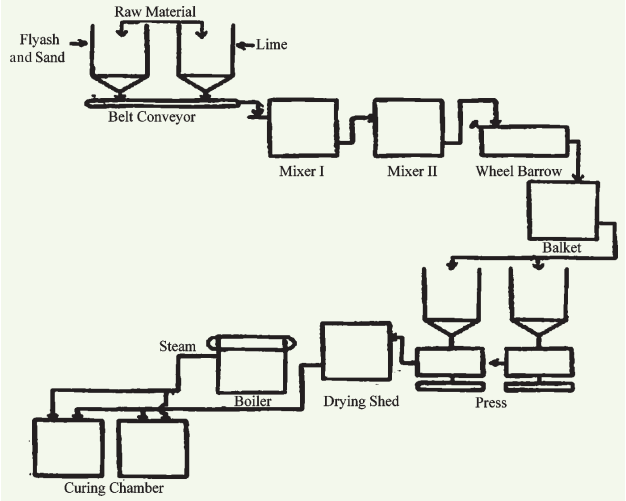
Construction and Working: Waste mainly from potato factories is collected. This normally contains peels of potatoes and waste water. It is first passed





Symba Process

Uses: *It can be used in agriculture to spray pesticides on crops and vegetables.*



to the process water system and then to the steriliser, where the whole sterilisation takes place and the sterilisation material is then transferred to the Endofermenter, where 'Endomycopsis ion fibuliger' acts on it to change it to starch. It is then transferred to the Symbios fermenter where it is changed to Symba Yeast, immediately by the action of Candida Utilis. From this, it is taken to the Sieve where the peels, etc. get separated out. It is then taken to the centrifugal machine, where the churning process takes place; shifted to the yeast separator where the yeast gets separated out and then to the drier where the so prepared Symba Yeast is dried up. It is finally taken to the silo or the storage container where the prepared yeast is stored for further use.

9. 1999

I. Industries and Environment

Utilisation of Waste Material like Fly Ash for Manufacturing Bricks

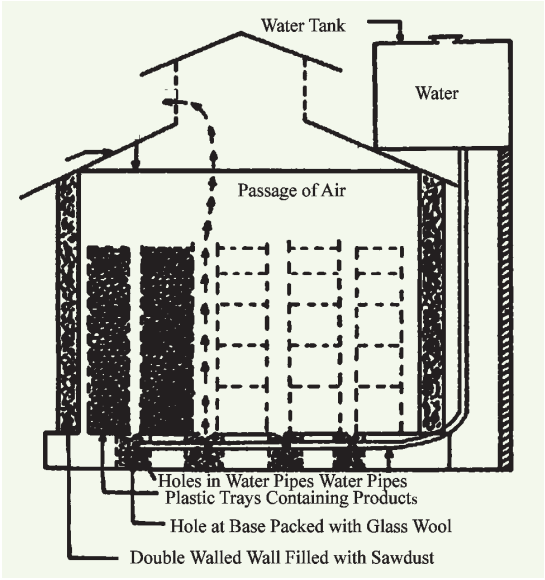
Construction and Working: The process of manufacture of Fly ash building brick stipulates mixing of Fly ash, river sand, lime and a small quantity of a chemical accelerator in a desired proportion. Suitable quantity of water is added to prepare a homogenous mixture of raw materials. The raw mixture is subjected to a pressure of approximately 1 ton/1 cm^2 in a suitable automatic hydraulic press. Formed bricks from the press are then exposed to natural drying, the period of which varies from 48 hours to 72 hours depending upon the weather conditions. Semi-dried bricks are cured under steam at a desired pressure and temperature. Steam cured finished bricks are stacked in open during which period they gain further strength. For a commercial project of the size envisaged the requirement of land will be of the order of 10,000 m^2 of which nearly 1000 m^2 will be required as covered space to house raw materials,

storage, material handling and mixing pressing and curing facilities. The heights of the industrial shed will vary from 7.5m to 16.0m to accommodate overhead raw materials storage bunkers.

II. Industries and Environment Protection

Cold Storage without Electricity

Construction and Working: The model shows a house which is double walled, filled with saw dust or glass wool to make it insulated as water is allowed to fall drop wise from the overhead tank on glass wool which after evaporation can enter through small holes into storehouse in which the agriculture produce is stored. The ceiling of the storehouse is made up of the porous sheet so that the air from store can cross through it and also prevent entry of heat. The roof is made up of steel sheets. There is a small space which has small opening through which air from storehouse can be exchanged. The dry air from surrounding enters at the base of storehouse containing small holes packed with glass wool and is moistened with dripping water from the overhead water tank so that the dry air will evaporate the water. It will cause cooling and cool air will enter the store house.

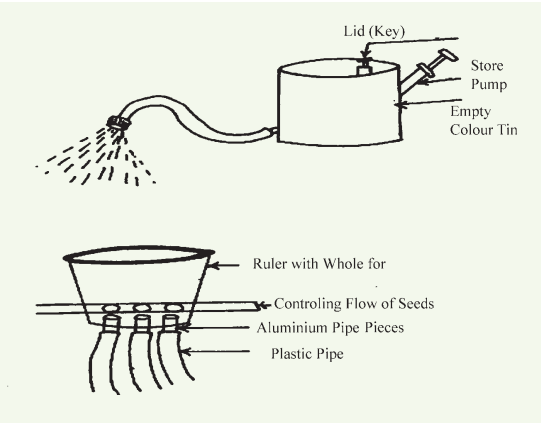


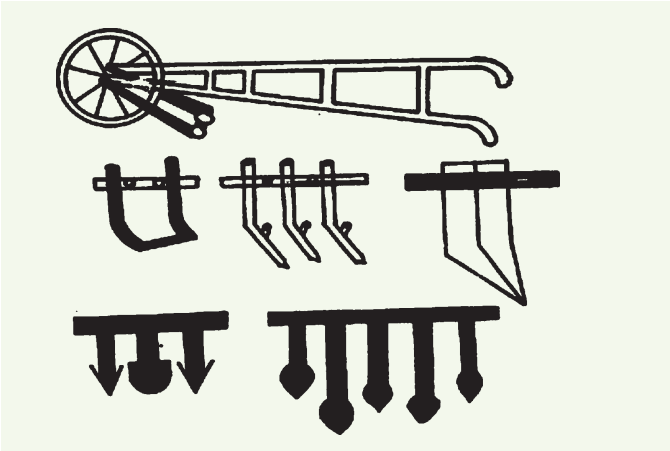
Uses: *This type of stores can be beneficial for farmers to store their perishable agriculture produce for longer periods so as to get good prices.*

III. Technology and Environment

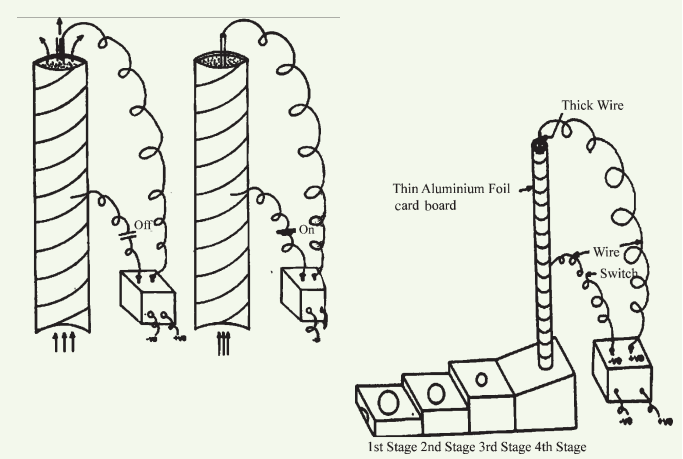
Multipurpose Cycle

Construction and Working: With the help of iron pipes, strip pieces and iron wheel, we made a frame. We bored two holes at 10cm distance on the strip of U-frame. Then with the help of iron strip we made different blades for different works. With the help of empty colour tin, stove pump and spray pumps nozzle, we made an air pressure pump. With the help of plastic ruler and plastic pipe we made seed or fertiliser tank. We drilled two holes at 10cm distance on the back side strip of U-frame. Also there are two holes at the same distance on the strip of every blade. So we can join any blade with U-frame according to our requirement. Also there are two stands—





Uses: *It can simultaneously sow the seeds, plough the field, and give fertilisers to plants or crops.*



Uses: *Efficiency of improvised smokeless chulha becomes 80 per cent.*

one for fertiliser tank and another for pesticide tank—on the two iron pipe frames. If we join the weeds blade, pesticides tank and fertiliser tank we can spray pesticide on the crops, remove weeds between two rows of the crops and supply fertilisers to the crops easily.

IV. Energy

A. Improvised Smokeless *Chulha*

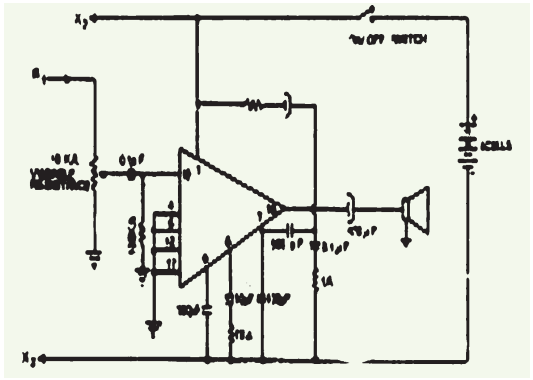
Construction and Working: This improvised smokeless *chulha* consists of four stages. These are the *Chulha* :first stage, the second stage, the third stage, and the final stage/chimney. The main *chulha* is made of easily available clay mixed with common salt, pieces of glass and bricks. This stage is used for burning fuels and also as the main chamber for cooking/ heating purposes. The side walls are made very thick. This smoke hole is made at an elevated angle of 45°, entering into the second stage thereby making an easy passage of the wasted flame in this stage. The second stage is made half feet higher than the first stage using the same materials. Here the side walls and base become thicker. The inner wall opposite to the entry is made vertical, whereas on top of it is a smoke escaping hole, elevated at an angle of 45°, the hot flame/smoke of the first *chulha* enters here giving heat. This unused heat of the previous *chulha* can be used for heating purposes. And now the remaining hot air escapes through the smoke hole into the third stage. With the same contents, this third *chulha* is made even higher by half feet to the second stage (one feet to the first stage).The even thicker base and walls make the chamber smaller, so that the decreasing heats are used here. The outlet elevating at the same angle with the previous outlet enters into the final stage. This is the stage consisting of a special chimney. A cardboard tube

one foot in diameter and ten feet in length is wrapped around with a thin aluminum foil. A thick metal wire is hanged down at the centre of the tube, without touching its walls. The foil is connected to a high voltage terminal (-ve) of an induction coil through a switch and the thick suspended wire to the other terminal (+ve) of the induction coil. The smoke produced during the burning of fossil fuels (wood) contains mainly of charged carbon particles. When high voltage is applied on the chimney and the wire at the centre, they act as an electrostatic precipitation. Thus, all the charged particles of smoke passing through this chimney will get attracted towards the wall of the chimney.

V. Transport and Communication

Radio Transmission

Construction and Working: The transponder set in the satellite receives the electromagnet waves from a station and retransmits the message either in the same frequency or different frequency in different direction. These signals are received by several ground stations located at various regions. These are weak and thus the ground station amplifies them before transmitting them.

