



BHARATIYA VIDYA BHAVAN

Sardar Patel College Of Engineering
ANDHERI BOMBAY 58

SARJANIKA



VOL. II.



APRIL 1967.

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BHARATIYA VIDYA BHAVAN

Sardar Patel College Of Engineering
SARJANIKA



VOL. II



MARCH 1967

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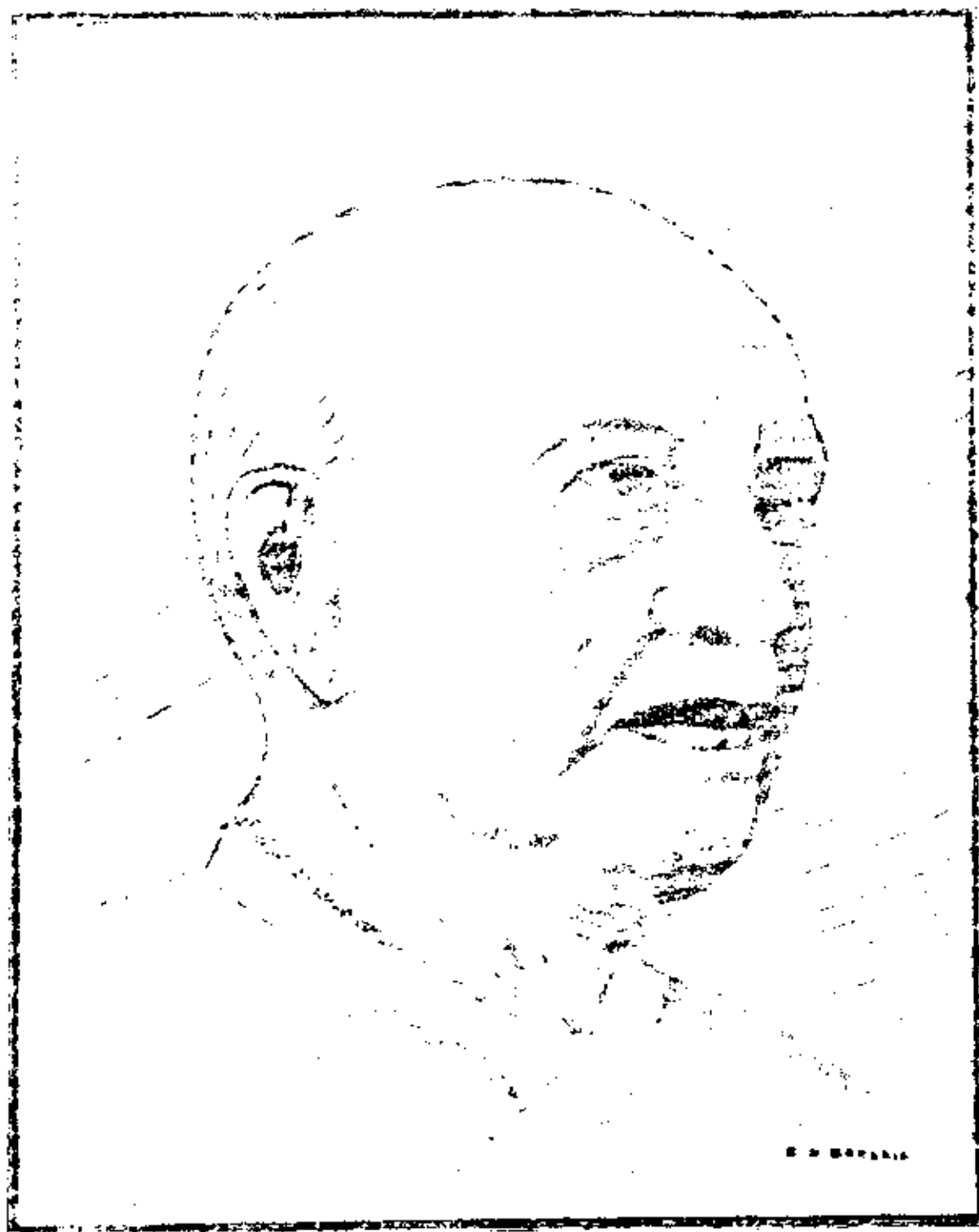
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SARDAR PATEL
(1875-1950)

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Editorial

We are pleased to bring this second issue of "SARJANIKA", our College Annual Magazine and we hope that our esteemed readers will find the Magazine interesting.

The success of any magazine mainly rests on its quality and its appeal to the readers. The wide appreciation, our first issue of "SARJANIKA" received from the distinguished readers and prominent men in all walks of life, has inspired and enthused the necessary confidence in our efforts and our students and staff members have equally responded to our request in making this venture a great success all these years. The magazine "SARJANIKA" provides a powerful medium for our students and staff members alike to develop their literary talents. It also brings in the lively picture of the various activities of the students of this College.

We are happy to note that a good number of articles on varied subjects, have been contributed by our students. This year too, we hope that our esteemed readers find them interesting as ever.

We sincerely thank all the students and staff members for their willing co-operation in bringing out this magazine. Our thanks are due to the authorities of Bhavan's press who have, at a very short notice, printed and brought up this magazine with an excellent get up. We sincerely express our thanks to all our patrons who have willingly subscribed for advertisements in our magazine.

NEWS FLASHES FOR 1966 - 67

The academic year 1966-67 is a very eventful year in the history of our College. It was in June, 1962 the College came into being and we will be just completing 5 years. A period of five years in the history of any Institution is too small a span to reckon with. But looking to the achievements in this

short period of five years we have every reason to be proud of. The College has been now fully equipped in all branches of Engineering (Civil, Electrical and Mechanical). The College has opened the Post-Graduate Courses in Structural and Mechanical Engineering. The College has sent so far two

batches of Graduates and now it has become a nucleus of the Engineering studies. Negotiations with Electronic Research Association, Bombay are in progress for establishing an Electronic Research Centre at this College.

All these achievements are mainly due to our revered President Dr. K.M. Munshi, Kulapati of Bharatiya Vidya Bhavan. Under his able guidance and foresighted policies, the College was able to steer through the initial set backs. The efforts of our Principal R.H. Chokhavatia, in this crucial period of the development of this College should be lauded. He has been a source of inspiration to many youngsters and his steadfastness and devoted interest in whatever work he undertakes leaves us with all appreciation and admiration for his ability.

The Academic Session of 1966-67 was inaugurated by Hon'ble Sri S.B. Chavan, Minister for Irrigation, Power, Buildings, and Communications Government of Maharashtra on 21-6-1966. Sri Shantilal Shah, the then Hon'ble Minister for Public Health, presided over the function. Principal acquainted the Chief Guest, Sri S.B. Chavan how our Institution grew into full fledged Engineering College in a short period of four years. While inaugurating the Session Sri S.B. Chavan recalled some of the problems that the Field Engineers have to face and suggested that a programme should be chalked out to exchange Field Engineers with Academicians in the Technological Field to bring a healthy blend of theory and practice for the betterment of both fields. Sri Shantilal Shah stressed the moral values in life and advised the students to stand by truth and do with a sense of dedication whatever work they are destined to carry out. He stressed that the future prosperity lies to a greater extent, on the performance of these budding Engineers.

On 14th August 1966, the Vanamahatsva was inaugurated in the Bhavan's Campus

by the Mayor Sri S.R. Patkar. Speaking on the occasion, the Mayor stressed the necessity of tree planting to help bring rains and said that he was of the firm opinion that the water scarcity in Bombay city would be solved in 8-10 years and stated that a well-planned scheme is already afoot to tackle the shortage of drinking water. Earlier Smt. Lilavati Munshi, while welcoming the Mayor, briefly acquainted him with the History and development of the campus and asserted that the problem of drinking water could be solved by sustained efforts and imaginative planning.

Mrutyunjaya Japa and *Sudarshan Homam* were celebrated by the members of the Bharatiya Vidya Bhavan and friends and admirers of Dr. K.M. Munshi on 21st August 1966, invoking the divine blessings for the speedy recovery of our Kulapatiji Dr. K.M. Munshi, from his illness. All joined in this to express their love and regards to Dr. K.M. Munshi and Mrs. Lilavati Munshi and prayed the Almighty to bless Bapaji and Mummy. (As they are reverely called by us) with long life.

The college annual functions were held in the third week of December. The students took a very active interest in all the Sports and cultural activities and contributed in a large measure to the grand success of the functions. Shri Sanjiva Pawar and his party and Shri Bakshi with his band of talented friends, entertained the gathering on 19th December, 1966 with a feast of melodious music. The Marathi and the Gujarati dramas were also a great success. Earlier on the same day morning the staff and students were shown a picture 'Chaitika Nam Gadi' at the Navarang Talkies.

On the 22nd December 1966 the social gathering was addressed by Hon'ble Minister for Irrigation and works, Government of Maharashtra, Sri S.B. Chavan, who was the Chief Guest. Dr. K.M. Munshi who presided over the function welcomed the

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Chief Guest and made a brief reference to the activities of the Bhavan. Principal R.H. Chokhavatia acquainted the chief guest and the audience with the development of the college during the last five years and recalled how we have been fortunate in getting the parental guidance and inspiration from our Kulapatiji despite his old age in moulding the destiny of this college. Sri S. B. Chavan, advised the students to keep pace with the developments in the practical field and study the basic engineering subjects in the light of their usefulness. He briefly enumerated the various problems to be faced within the executive field and posed a suggestion why it should not be considered worthwhile to have a programme of periodical exchange of men in the teaching profession with those in the field so that a sound background of theory and practice could be achieved to the mutual advantage of the field engineers and the academicians. After the prize distribution by Smt. Kusumtai Chavan, the Vice-principal, Prof. S.S. Dighe and our General Secretary Sri Sahadev Ghei proposed a vote of thanks and the function came to an end with National Anthem.

The 20th Convocation of the Bharatiya Vidya Bhavan was held in the campus on 24th December 1966. After the ceremonial procession the function started with the prayer and the Bhavan's Sanghagana by the students. This was followed by vedic invocation by the principal of Mumbadevi Sanskrit Mahavidyalaya. Dr. P.B. Gajendragadkar, Vice Chancellor of Bombay University, who delivered the convocation address was welcomed by Kulapatiji Dr. K.M. Munshi. In his welcome address, he said, 'Sir, you have been a distinguished lawyer, eminent judge of the Bombay High Court and the Supreme Court and the Chief Justice of India. Apart from being a Jurist you are a scholar of distinction deeply read in law and literature'. Dr. Munshi referred to the activities of the Bhavan and said "Those who are connected

with the Bhavan should realise that it is not merely an Educational Institution. It is a mission, pledged to reintegrate Indian culture". He continued further that the Bhavan tried to hold fast to the fundamental values of our culture, shraddha, satya, samyama, and samarpana.—Truth, Love and Beauty. He said, "The integrated life that the Bhavan tries to offer; its many sided activities in which quite a substantial number of teachers and students participate; its fortnightly shibirs, where all the students, teachers and some of us meet and discuss; live problems; the attempt to weave a bond with the past students as well as the parents of the present students are intended to give a new vision and a new sense of fulfilment. "He reiterated that all the activities of the Bhavan are directed in quest of Truth, Love and Beauty and thanked all the members of the Bhavan for contributing their best to build up the reputation which the Bhavan enjoys.

The report of the Bhavan was read by Sri. J. H. Dave Hon. Director. Then the chief guest was requested to confer the degrees and diplomas and distribute the prizes to the winners of various institutions of the Bhavan.

Delivering the convocation address, Dr. P. B. Gajendragadkar referred to the progressive pursuit of the ideal of cultural renaissance that the Bhavan has adopted even since 1938 and said ".....that when the political disputes and the days are forgotten in course of time, Bhavan and its founder Munshiiji will always be remembered in India so long as Hinduism lasts. It is because, I have been given chance to speak a few words on this platform of the Bhavan that I regard it as a great honour". He dilated upon the present chaos and confusion on the Indian scene and condemned the fasts undertaken to-day for the achievement of partisan and political objects. He said that all these fasts and threats of immolation are

illogical, irrational and democratically reprehensible. He appealed to Dr. Munshi, Vinobaji, Rajaji and Sri Jayaprakash Narayan to tell the public that they so completely discouraged prolonging these fasts that sooner they stopped the better. He advised the young diploma holders and graduates to follow the path of Satya and Rita (Eternal truth). He referred to the rapid expansion of the world culture and emphasized that Vidya Bhavan has a glorious future ahead of it and hoped "that after 25 or 50 years India will say, as of the Ramakrishna mission mutt; the Vidya Bhavan is playing an important role in the history of India."

We are glad that our Dr. Munshi entered his 80th year on 27-12-1966. His birth day felicitation function held at Bharatiya Vidya Bhavan offered us an opportunity to pay our homage to Kulpatiji and Smt. Lilavati Munshi and pray to God for their health and long lives.

We are deeply moved to record here that we have lost this year two pillars of the Bhavan in the death of Sri. Acharya Venkateswara Dikshitar and Dr. C. P. Ramaswamy Iyer. The sudden death of Dikshitar on 14th Aug. was a great shock to all of us. He was a well known scholar and he was the recipient of the presidents' certificate of merit for his erudition in Sanskrit. As the principal of Mumbadevi Sanskrit Mahavidyalaya, he served the Bhavan with rare dedication to promote Sanskrit. His death has been an irreparable loss to the Bhavan and his countless number of admirers all over the country.

The death of Sir. C. P. Ramaswamy Iyer on 26th Sept. 66 removed one of the greatest sons of India. He was an eminent lawyer, an educationist, an administrator and a shrewd statesman. He was a versatile scholar in English, French, Sanskrit and Tamil and was an embodiment of culture at its best. His death, as our Kulapatiji has

stated, has indeed marked the end of an era.

We are all greatly grieved to record here, the sad demise of Sri Ramesh Radhakrishnani a student of B.E. Electrical class of our college in a local train accident on 19.9.66. He was a promising young student of our college. We convey our deep condolences to the bereaved members of his family.

College activities: The report of our Principal R. H. Chokhavatia and the College News Bulletin throw enough light on our academical activities and the achievements of our students in the sports, Social and Cultural activities. Our achievements are indeed noteworthy and the success of our activities are mainly due to the untiring efforts of our principal. R. H. Chokhavatia.

We have amidst us several new staff members this year. With the introduction of the 4 year degree course, we have added Physics and Chemistry departments now Prof. V. R. Doiphode, Head of Dept. in Physics; Miss F. L. Thailamani, Lecturer in Physics; Mr. M. M. Zurale, Demonstrator in Physics; Mr. C. D. Agte, Lecturer in Chemistry; Miss R. Vatsala, Lecturer in Chemistry; and Mr. R. G. Bhatt, Lecturer in Chemistry have joined us this year.