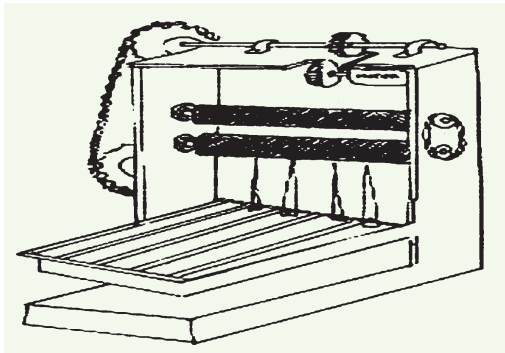


10. 2000

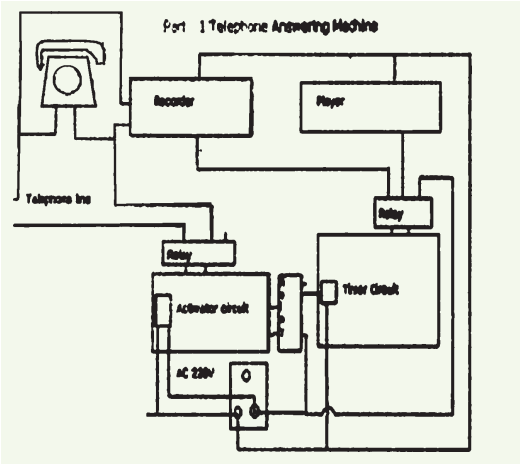
I. Industries

Coconut Palm Leaf Separating Machine

Construction and Working: Fix two rollers and connect them in the frame. Below the roller, fix the blade fixing bracket. Fix the motor at the top; connect it to the second roller with the help of chain. When motor rotates, the second pulley rotates which in turn rotates the first pulley. When coconut palm leaf is kept between the two rollers, the leaf is pushed forward. The blade cuts through the leaf and the stick gets separated.



Uses: *It is a low cost machine. Work can be done faster. 3 kg of palm leaf stick can be produced in an hour. Even a child can operate this machine.*



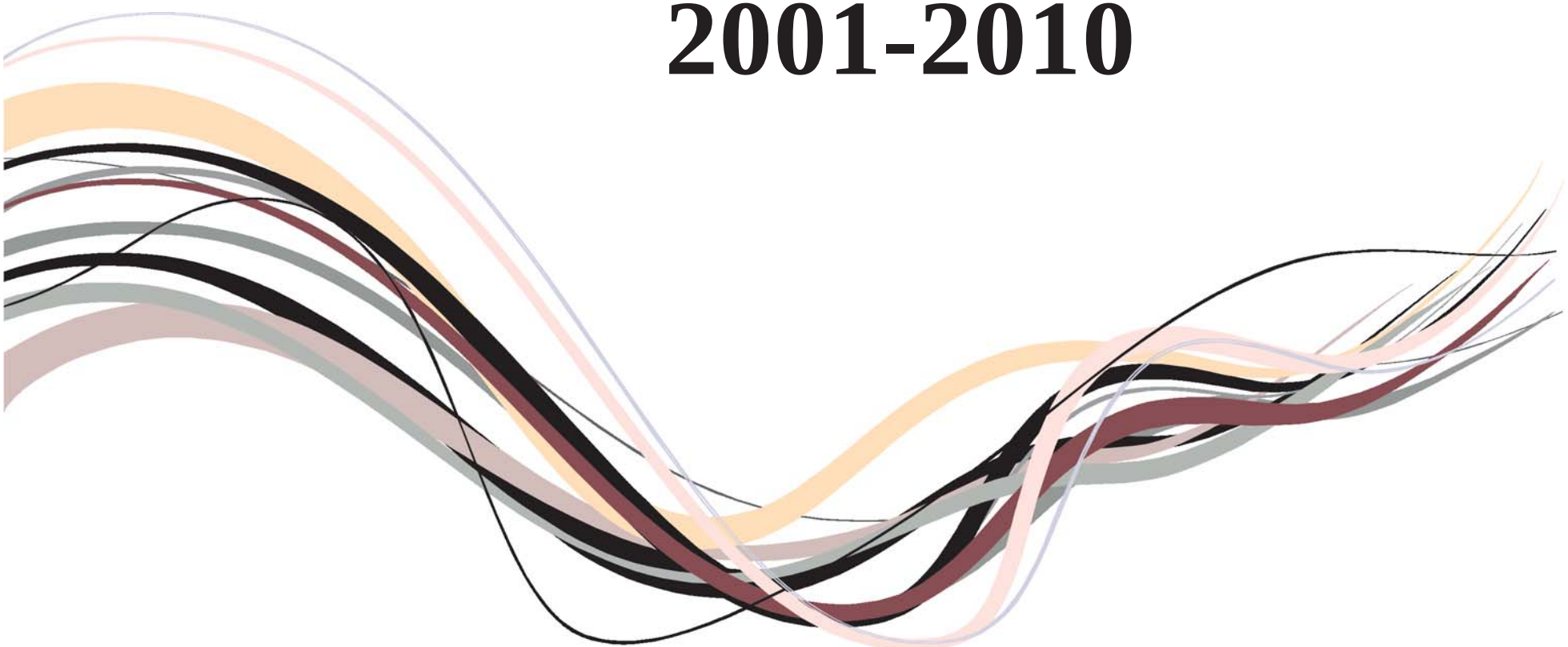
Uses: *As told earlier the exhibit can be used as a cheap alternative to the commercially available Telephone Answering Machine. Besides this it can be a life-saving device in case of the emergencies like fire, burglary, etc.*

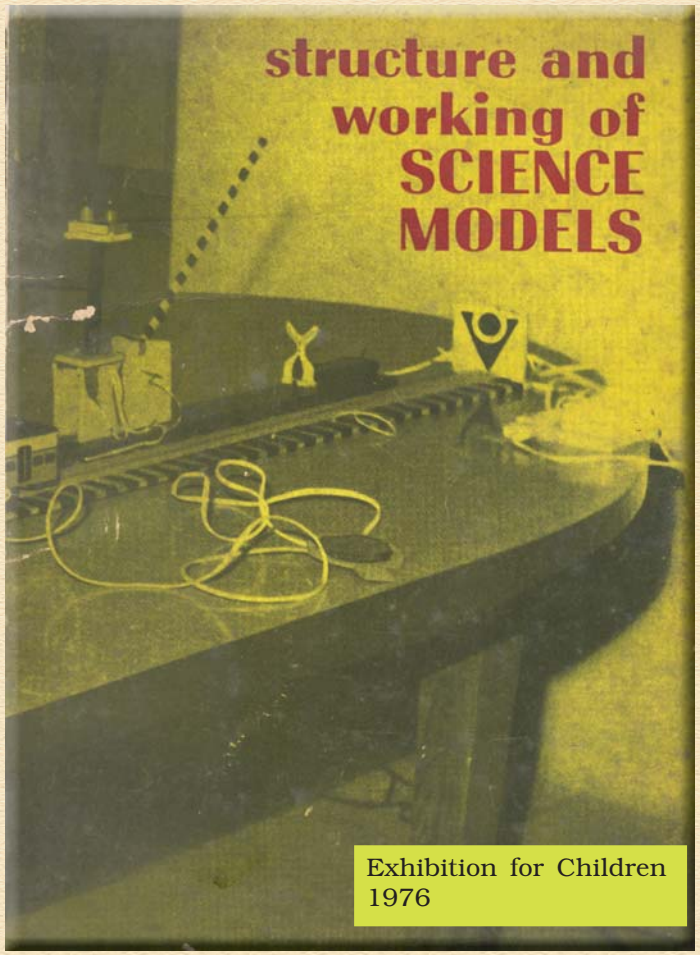
II. Transport and Communication

Telephone Answering Machine

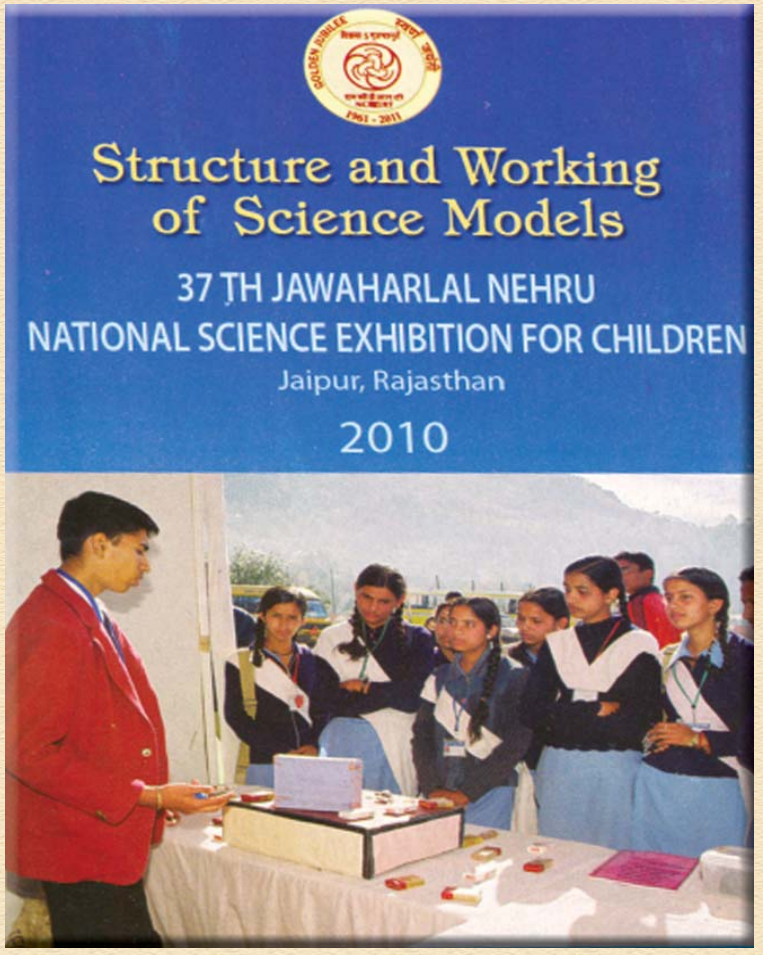
Construction and Working: It consists of an 'activator circuit', 'timer' and two tape recorders (here called 'player' and the 'recorder'). On receipt of the call the current flow in the line is of 50V AC, the transistor of the activator circuit is activated due to this and it in turn activates the timer IC 555. The timer is further connected to two relays, which are switched on due to the current flow in them. One of the relays closes the circuit of the telephone line which is connected to the telephone set and recorder. The other one closes the circuit for the flow of current to the timer circuit. The timer circuit is connected to the player and its time can be adjusted depending on the length of the message, by turning the knob of the POT. The timer allows the current to flow through the player, which plays the pre-recorded message of the user. After the stipulated time, the timer turns off, which happens to be the pre-adjusted duration of the message, and the current starts to flow from the recorder. The message of the caller is recorded during this step. After the pre-set time of the IC 555 of the activator circuit has expired, those primary two relays connected to it, mentioned earlier,are switched off. Now the system is ready again to receive the second message.

2001-2010





Exhibition for Children
1976



Invitation to Explore: Entrance to the Venue

2001–2010

Press Conference and Inaugural Sessions


33rd Jawaharlal Nehru National Science Exhibition For Children 2006, Pune.
33 वाँ बालकोंके लिए जवाहरलाल नेहरु राष्ट्रीय विज्ञान प्रदर्शन २००६,पुणे.

Waiting for the turn


BAMBOO MATCH STICKS
WOOD MATCHES
WAX MATCHES
Splint Making
Treating with Sodium Meta Silicate
Bleaching
Carbonization
Wax Fixation
Head Fixing
Why Bamboo Match Sticks?


Sarvodaya Kanya Vidyalaya
Delhi Cantt - 10
Manufacture of Recycled Paper
MANUFACTURE OF RECYCLED PAPER
DECKLE


Santhiniketan
Cell Phone Charger
Water Pump
Drip Irrigation Sprinklers

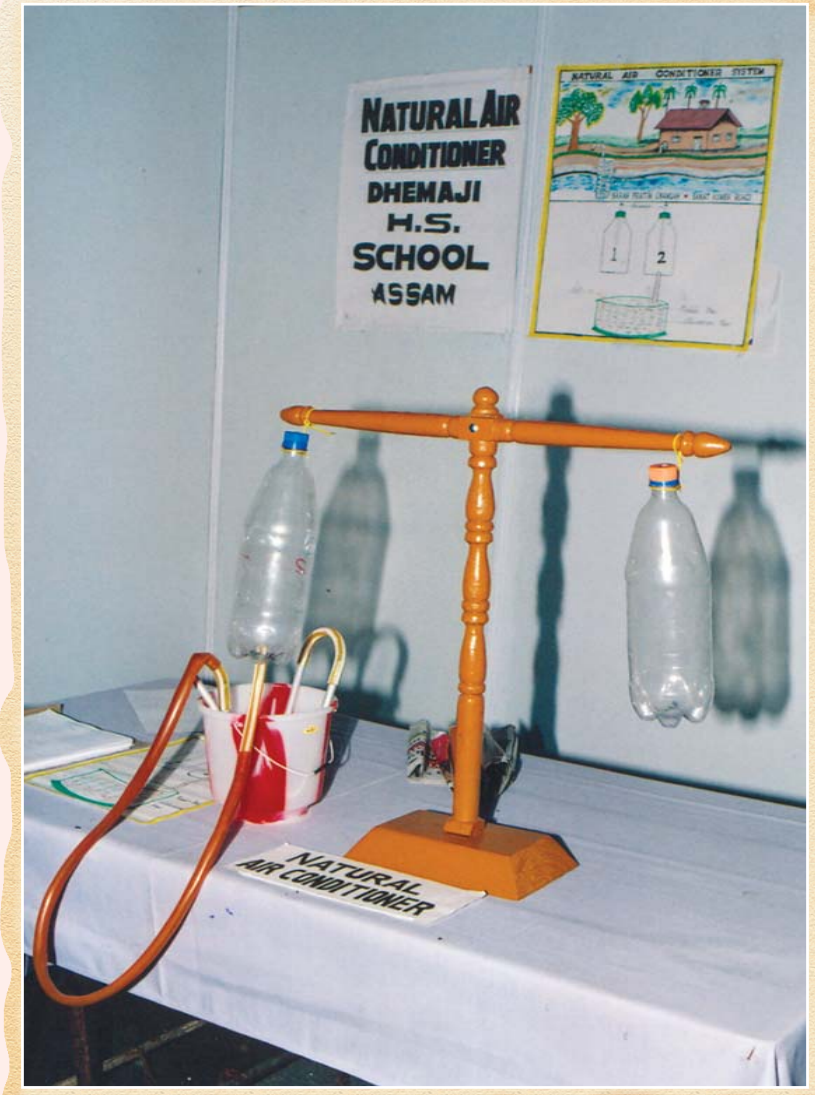
Display and Activities: Environment Education Stall

Display and Activities: Environment Education Stall

Participants Interacting with Visitors

Participants Interacting with Visitors


श्री छत्रपती शिवाजी हायस्कूल
शारदानगर-सगरोळी ता.बोंडे.
विजेविना यंत्र


NATURAL AIR CONDITIONER
DHEMAJI H.S. SCHOOL
ASSAM
NATURAL AIR CONDITIONER

Innovative Ideas at Display

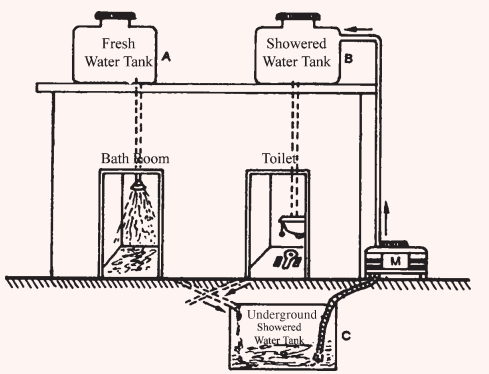
2001–2010

Participants Interacting with Curious Visitors

1. 2001

I. Industries

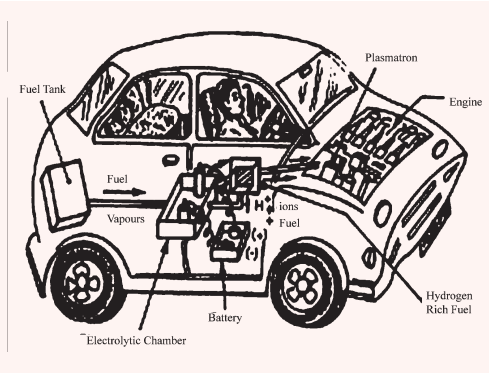
Recycling Shower Water for Toilet Purpose



Construction and Working: If for every house/building three tanks are to be used, i.e. two on the top and one at the bottom, the tanks at the top are tanks A and B and the tank at the bottom is C. Tank A is used for regular water; tank B is used to store the shower water and tank C is used to collect shower water. Pump is used to lift water from tank C to tank B. Tank B and toilet are connected with flexible pipe. When water from tank A is used for shower, the same water is collected in tank C. The water from tank C is then pumped to tank B for storing purpose. The water from tank B is then used for flushing the toilet whenever needed.

II. Transport and Communication

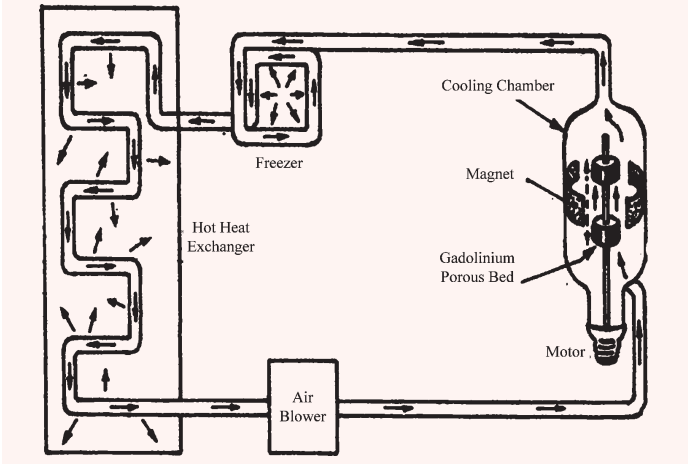
Plasmatron on Fuel



Construction and Working: The fuel vapours from the fuel tank are allowed to load onto the driver's seat. Beside the driver's seat, a battery is placed as usual in every vehicle. An electric current is let into the electrolytic chamber where the current ionises water, producing hydrogen. This hydrogen is in ionic form. It is led to the Plasmatron where the fuel vapours and hydrogen ions are mixed up and make a hydrogen rich fuel. This hydrogen rich fuel is allowed to go into the combustion chamber where combustion takes place and engine works smoothly and cleanly. A plasmatron is a soft drink can-size device tucked beneath the driver's door. When the fuel burns, the device lets go with a gush of electricity that turns the fuel and surrounding air into plasma (a hot collection of charged atoms and electrons). As a result, a hydrogen rich gas/fuel burns in the combustion chamber producing high pressure in the cylinder and enabling the piston

Uses: *Plasmatron can convert about one-quarter of a typical automobile's fuel into hydrogen. This device is going to clean up cars, trucks and buses around the world soon.*

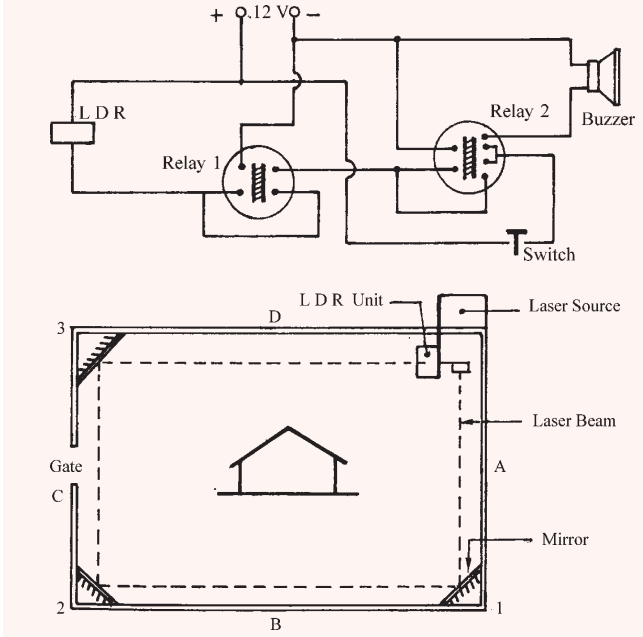
to make the vehicle move more efficiently, producing only a fraction of the smog causing pollutants. In other words, it provides the vehicle a cleaner fuel rich in hydrogen.



III. Educational Technology

A. Magnetic Refrigerator

Construction and Working: This refrigerator is filled with nitrogen gas and a motor is used to make to and fro motion of porous gadolinium connected with the shaft in cooling chambers. This movement takes place in permanent magnetic field. The porous bed expels from magnetic field and produces cooling. Nitrogen gas blowing through porous beds gets cooling. Cooled nitrogen gas is then circulated through freezer coils. Heat in the freezer is transferred to nitrogen gas. From the cold heat exchanger nitrogen gas passes through hot heat exchanger and expets heat into the coolant. The refrigeration cycle is repeated and freezer temperature decreases.

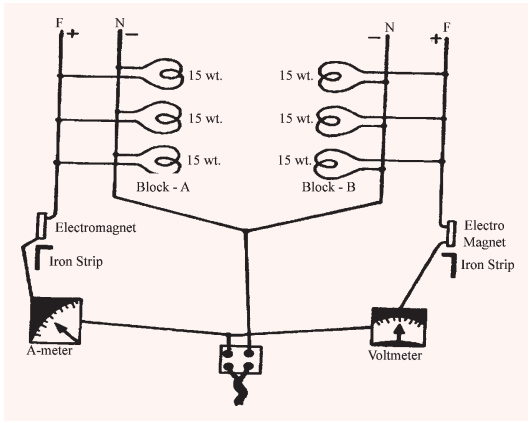


B. Laser Guard

Construction and Working: Plywood pieces A, B, C,and D are joined with each other at 90° angle. Mirrors are fitted at 45° angle on the corners of the plywood compound formed. Laser light is fitted to the horizontal side of the box. LDR unit is fitted to the source of laser beam. The laser beam is reflected by mirrors 1, 2, 3 and then this beam falls on the LDR unit. When the laser beam is continuously falling on the LDR unit, the electrical circuit becomes incomplete due to the above relay arrangement. When the laser beam breaks due to the presence of the person (thief), the electrical circuit becomes complete due to the above relay arrangement. As a result the alarm starts ringing and makes the security man alert. There is another provision to keep contact with the police station. In this way security can be made strong by adopting the above laser guard system.

C. Alarm for Excess Load and Theft of Electricity

Construction and Working: The electric supply poles are fixed vertically on both sides (4 on each side) on the ply board. Six bulb holders with bulbs are fixed on the board. The holders are connected to the poles with proper wiring. The transmission lines to the poles are given a proper load and supply. Ammeter and voltmeter of required range are connected to the circuit to measure the voltage and the current. Two iron strips are attached to the two poles near the electromagnets attached with buzzers. Electromagnets are connected to the supply lines. In this exhibit, a fixed electrical load which is supposed to be sanctioned to a colony is supplied through the transmission lines. There is smooth supply of electricity if the load is consumed within limits. When excess load is drawn from the transmission lines, the magnetic field produced will increase. The electromagnets attract the iron strips and the circuit is completed. The buzzer will start producing sound.