Mr. D. S. Joshi, Lecturer in Structural Engg. Dept.; M. G. Nayak, Lecturer in Elect. Engg.; Mr. P. P. Parameswaran, Lecturer in Civil Engineering Mr. Jaxmi Narasimhan Lecturer in Metallurgy; Messrs. K. D. Desai, A. B. Khere and C. S. Narulkar Associate Lecturers in Mech. Engg.; M/s. T. Karkaria and S. B. More Associate Lecturers in Elect. Engg.; Mr. T. Narayanan, Associate Lecturer in Civil Engg.; Mr. U. S. Handikar, Associate Lecturer in Structural Engg.; Mr. S. P. Pandit, Demonstrator in Physics; Mr. S. L. Pendse, Draftsman in Civil Engg.; Mr. K. K. Chawla, Lecturer in Business Organisation, who have joined the college

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OUR KULAPATI



DR. K. M. MUNSHI

OUR VICE-PRESIDENTS



Sri H. V. Divaria



Smt. Lilavati Munshi

OUR PRINCIPAL



R. H. Chokhvasatia

this year and thus strengthened the teaching potential of the college considerably. We welcome the new staff members heartily. We are happy to report that Sri D.K. Chawla, Sri K.D. Desai, Sri I.M. Padaria, Sri E.M. Pereira and Sri V.B. Singh have been promoted as Lecturers and Registrar of the College and Sri B.M. Gandhi has been promoted as Head Clerk.

Sri K.K. Thakore, Prof. and Head of Elec. Department; Mrs. P. Bhide, Lecturer in Elec. Engg.; M/s. A.R. Trivedi, S.B. More, P. Karkaria, Asstt. Lecturers in Elec. Engg., Sri S.W. Bhagwat, Asstt. Professor in Mech. Engg., Sri C.A. Mehta, Lecturer in Mech. Engg., M/s. D.R. Desai and M.B. Mahaskar, Asstt. Lecturer in Civil Engg.; Sri S.P. Pandit, Demonstrator in Physics; have left the institution during the current year. We miss them all very much and we sincerely wish them all better prospects in their new field.

It is a matter of great pride to see that

young staff members are sponsored for higher studies by the college. Sri B.H. Pancholi, Lecturer in Civil Engg. has been sponsored to study M.E. in Public Health Engg. Sri M.H. Jhaveri Asstt. Lecturer in Structural Engg. has resigned to prosecute higher studies at U.S.A. Mr. V.D. Khatri, Assistant Professor, Structural Engineering, has joined us again after completing his specialisation on Earthquake Engineering in Japan.

Though there is a separate section for the ex-students of the college in the magazine, we regret that the ex-students have not taken any active interest so far. We hope that our ex-students will make use of the opportunities provided to them.

We once again thank all the staff members and students for their willing co-operation in all our activities and hope that the college will register a grand spectacular progress under the able guidance of Dr. K.M. Munshi.



NOTICE

The next issue of this magazine will appear in March 1968. There will be a separate section for Ex-students of the College also. All material intended for it must reach the Ex-officio in-charge, Magazine Committee, latest by the 15th September, 1967.

What makes a good Engineer

Shri R. H. CHOKHAYATIA

Principal

Who is an Engineer? In former days it was believed that an engineer is he who does in a penny what a fool can do in two. This was true then and now it is partially true. In modern days an engineer is he who can do a thing what any other man cannot do despite giving him any amount of money. This is because the Science and Technology in modern days have so developed and advanced that they baffle description. A decade back it was impossible for any one to believe that man could reach the moon. Now the day is not far off when it will become a reality - a matter of fact.

Students after passing Intermediate Science enter the Engineering Colleges with big expectations and aspiration. They dream of many things believing that they would create so many new things they are observing in their daily life and which inspire them to do new things, and perhaps much grander than those objects. The question arises whether their dreams would come true and whether many of them possess the qualities that make a real engineer. The author is reminded of the great scholars who have given in a nut shell the tasks facing an engineer. Sri S. B. Chavan, the Honourable Minister for Irrigation, Power, Building and Communications, Government of Maharashtra, while inaugurating the new academic year in June 1966 at the Sardar Patel College of Engineering said that the new generation of Engineers will have to build dams over sites rejected previously by their predecessors simply because, all good sites have already been utilized and now they will have to build on sites naturally unsuited but made suitable now by using their scientific and technical knowledge. Previously they used to get so many ready made equipments from foreign countries and therefore had not to worry about their efficiency. But now they will have to build their own equipment and worry about their efficient working and learn from their mistakes of the past.

Another instance is of the eminent ex-Chief Engineer of Gujarat State, Sri Dhanak of the B.S.E. I, who described in his lucid and attractive language while exhorting the students of Birla Vishvakarma Mahavidyalaya, Vallabh Vidya Nagar, a decade back, a story "Get me a Cobra?" Through this story he told the stu-

RAVATIA

Principal

dents that engineers had to develop the qualities of *getting things done* at the proper time however difficult and impossible the task might be. The youth in the present days take up a job and looking to difficulties and hurdles in its path abandon it and take up another job. This tendency prevents a young man from becoming a real engineer. He has to realise that he is there to solve the hurdles and many other problems and difficulties that may come in his way and it is through this strength that he becomes a real engineer.

An engineer has to know what he wants and where he could get it. He has therefore to examine each and every book he comes across in his College Library, try to read and understand various technical journals made available to him and study at first hand the latest trends of research and problems facing the engineering world.

A student of Engineering has to remember that merely reading the books and articles from the magazines would not suffice. He will have to judge the correctness of those ideas in his practical fields and if found to be conflicting, that is theory conflicting with practice, he should not run to a rash judgment, since there may be many drawbacks in his practice but exchange his ideas with his colleagues in the profession and by constant exchanges and numerous practices and a lot of experience he would be in a position to contribute to the technical knowledge. Humbleness is a great virtue that has to be created and it is always after a sober re-thinking, that correct conclusions can be reached.

An engineer has to be social minded. He has to remember that he has to develop the character of leadership in order to be able to be a successful engineer. He should remember that he is just a cog in the wheel—in the system of social process and it is only when the entire system moves by the joint efforts of all, that production and creation become possible. Man is a social being, is true to the whole society— all sections of human society— and all creation is social—not individualistic. It is only when all the wheels move according to their respective tasks assigned that production becomes possible. But if any one of the wheels in the system or any one part fails or stops in this process, the entire system collapses. Everything comes to a standstill and therefore it is the task of an engineer to see that the entire system moves and functions satisfactorily. If there is any defect in any one he has to set it right. The engineer has therefore to become a doctor of his profession.

Hard work and perseverance are the qualities that an engineer has to cultivate for he has to remember that unfathomable are the laws of nature and that the knowledge of the Universe is infinite. He has to develop an engineering phi-

philosophy of life that in order to create better and better things he has to study nature and unravel its secrets as far as he can. This is a formidable task and to accomplish it he has to persevere and continuously work. His attempts should be to understand laws of nature and use it for the benefit of mankind. It is only then that nature will be his handmaid else nature will retaliate with vengeance. Who does not know the horrors caused by the bursting of Panshet Dam! A little fault in the electrical system causes disastrous results, sometimes fatal.

The new generation of Engineers coming out of the Engineering Colleges will be called upon to shoulder the greatest responsibilities and perform stupendous tasks which would belittle the past achievements. Let the young engineer realize what he is upto and what is expected of him by the country. Let him prove his worth that the confidence placed in him is justified



DON'T USE BIG WORDS

1. Some people have the nasty habit of using big words. They will not cull a spade, a spade, but an agricultural implement for the tituration of soil. We have the classic example of Micawber addressing David Copperfield and saying:

"Under the impression that your peregrinations in this metropolis have not been extensive, and that you might find some difficulty in threading the arcana of this modern Babylon, in short that you may not lose yourself. I shall be happy to call this evening and instal you in the knowledge of the nearest way."

2. Now I hate using big words. For the benefit of all such people who may be inclined to use *Big words*, I have prepared a short speech, on how to speak and in what manner, in very simple language for your benefit. Thus:

3. In promulgating your esoteric Cogitations and articulating your superficial sentimentalities and amicable philosophical and psychological observations, beware of platitudinous ponderosity. Let your conversational communications possess a clarified conciseness, a compacted comprehensibleness, a coalescent consistency and a concatenated cogency. Eschew all conglomeration of jejune babblement asinine affectation and thrasonical bombast. Sedulously, avoid all pollysyllabic profundity, pompous prolixity, psellitious vacuity ventriloquial verboosity and vaniloquent vapidty. Shun double entendress, prurient jacosity and pestiferous profanity, obscurent or apparent.

4. In other words Say what you mean and mean what you say. Talk plainly, directly and simply. Above all Don't use Big Words, and talk in the way that *I have done*

Principal's Report Annual College Day - 1966-67

It gives me great pleasure to heartily welcome you all on behalf of Staff, Students and myself on the occasion of our FIFTH ANNUAL DAY CELEBRATIONS. I am grateful to Hon. Shri S. B. Chavan & Mrs. Kusuntai Chavan who readily accepted our invitation despite their busy engagements. On such occasions it is customary to introduce the Chief Guest but fortunately for us Shri Chavan Sahab needs no introduction. He is one of the finest sons the State of not only Maharashtra but India as a whole has produced and is known to you all as a fighter for freedom and an able administrator and scholar, it would be impertinent on my part to say anything more. I would therefore straightway begin to give the short story of our college, our achievements and failures in a short time that we have at our disposal.

Our Institution, Sardar Patel College of Engineering came into existence in June 1962, when the University granted us permission to admit the first batch of students to this College.

2. The work of constructing the Engineering College Building which commenced from January 1962, was completed in all respects by December 1964 in three years time despite the difficult period. We started with an intake of 120. This intake was increased to 180 from June 1964 in the situation of national emergency. On account of this increased intake the Government sanctioned the additional grant of Rs. 4,02,600/- for additional accommodation facilities to be erected at this centre in addition to Rs. 24,62,680/- for the initial stage of the project for buildings, making up a total of Rs. 28,65,280/- towards the building. For equipment, the Government of India sanctioned a further sum of Rs. 7,53,000/- in

addition to Rs. 17,60,000/- already sanctioned for the intake of 120. The total amount sanctioned for equipment is therefore Rs. 25,13,000/-. The total aggregate outlay on the project as a whole to day is Rs. 67,50,000/- including land, buildings, equipment and Hostels.

3. The work of creating the additional facilities by way of accommodation was taken up in the beginning of this year and it is heartening to note that it is almost completed. The expenditure on building is Rs. 29,60,000/-. For equipment we have got sufficient funds to equip our laboratories for the three years course and an amount of Rs. 20,95,000/- has been spent so far.

The University of Bombay has changed the pattern of education from three years to four years course from the current academic year. The College has therefore been obliged to build up the Physics and Chemistry Laboratories from its present resources. The Government of India and State Government have yet to sanction the additional accommodation and equipment required for the four years course. We have approached both the governments to sanction the additional facilities to be created at this College.

Hostel The scheme for the Hostel to accommodate 204 students sanctioned by the Government of India with an interest free loan estimated to cost Rs. 6,96,400/- has been completed in December, 1965. The total amount of expenditure is Rs. 7,69,668.

4. The year 1966-67 passed with great many difficulties. The cost of the equipment went up with the devaluation, entailing increased cost of other commodities, creating problems of economic strains and stresses on the college, its resources and finances and grants from the Governments.

We received during the year Rs. 1,75,000/- as grant from the Government of India and Rs. 3,50,000/- from the State Government towards the non-recurring grant. Total grant received from the two governments for the development is Rs. 7,25,000/- and total received so far for the entire scheme is Rs. 37,32,300/- (24,00,000 Government of India and Rs. 13,32,000/- from State Government).

Members of the Staff of this College are paid the scales of pay existing in 1962 with the rate of D.A. as existing then. Although the State Government has revised the rates of D.A. twice during this year, firstly from April 1966 and second from 1st July 1966 it is regretted that these increased rates are approved for the Government Engineering College and other non-Government Colleges in Arts, Science and Commerce but have

not been approved so far for non-Government Engineering Colleges. As a consequence of this, the Staff Members are put to a lot of hardships and are called upon to meet the much increased cost of living. In a city like Bombay, with prices of almost all the materials including transport have risen considerably high. It is no wonder therefore that the Staff of this College is called upon to bear the consequence of this high cost of living without any additional compensation at the present stage. It is expected that the State Government would take sympathetic attitude and sanction the same basis for salaries and allowances for non-government Engg. Colleges as are applied to the Government Engg. Colleges.

5. On the academic side the college sent out its second batch of students in April 1966 and the results there-of are as under:

		1965 April	1965 Oct.	1966 April	1966 Dec.
F.E.	A	211	119	235	89
	P	78.77%	79.66.4%	141.60%	59
	I	11	21	42.1	1.11
		ATKT 70	ATKT 24	67.11	58 Pass 66.3%
S.E.C.	A	50	34	48	15
	P	20.40%	26.73.5%	38.66.6%	19
				6.1	32.63.36%
		ATKT 6	ATKT 4	24.11	2.11
S.E.M.	A	48	13	13	2
	P	35	10	79	17
		73.0%	77.0%	79.89.8%	15
		3.1	2.11	32.1	1.11
S.E.E.	A	44	28	33	14
	P	12	16	5	14
		27.0%	57.1%	33.11	87.65%
		6.11	9.11	6.11	2.11
B.E.C.	A	10	9	89	35
	P	11	7	61.68.53%	27
		68.0%	88.88%	7.1	1.11
			1.1	39.11	28
B.E.M.	A	33	11	15	2
	P	21	9	19	13
		64.0%	81.9%	26	8
		3.1	2.1	17	61.7%
B.E.E.	A	11	6	34	13
	P	3	5	20	6
		27.3%	83.33%	58.82%	46.3%
			2.1	1.1	

The results are very encouraging and they are an improvement on our last year's achievements. Miss. M. B. Gandhi stood first in the University securing Rao Bahadur Rajadhyaksha Scholarship from the University of Bombay. Shri Sahjivani A. K. is one of the recipients of Principal Junnarkar Medal for securing the highest marks in Structural Group of subjects. It gives me a great pleasure to declare that the expert committee have decided to declare Miss Asha Kolhatkar of B.E.E. class as the first best all round student of this college and she will receive the Kulapati's Gold Medal at the Bhavan's Convocation ceremony tomorrow the 24th instant. Shri K. C. Patil of F.E. class is selected as the second best all round student and will be awarded Kulapati's Silver Medal at the same function.

Our student Shri Rajendra Gadkari of the B.F. class has won the following prizes at the elocution competitions:

- (i) Late Sri Banda Itardikar debating competition organized by Maharashtra Mandal—first prize of Rs. 100-. This was open to all colleges in the Maharashtra State.
- (ii) An elocution competition organized by Janata Kendra for Bombay Colleges—He won the Second prize in the form of books worth Rs. 20-.

Our student Sri Satish Ingale won the fourth prize Late Sri Bhausabeh Hire debating competition organized by Nasik Yuvak Sanskrit Mandal.

The college is awarding Sri Pruthvish Narayandas Killavula prizes to the following students:

1. Shri Varma K. J. (S.E.E.) for passing F.E. Examination in first class and joining Electrical Class.
2. Miss. Athavale S. V. (B.E.E.) standing first at S.F.E. examination.

3. Shri Patel Asit G. (B.E.E.) for passing in first class and standing first from the college in B.E.E. class.

The college is awarding Shripadrao Dubhashi Prize to the following student:

1. Shri Rupavate P. M. for securing more than 70% marks in drawing and standing first in the college in the subject.

These prizes will be awarded at the Bhavan's Convocation on 23-12-1966.

6. The college has received the proposal from Electronics Research Association to establish a centre at this college and this proposal has been submitted to the Government of India for their approval. It is expected that this sanction would soon be forthcoming and this Institution will have an opportunity to build up a real research centre attracting young and brilliant men from all over the country to this Institution.