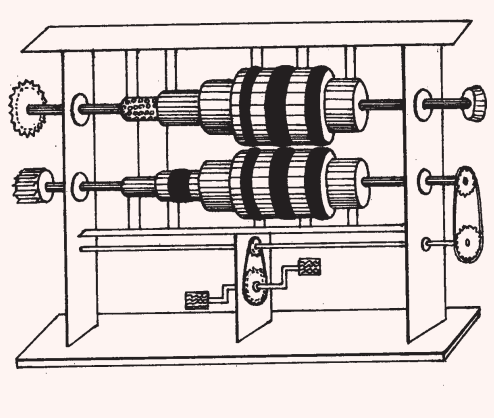
Uses: *The project could be used to check the theft of electricity. Energy crisis and load shedding can be reduced by the application of the given idea.*

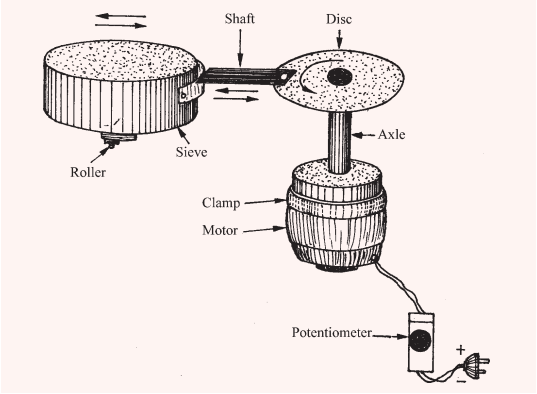
2. 2002

I. Technology Help

A. Device for Incising Bamboo Sticks and Canes

Construction and Working: Two wooden rollers measuring 10 cm × 10 cm are perfectly wrapped up with a rubber cloth, so that the bamboo reeds can easily pass through the roller, when the device is operated. A tin sheet with a small hole is drilled in it such that it is fixed at particular places on the rollers and its outside to guard in such a way that half-stretch shaped thin sheet of bamboo can pass through easily. Four bearings are fixed horizontally with two wooden pieces each of 10 cm x 5 cm (two bearings on each) so that one of the rollers begins to move round the other. The razor blades are set accordingly on it both vertically as well as horizontally. A 15 cm long and 2 mm thick blade is set lengthwise on the left hand side, so that the bamboo stick can be cut in two equal parts. Similarly, a 5 cm long and 1 mm thick blade is fixed lengthwise on the right hand side that further cuts the bamboo pieces to the size of incense sticks. The rollers in the machine are divided into four zones. The 15 cm long razor blade is set

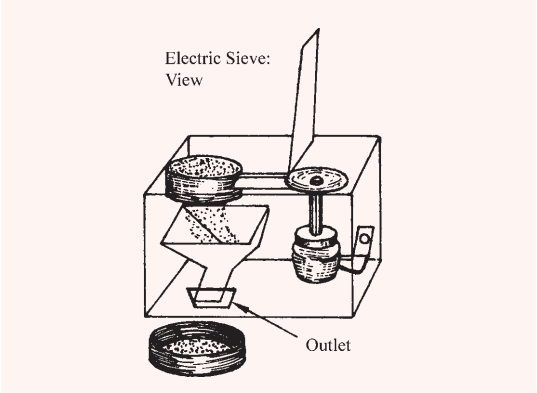




in between the rollers. So if and when the bamboo staff piece is placed between 'roller one' and that is rolled over, the bamboo staff will pass through it and come out from the other end in two equal parts in the form of a cane. If a cross-blade is also applied simultaneously, one can get four pieces instead of two of the cane. In the second zone, following the same process, one can get bamboo canes that are used for making house-fencing. At the left hand side of the enlarged portion of the upper roller, a round saw is set to cut the bamboo sticks into small pieces. Besides, a 7.5 cm diameter wooden wheel is affixed in the enlarged portion (left hand side) of the lower roller. On it 6 blades of 2.5 cm each are affixed in such a manner as would incise and polish smoothly the bamboo reed into small sticks of the size of incense sticks.

Electrical Sieve

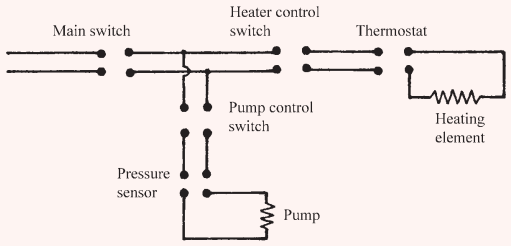
Construction and Working: The potentiometer is connected to a motor of 0.25 HP inside the wooden box with the help of an iron clamp. The motor is then connected to an axle which is connected with a disc. The disc is connected to a sieve with the help of a shaft. On the lower part of the sieve, two rollers are fixed on the either side. Below the rollers, two beadings are fixed to the wooden box, which regulates the movement of the sieve. When current is passed through the motor, it rotates the axle, which rotates the disc. The shaft on the disc helps in to and fro motion of the sieve because of which the fine particles get sieved. The potentiometer may be used to increase and decrease the speed of the motor as and when needed.



Uses: *By just changing the mesh size of the sieve, we can use the electric sieve to sieve rice, wheat and flour, etc.*

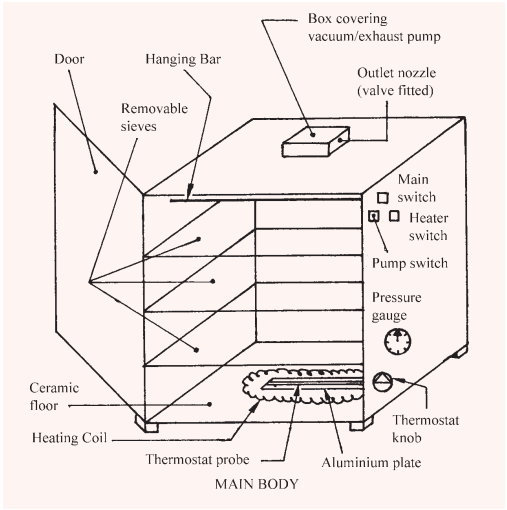
C. Vacuum Thermal Drying Machine

Construction and Working: One hold of about 2 cm diameter is made at the centre of the top face of the air tight box. A vacuum pump/exhaust pump with its inlet point lying over the hole is fitted and covered with a small air-tight box, protruding its outlet nozzle with outlet valve out of the wall. A heating coil is fixed on the ceramic plate placed over the floor of the box. A thermostat with its probe lying about 4 cm above the floor is fixed such that it can be adjusted from outside. On the side wall, near the thermostat knob, a pressure gauge is fitted to measure the pressure inside the chamber. Two or more rods are fitted horizontally near the top of the box for hanging clothes, etc. Two or more removable sieves are placed supported by rims on the side walls for drying vegetables and fruits, etc. Three one-way switches are fitted near the top of the walls on the same side



CONNECTION (CIRCUIT DIAGRAM)

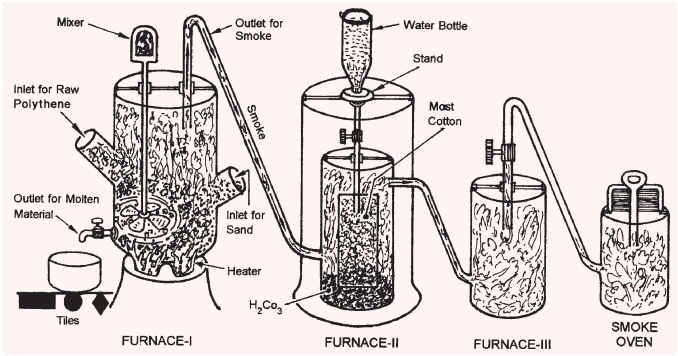
as that of the pressure gauge and thermostat knob. According to the nature of the article to be dried, the required pressure and temperature are to be pre-adjusted. When all the switches are put on, the chamber is heated and air from inside is exhausted. As temperature rises and pressure lowers, evaporation takes place very fast. When it reaches a certain stage (both temperature and pressure as adjusted before) the current is switched off. As evaporation goes on, pressure increases and the pump starts working again exhausting the humid air. Likewise, as the temperature falls down, heater starts working, thus raising the temperature inside the chamber. The process goes on continuously until the article is dried to the desired degree.



II. Environmental Management

Raw Polythene Utilisation Plant

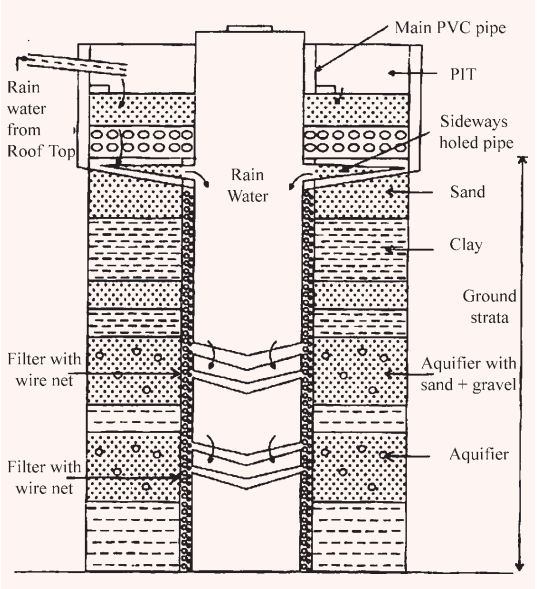
Construction and Working: The plant consists of four furnaces of different sizes. The first is larger and has two inlets for sand and raw polythene respectively. It has two outlets—one for smoke and another for molten material formed during the process—and electric heater is fitted on the base of the furnace. A mixer furnace is fitted at the upper end of the tumbler. Polythene and sand are drawn into the first furnace through the respective inlets in the ratio of 5:1 (ratio is of 5:2 for making hard tiles). The apparatus is made airtight and electric current is supplied to the heater for melting the polythene. After attaining the temperature of about 500 K, polythene starts to melt and at the same time electric current is supplied to the mixer which mixes the polythene and sand. The molten material formed is collected in the tray from the outlet at the base of the furnace which on cooling forms a tile. It is very hard and can be used for making of footpaths, and other purposes. The smoke produced during the process comes into the second furnace. The carbon monoxide (CO) forms carbon dioxide which forms carbonic acid (H_2CO_3) after reacting with water that can be used in the laboratory. Hydrogen and other part of this smoke is combustible and can be stored in the third furnace, from where it is supplied to the fourth furnace and used as fuel. The electric heater at the base of the first furnace is placed in the fourth furnace, which provides heat and energy by burning the fuel.



3. 2003

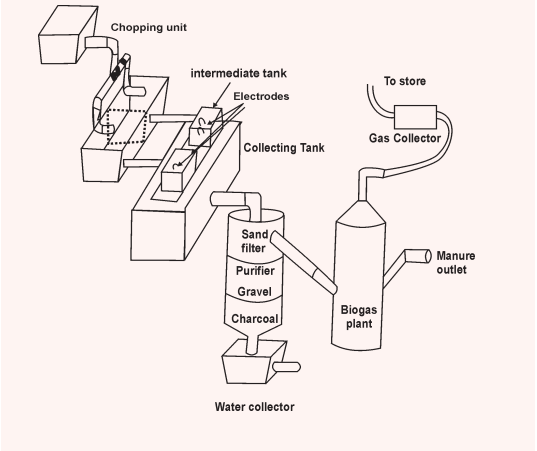
I. Environmental Management

A. Injection Tube well



Construction and Working: The main PVC pipe is fitted with two sideways holed pipes near the upper end at an angle of 15° on both sides. The GI sheet box is filled with different layers of sand, clay, gravel and boulders after putting the main and sideways PVC pipes in it. The roof of thermo cool building is attached to the pipe fitted at the top of GI sheet box through a pipe. Water is showered over the building to show as rainfall. A 6V D.C. motor fitted with a pipe system acts as pump to draw water from the aquifier. When rainfall (showered water) falls on the roof top of the building, water is collected by a pipe and supplied to the pit box fitted at the top of the G I sheet box. The water from the pit above and GI box is collected by two holed sideways PVC pipes and supplied to the main pipe. The water passes through sand and gravel layer and then boulders layer before entering into the main pipe. Due to atmospheric pressure and under gravity this water goes to the aquifier layer of sand and gravel through the filter of wire net and the recharge of aquifier can be proved by drawing water through the pump again and again.

B. Garbage Elutriator



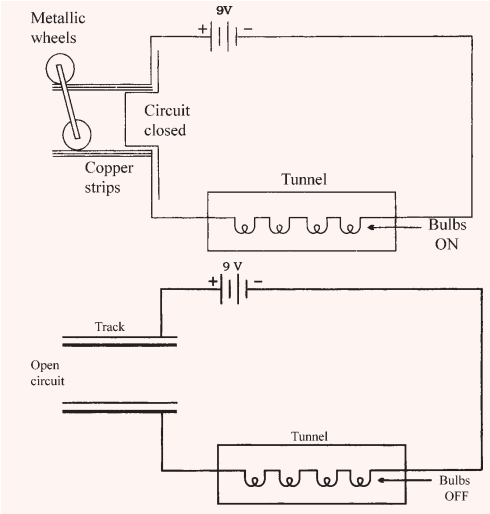
Construction and Working: The exhibit is divided into a chopping unit, intermediate tank, collecting tank, filtering tank, water collector, biogas plant, gas collection unit, burner, etc. The collector unit collects water either from the toilet, kitchen and also collects the chopped waste from the chopping unit. The waste is kept into various 'electrolytic cells' to generate electrical energy to obtain e.m.f. of about 1.5 V. The waste water is then brought in a filtering unit of the plant. The first compartment of it is filled with sand. The outlet of this compartment gives the water which is suitable for irrigation purposes. The second compartment of the filtering unit is filled with gravel,

the output of which is suitable for household (but not potable) purposes. The third compartment of the filtering tank is filled with charcoal. The net output of the third compartment may become potable after necessary chlorination. The unused waste is brought in biogas plant where anaerobic fermentation of waste by means of bacterial processes produces methane gas, which can be used for cooking, etc. The dried residue from this biogas would be used as manure.

II. Transport and Communication

Automatic Light Controller in Railway Tunnels

Construction and Working: The exhibit constitutes a simple series circuit of 4 bulbs (2.2W each) with the battery supply voltage of 9V. Two copper strips are laid on the plastic tracks fitted on the plywood. One terminal of the battery is connected to one end of copper strip (track) and the other terminal is connected to second copper strip (track) through 4 bulbs placed inside the PVC tunnels. Toy train with the metallic wheels (herein 10 paisa coins are used) is made to move on the track with its dry cell battery power supply. When metallic wheels of train come in contact with the copper strip, the electric circuit is completed and bulbs in the PVC tunnels start glowing. When the train leaves the tunnel then the bulbs in the tunnel are automatically switched off. Bulbs are fitted only in the tunnel. The tunnels with lengths less than 100 m are not provided with lights.

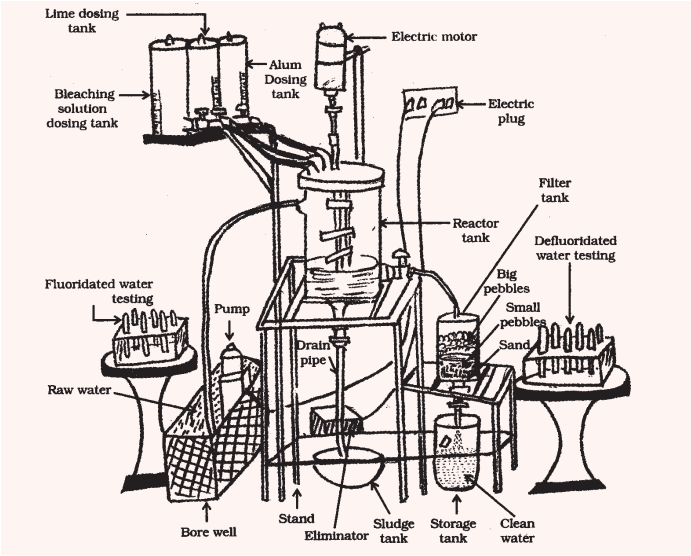


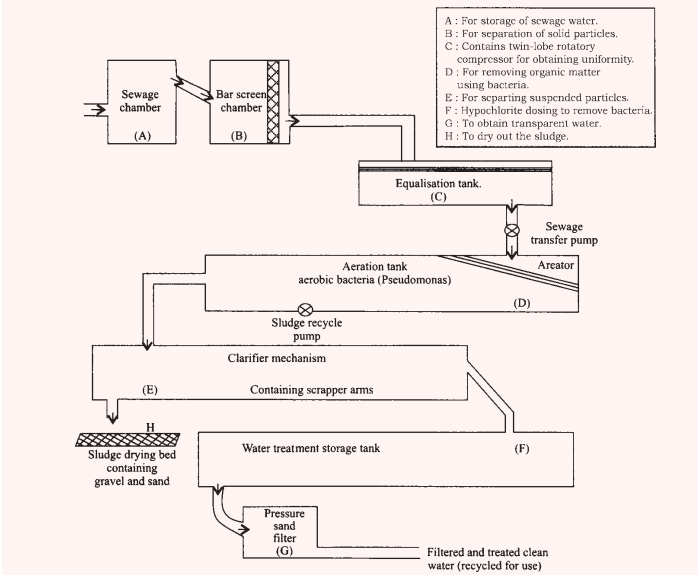
Uses: *With the application of light controller the consumption of electrical energy can be conserved / controlled to a large extent. And also the wear/tear and life of the components used for electrification can be prolonged.*

III. Health and Nutrition

Nalgonda Technique for Defluoridation of Water

Construction and Working: Reactor tank is joined with the fluoridated water pipes. The topmost part of the reactor tank is joined with alum dosing tank, lime dosing tank and bleaching solution dosing tank. Stirrer with stirring lades at the bottom end is being set for churning the water. A valve connected with the drainpipe is set at the bottom of the reactor. The other end of the drainpipe goes into the sludge tank, which is kept below the





Uses: *Such a plant can be made use in industries and housing societies to treat common waste water.*

drainpipe. Reactor tank and filter tank are joined by the clean water pipe. Three layers of big pebbles, small pebbles and sand are placed in the filter. Storage water tank is placed below the filter tank. Water testing tables have been set for testing the supplied borewell and filtered water separately. The original borewell water is tested and if the fluoride exceeds the permissible level then the colour of the water looks dim red-orange. Water supplied in the reactor is the mixture of water and added salts. Lime salt and bleaching powder are added from the tanks. Solution of bleaching powder is added in proportion of 3mg per litre. The mixture is stirred to make it uniform. Suitable quantity of alum is also added to remove fluorides from water.

Lime solution changes alkaline flocs into denser flocs, which help in the purification process. Bleaching solution destroys bacteria lying in water reactor tank. (This also works as flocculation tank as well as sedimentation tank.) Sludge settles at the bottom within short duration depending upon the size of reactor tank. Thereafter the floating water is brought into the filter tank through the valve. During filtration, insoluble impurities are removed from water and pure de-fluoridated drinking water is obtained. The sludge may be sent to sludge tank using the sludge valve. The de-fluoridated water is tested by spond's reagent again. Two drops of spond's reagent are dropped into the test tube filled with water. A dark red or orange colour of water ensures the satisfactory level of fluorides in water.

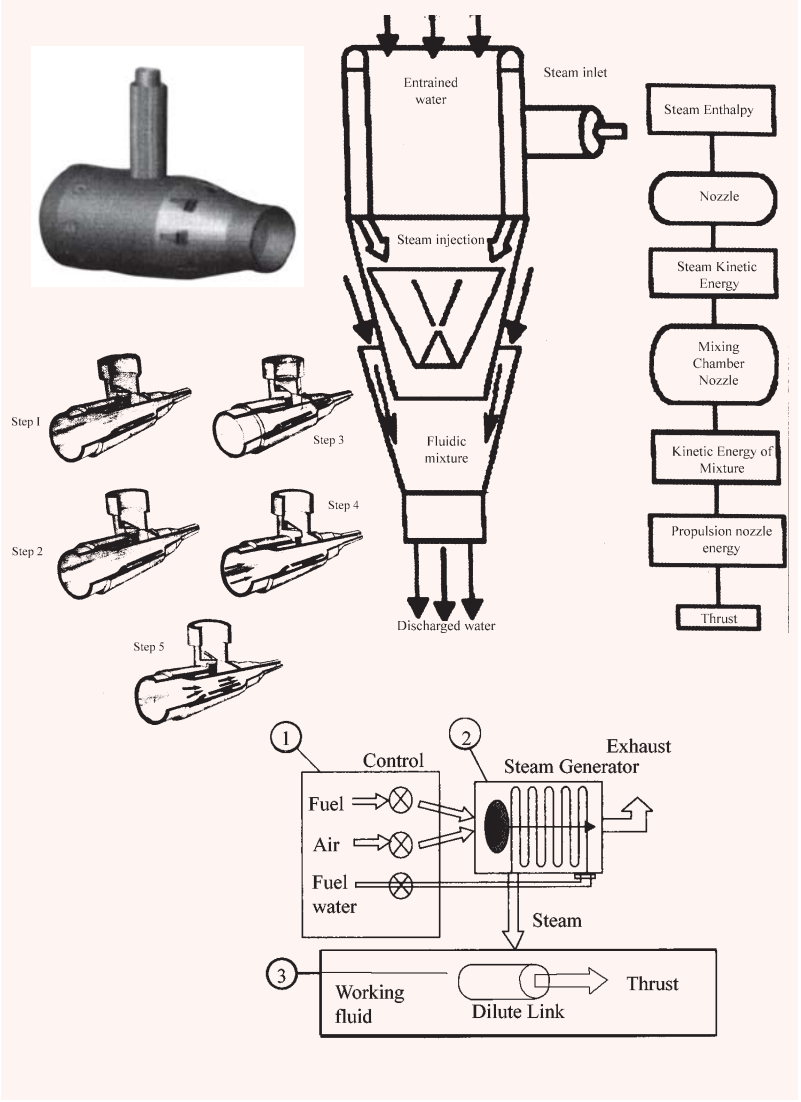
4. 2004

I. Biotechnology

Application of Micro-Organisms in Sewage Water Treatment Plant

Construction and Working: The raw sewage is collected from the client and is stored in a sewage chamber from where it is

sent to a bar screen chamber to separate any solid particles. The sewage goes to the equalisation tank which consists of a twin lobe rotary compressor and sewage transfer pump. The aeration tank has an aerator and one sludge recycle pump. The aerobic bacteria (pseudomonas) are added in the aerator tank. The bacteria use the sewage as food for growth. The sewage is then transferred to a clarifier mechanism tank where the suspended matter settles down at the bottom of the tank which has scrapper arms that rotate at a very low speed to help the suspended matter to settle at the bottom. This suspended matter that has settled, called sludge, is thrown out to a sludge drying bed consisting of gravel and sand. The clean water is transferred to a water treatment storage tank wherein hypochlorite dosing is done. This water is then sent through a pressure sand filter where it gets ultra filtered. The sludge in the sludge drying bed is kept for drying in the sunlight.