7. The present strength of students on roll is 671 distributed class wise as under:

F.E.	180
S.E. (C)	60
S.E. (M)	78
S.E. (E)	78
B.E. (C)	71
B.E. (M)	101
B.E. (E)	96
M.E. (S)	4
M.E. (M)	3

The total number of engineering graduates who passed from this college so far is 137 and a substantial number of these is in the U.S. for advanced studies in Engineering. We have 49 members of staff imparting instructions to the students. The students-teacher ratio is thus 13:1.

8. Gymkhana Report:

Our students are participating in various sports organised by the University such as

cricket, Volley-ball, Hockey, Table-tennis, Badminton, wrestling, Chess and Athletics.

Sri K.C. Patel of F.E. class has won Inter-Collegiate Feather Weight Wrestling and won Silver Medal in Inter-University Championship held at Chandigarh. Our volleyball team had qualified for semi-final.

The following students and classes showed outstanding performance in College championship.

- (1) Mr. Doshi S.K. B.E.(M) and Mr. Cherian S.E.(E) in Table Tennis.
- (2) Mr. Ghate (F.E.) and Mr. Dalal S.N. (B.E.E.) in Chess.
- (3) Mr. Mulla A.S.H. (B.E.M) Hattangadi (B.E.E.) in Carrom.
- (4) Mr. Heroor A.G. (B.F.E.) and Balsubramaniam (B.F.M.) in Badminton.
- (5) Interclass cricket championship was won by S.E. class under captainship of Kamat A.S.

9. Conclusion;

All these achievements for Bhavan's Sardar Patel College of Engineering are due to liberal grants released both by the Government of India and the State Government from time to time, by the parental guidance and inspiration from our Kulapati who des-

pite his old age, is continuing to mould the destiny of his college with his fatherly care. Principal S.B. Jannarkar who steered the ship of this college during the most difficult years at the time of the birth of the institution, the willing co-operation the staff members of this College who under went hardships, worked hard building up brick by brick the different laboratories where nothing existed with inexperienced assistants and their devoted zeal in seeing that the students received the adequate training in laboratories and workshop. I am specially grateful to Mrs. Munshi (Mummy as we all call her) for taking keen interest in the development of this beautiful campus and looking after the facilities for the students with all her motherly care.

Our Kulapati will be entering 80th birthday on 30-12-1966. On this occasion we pray to almighty that he and Mummy live happily many more years and continue to guide us so that this institution grows as one of the leading colleges in our country.

Once again, I welcome you all and thank you Sir, and Smt. Kusumtai for sparing your most valuable time on this occasion and having agreed to join us today in our celebrations.

Thanking you,

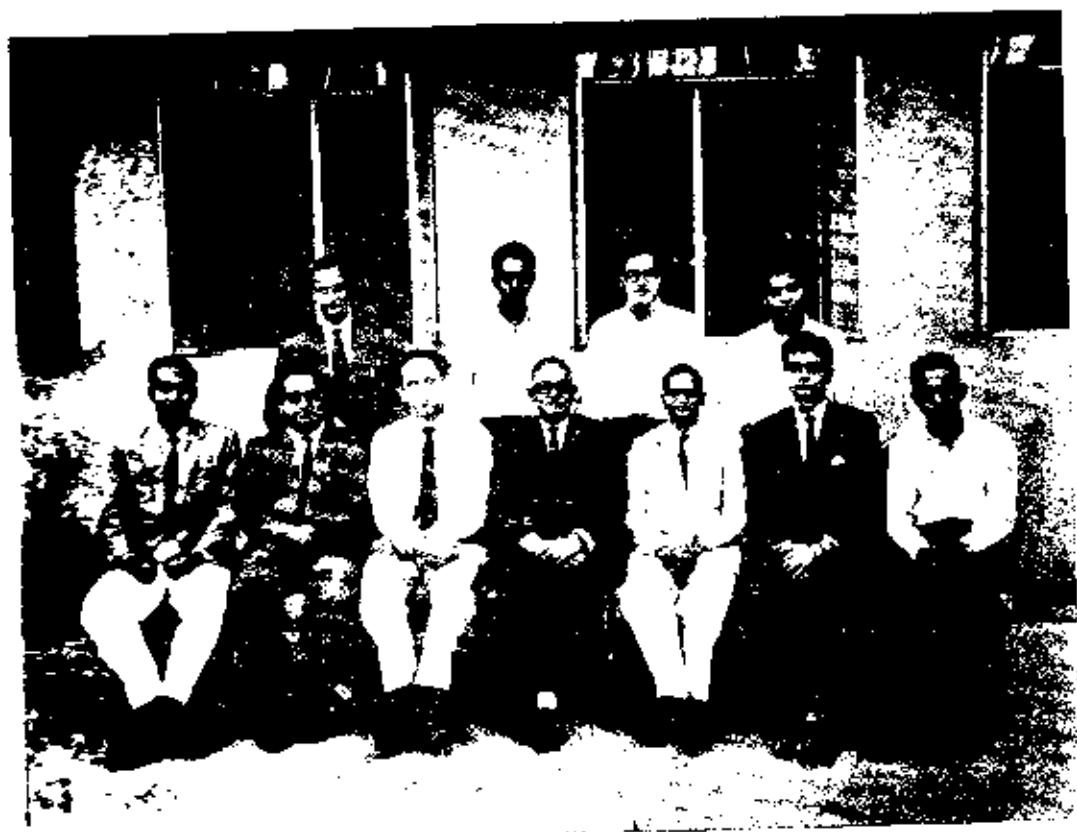
"Jai Hind"



GYMKHANA COMMITTEE-- 1966-67



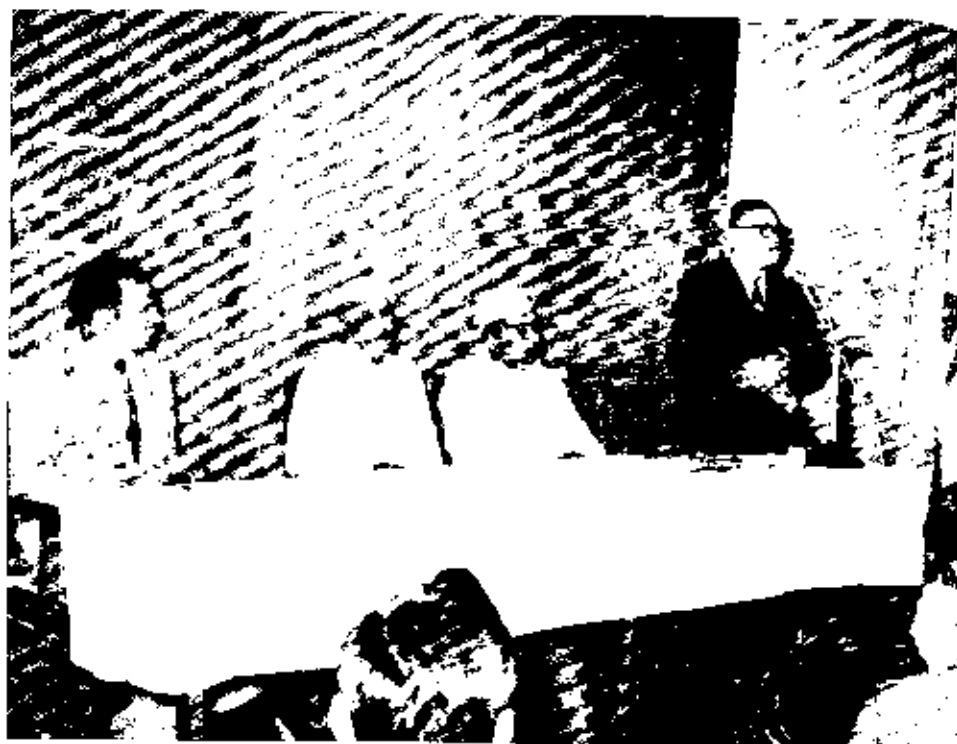
HEADS OF DEPARTMENTS AND EX-OFFICIO STAFF OF GYMKHANA -1966-67



INAUGURATION OF THE ACADEMICAL SESSION



Arrival of Chief Guests



Principal Welcoming the Guests

THE STRENGTH OF A NATION....

*If India should prosper and march with dignity,
we Indians have to decide for it.....*

*.....The question is not whether we can,
but whether we should.....*

*.....If we should,
then we also can.....*

By P. N. Krishnan

If we review the past history of the world, we find that there have been instances, when Nations have worked miracles at a time when affairs have been most deplorable. We know of countries, which have been rebuilt from a state of wreck to be one of the mightiest. Is then a Nation strong by the gold reserve or war-potential that she has? No... it is something else; and that is the people, who stand for the real strength of a Nation.

A country may lose everything; but, if the people don't lose faith in themselves, they can remake everything. After all, **NATIONS DON'T MAKE PEOPLE PEOPLE MAKE NATIONS.**

It is through faith that the infinite potential of Man get recognition. There is a tremendous latent force within every individual and this expresses itself as faith. There is nothing like 'providence' or 'destiny' that directs the events, once the WILL, POWER takes command. It requires only faith to say: I cannot fail.

When the people in a country are bound by faith to form ONE great mind, with a common goal, it has to be realized. The record we with Pakistan has shown us how our soldiers could fight against the most so-

phisticated weapons and rout the enemy. Our soldiers had faith in their might and they were grimly determined to go ahead. It is this secret weapon that won the war for us. There could be no superior weapon that could destroy their confidence.

Again, the courage and the unsundering attitude of the British people kept them fighting even after suffering the enormous loss at the hands of Germans. Against every odd they marched till victory was theirs!

Gandhiji was a man who was driven by the power of faith—faith in his principles, faith in his own self and faith in the success of truth (satyam-eva jayate). He had no army, no weapons of war, no money; yet, he moved the millions; he shook the entire British Empire. The whole world recognized the dynamic power behind this half-dressed man of no material possession.

Our country is today in a shattered economy. But, let us not forget that we have an army of 480 million people, who can surge up with a violent spirit of sacrifice and a burning sense of dedication, to build this fallen Nation. If events can make History, People can make events. We have in our living memory, the case of Japan, which was reduced to shambles in the second World War. But today it is in the command of the

World-Market. It is, therefore, the people who ultimately decide.

The life of any Nation has its own ups and downs. We were under foreign rule for more than two centuries and within eighteen years of our Independence, we have seen two major conflicts, with heavy military involvements. As a result, we are today in the bitter grips of a great National-Crisis. We have a pinching shortage of everything: from drinking water to the basic raw materials of every industry. Miles and miles of our land lay barren, waiting for rains, and the farmers in the villages are sitting helpless. In the cities, factories are closing down and thousands of workers are thrown jobless on the streets. There are the Defence needs that call for all the attention and there is the common-man's belly that needs to be filled before anything else can be done. Our export market has crashed down, foreign exchange has collapsed and the supply-demand inequality is beyond the control of all the economic experts. The price-index has reached a new high, taking up the blood-pressure of the people. There is a murmur of discontentment and a feeling of despair fuming in the hearts of the people. It is at such a time that we must temper ourselves with tolerance and patience. Tears can only be a coward's weapon. Though the condition is precarious, meshed with it is also, a challenge, to the people. It is in us to fail or to face; to ruin or rebuild the Nation. We are at such a critical juncture, where lack of hope and confidence in the minds of the people, can only take them face to face with doom.

The need of the hour is the faith of the people in themselves. After all, the failure of a Nation is the failure of its people. "Muster up the guts and confidence and on we wage the battle; let us be the masters of our own situation. Forget the self and pledge yourself in the cause of the country. If it is death that we shall have to face, let

that be so; why fear, when our spirit is deathless. It is not how long we live, but how we live that will speak for our country."

What is lost if there is a famine, or if the country's economy has tumbled?... Nothing; we can call it all nothing, so long as the people have the will and confidence. Our worth lies in our faith. Imagine a sea of humanity crowding this sub-continent, dedicated with determination and with their hearts full of the power of will -- no force of circumstances can shake the might of their spirit. They will stand as lords of their land -- far beyond surrender and challenge.

In a Democratic country like ours, there are limitations for the Government prescribed by constitution. People therefore should not wait for the compulsion of law for co-operating in every need of the hour. They should be guided by sincerity and staunch patriotism. Corruption has taken such strong roots in our country, that no official machinery can fight it, unless the people change their attitude. There should be a voluntary curb of social evils like profiteering, hoarding and anti-propaganda. The people should come out of their narrow selfish thought and broaden their outlook. Schemes like gold-bond, miss-a-meal, etc. should be encouraged out of an understanding of the implications. The women-folk should realize that at such a time of peril in the country the hoarding of the yellow-metal amounts to virtual traitorship. The women should actually be a great moral support in the great task. Wastage should be stopped at all levels. We should curtail the celebrity, pomp and show at all occasions and make a saving at every stage. We had to wage two military wars. War means money for the Government and money means taxes -- we should therefore be willing to bear taxes.

It is ultimately we, who have to decide whether we are facing a crisis or are in the process of shaping a self-sufficient, powerful India. This land is ours and we are 480

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We don't lack in human potential; we
not short of natural resources. All that
is needed is a judicious tapping of the vari-
resources. We shall do it. We shall do
it with faith—the kind of faith, that pro-
duced itself in the firm and unmistakable
stance of Swami Vivekananda thus:
"the Indian Nation cannot be killed.

Deathless it stands....."

Let it be recorded in History, that this
was a generation of Indian Heroes, who had
muscles of iron and nerves of confidence
and courage—who fought fate with FAITH.

"Life's battles don't always go,

To the stronger or faster man;

But, soon or late, the Man who Wins,
Is the Man who thinks he CAN."

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"It is not important whether some one is
Hindu, Jew, or Christian, but whether he is
a good man or bad...."

—President Sarvapalli Radhakrishnan

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"If you close the door to all errors, you also
shut out the truth...."

—Rabindranath Tagore

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"The life of every man is a road unto him-
self, to self realisation...."

—President Sarvapalli Radhakrishnan

ENGINEERING CREATIVITY

—THROUGH IDEA - PROCESSING

K. A. PUROHIT, B.E. (Elect.) Student, B.E. (Mech.)

Your ability to grow in job -to make your engineering prospects to grow—depends upon progressive power of ideas. Engineering creativity is a talent where each one of us should be developing new outlets. As an aid in organizing your experiences to produce helpful ideas, the following idea processing steps are suggested.

SATURATION—Fill your mind with data

The creating of new and original idea starts with the saturation of mind with thorough painstaking research. Today, robins build their nests the same way they have for centuries. But human beings can build on knowledge handed to them from history.

Edison's approach to a problem is a good example of saturation. He started where other men left off. He read about what others had done to try to solve the problems. He gathered his materials from thousands of experiments, others had performed.

Only after he gathered all of these facts was he ready to launch his own attack on the problem. Perhaps this is why Edison observed! "I am more of a sponge than inventor!"

Others said: "Nothing comes of nothing. He who has laid up no materials can produce no combinations. The more extensive your acquaintance with those who have excelled, the more extensive will be your power of invention; the more original will be your conceptions.

John Patterson, the father of modern salesmanship, put it in these words: "He is

most original who adapts from most sources."

Engineers knew the word "saturation". It is a matter of fulfillment that remains. The more you put into your mind the more material you will have to work with in creating ideas.