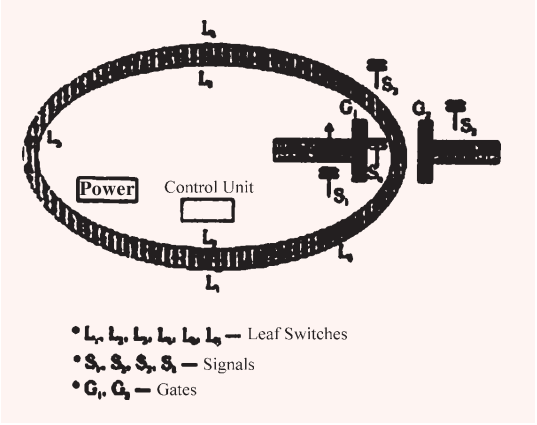
II. Transport and Communication

Underwater Turbo Prop

Construction and Working: A nozzle unit is the primary propulsion system. The system is immersed in water under a vessel. Steam is generated in a boiler at required operating pressure and temperature. The steam is flown at a required rate as per the design through a control unit which is responsible for interface between operater, steam generater, and air flow.

5. 2005

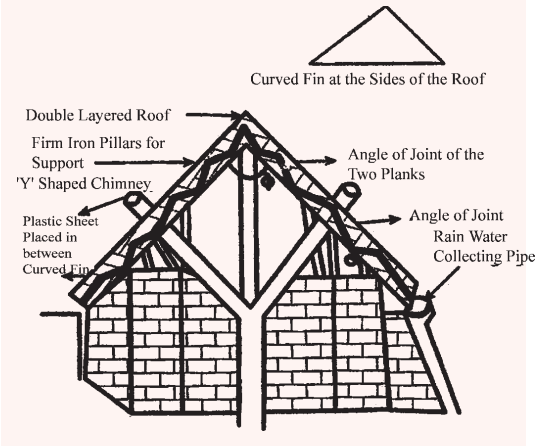
Educational Technology and Mathematical Modelling



A. Fully Automatic Railway Gate

Construction and Working: We fixed the rail on the plywood and then the gates were placed at suitable places. Road and signal posts were also arranged at appropriate places. The leaf switches were also placed as required along the rail distance. Some modifications have been done in the train. The control unit has been fixed at a suitable place and required wiring has been done. When the train reaches a particular point, a switch works and it induces some activities in the control unit. Two switches operate and electricity flows to the signal light and buzzer. Then within a short period (20–30 seconds) the gates slowly close. After passing through the railway crossing, when the train reaches a definite distance from the gate the other leaf switches work and that makes some activity in the control unit. Signal changes and the gate opens slowly.

Uses: *This automatic gate system can be successfully applied in the unguarded railway crossings.*



B. An Ultra Tech Roof

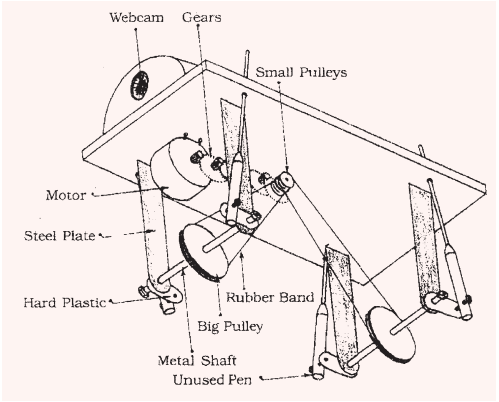
Construction and Working: The base structure has been firmly constructed by using wood to provide support to the roof. The plywood has been laid on the wooden frame and as seen, it is a double-layered structure with a plastic sheet in between so as to minimise the effect of pressure of wind and seepage of water. A curved fin has been made on both the sides of roof and this is firmly attached to the base walls. The roof has been gradually flattened with the reduced angle of steepness, to prevent it from attaining aerodynamic property like the wings of an aeroplane. The design of the roof is well suited for rain water harvesting and therefore rain water pipes have been constructed on all the sides. For houses in the coastal areas, the second layer of the roof is made slightly sliding; so that it can be easily brought down to prevent the hitting of waves to the walls directly. The beam under the roof has been constructed as a thick layer for minimising the effect of earthquake. The chimney has been constructed in almost vertical position and has a 'V' shape, in order to minimise the pressure on the roof. Various modifications introduced in the ultra tech roof meet the demands of people living in coastal areas as well as hilly areas.

6. 2006

I. Information and Communication Technology in Education

Tetra Pod – a Robot

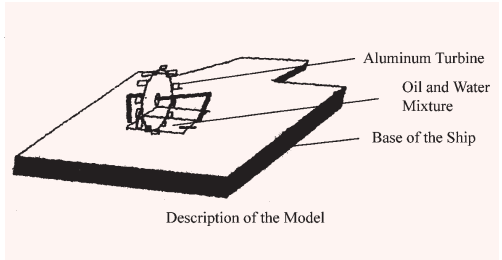
Construction and Working: Fix 6V motor on a cardboard and connect gearbox with the output of the motor. Fix two small pulleys with the output shaft of gearbox and make a platform of steel shafts to support main shafts. Fix one big pulley in each shaft and insert these shafts in the holes provided in platform, connect small pulleys with big pulleys by rubber bands,and at the end of shafts fix hard plastic plates and on these plates fix bolts parallel to the shafts. Connect unused ball pens with bolts such that ball pens can rotate freely on the bolts. Support the end of ball pens in holes provided in cardboards. Connect 6V battery with motor. Fix a webcam on upper surface of cardboard and connect it with computer. As we supply 6 Volt DC power to motor, it rotates approximately at 1500 RPM. Rotations are decreased to approximately 80 to 100 RPM due to gearbox mechanism. After reducing its rotation, motion is transmitted to main shafts with the help of pulleys and rubber bands. At the ends of shafts, arrangement is so made that rotary motion is converted into linear motion. This linear motion is given to unused ball pens. These pens work as the leg of robot. When power is supplied from battery, robot walks forward and backward as a four-legged animal. At the end of pen, rubber is fixed which provides higher friction between floor and end of pen and avoids slipping. On the upper side of robot body one webcam is fixed. Webcam catches pictures of surroundings and delivers to computer.



II. Environmental Management

Oil Spill Remover

Construction and Working: In the project, the plastic box with water and oil mixture represents the sea. The aluminium plate with a cut in the centre is the portion of the boat with the gap exactly over the oil slick. The turbine with aluminium blade is connected to a motor. When the motor runs the turbine rotates and the aluminium blade touches the oil. The oil sticks to



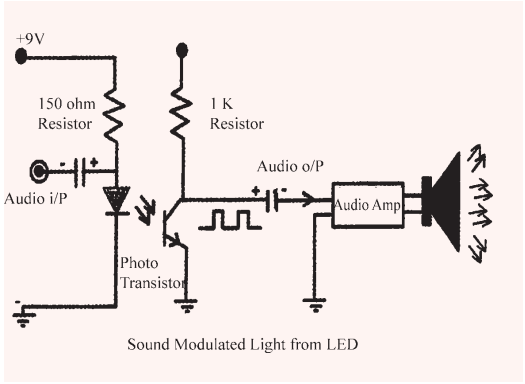
Description of the Model

Uses: *Removal of oil spill to maintain environmental balance. To prevent the wastage of oil and recover it for reuse.*

the blade and is carried to the other side where it is collected in separate chamber. A slope is provided so that the oil flows easily to the oil collection chamber. The separated oil can be used for various other purposes.

III. Landmarks in Science

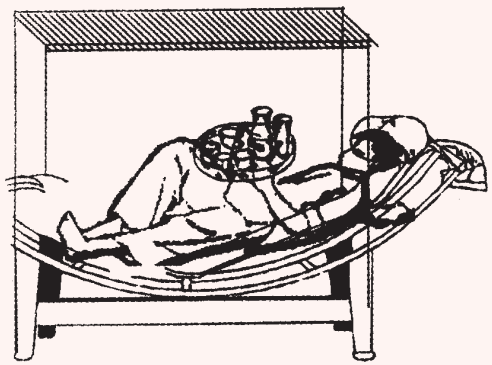
A. Optical Communication through Sound Modulation



Sound Modulated Light from LED

Construction and Working: It is very convenient to use a small radio to supply the audio signal. A small hand held audio amplifier from radio shack is used to drive the LED. The receiver is simply a photodiode connected to the input of a tiny hand held audio amplifier from radio and speaker attachment. Both the transmitter and the receiver circuits are biased with 9 volt battery source. Since the light intensity is varying, according to the original modulating audio signal, the photodiode will put out an audio voltage that is like the original signal and will be heard in the pickup amplifier. The range of transmission can be greatly increased by a convex lens in front of the LED, a lens in front of the photodiode, using a super bright LED. All of the above will give the maximum range and performance but the focusing with the lenses requires careful adjustment. In this design, replacing the visible LED and opto-transistor with infrared emitter-detector pair can reduce the noise level due to light source around us.

B. Hi-tech Bed

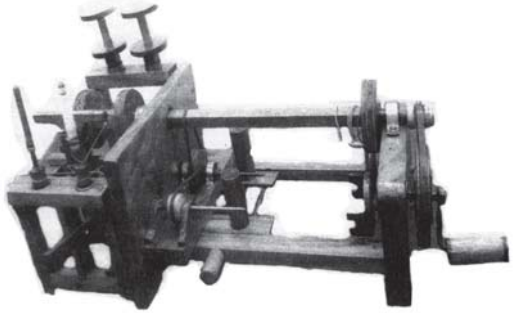

Comfortable Eating and Rest

Construction and Working: This bed is divided into three parts. All the three parts are fitted with motors. If the motor fitted in the middle part of the bed is started, it will remove the middle portion of the bed and make an empty space. By using this movable commode latrine the person can use the toilet. After freshening up, again by using the motor, the bed can come to its original position. By using the motor fitted with the upper part, the bed can be made like a chair, where the person can eat or read comfortably. Like this by using the fitted motors, the parts of the bed can be moved according to the need and choice. This can be helpful to break the monotony of sleeping in a single posture. The individual can use the warning bell, to inform the family members, if any emergency occurs. The bed-ridden person

can turn on the third switch, so that the mosquito net will cover the whole bed at the time of necessity. The same switch can be used to uncover the person himself. In all the above cases the conversion of energy does the work of pulling and pushing.

IV. Industries for Rural Development

Multipurpose Charkha

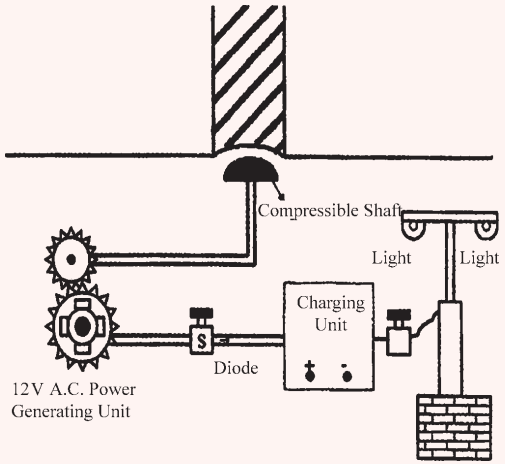


Construction and Working: Two circular discs are rotated. Big one for twisting double threads and the other for twisting single thread. This rotation is made by means of mechanical advantages of pulley system. The twisted threads are rolled in respective spindles which are also rotated by pulley system. To spin thread into spindles, a spinning chamber is also attached to the rotating axis. This spinning of the thread is also done by pulley system designed on a wooden frame. The spinning chamber is designed for spinning thread into more than one spindle at a time, i.e. two spindles. But it can spin threads into as many spindles as required in the design. It is useful for twisting double threads for making thick clothes. It can spin the thread into many spindles at the same time thus saving the time of the weaver.

7. 2007

I. Energy

Energy through Speed Breakers

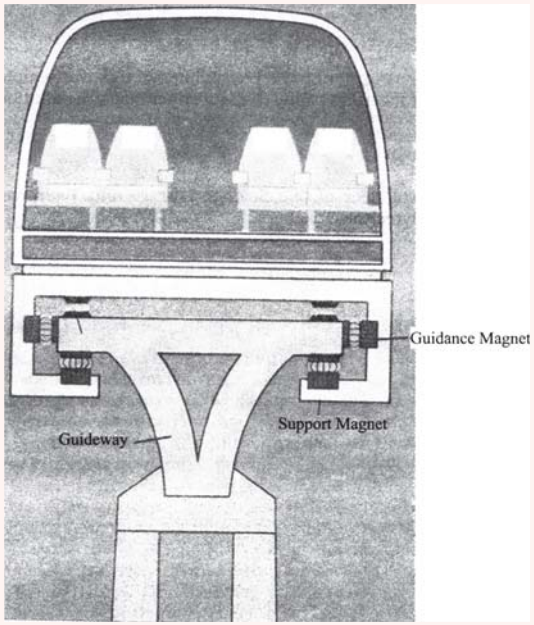


Construction and Working: This compressible speed breaker gets compressed, when the vehicle passes over it. The compression in turn presses the long handle of the generating unit, which turns the magnet inside the coil thereby generating powerful 12V current. This is then sent into a charging battery through a diode. This diode acts as a valve, i.e. it allows the current to flow only in one direction. The continuous passing of vehicles over the speed breaker charges the battery continuously and electrical

energy is stored. This stored electrical energy may be used for lighting during nights. This speed breaker not only regulates the traffic but also has a high potential in generating huge electricity. It gives a rough estimate of energy that can be produced by a single speed breaker with generating unit.

II. Transport and Communication

A. Flying Monorail Train



Construction and Working: Linear motor is made by using cores and copper wire coils connected in series. Copper plate acts as a vehicle. Old tube light plastic cover acts as a base as well as a guiding track for the vehicle. Copper plate is placed on the tracks, timers and the point of contact are connected to the coils. When the supply is given to the coils, magnetic field is produced. The activation and deactivation of the field is controlled by timers and the point of contact. The copper plate gets induced by magnetic field. The coil ahead attracts the plate, whereas the backside of opposite polarity repels it. Hence the plate gets lifted and moves ahead.

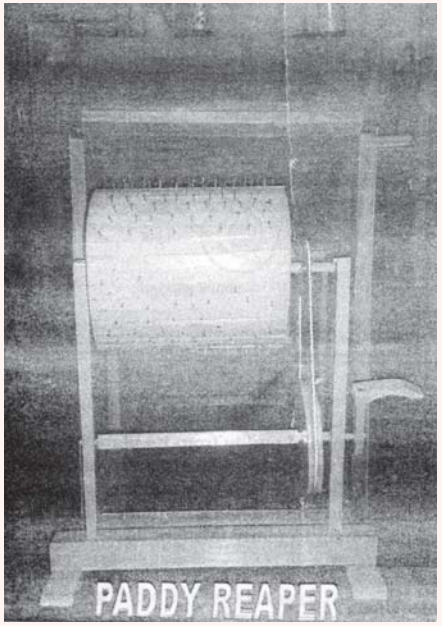
B. Emergency Wheel for Two-wheelers

Construction and Working: Some unused pieces of iron grill rods are taken mainly for the upper curved surface of the device which can fit the punctured wheel. At the lower surface of this device, three wheels are fixed on front and backside. On one side, two wheels are fixed and on the other side one movable wheel is fixed. The movable wheel is especially helpful in the movement when the front tyre of the vehicle is punctured. While moving on the motorcycle, if the tube of any wheel gets punctured, the wheel is to be slightly lifted and put on the curved surface of the device. Then the vehicle can easily be taken to the garage with the help of wheels attached to the device. This device acts as an emergency wheel for the motorcycle. It will require less effort for the rider to push the motorcycle to the garage. If the front wheel is punctured, this device can be put below the wheel and the rider can even drive the motorcycle at a slow speed. As the wheel of the

punctured tube gets support of the emergency wheel, there will be no damage to the tube, tyre and rim. This device not only helps during puncture, but also helps when the movement of wheels of the motorcycle is seized by any mechanical defect also on the way.

III. Food and Agriculture

Paddy Reaper



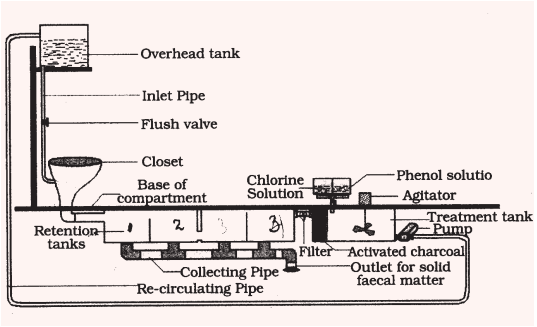
Construction and Working: The model constitutes a box made up of plywood and plain sheet. In the box a drum made up of wood is fitted in such a way that it can be rotated. For rotating the drum a small wheel is fitted in the axle of the drum. Another bigger wheel is also fitted in the box on a separate axle. The small wheel of the drum and the bigger wheel are connected with a strong rope. On one side of the axle of the bigger wheel a handle is fitted for rotating the wheel. As the bigger wheel rotates, the drum fitted on the axle of the smaller wheel also rotates. On the drum large numbers of nails are studded, which help in separating paddy grains from its plant. On the top of the box a big funnel-like structure is also fitted, which opens inside the box just above the drum. When the drum is rotated after putting the paddy plant in the funnel, the nails present on the drum pull and separate the paddy grains from the plant, which are collected inside the box.

8. 2008

I. Water Management

Toilet Modification in Indian Trains

Construction and Working: Water from the overhead tank flushes into the toilet after use and the human waste with water gets collected in tank I after passing through a tube bent in U-shape. This U-bent tube always holds some water which acts as a seal (to prevent the spread of odour). In tank 1 the heavy matter of the excreta is allowed to settle. A pipe has been



Uses: *The present model ensures safe disposal of human waste in running trains and helps in minimising the use of water by recycling it.*

attached to this tank in order to prevent air blockage. This tank has another pipe near its top through which water and light-weighted matter overflows to the tank 2. Tank 2 is connected to the tank 3 through a pipe fixed near its base. Water reaching the tank 3 may contain some particles, which may settle down after some time. When the tank 3 gets filled up, water from it overflows to the tank 4 where it gets filtered. Filters remove tiny particles and the water is then transferred to the treatment tank. Two chemicals (10 per cent bleaching powder solution and 1 per cent phenol solution) are kept in two separate tanks, fixed over the treatment tank, and are connected to the treatment tank through pipes, with valves to control the flow of chemicals. An agitator is provided in the treatment tank, for the proper mixing of chemicals with the water. The treated water is then sent to the adsorption tank where unwanted chemicals get absorbed by activated charcoal. Charcoal removes foul odour as well as chemicals such as phenol by process of adsorption and makes the water clean. The treated water is then pumped into the overhead tank with the help of a sensor-operated pump. Whenever the water level reaches a particular level (maximum), through a relay system and IC, the pump gets switched on and pumps water to the overhead tank. The same process repeats again and again. The water in the overhead tank is only meant for use in toilets for flushing, not for washing and other purposes.

II. Energy Resources

Car on CAT System

Construction and Working: This system is based on the utilisation of potential energy of compressed air. The compressed air tank is connected to a controller through the pipe, which is airtight and which can also be used to increase or decrease the pressure of air. The controller is connected to the engine through the pipe, which releases air at desired pressure for operating the engine with compressed air. Air in the tank is filled at high pressure at about 300 bars. The air is then allowed with a controller to pass through the pipe into cylinder of the engine which pushes the pistons due to high pressure. By this action the engine starts working with a very high speed. The speed of the car can be increased or decreased through the

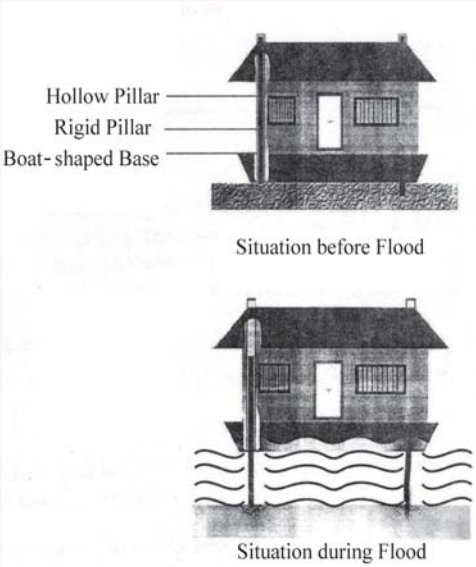
controller, which works like the accelerator pedal in a car. In the model of the car the air tank has only a pressure of 2.5 bars which is utilised to set the fly wheel of the engine to rotate for 45 seconds. If the pressure could be increased to 300 bars, the model of the car will move for nearly one and a half hours. The tank can be refilled with high pressure in three minutes by an electrically operated compressor similar to the one provided at petrol pumps. Depending on the voltage of electricity sources capacity and watts of the compressor, the time for filling the tanks in a car may vary from 3 hours to 6 hours.

9. 2009

Disaster Management

Floating House for Flood-affected Areas

Construction and Working: While constructing the floating houses, four rigid cylindrical iron pillars are erected on concrete foundation on the land. On these four rigid pillars, four hollow pillars are fixed with minimum gap in between and with the support of these four hollow pillars. The base of the floating house which is separated from land is made like a flat small boat. The house is constructed on the base with hollow and lightweight concrete blocks, so that the weight of the house is less. When the flood water will surround the house due to specificity of house it will slowly float on water according to the Archimedes principle and because of the vertical transitional motion on specific double-layered pillars the house will hold its position. When the flood water will decrease, the house will come to the original position.



Uses: *It will be helpful for the effective management of disaster, specially caused by the flood.*

10. 2010

I. Everyday life and Mathematics

Mathematical Modelling of Football Penalty Kicks

Penalty on the Ground: Figure 1 shows the best point to place a penalty on the ground. Now, the reason that the best region starts 8 feet away from

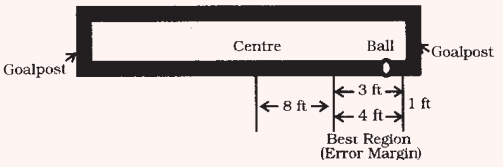


Fig. 1

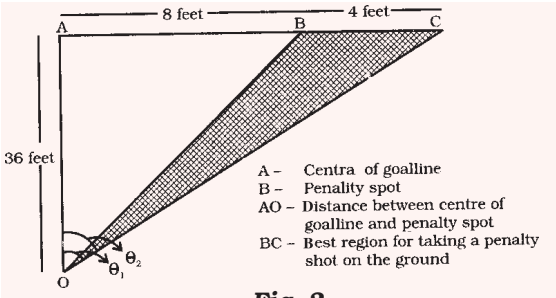


Fig. 2

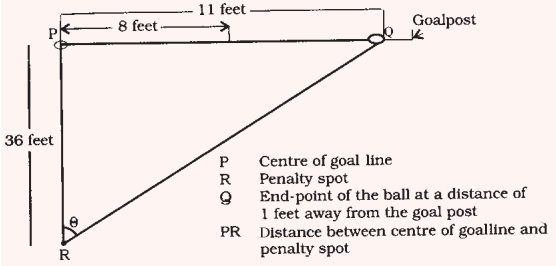


Fig. 3

the centre of the goal line is that a goalkeeper must stand in position at the centre of the goalline. A fully stretched keeper in a horizontal position with arms outstretched will be 1.25 times the keeper's height. Thus even a 6.5 feet tall goalkeeper has a reach of 8.1 feet. Hence, 8 feet from the centre of the goalline will be just outside such a keeper's reach.