Engineers have an advantage in this respect in engineering, the training process has directed the thought process to assembly of facts as a tool for creative process. So, only an expansion of this reservoir is needed.

Not only is this needed to stay abreast of the rapidly changing technology; but to increase the potential force directed towards the unsolved problems.

As you consciously work on the problem you may solve it or you may work to the point of complete frustration and temporary defeat.

But, while you are working on your problem on your conscious level, you are also saturating your subconscious mind with the elements from which the answer may spring. You have given your subconscious mind the data with which to work. You have prepared the soil and planted the seed.

It is in the subconscious mind that we associate and re-associate new problems with what we already know; turn over permutations and combinations of thoughts, find pattern of relationship, and alternate choices.

The choices may or may not pop into the conscious mind; where we can appraise them. The subconscious mind works best

PROCESSING

(Mech.)

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when it is loaded. Problems seem to give direction. We can 'load' it by preoccupying it with problems; by dumping in related study material; by curiosity on all that goes on about us; by simulating discussions with others; by familiarizing ourselves with the work of others; and by consideration of relative courses and values....

INCUBATION

Remember that the subconscious mind works 24 hours a day. It works best when you relax. When you are playing cricket, listening to music, enjoying your hobbies, the subconscious mind is "in" there pitching.

Allow your problem to incubate in your mind. It is a store house of all you have learned in your lifetime. It works in some mysterious way, it works while you relax. It converts the data fed into it into new patterns, perspectives and concepts.

The effect of dictating to subconscious mind just before falling asleep is universal. It is of no small benefit, when you lie in bed at dark, to recall in imagination, one after the other, the outlines of the problems you have been studying. And on awakening you will often find your work clarified and the answer ready.

These are mounting days of tensions. The radio, the telephones, the calendar constantly pressuring (becoming hinders to the young executives of today, living up the 'idea production'). Let the subconscious mind help you to balance your work load and work relaxed. The subconscious mind works all the time while your conscious mind is either awake or asleep. The subconscious mind can handle many problems at the same time—like any most sophisticated computer of today. Give it work and deadlines to meet.

When you harness the power of subconscious mind you extend your creative powers

around the clock—at work, at play, awake or asleep. You multiply your power of achievement.

ILLUMINATION—The pay-off from the saturation and incubation.

Illumination is the actual flash of creative inspiration that comes from your subconscious mind during a period of incubation. It is the "Eureka, I've got it" stage.

Sometimes it is just a clue or a hint of the direction to take and require further work. Sometimes the idea is complete worked out. It is not a deliberate attempt to put the things together forcibly. Illumination can occur any place on your cricket pitch, at the dinner table, or on a bicycle, cycling through the country (may be, you have a car!)

A prelude sometimes helps. Such a prelude could be the discussion of the idea with someone else. The many facts seem then to become organized into a pattern, something usable. This is one way in which you can stimulate and increase the flashes of illumination from your subconscious mind.

Another way of keeping your mind open and receptive to idea is to think of it as an open door. It is a quiet, confident, expectant attitude of mind. It is loafing with an awareness that the answer is present [".....They are ill-discoverers who think there is no land when they can see nothing but sea.....'Francis Bacon', quoted in 'Indalink'] It is being mentally alert to ideas that may be discovered in your surrounding environment. "It means looking at everything with your mind as well as your eyes."

A couple of examples will illustrate this—Galileo was loafing and finding peace for his soul in a cathedral when he saw a great lamp swing to and fro. From this he conceived the idea of pendulum. Lissajous was sun-bathing on a beach when he thought of us-

ing sand as a method to define his well-known periodic functions.

The great thinkers in history had at least one thing in common. They were men who kept their mental doors open for stimuli to cause creative action.

When the ideas come through your open mental door, write them down. Many excellent ideas have escaped on the 'wings' of forgetfulness. A Chinese proverb says, "The strongest memory is weaker than the palest ink". Keep your note book handy at all times. Note them down as they strike.

There is one word of caution here. Don't attempt to judge the ideas at this point—write all of them down. 'Capture' the ideas in your note book.

VERIFICATION *The Step of checking, evaluating and polishing ideas.*

There is a sound wisdom in having verification come at the end of the creative process. It should not interfere with the three previous steps. To interject judgment and critical analysis will freeze the flow of ideas. Create a stockpile of ideas but don't attempt

to judge their values until you arrive at the final step.

The gathered stockpile of ideas through evaluation, be a gold mine of possibilities. Those, at first humorous, may, analysis contain a hint for completely approach to your problem. A new product, or simplification of a complex circuit may well be derived from what is originally "far-fetched" or even crazy. Some ideas will be discarded, of course, but many will be found priceless. It is worthwhile to use this slogan for engineers: "Let your imagination soar—then 'engineer' it down to earth."

In summary, 'ideas' are the beginning of the things created by man. The power of ideas brings new inventions to forth, the power that increases your business, the power that opens new doors of opportunity is the power of creative thinking.

The new and revolutionary developments in processes, designs, mechanization, selling are the results of creative ideas generated by curious, imaginative, satisfied, daring minds. Leadership of a country and for you as an individual depends upon your effort in 'creating'.

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"We come closest to greatness when we are great in humility...."

- Rabindranath Tagore

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"Purity is to accept no other influence but only the influence of the Divine...."

--Sri Aurobindo

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Sri S. B. Chavan, Hon'ble Minister for Water, Power, Buildings and Communication, Government of Maharashtra. Inaugurating the Session



Shri Bal Shah, Hon'ble Minister for Law and Public Health, Government of Maharashtra. Advising the Students.

ANNUAL COLLEGE GATHERING



President Dr. K. M. Munshi being received by
Staff and Students.



The Chief Guest being received at the College.

KRISHNA K. CHAWLA

Professor in Economics and Business Organization

'DEVALUATION OF RUPEE'

"I approve of the Prime Minister's decision to devalue the rupee. It ought to have been taken at least four years earlier. I congratulate Mrs. Indira Gandhi on the wise, bold and realistic step, which if followed up, appears to herald a new policy in the economic and political life of the country."

K. M. MUNSHI

IN a broadcast on the 5th June 1966, the Finance Minister pointed out the Government's decision to change the par value of rupee from 18.66 grammes of gold to 11.85 grammes of gold. This involves a reduction in the external value of rupee by 36.5%. In practical terms, this means that the value of a U.S. dollar is now Rs. 7.50 as against Rs. 4.76 so far and the pound sterling Rs. 21 as against Rs. 13.53.

As in the case of any other commodity, the price of foreign exchange should be fixed on the basis of strictly economic considerations. It should reflect the economic realities of the country. It should serve the main purpose of a policy which is to enable and facilitate the efficient allocation of resources. The value of rupee, because of internal rise in prices, had fallen considerably but the prices have risen to this extent in the main countries of the world with whom India trades and consequently Indian exports were meeting increasing resistance in the foreign markets. At the same time our need to increase our foreign exchange earnings had become greater. In order to overcome price resistance to Indian exports in foreign markets, our Government tried many measures such as subsidising exports in several ways—by import entitlements, by direct subsidies and by tax credit certificates. Because these measures succeeded only to a limited extent

and because our difficulties had been permanent in character, India had therefore, decided to devise a more enduring and reliable way of restoring and increasing the competitive power of our exports. The change in the par value of the rupee or DEVALUATION as it is called, will enable an exporter to get Rs. 750 as against Rs. 476 so far, from \$ 100 earned by him. This will not only give a very strong stimulus to export effort but it will provide a strong inducement for the flow of investment into export industries and thereby progressively strengthen our export position. Devaluation will also quicken the pace for import substitution. The cost of imports in terms of rupee will go up making it worthwhile and attractive for Indian industrialists and entrepreneurs to invest in those industries which produce goods which are still being imported. Enduring encouragement to both exports and import saving activities, it will enable us to move faster towards self reliance allround. Moreover, the remittances to India will be encouraged and remittances out of India will be discouraged. The foreign exchange burden arising from repatriation of profits, capital and royalty payments by private foreign investors will automatically go down. On the other hand, new private investors who bring foreign exchange into the country will be able to realise more rupees and this would serve to encourage

new foreign investment. Similarly India will become more attractive to foreign tourists whereas foreign travel by Indians will become more costly and therefore less attractive. At the older rate of exchange anti-social practices such as under invoicing of exports, over invoicing of imports, sale of travellers cheques in the unofficial markets, remittances through unauthorised channels, smuggling of gold and other articles would also receive a check since at the new rate they will become less attractive and therefore less widespread. With the reduction in the leakage of foreign exchange through these means, our official foreign exchange reserves would get strengthened.

While discussing the need for devaluation of Indian rupee Mr. N.A. Palkhivala pointed out that 'Devaluation was desirable in as much as legal recognition of a long standing factual position is desirable. It was advisable in so far as international business, like internal trade, has a better chance of thriving under natural conditions than under artificially fixed ratios. It was equitable and necessary to restore the balance between the importer who had been paying too little for foreign goods and the exporter who had been forced to charge foreign buyers of Indian goods too much. It was unavoidable since the rupee had fallen to less than half its value in parity with sterling and the dollar. Devaluation was inevitable since our Government had been living beyond its means and beyond our means for ten years.'

There is the common fear that by devaluation our debt burden has gone up. India has been borrowing from abroad for development on a substantial scale and our burden of debt repayment is continually increasing. In terms of foreign exchange, neither the total value of the debt nor the annual payments will change as a result of devaluation. In terms of rupees, of course the burden of repayment has gone up. But against this, the budget will also benefit from devaluation in a number of ways e.g. export

duties on traditional items of export yielding substantial revenue, and the going up of the rupee value of foreign aid. On balance it is expected by the Government that devaluation will have no adverse effect on the budgetary position.

No Government devaluates its currency unless it is forced to do so by harsh necessity. In the case of India such compulsion had existed for sometime. It became clear during Mr. Asoka Mehta's visit to Washington that regular flow of foreign aid in future would largely depend on the action taken by this country to ensure the external viability of its economy and peg the rupee at a value which would reflect its true relationship with other currencies. The authorities of the International Monetary Fund and the World Bank gave the Indian government their advice that the loan which we require could be given at the real intrinsic value of the rupee and not at the exchange rate artificially maintained. They have the right to say that they cannot lend us a dollar for Rs. 4.76 and a pound at Rs. 13.33. Hence they gave us their advice and left the choice to us.

The root cause of devaluation in the view of many economists, was the attitude of the Planners who were adamant not to cut down the size of the Fourth Plan which runs into phenomenal figures quite out of proportion to the financial position of the country. The planners would not listen to any advice to cut the cost according to the size of the cloth. The size of the Plan had indeed to be judged not by what is desirable but by what is possible. A seemingly smaller Plan in terms of financial outlay but executed without experiencing a price inflation may indeed in terms of physical output no smaller than a larger financial Plan whose size contains a sizable element of price inflation traceable to significant credit creation. The economist or politician who is willing to trade away price stability for an unexpected higher rate of economic growth may end

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pay for an air conditioner the price
a motor car; and pay for a motor car
of a house after waiting ten years
the privilege of paying it. India's decision
the rupee confirms officially the
that during the past few years of our
planning. India's economy has
the doldrums. What has been a com-
experience all these years has now the
seal of approval. Devaluation
of Mr. Dandekar was the inevit-
consequence of the ruinous economic
adopted by the Government over
ten years. Hence he approves the
to devalue the rupee only in the
which he would approve a declara-
of insolvency by an insolvent who was
determined to mend his ways so as
to start again.

EFFECT ON MASSES

Devaluation is too complex a business for
men to understand all its im-
plications. Being an essentially long term
devaluation has, as was only to
be expected made people to sit up and think
about what has gone wrong with the coun-
try's economy. But what of the people living
in the country which has devalued? In ad-
vanced countries, which are heavily indus-
trial and technologically strong, the
effect of a devaluation is relatively rapid and
it affects nearly everybody. But in
India the effect of devaluation has not been
felt by a large portion of the popu-
lation who have little to do with foreign trade or
imports at all. This is the sector of the
economy which feeds itself as best as it can
on local products, with only small
quantities of such as radios, bicycles and torches
which are paid for in money. So millions of In-
dians have little or care less about Rs. 21
per pound of Rs. 7.50 to a dollar; a hand-
ful of handbags is the only 'currency' they
use at the moment. But there will be

some effect for a large number of ordinary
people. If a worker taps rubber or plucks tea,
then his industry may do better because of
devaluation; there will be more jobs and
jobs will for the time being more secure.
But if a worker sweeps a factory and that
factory depends upon imported raw ma-
terials or imported machinery, then he may
be sacked because the cost of imports will
rise.

An increase in the cost of imports is an
essential feature of devaluation. Devalua-
tion while it has created conditions in which
country can resume its march for develop-
ment, it would be extremely difficult to pre-
vent rise in the price of such essential goods
as food and cloth. The government can
manage to subsidise some of the industries
but it will not be able to prevent the rise in
prices as a result of increase in the cost of
new plants. It is only to the extent devalua-
tion leads to liberalisation of essential im-
ports, gives a fillip to production and pro-
mote dismantlement of controls, it would
help the process of growth. Devaluation by
itself will neither achieve healthy growth nor
avoid recurrence of balance of payment dif-
ficulties unless certain essential austerity
measures are immediately taken. A success-
ful implementation, in the view of Munshiji,
of the decision to devalue the rupee would
require (i) pruning the size of the Fourth
Plan to our resource potential, (ii) encour-
agement of Swadeshi spirit, (iii) greater
and larger incentives for the private sector,
(iv) a simplified and less burdensome taxa-
tion structure, (v) an unambiguous declara-
tion regarding the economic and political
goals of the country and (vi) setting up of
a non official body consisting of experts, re-
presentative industrialists and spokesmen of
all parties to maintain a constant liaison with
the Government.

Some of the suggestions put forward by
economists and politicians to counteract the
evil effects of devaluation include drastic

economies in public expenditure in the Central and State budgets including all non-Plan Public expenditure whether developmental or otherwise excluding that on family planning, technical education and infrastructure public utilities. All efforts must be concentrated on increasing domestic production. All unutilised capacity must be put to use. All imports must be scanned by a national committee to ensure that imports of non-essential are cut out. Steps must be taken to provide employment to unemployed labour class. India loses between 20 and 30 crores of man hours a day because of under employment and unemployment. Inflationary pressures can certainly be checked by adopting sensible fiscal and economic policies. What we need are curbs on budgetary deficits, fewer controls, more incentives, more fertilisers and imported raw materials and components, fewer additional public sector projects and a sensible rephasing of our development programmes. We also need less advice to the people from the Government.

There must be an end to corruption which has been on the increase since we became independent. The public sector undertakings have not been bringing any returns. 50% of what the Government spends goes into the pockets of officials, contractors, politicians and middlemen of other kinds and only 50%

yields a return. Even those who manage cooperative societies, social service institutions and indeed religious and charitable endowments misappropriate funds. This state of affairs is a sorry blot on the economy. Steps must be taken to increase the profitability of investment. Moreover, the emphasis in production has to be shifted from schemes which take a long time to fructify to schemes which will yield increased production quickly. Any tendency to favour a particular project merely on the ground that foreign exchange for it is likely to become available will be the height of folly. Every project should be tested on the touchstone of how it will strengthen the national economy. A quick look at the programmes, from the point of the new angle is essential if the country is not to face again conditions similar to those that brought about devaluation.

If we put our house in order, devaluation will be of immense benefit in our development plans. No doubt devaluation involves hardships the hardship of the unceasing responsibility of the private sector hold price line as far as possible, even the cost of making a dent in the existing profit margins but these hardships have to be faced and responsibilities shouldered. Our economic history is to be prevented from repeating itself.

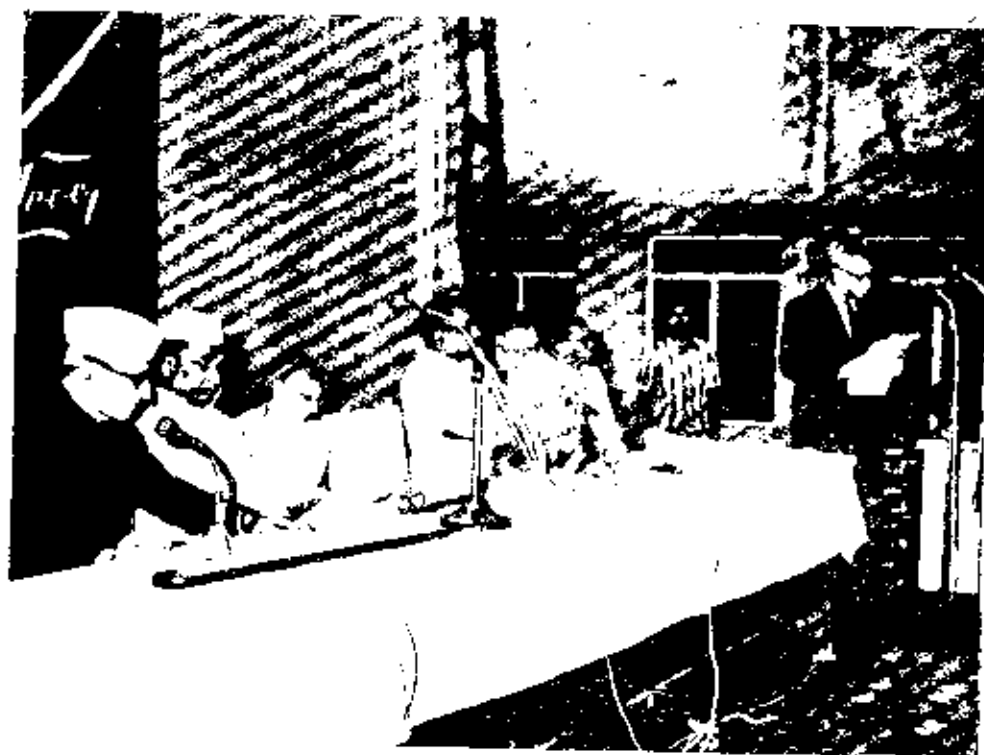
★★
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"If one keeps firm, falls do not matter.
One rises up again, goes forward....
Mistakes made on the path are often even
more instructive than the mistakes made
by turning aside from the path....
If we stumble, it is to learn in the end the
secret of more perfect walking...."

—Sri Aurobindo

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Principal R. H. Chukhasatia delivering his Welcome Address.



Dr. K. M. Munshi Addressing the Gathering



Manshi Addressing the Gathering.



Chief Guest Sri S. B. Chavan Addressing the Gathering.

TRANSISTOR AUDIO AMPLIFIER

By Harcharan Singh B. E. (Mech)

HERE is an amplified circuit for hobbyists. What is an amplifier? You must have seen some person addressing a big meeting. It is an amplifier which helps him to be heard all over. He speaks through the microphone. His voice is amplified by the amplifier. You must have seen the amplifier too. It is a box type container, very heavy and difficult to carry. It works on mains.

The amplifier, given below, on the contrary is very light, weighing not more than 100 gm. It works on torch cells and can be carried in a soap-size box. It will amplify your voice more than ten times.

One special feature of this amplifier is that it carries no transformers. Transformer is the heaviest and the most bulky part in any radio or amplifier circuit, so by the elimination of transformers, the weight and size of the amplifier has been reduced considerably.

The components to be used are listed below:

R1—100K R4—1.5K
R2—10 K R5—200 ohms
R3—5 K R6—200 ..
R7—200 ohms
R8—50K ohms R9—1 K

C1—10 mfd-3V
C2—200 pF
C3—100 mfd-12V
C4—100 mfd-3V
C5—1000 mfd-6V

TR1—AC 126 (PNP)
TR2—AC 152 (PNP)
TR3—AC 127 (NPN)
TR4—AC 128 (PNP)
TR5—AC 128 (PNP)

Others

Two Loud Speakers—each of 8 ohms
Disc Volume Control.
6 Volt Battery.
Switch etc.

How To Assemble

Before we proceed with the assembling, here are some points to note down:

A transistor has 3 leads. One lead is marked either by a triangle or a coloured dot. This lead is the collector (c). Now holding the transistor in such a way that the leads face you, and counting anticlockwise, will give you Collector (c), Base (b) and Emitter (e). Another way of finding c, b and e is that the middle lead is always base (b), collector (c) is marked with dot and the third lead is therefore emitter (e). Whether the transistor is PNP or NPN, the method of finding c, b and e is same.

All the capacitors are marked positive and negative and should be connected accordingly. 200 pF capacitor has no polarity and can be connected anyway.

R-3 is a variable resistor for controlling the output volume. A disc volume control is used here.

A disc volume control has five terminals, two extreme and three (the smaller ones) intermediate. Out of these three, any two consecutive terminals may be used. Rest three terminals are not to be connected anywhere. It will be better understood from the figure given below:

Use the terminals 1 and 2 or 2 and 3 and leave the others unconnected.

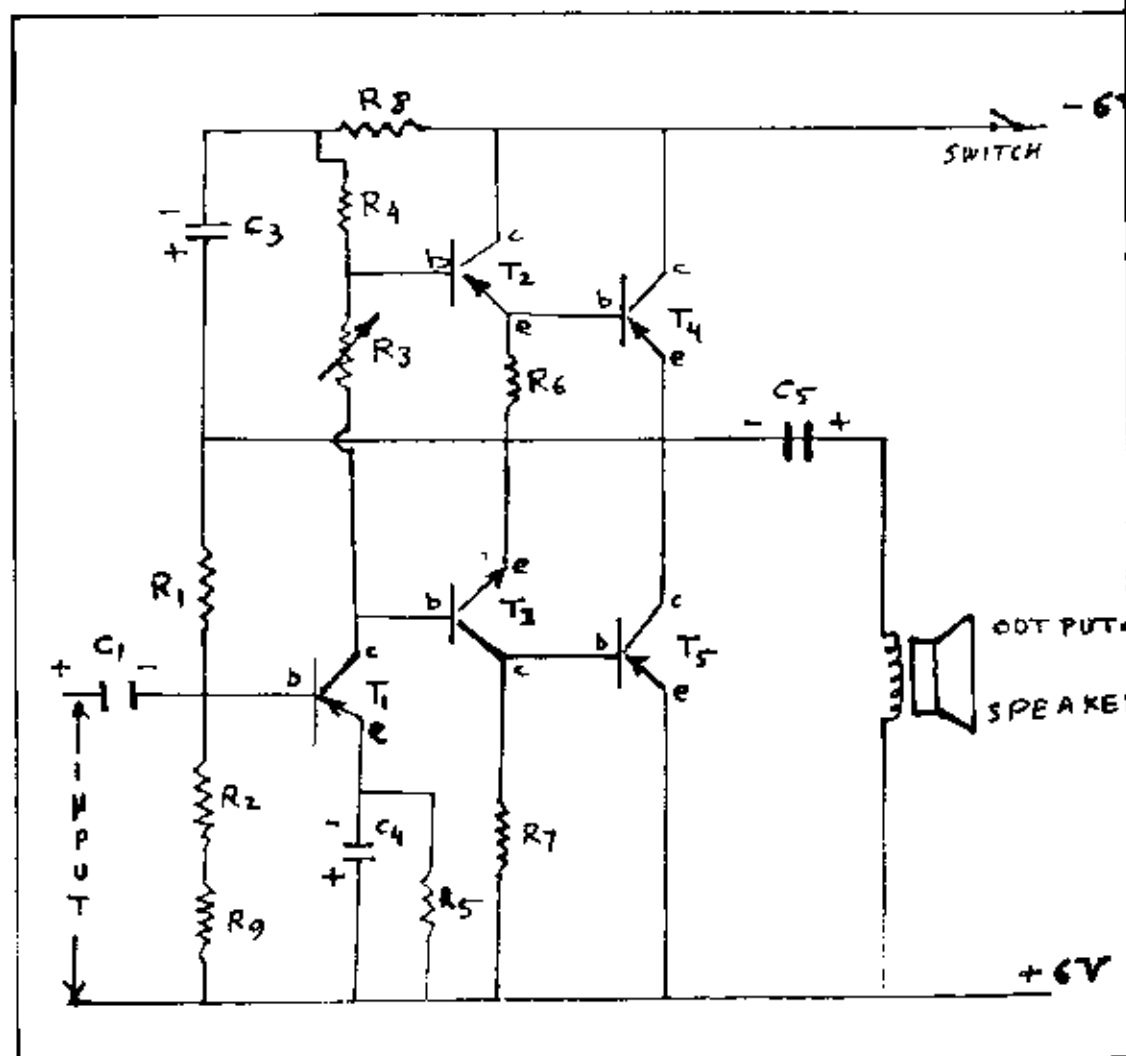


FIG. 1

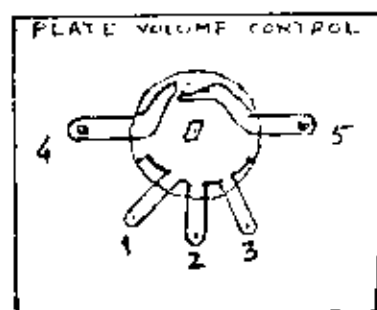


FIG. 2

SWITCH

OUTPUT
SPEAKER

+6V

Now we proceed with assembling. Take a piece of size 5" by 4" by 1". Fix the metal plates on this wooden piece of nails. These metal plates should be sanded with sand paper, on the top surface. Fix some nails in the wooden

piece separately, as shown in the following diagram. Nail-heads also should be cleaned with the sand paper or file. Now solder the components on the metal plates and the nails as shown below.

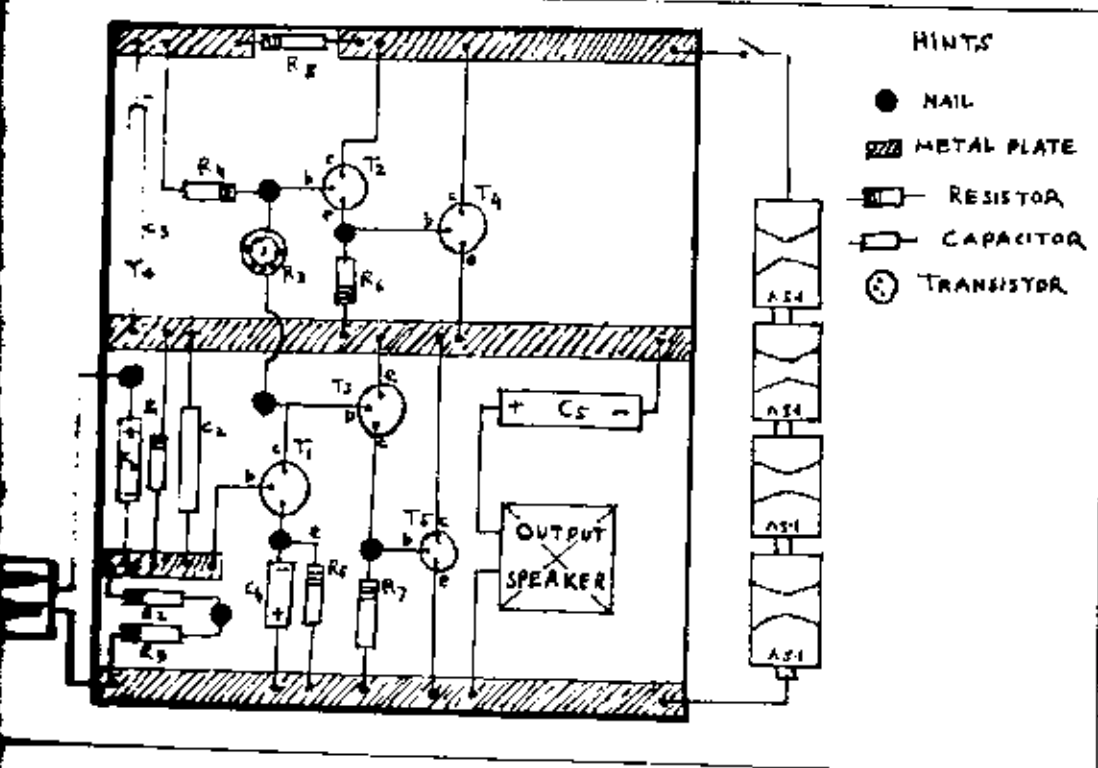


FIG. 3

6.1

If you don't have a soldering iron, another way of assembling is to connect the resistors and capacitors by neatly tying them together with wires. However, this method is definitely much superior to the first.

The input and output speakers are of 8 ohms. Connect any one speaker in the input and the other in the output. Put the battery in the output. Put the switch in the input. You will hear your voice very

This amplifier can be used to address a small gathering, to hear a radio whose volume has run down (by putting the input speaker in front of the radio) and as a "telephone" by connecting the two speakers through a DPDT switch.

The amplifier will give a better performance when worked on 9 volts instead of 6 volts. But for this, two resistors of 1 ohms each should be connected in the emitters of transistors T4 and T5.

★

SOME SOLID-STATE DEVICES

Prof. Mrs. P. M. Bhide

SEMI-conducting devices: A semiconductor is a material whose conductivity lies between a good insulator and metal.

(a) Two terminal devices: Diodes are two terminal devices and are classified under two major groups

1. Metal semiconductor diodes (i) cuprous oxide (ii) Selenium (iii) point contact Silicon and Germanium diodes.

2. Junction diodes (i) Germanium (ii) Silicon diodes.

1. (i) Cuprous oxide metal diodes: These consist of a disc of Chilean copper which has been heated in an oven at 500 degree centigrade to acquire a coating of red oxide of copper. The copper side acts as one electrode and a counter electrode of graphite or lead is painted on the other side.

(ii) Selenium metal diodes: These consist of an iron or aluminium plate on which is deposited a layer of amorphous Selenium (If iron plate then coated with Nickel and Aluminium coated with Bismuth). Selenium is painted, sprayed vacuum deposited or plated on the prepared surface. On the Selenium layer is applied other contact material or counter electrode by liquid chemical baths or gaseous fuming baths. Rectification takes place between Selenium polycrystalline layer and counter electrode. Selenium acts as anode and counter electrode as cathode. (See, fig. 1).

(iii) The point contact type or catwhisker diodes as they are called can be subdivided into two main categories. The high back voltage type and the crystal detectors. The design of these two types is slightly different but the manufacturing process is almost the same. The high voltage type uses higher sensitivity extrinsic semiconductor usually n type while crystal detector uses

low resistivity material. The cat whisker a fine point or gold wire bent in the form of letters C or S. It is pressed on a semiconductor Germanium or Silicon pellet. The crystal assembly is sealed in moisture proof casing.