For a penalty a kicker must make sure that the ball goes within the best region from the penalty spot.Also he needs to know the value of the angle at which he should kick the ball.

Figure 2 shows the minimum and maximum angles required for taking a penalty on the ground such that the ball goes within the best region.

Hence, we find that if a player wants to take a penalty kick in such a way that the ball goes within the best region, he should shoot the ball in such a way that it is more than 12.5° and less than 18.4°. This will ensure the ball entering the goal with a high success rate of beating the outstretched hands of the goalkeeper.

Hence, the value of the best angle for taking a penalty on the ground is 16.9° (Fig. 3) from the penalty spot to the point on the goalline which is 1 feet away from the goal post.

II. Green Energy

Recycling Smoke to Make Bio-Fuel

Working of the Model:

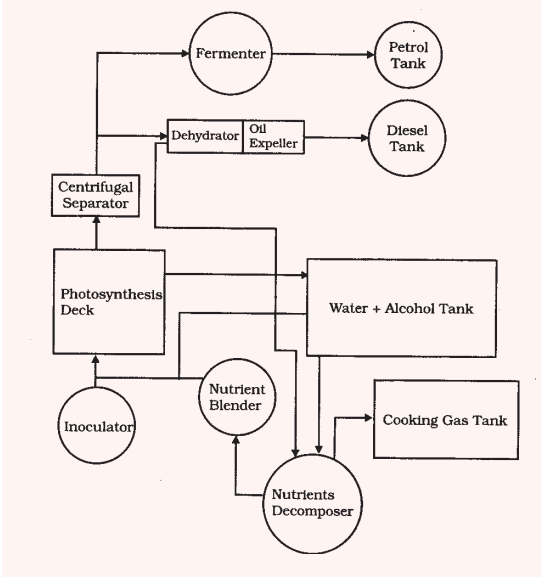
1. Inoculator: In the inoculator we multiply the algal strains or algal microbes of Botryococcus braunii alga.
2. Photosynthesis deck: The alga strain mixes with the smoke and photosynthesises. As a result hydro-alga is formed.
3. Centrifugal separator: Separates water from algae, i.e. hydrocarbons through the process of centrifugation. The water gets separated and goes to the water tank and the algae is further processed:
   (i) Dehydrator→Oil expeller→Bio-diesel tank: The algae is first dehydrated to remove the remaining moisture and then crushed to obtain oil from it. This oil is bio-diesel. 80 per cent of this oil

mixed with 20 per cent fossil fuel forms a healthy environment-friendly fuel.

(ii) Fermentation →Bio-petroleum tank: The algae is also sent to the fermentation tank. Here it ferments to form ethanol. Ethanol is sent to the bio-petroleum tank. 80 per cent of this ethanol and 20 per cent of gasoline together form engine fuel.

(iii) Decomposer: The crushed remains of the algae in the fermentation tank are sent to the decomposer. During the process of decomposition methane gas is formed. This gas is light in weight, so it rises up. It can be captured from the top of the tank and used as cooking gas.

(iv) Nutrients blender: The compost left after decomposing algae contains all the nutrients required by algae. It is mixed with water in the nutrients decomposing tank. Here a blend is formed and sent to the photosynthesis tank along with the microbes from the inoculators and smoke, thus the process repeats.



National Science Exhibition for Children:

Future Perspectives

The Jawaharlal Nehru National Science Exhibition for Children, which was earlier named as the National Science Exhibition for Children has witnessed tremendous students' enthusiasm and participation all through the four decades of its organisation. Equally enthusiastic have been the local people wherever the exhibition has been held. The response in the form of huge number of people thronging in at the venue to see the exhibits has been overwhelming at all the places of the exhibitions. Many of the ideas and innovations displayed by the students through their exhibits are novel. Some have been patented and have been found to be used in the industrial sector after further improvement and fine tuning of the exhibits. Some of the outstanding exhibits from different years that can be cited include Auto Water Tap (1978), Call Indicators – Saline Indicators (1996), Spark Plug as Air Filling Device (1997), Utilisation of Waste Material like Fly Ash for Manufacturing Bricks (Hollow bricks) (1999), Raw Polythene Utilisation Plant (2002), Automatic Light Controller in Railway Tunnels (2003), High-Tech Bed (2006), Oil Spill Remover (2006) and Toilet Modification in Indian Trains (2008). These suggest that JNNSEC has not only succeeded in achieving its primary objective of popularisation of science in the nation but has also contributed to the society by directly impacting the lives of people.

Nevertheless, besides the success that JNNSEC has seen over the years, the fact which cannot be ignored is that due to various administrative and financial constraints JNNSEC is able to provide platform to only a restricted number of students of the country. It may be mentioned that the exhibitions are held in different states/UTs and a deliberate effort is taken to ensure that different states/UTs get the privilege to host the exhibition. As such permanent facility to organise the exhibition year after year cannot be established. Hence, it becomes practically unfeasible for the states/UTs to accommodate huge number of students along with their teacher guides for

the week-long affair keeping in view the various needs to be met for them in terms of lodge, food, water, transportation, security, medical facility, and perhaps, space to display the exhibits itself, and manpower and expertise to handle these. Administrative constraints would also be faced by the NCERT. With the limited number of faculty and administrative staff contributing in the activities related to the exhibition, expansion of the programme would be a matter of great concern for the Council in general and the Department of Education in Science and Mathematics (DESM) in particular. Besides these, financial constraint is a major factor. JNNSEC, though considered a flagship programme of DESM, NCERT is just one amongst all the programmes the department takes up every year. Limited and fixed budget is allocated for various programmes of the department for each financial year which is invariably always much below the proposed budget. In this situation, a raise in the budget allocated for the organisation of science exhibition is not likely. As a result of these constraints limited numbers of students are invited to participate in the exhibition. These students are identified by the respective state functionaries during the state-level exhibitions based on various criteria for selection of the exhibits. And for those children from outside the school system little has been thought over as to how these children that form a major chunk of our population would be able to showcase their ideas and innovations.

Further, it is felt that except for those children who are from the host locality where the exhibitions are held, rest of the children from the host state and outside the state have not been able to visit the exhibitions and have first-hand experiences to learn about the exhibits. Keeping in view the population of children in our country (approx. 36%), both school-going and those out of school, it would be a good initiative to open certain forum or platform where there are no strict rules on the restriction of participation. The NCERT's constituent body, the Central Institute of Educational Technology (CIET) has been trying its best to reach out to maximum audience by producing and disseminating CDs of selected exhibits of the exhibition. Another attempt to popularise the exhibition is by way of telecast of the recorded version of the exhibition which is a regular feature in Gyan Darshan year after year. Yet these attempts have their own drawbacks as they are not interactive. Hence, a broader forum can be visualised for bigger participation with an aim to extend and expand the perspective of the existing science exhibition.

With the world booming with information and communication technology, utilisation of electronic media seems to be a good option for openly reaching out to the masses. An open interactive forum may be created where children, school-going and out of school, might get the opportunity to upload their innovative ideas which may be in any form—written report or working or static model. The proposed forum could have a moderator who would look into the task of identifying and verifying the projects or activities to be uploaded. Uploads may be open for comments and suggestions for improvement. Interested children or anybody may comment. Besides children, any interested person can have access to it and make use of some of the ideas in his/her daily life. The issue of dumping of ideas as it has been happening in the past will no more remain with the introduction of this forum. The appropriate process or modalities for utilisation of ideas can be worked out accordingly. Introduction of this forum will definitely be a herculean task initially. It is bound to face more questions than appreciations. But with experts in every area of this field available in our country today, the task can be very much achieved. It may have its own limitations and drawbacks but once put on wheels, this initiative will go a long way in popularisation of science, in the true sense, with participation from the remotest part of the country. The NCERT might begin to think on this perspective.

Another matter that needs to be addressed at this point of time is the widening of scope of the kinds and varieties in terms of presentation of the exhibits. This has become necessary following the renaming of the exhibition as the Jawaharlal Nehru National Exhibition for Science and Environmental Education for Children (JNNESEC). Introduction of the words 'Environmental Education' in the name suggests that the focus that has been given to environment-related concerns has to be increased further henceforth. It looks forward to bring about parity both in the field of science and environment-related themes in terms of projects, activities and models that the students work on to find place in the exhibition.

Environmental education is all-encompassing covering both environmental-related social as well as scientific issues. As environmental education is being highlighted in the name of the exhibition, it is envisaged that this will instil in the students a renewed passion and zeal to undertake projects and studies on the social and scientific aspects of the environment in totality. As the children take up studies on issues related to their local

environment they will not only be able to understand their local environment better but also contribute towards solving environment-related issues of their locality. This in turn will mould them to become a more concerned and responsible citizen. For example, working on solid waste-related issues such as electronic waste, medical waste, domestic waste, etc; pollution of air, water and soil; GM crops and conventional cropping; fertilizers; etc. Studies on all these issues cannot be complete without taking into account their interconnectivity with the society. Therefore, when students are involved in such activities, they will be able to see and understand the issue in a broader perspective keeping into consideration all the elements related to the issue in the process of their studies. Moving a step further, when studies on these issues are uploaded by children from various states/UTs using the electronic medium as mentioned earlier it will be very helpful in spreading information and awareness about the status of the environment of that place.

Another benefit that can be mined out of electronic media is a platform wherein all the previous participants of the exhibition beginning with the year 1971 can update information on their experiences of the exhibition(s) they participated, whether their participation in the exhibition has helped them in any way in their lives including careers, etc. This will serve as a kind of indicator about the impact of exhibition on the participants. Besides, no mechanism has so far been developed to obtain feedback about the programme from the participants as well as visitors which this platform will help serve the purpose. This feedback will help the NCERT to improve upon the organisation of the exhibition.

It may be concluded that the future perspectives about the exhibition is essentially towards venturing into, and making the best out of the information and communication technology available to us today. If systematically and successfully exploited, this attempt will go a long way in popularisation of science and environmental education, penetrating to the remotest parts of our country with participation from all children, whether school-going or out of school. This effort will also be more sustainable in terms of information loading, storing, sharing, accessibility, dissemination and utilisation and this in itself can become a resource centre.

NEHRU ON SCIENCE

… science is not merely an individual's search for truth. It is something infinitely more than that if it worked for the community. Its objective must be to remove the ills of the community. It must have a social objective before it. For a hungry man or a hungry woman, truth has little meaning. He wants food. And India is a hungry, starving country and to talk of truth and God and even of many of the fine things of life to the millions who are starving is a mockery. We have to find food for them, clothing, housing, education, health and so on–all the absolute necessaries of life that every man should possess. When we have done that we can philosophise and think of God. So, science must think in terms of the 400 million persons in India…

Pt. Jawahar Lal Nehru
Indian Science Congress
3 January 1947