2. Junction diodes— P-N junction diodes are more common and reliable type. Both Si and Ge are used extensively but Si has the advantage of higher power operating temperature and reverse voltage. Kc on the other hand offers lower forward resistance. P-N junction can be fabricated in two ways. Firstly it can be made by the fusion of proper donor or acceptor impurities or the alloys to the opposite faces of a small crystal wafer. Secondly the rectifying junction is built into the crystal during its growth by either dropping or altering the rate of crystal growth. P-type material contains fixed negative charges and immovable holes and N-type material contains fixed positive charges and free negative charges or electrons. When in a P-N junction p type material is made positive with respect to n type region (i.e. forward biased) electrons from n region move freely in the p region. However both of these movements constitute a current from n to p to N region. Thus the application of forward bias to a P-N junction provides easy current flow. In the case of reverse bias i.e. (N positive and P negative) the current can't flow easily because electrons can't move from N to P and holes from P to N easily. Thus it acts as diode to get very small back current. Impurities of both the regions must be rigorously adjusted.

Tunnel diodes: In certain junction diodes it has been found that the current voltage characteristic do not conform to the shape theoretically predicted by the usual diode equation. Diodes with this peculiar

ICES

Let whisker is in the form of a semiconductor crystal. The crystal is moisture proof.

junction diode is of the type. Both Si and Ge but Si has the higher operating temperature.

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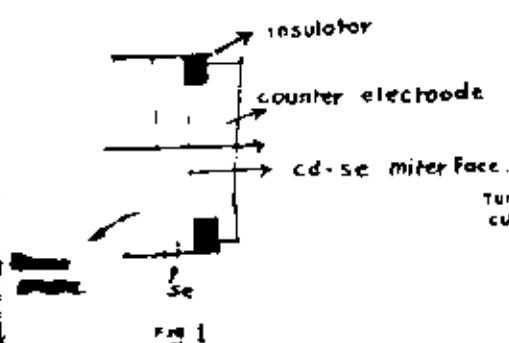


Fig 1

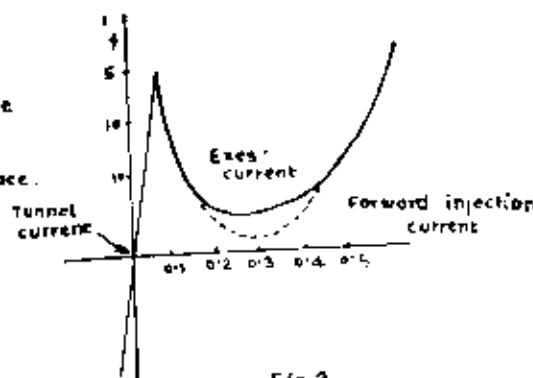


Fig. 2.

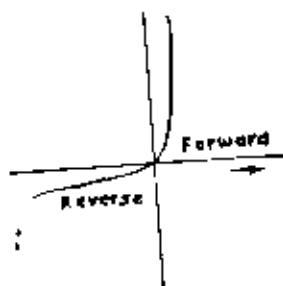


Fig 3.

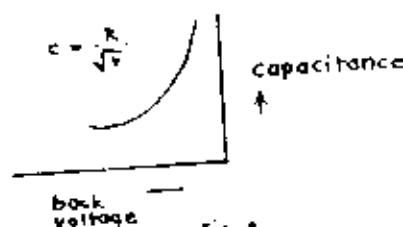
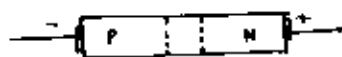


Fig 4

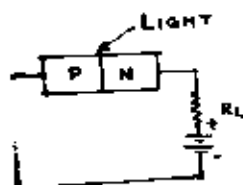


Fig. 5.

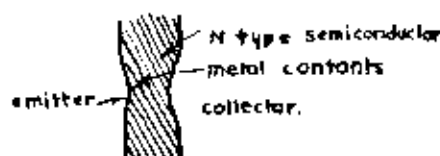


Fig 6.

characteristics were observed and explained by Esaki in 1957 and are called tunnel diodes. They show negative resistance characteristic in a limited range. (see fig. 2)

The tunnel-diode effect controls the current at very low values of forward bias where the normal injected diode current is very small. The electrons on one side of potential barrier will leak through the barrier if it is very thin. The barrier must be of the order of 100 Angstrom thick. In the case of p-n junctions it is possible to have such thin barriers if P and N type materials are both very heavily doped. The effect of high doping is that donor level widens and overlaps the edge of the conduction band and in p type material Fermi level moves into the valance band. These are used in high frequency circuits because tunnel current is carried by majority carriers which are very fast, junction capacitance is very small and temperature effect is very little.

Zener and avalanche diode: In some diodes breakdown is observed as a sudden increase in reverse current at the same voltage. The sharpness of the knee and shape of the characteristic vary in details usually the current is limited by the external circuit resistance. Two mechanisms can be used to explain this type of breakdown. One of these is Zener breakdown and other the avalanche breakdown. Zener breakdown occurs in the case of narrow junction and in this case breakdown voltage decreased as the temperature is increases. Avalanche breakdown occurs in wider junction diodes and the breakdown voltage increases with the increase in junction temperature. This is due to internal field emission. Internal high field results due to thin junctions when many electrons pass the potential barrier formed by forbidden band. As the temperature increases the forbidden band becomes narrower as a result Zener emission increases and Zener breakdown occurs at low voltage. (See fig. 3)

Avalanche breakdown occurs due to ionisation process. In P-N junction electrons are accelerated from P to N region. Normally they have scattering collisions which do not allow enough energy to build in one free path but if the field is large the energy built up in one free path may be high to excite another electron from bonded state raising it into conduction band and leaving a hole in the valance band. These two can again cause ionisation. At higher temperatures mean free paths become shorter and large field is needed to cause ionisation and high breakdown voltage is observed.

Semiconductor variable capacitor: The region of P-N junction where holes and electrons combine is known as depletion region. When such a diode is biased in the reverse direction an insulating charge free layer builds up whose thickness depends on the reverse d.c. voltage. This layer is a low loss dielectric since any charge generated there are quickly swept out and produce no effect upto rather high frequencies. The junction can be considered as a capacitor whose value depends on the d.c. voltage applied to it. For a Ge P-N junction capacitance changes in 3:1 ratio with change in 15 volts bias. (See, Fig. 4).

L.J. Giacoletto and J. O'Connell designed high Q capacitor junction diode for v.h.f. Such a diode is independent of temperature and has no hysteresis loop up to frequencies of many thousands of megacycles.

Thermistors: A thermistor is a resistance with a high negative temperature coefficient of resistance. These are semiconductors and their resistance changes with temperature. These are usually made of fused oxides of Manganese, Nickel and Cobalt and are very stable for long length of time. Their resistance changes about 4% per degree centigrade change in temperature. They can be used as sensitive bolometers for microwaves or visible light if connected

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Fig. 7

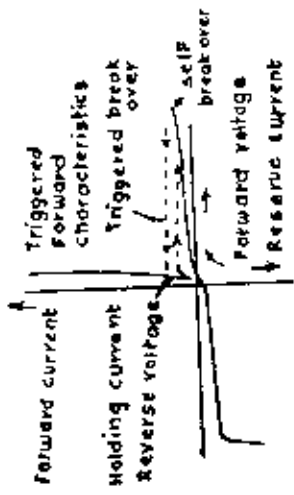
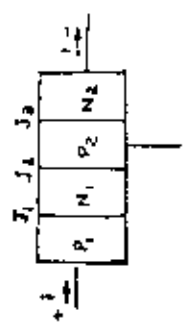


Fig. 8.

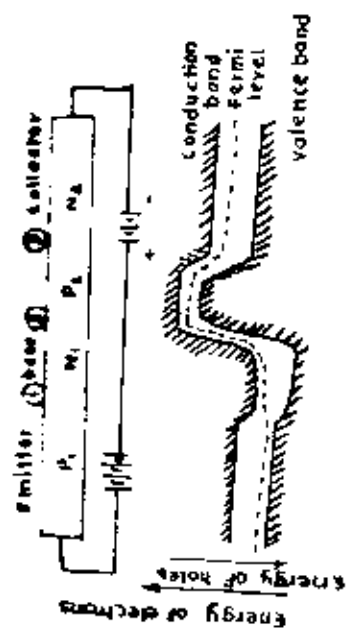


Fig. 9

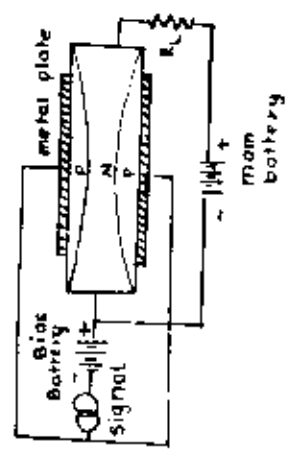


Fig. 10

bridge circuits to balance out ambient temperature changes. It is also used as a non-linear circuit element as carbon filament light bulb, automatic volume controls, level indicators, oscillators, filters and modulators.

Other non-linear resistances have been used for surge protection of power systems e.g. thysite and metrosil. Silicon carbide varistor is a symmetrical circuit element and can be designed to withstand several hundred kiloamperes for short duration. These are connected in shunt across the element to be protected. Because of their non-ohmic character they draw very little current but pass current easily when the voltage rises to several times the normal value. Mathematically their characteristic is represented by an equation of the type $I = KV^n$ where range of n is from 4 to 6 usually.

Semiconductor photodiodes:—The generation of free carriers across an unbiased P-N junction as a function of light is not very significant as compared to the thermal generation of mobile carriers. In order to make P-N junction more sensitive to variation in light intensity thermal generation of mobile carriers must be kept to a negligible value which is accomplished by applying reverse bias to the P-N junction. In this condition a small magnitude of reverse current of reverse biased semiconductor diode flows. This is called "dark current" since it flows in the absence of light. When the junction is exposed to light radiation the photons bombard the junction area and a number of minority carriers acquire sufficient increments of energy to permit them to break their covalent bonds and migrate across the junction. Only minority carriers in the immediate vicinity of the junction contribute to this flow of reverse photo-current, and those liberated at relatively great distances from the junction undergo recombination before they reach the edge of the junction. The dark current can be kept down to less than 10 microampere by proper reverse biasing

and the diode being reverse biased its impedance is high in the order of 1 to 10 megohms. The light aimed at junction may be modulated and the diode photo-current will follow the variations in light intensity upto 500 kc/s. (See Fig. 5).

Three Terminal Devices

Transistor:—Transistor action is the control of currents or voltages in one junction by currents or voltages in another junction. This control is possible because the minority and majority carriers which flow across the junctions are controllable.

(a) *Junction transistor* consists of two P-N junctions on the opposite sides of a thin slab of semiconductor crystal and can be viewed as two diodes connected "back to back" sharing a common element the base. The first diode is customarily in the forward bias condition and the second is under the influence of the reverse bias. There are two types of transistors NPN and PNP. To construct it a dot of the correct impurity type is placed on each side of thin section of the semiconductor crystal and the subsequent heating cycle forms a pair of alloy junctions. The collector junction is made larger than the emitter junction to improve the collector action. Except for this the transistor will be symmetrical bilateral device i.e. it would function as a good amplifier in either direction if proper bias voltages were applied.

(b) *Point contact transistor* consists of two point contact diodes which are very close together. The current in either diode will have an important effect upon the current in other diode. By biasing the diodes properly power amplification of electric signals is obtained. The spacing between the contacts is only a few mils. The contacts are applied to a carefully treated surface and usually electrically formed in some way. One of the points is designated as emitter and biased in the forward direction the other as the collector and biased in the reverse direction. Third contact is the large area contact

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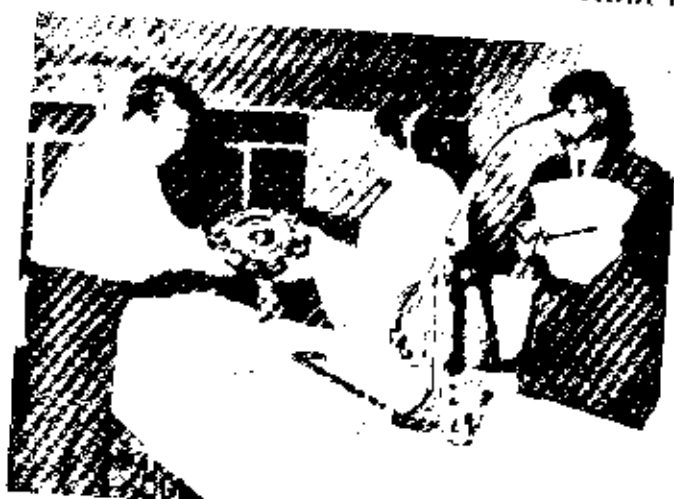
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Shah G. B.
Capt. in the
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placed on the back of the polished Ge. An increase in the emitter current results in a corresponding increase in the collector current thus amplification is achieved.

Surface barrier and diffused junction transistors:—These are a junction for the operation of a transistor in a different manner from the **point contact** type. The junctions for the **surface barrier** type transistor are supplied by a **metal** and semiconductor rather than by two types of semiconductors. To form a **surface barrier** junction two jets of an electrolyte are sprayed against small slice of N-type Ge. Electrolyte being any type of solution capable of conducting electricity, with one jet of **one** polarity through the electrolyte the jet acts as an abrasive and etches the surface of the Ge. This is continued until the Ge thickness is reduced to a desired value and then the polarity of current through the electrolyte is reversed. This stops the etching action and the jet begins plating on the Ge electrode. The use of electrolyte permits a great degree of accuracy in controlling the thickness of the Ge layer. For this reason surface barrier transistors can be operated at high frequency. An N-type Ge is obtained between two electrodes (See Fig. 6).

Diffused base transistor: obtains its structure from the manufacturing process. A slice of Ge is placed in an oven where a layer of impurity is deposited on the surface. The impurity diffuses into the Ge forming a **base** region. The emitter is then formed on this diffused base and the original material is collector. With this process **base** regions are possible thus permitting very high frequency operation.

High power, high frequency and low noise transistors:—All transistors have certain features. They are generally small and the actual working volume seldom exceeds a cubic mm. This is true even for high power devices. In high power applications particu-

larly the heat dissipating structure is many times the size of the device itself! Further the transistor characteristics depend on the operating temperature to a great extent and special consideration must be given to the stability of transistor circuits as a function of temperature because power dissipated in the circuit will be large enough to cause large changes in the temperature of the transistor. Ge is good for devices operating upto 90 degree centigrade and Si can be used upto 200 deg. Centigrade and new high temperature materials are being developed. A slightly different geometry may be used for a power transistor. In this good contact to the base is assured by using a ring contact and the emitter area is large and placed between the base contacts. The collector is connected directly to a large mass of copper which acts as a heat sink. Almost all power is dissipated at the collector contact. A transistor constructed in this way will control about 12 Amps and dissipate over 50 watts when mounted on a suitable heat sink.

It is interesting to know the difficulties in the design of high frequency transistors. At higher frequencies the response is affected by the collector to base capacitance and base to emitter resistance. Further the base resistance should be decreased. (See fig. 6) i.e. conductivity of base region must be increased and thickness also increase. But we know that if the base region is made thick all the carriers released from emitter will not reach collector because of recombination in the base region and therefore the gain of the device will decrease. Thus the requirement of better high frequency response and better gain are opposite and a compromise has to be made in design.

For improving the frequency response if base conductivity is increased the collector breakdown voltage is decreased and collector and emitter capacitances will increase for which purpose the junction area may be decreased but by doing so we reduce power handling capacity of the junction. Thus the

power handling capacity decreases with increasing high frequency response. It is difficult to design a high frequency high power transistor by this technique.

Another technique that has been used is to make the base non uniform in structure i.e. by diffusing the base in the collector region and not having a sharp boundary between collector and the base. Since in this case static charges on the two sides of the junctions will diffuse through therefore the base to collector capacitance is decreased. PNIP and NPIN transistors make use of this technique.

In case of drift transistor which is of the diffusion type, the impurity concentration from emitter to collector is made to decrease in exponential manner.

Photo transistor: Fig. 7 gives the basic phototransistor circuit. Light is focussed at the collector to base junction. The emitter base region is forward biased as explained earlier. This is by virtue of potential divider circuit in the diagram. A PNP type transistor is shown. Any increase or decrease of current between collector and base will be amplified in the base to emitter by the current amplification factor. (Note that this is a PNP transistor). By increasing or decreasing the light on the collector junction the collector current increases just like in a photodiode. In case of phototransistor automatic amplification is provided. The dark current in typical phototransistor may be about 10 to 100 μ A and it can work upto frequencies as high as 100 kc/s. and therefore can be used in cinematographic applications.

Current multiplication or hook transistor:—In this case there are three junction instead of two and the energy level diagram assumes the typical shape as shown in Fig. 8 and hence the name hook transistor. It is also called PNPN transistor. In junction 1 the forward current flows from the emitter, and collected by the P_2 region as in a usual transistor however the junction

3 does not allow these holes to escape to the right side due to the typical shape of diagram and these holes are trapped in the P_2 region as a result the energy barrier of the junction 3 is lowered and enough current can flow from the battery, from right to left of junction 3. Current amplification is achieved in the process because the number of electrons flowing across junction 3 is much larger than the number of holes trapped in region P_2 . Thus although a basic transistor has a current amplification of less than unity here the gain is larger than unity. This is however very difficult to manufacture and two transistor in cascade would be found more economical in most of the cases than use of a PNPN transistor of this type.

Thyristor or Silicon Controlled rectifier:—Recently the Silicon controlled rectifier or thyristor has been a new competitor to thyatron and has almost completely replaced it in most of the applications.

The controlled rectifier, thyristor or silicon controlled rectifier is a piece of silicon PNPN structure as shown in Fig. 9. Its action can be understood by considering it as two transistors p-n-p and n-p-n collected with a common collector junction J_2 . With the polarity shown the current through this junction consists of three components. A current from collector P_2 to n_1 due to thermal generation of electron hole pair or leakage current I_{co} , a current $\alpha_1 I$ due to current injected in p_1 region, and third a current $\alpha_2 I$ due to electronic current in n_2 . The total current I must be sum of these three current thus $I = I_{co} + \alpha_1 I + \alpha_2 I$, or

$$I = \frac{I_{co}}{1 - (\alpha_1 + \alpha_2)}$$

If the sum of current amplification of the two transistors is less than unity then hardly any current will flow because the total current will be of the order of I_{co} . However if this sum can be brought to unity the current becomes infinite i.e. it

escape to the shape of the barrier of enough current from right amplification the number of holes through a basic junction of less than unity. manufacture could be found the cases than type.

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ification of than unity flow be- of the order be brought finite i.e. in

very large and the device is switch- from a nonconducting to conducting The forward drop of a device may be 1.5 volt at 10 amp.

Question naturally arises as to how one can increase the value of current ampli- In absence of any current through the base electrode known as control elec- the current in two directions will be as shown in fig. However if current is in- to the control electrode the value of is increased and the device can be turned from an "OFF" position. Thus it acts as a switch.

It is to be noted that the forward voltage can be increased beyond self breakover voltage which will cause puncture of the junction and control can be achieved only below this voltage.

Field effect or unipolar transistor: One feature of the transistor as a device compared to vacuum tubes is that its input impedance is much higher. emitter circuit is only upto 5 Ω and in common collector confi- of the order of 1 Meg. Compare with an input resistance of 20 meg. in a tube circuit and of the order of 10^{12} Ω in electrometer tube circuits. Transis- can be used where high input im- is needed i.e. in instrumentation.

Invention of field effect transistor has made possible to achieve input impedance of the order of 10 to 100 megohms.

Although its basic structure consists of functions physical operation differs from that of the basic junction type. The essential structure of field effect transistor is similar to P-N-P because of the presence of N type layer between two layers of P type material. The path of main current which contains the load resistor is shown by dark line in the figure. The N type layer provides the path of main current through the transistor, since the electrons are the majority carriers in N type the main current is composed mostly of electrons. It is the function of signal voltage to control the amount of electrons which flow through the N layer and thus control the main current. The signal voltage exerts this control by applying reverse bias to both P-N junctions. Because of circuit symmetry same action takes place at both the junctions. Reverse bias of P-N junction causes the majority carriers of both P & N regions to be drawn away from the junction which results in depletion region and hence increase in voltage barrier. When reverse bias is increase volume of depletion region increases, also the electrons withdrawn as available current carriers and this depletion effect provides control in the field effect transistor.

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"Vices are simply an overflow of Energy in irregular channels...."

—Sri Aurobindo

* * *

"War is a dangerous teacher and physical victory leads often to moral defeat...."

—Sri Aurobindo

* * *

"It is not what others think of you that matters but what you are yourself."

—Sri Aurobindo

Theories of Gravitation

Aiyer P. Sankara Narayan
S. E. (MECH.)

IT is known to all how the Theory of Gravitation was invented by Sir Issac Newton and the story of Apple that goes with it. This discovery of the gravitation marked the beginning of modern physics. Newton gave not only the reason and stated why the matter attracts matter but also stated the quantitative law which is well known as the inverse square law of gravitation. The inverse square law states that the attraction between two masses is proportional to the product of the masses and inversely proportional to the square of their distance apart. This law helped to find answer to several natural phenomena such as bodies falling on the earth; moon going round the earth, and motions of planets, which baffled the Greeks, centuries back.

The progress since Newton has been highly remarkable. Modern physics helps to explain most of the observed phenomena by four basic laws which describe the interaction of one piece of matter with the other. There are strong interaction forces, weak interaction forces, Electric magnetic forces and Gravitational forces. The strong and weak interaction forces can be studied only when an atom is split up. Of these four forces gravitational force is the weakest. To give an example consider the Electric forces between Electron and proton that form or constitute an atom of Hydrogen. The electric force between these particles is something like 10^{40} times the gravitation force between them (i.e. one lakh crore, crore, crore, crore, crore). But gravitation force, although the weakest was the first to be discovered because of the strange property it

only possesses. This property is that gravitation cannot be non-extinct. It will always be there and it can influence the surroundings. This is not true of Electro magnetic forces. These forces affect the matter only when it has an electric charge. If the charge is neutralised, the matter will remain immune to the electro magnetic field. But in the case of matter, as matter becomes greater and greater its influence or the force increases and it is the reason why earth a big mass of matter has such a gravitational force as to be easily conceived.

The gravitational force assumes serious proportions when the objects become as massive as sun. It is interesting to know what keeps the sun in equilibrium. If there were only the gravitational force of sun, all the particles in the mass of the sun would begin to contract, and if that contraction proceeded uninterrupted, it would sink to a point in a matter of hours. But the sun appears to be in more or less the same form from day to day. This would lead to the inevitable conclusion that there must be other forces present in the body of sun. It is now generally accepted that the nuclear reactions take place continuously inside sun converting the Hydrogen atoms into Helium. This process of nuclear reaction liberates tremendous energy which not only keeps the sun shining as bright as ever but brings in a state of equilibrium, opposing the huge gravitational forces tending to shrink the mass of sun. Thus gravitation plays a very interesting role in the universe. There are other strange effects also. If a live star is connected with a dead star like sun, the heat from

Sankara Narayan

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the star lives to the cold or dead star result-
ing in the loss of heat of a live star and at
the same time increase in the heat of the
dead star. As this process takes place the
pressure of the hot star reduces and it be-
gins to contract, but while undergoing con-
traction it becomes hotter. In the same way
the dead star receiving heat from a live star
expands and while expanding becomes
cooler. This phenomenon is quite the oppo-
site of what we observe on earth. The main
reason being that the gravitational force of
earth does not play such a dominant role
inside the stars.

Again Newton's Law of gravitation was
formulated in the back ground of absolute
space and time. But if two observers A and
B are in motion relative to each other their
time differs. A's watch goes at a dif-
ferent rate from B's watch. So what appears
to A as one foot may not appear to B as one
foot. Although this has been hard to ac-
cept, experimental evidence supports this. It
is considered that the motion of a body has got
to be considered in 4 dimensions, viz: three
of the space and one of the time. This con-
cept has been due to the fact that space
and time become related, and it was Ein-
stein who brought this revolutionary change
in physics by his special theory of relativity.
According to this theory, no physical signal
can travel faster than light. But according to
this theory, gravitational attraction is instan-
taneous and it propagates at infinite speed.
If a heavenly body ceases to exist, it's
effect would be noticed instantaneously by
everywhere in the gravitational force where
it exists. So some time to see the heavenly
body disappear. So the special relative
theory of EINSTEIN was inconsistent with
Newton's Law of gravitation. So Eins-
tein had to produce a new theory known as
General Theory of relativity which is per-
fectly consistent with his special theory of
relativity and at the same time agreed with

the Newton's Law when the gravitation was
very strong.

The basic idea behind Einstein's Theory
of relativity is that when gravity is present
in a region it cannot follow the geometry
of Euclid's. If three observers are stationed
at A, B, C, around the earth and if they
are asked to communicate with one another
by light rays, a triangle is described by the
rays. The triangle ABC formed is not a
plane triangle and the sum of these angles
is not equal to two right angles. This dif-
ference in the angle is too small to be ob-
served because the gravitational force of
earth is too small but the difference is very
well marked if the same observations were
to be held with sun. According to Einstein,
the clocks go slower in heavy gravitational
fields. Let two persons A and B be stationed
on a strong gravitational field, say on the
surface of the sun such that A is nearer
the centre and B is further away from the
centre; let A and B send the signals at
every one minute according to their clocks.
But when signal is received by B, he feels
that signal from A is not sent every minute
but at longer intervals, similarly the signals
received by A connotes that the signal from
B are sent at shorter intervals than a minute.
It is because of the fact that clock at A
runs faster than the clock at B. This effect
is due to the consideration that space time
is different from the ordinary concept of
time. Since the gravitational force of earth
is small the geometry followed on earth re-
sembles the plane geometry and hence the
Einstein's equations can be reduced to New-
ton's inverse square law.

Though Einstein's gravitational theory
can answer all the strange phenomena of
the motion of planets, etc. several new
theories of gravitation have been proposed
from time to time. This is because that all
the laws of Newton regarding motion of
matter are formulated with regard to same
relative back ground, and he postulated such

a back ground as absolute space. Absolute back ground, which Newton assumed has been the back ground in which the distant parts of the universe are non rotating. It is known that as the earth rotates, the stars, or a galaxy would appear to go round and from this it is possible to know how fast our earth is rotating relative to that distant object. According to Mach principle the measurement of inertia depends on the Newton's Laws of motion which are valid against the back ground of the distant parts of the universe. So the property of inertia is directly connected with the distant parts of the universe. Inertia is thus not a property of the matter but it is a property which a matter gets in the presence of the rest of the matter in the universe. If the rest of the universe is empty, the matter would have no inertia.

Einstein was impressed by this Mach's idea but he could not incorporate this in his

theory of gravitation. But now Prof. H. and Prof. J.V. Narlikar have given a theory of gravitation which begins with concept of Mach. The New theory has identical equations, similar to Einstein's and the observational predictions and theories are the same as Einsteins on a microcosmic scale. But there is only one difference, the new theory is based on the Mach concept that in an empty universe a particle would have no mass. It is in this respect, the new theory is able to state why the gravitation is attractive and not repulsive and thus why the Newton's apple would necessarily fall on ground and not fly up.

Reference:

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★★
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"Follow thou thy Star, thou shalt not fail
of glorious heaven."

—Dante

* * *

"We live in deeds, not days
In thoughts, not breaths;
In feelings, not in figures on a dial,
He lives most who thinks most,
Feels the noblest, acts the best."

—Swami Ramatirtha

Are Flying Saucers Real?

Naresh C. Mehta

BY S.E. (Elect), Roll No. 35,
S.P.C.E.

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On September 22, 1951, five orange-red unidentified flying objects were sighted over the Sheffield Airport, Washington. The Radar operators in the control room also got the blips on their scopes. The Ground Control Intercept order-ly Airforce jet pilots to chase these flying saucers. Flying at high altitudes, as their fighters moving at full power approached these disc-shaped machines took them and ascended in a vertical climb, disappearing in 3 to 5 seconds. Meanwhile, the machines were manoeuvring over the airport, at the tower of the airport terminal building. The Radar operators, in the control room, from their radar-sets, a speed of 300 miles an hour of these UFOs! True—no man-made aircraft can sustain a high speed.

Are these flying saucers real? Are these machines some secret weapons of the USA or the Soviets? Are these UFOs in the hands of the Soviets? These are the questions generated among the astronomers and the intelligence and military experts and aeronautical engineers. As a matter of fact, no one, on this planet, has found a proper explanation for these strange phenomena.

Flying saucers are sighted all over the world. Particularly, they are seen over the USA and their Airforce Bases in the various states. These machines are sighted over the most important key places of the US. They are seen over the atomic energy bases, Airforce bases and military research and Rocket laboratories, the Navy bases and the Civil Aviation

According to the sighting reports by various persons, there are three types

of these amazing machines:—

Type A Large cigar-shaped mother ships at very high altitudes such as 3,00,000 feet or so. They carry small ships and other saucers. Their estimated length is 600 to 1000 feet. The maximum recorded speed is 9000 mph. Unofficial reports say their speeds as 20,000 mph.

Type B—Disc-shaped machines of various sizes, ranging from 8" diameter to a diameter of over 100 feet. Radar-calculated speed is 5000 to 7000 mph. And the visual estimate is more than 11,000 mph. They are reported to be making abrupt turns, climbs and reversals and very swift acceleration.

Type C—Cigar-shaped machines, much smaller than the mother-ships. Their sizes are estimated from 100 to 200 feet in length. Their recorded speed is 1000 mph and the visual estimate is over 1,500 mph. They make less violent manoeuvres than the discs. The maximum speed is about 42,000 miles an hour!!

Now we discuss about their colour. In the day time, they are silvery white like aluminium. At night, they are sighted as having many types of colours. Usually, they are yellow, orange-red or red like a red-hot metal. Sometimes, they are seen blue, bluish-white or green. In some cases, they are seen with rotating red, green and blue lights, and two white rods from the top. But the latter reports are very few. As the saucers are always seen at a very great height, they can be seen as a bright red or white spot. But the jet pilots, who tried to chase their saucers, can give a better idea.

According to some reputed persons, generally, these machines are disc-shaped, some

reports say, that there is a central cabin, around which is a rotating ring, just like a flywheel with a central hub. They make very violent manoeuvres. They climb and descend vertically. They make sharp turns of 270° or more, at very high speeds. They seem to disappear in a very short time, indicating very swift acceleration. No terrestrial, man-made aircraft can make such manoeuvres at such high speeds.

It is believed that those creatures, controlling these machines, must be having some new, advanced method of propulsion, now unknown to us. Some scientists propose the magnetic theory of propulsion. They say, it is possible to get a very powerful resultant magnetic force by the combination of earth's magnetic field and that produced by the machine. We can get this resultant force in any direction, so the saucers can move in any direction with a high speed and with a swift acceleration. It seems, this is the most convincing theory of propulsion, at the moment. When this powerful force is produced in the outer ring, there is a very large current flowing in the rim. This is the reason, why the saucers do not come at low altitudes in inhabited area. If they come enough low, our fuses might go off. This explanation supports the theory.

All the scientists agree that these machines are controlled. They may be remote-controlled as there may be some very intelligent creatures—more advanced than our human beings in the ships, controlling these ma-

chines. It is believed that the manufacturers of these saucers are far advanced than us, in science. Every moment, they have to calculate the resultant magnetic force and make the necessary changes in the trajectory of the saucers. For this reason, they must be having some very accurate and quick devices, ever quicker than our modern electronic computers.

There are several opinions about these UFOs and the people, controlling them. Some say, they are secret weapons of the USA. Some call them as the secret weapons of the soviets. But the most general belief is that they are interplanetary. They may be coming from an inhabited planet of our solar system as they may be from a planet of a distant star, i.e. from the outer space.

Since 1947, these saucers are sighted, above our globe, but they have shown no hostile attitude towards us, upto this moment. So it is believed that those creatures from the outer space are observing our planet. If they are convinced, they may contact us, in the future, by radio-signals as by some other means. But we need not worry about the mass attack or any hostile actions, because we are also having the nuclear weapons, now-a-days.

Still some people cannot believe a disc-shaped saucers, moving at a tremendous speed of 42,000 miles an hour! It is an unsolved problem for the human scientists to solve in the recent future.

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"Happiness is the only good;
The time to be happy is now;
The place to be happy is here;
The way to be happy is to make others so."

Robert Ingersoll

VARIETY ENTERTAINMENT

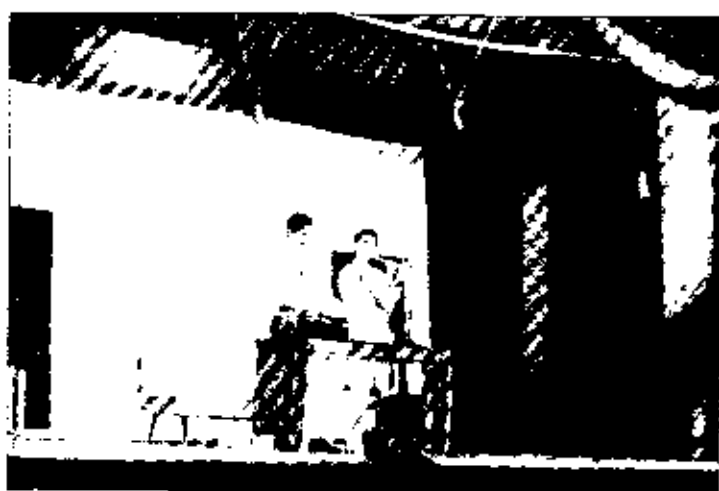
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S. C. Pawar, with
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entertaining the
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hilarious Music.



Kushi and his
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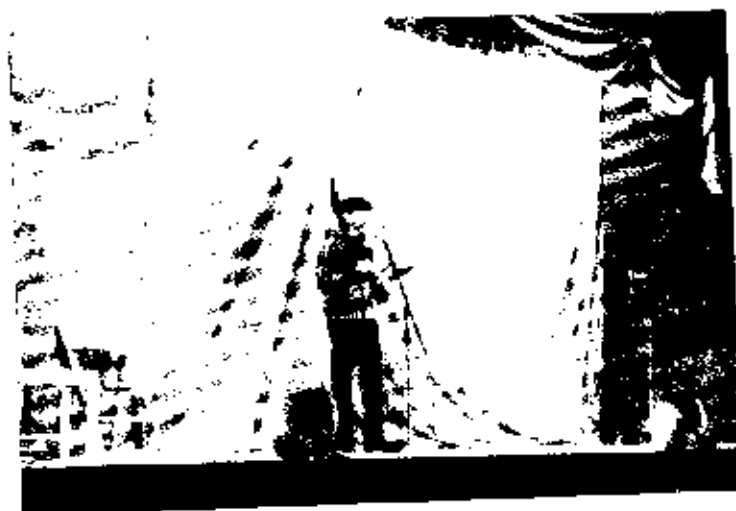


S. C. Pawar and
his orchestra
group.

VARIETY ENTERTAINMENT



Guest Mimic
Dilip



Contractor R. S.

Students' Trends

By
K. RAGHUVVEER PAI, S.E. (Elec.)

THIS year unfortunately there is a wave of violence sweeping throughout the country. Violence, as it settles nothing, destroys everything, has to be contained wherever and whenever it takes place. This is more so when there is violence among the students, who form the literate part of the society.

What are the reasons for this unrest among the students? Why are the students particular about the location of a steel plant? Why are they so sensitive to the question of boundary adjustment? Why are they as irresponsible as to stone 'The Temple of Learning'?

All these problems are complicated, and the solutions are still complicated. Ours is the largest democratic country in the world, there will be different angles of opinion.

These suggestions have to be accepted on the basis of the majority. For the majority, tolerance is the best medicine. There is no sense in indulging in violence which is creating another problem, instead of solving the previous one.

Whether a steel plant is located here or there, it will be in our Mother Country, that is India. Whether a piece of land belongs to one State or this, it belongs to India.

Whether this unrest is the shadow of the coming events or the mere reflection of the thoughts in the elders, it needs to be nipped in the very bud. Youth is the time when seeds of character are sown. If such seeds continue, the political freedom, which we have won against the mightiest, will have no meaning. When we have our own government, we should assist the government in resisting the odds, which

a young nation has to face. Permit me to quote Lenin: "You (students) have got three duties to perform and no fourth. Your first duty is to study, your second duty is to study, your third duty is to study."

Of course, the students alone are not to be blamed for this indiscipline. The overall rising prices, the increasing tuition and exam fees, the increased cost of books, the lack of efficient teaching staff, the lack of well equipped library, the growing unemployment, all have been the fuel to the fire of discontent in the students.

The authorities in power, should see that students are not in a position to feel that they are irresponsible and unwanted lots. They should impart education not merely from examination point of view, but with the real purpose of training them, for the task lying ahead of them. According to Herbert Spencer, "The object of education is to make a person most useful to himself, his family and his society."

Further, politicians should not monkey with the student affairs. Shri M.C. Chagla has rightly said that political parties should consider the educational institution to be 'sacred ground'.

Energies of youth should be channelised into fruitful and constructive channels. It is not true that we have lost the sense of unity. This we display only in times of acute external threat. Why can't we maintain this sense of unity for all the time? In doing so, we will be able to build a strong nation free from poverty, hunger and socio-economic inequalities. Let us strive to build a strong country in particular and hence a strong world in general.

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Some Interesting Solid-State Phenomena

By

Kunt. L. L. THAILAMANI, Physics Dept.

IN the article which follows, some specific solid-state phenomena of interest to circuit and device engineers have been discussed.

Superconductivity

Superconductivity is a strange phenomenon of nature by which certain metals and metal compounds actually lose all the electrical resistance suddenly at temperatures near absolute zero.

It was known a long time ago that the resistance of a metal decreases with temperature. In 1908, Kamerlingh Onnes liquefied helium for the first time. He then decided to investigate how the resistance varied in the newly-available range of low temperatures below 4.2°K. Now, according to the theory of electrical resistance, there are three possible forms of temperature variation of resistance in metals. In Fig. (1), curve (a) would occur if the resistance was due entirely to the obstruction of electronic paths by thermal vibrations, (b) would occur if obstruction by chemical impurities and other lattice imperfections such as missing atoms, interstitial atoms etc., was important, (c) would occur if the number of free electrons available to carry the current fell off rapidly at low temperatures due to 'condensation' on the atoms. Fig. (2) represents Onnes experimental results (1913). Resistance of very pure platinum became constant instead of passing through a minimum or of tending to vanish at the absolute zero. The constant value of the resistance turned out to depend strongly on the impurity content of the metal. The resistance of a wire of solid mercury was found to fall

to inappreciable values at the lowest temperatures which were possible. Thus the existence of a new state of mercury in which its resistance has practically vanished came to be known. Mercury was said to have passed into a new state, which on account of its extraordinary electrical properties may be called the superconductive state. Later investigations showed that the zero resistance was not just a matter of using a very pure metal. Addition of impurities did not prevent this drop to zero resistance.

As many as twenty-one metallic elements and a large number of alloys became superconducting, the transition temperatures being characteristic of the particular metal and varying from as low as 0.35°K for hafnium upto about 8 K for niobium. Superconductivity is neither the property of only certain metals, nor a particular type of crystal lattice is necessary for it to be exhibited. Two metals of same atomic species but having different crystal lattice—one shows superconductivity and the other does not, e.g. white tin is a superconductor and grey tin having a different crystal lattice does not become superconducting down to 1.3°K.

Next, considering the sharpness of the transition to superconducting stage, it is found that in 'ideal' conditions the transition is practically discontinuous, the observed breadth being due to slight inhomogeneity of purity or strain or to the effect of a finite measuring current. Fig. (3) indicates the influence of specimen quality on the sharpness of superconducting transition. In Fig. (1) pure tin single crystal (2) pure tin polycrystal (3) less pure tin polycrystal

Phenomena

lowest temperature. Thus the primary in which the finished ceramic is said to have been made on account of its properties may be in a state. Later, the zero resistance using a very small resistance.

Allic elements became superconducting at temperatures below 4 K for hafnium. Superconductivity of only certain types of crystal lattices exhibited. Two types but having shows superconductivity does not, e.g., and grey tin. Surface does not go to 1.3°K.

Sharpness of the transition stage, it is across the transition, the observation of inhomogeneous effect of Fig. (3) indicates a quality on the transition. (1) pure crystal (2) pure polycrystal.

The phenomenon of superconductivity is that the electrons pass through a superconducting metal without communicating their energy to the fixed atoms. The electrons are in a superconducting ring and move indefinitely without dissipation. The details of the theories put forward to explain the phenomenon of superconductivity are such that this combination of loss of resistance must be a consequence of some fundamental change in the structure or atomic structure of the metal.

Effect of External Agents on Superconductivity

(1) Magnetic Field. Fig. (4) shows that as a magnetic field is applied to the length of a long superconducting wire the resistance of the wire is restored. This restoration is absolute if the metal is perfectly pure and free from strains etc.) at a definite field strength which depends on the temperature and the nature of the particular metal. This field is known as the 'critical field' H_c . The relation between H_c and temperature is given by the equation, $H_c = H_0(1 - T^2/T_0^2)$ a parabolic relation.

(2) Frequency. The zero resistance of a superconductor is modified at very high frequencies of alternating currents. Up to a certain frequency the resistance is still zero within experimental accuracy. But for 100° C. H. G. has shown that there was a critical frequency below which there was a small resistance even below T_c (critical temperature).

(3) Nature of the Phenomenon: Superconductivity has led to a new family of so-called superconductors.

(4) Superconducting Magnets—These can develop fields of the order of 20,000 gauss (214,000 times more intense than the earth's). In such magnets, current can flow even if the applied voltage

is removed, provided the metal is locked up in deep freeze.

(2) The Cryotron—A superconductive computer component. It makes use of the fact that a magnetic field affects the superconducting transition temperature.

(3) Superconducting Magnetometers—These give a field resolution of small fractions of a microgauss.

(4) Galvanometers are constructed by using a single turn of superconducting wire. They can detect e.m.f.s. of the order of 10^{-12} volts.

Dielectric Phenomenon

The study of dielectric materials sprang from the practical need for insulators. A dielectric increases the charge storage capacity of a condenser by neutralizing some of the free charges which would otherwise contribute to the potential difference opposing the battery voltage.

Theories of dielectric behaviour could predict the possibility of what is called 'ferro-electricity' or spontaneous polarization. Polarization of the dielectric is the analogue of the magnetization of a magnetic material. Dielectric materials which exhibit spontaneous polarization are termed 'ferro-electric'. However, unlike ferromagnetic materials where spontaneous polarization is revealed by the presence of magnetic poles at the surface of the specimen, in ferro-electrics the polarization charge at the surface of a dielectric material is almost invariably neutralized by the acquisition of free counter charges either by conduction from within the body of the crystal or from some external source.

The occurrence of spontaneous polarization is associated with the phenomenon of pyroelectricity. Pyroelectricity is a state of electric polarity produced in certain crystals by changes of temperature. In this case the spontaneous polarization of the dielec-

tric is revealed by the variation of specimen temperature. Ferroelectric materials are a subgroup of the pyroelectric. In the straightforward pyroelectric effect, the direction of the spontaneous polarization cannot be reversed by the application of electric field. But in ferroelectrics, it can be reversed. Thus ferroelectric crystal can be 'switched' by the application of the field and a hysteresis Fig. (5) is associated with the switching. This hysteresis loop can be demonstrated on an oscilloscope by means of the circuit of Fig. (6). Thus the existence of a hysteresis loop is a proof of the presence of spontaneous polarization in the crystal. Ferroelectricity is generally exhibited below a specific temperature for any material called its Curie Temperature. Above this temperature, the thermal agitation is sufficient to destroy the co-operative ordering of the dipoles which gives rise to the spontaneous polarization. Spontaneous polarization is found to occur in highly specialized classes of crystals having a low symmetry. Examples of ferroelectric materials are: Uniaxial ferroelectrics Rochelle salt and related tartrates, lithium selenite. Multiaxial ferroelectrics Barium titanate, ammonium cadmium sulphate

Ferroelectric Domains: A spontaneously polarized, ferroelectric crystal will usually minimize its electrostatic energy by forming domains. Domains are regions, of area large compared with a molecule, in which the dipoles are all aligned parallel to each other. In a uniaxial crystal the domains will be 180° ones i.e. the polarization will be in opposite directions in adjacent domains. In the multiaxial crystals, adjacent domains may be polarized in directions having an angle between them. Domains can be rendered visible by suitable techniques.

Dielectric Devices

(1) Capacitors:- High permittivities of ferroelectric materials give rise to capacitors having large capacitance combined with small size.

(2) Dielectric Amplifiers:- Use capacitors, whose dielectric layer is a ferroelectric. Thus it has a variable effect on the capacitance depending on the impressed voltage across the capacitor.

(3) Space-charge limited Dielectric Devices:- The study of space-charged filamentary currents in dielectric crystals has led to a solid state analogue of vacuum tubes.

Magnetic Materials

Practically every electronic equipment today contains magnetic materials in one form or the other. Use of magnetic materials to improve the inductive components by reduction of magnetic circuits.

All magnetic materials are based on three ferromagnetic metals, iron, nickel and cobalt. Various alloys of these three metals plus various additions of silicon, tin, etc. constitute the host of magnetic alloys.

For use in high frequency coils, the material of the core must be in the form of powder or the so-called "dust core". To avoid high losses, the individual grains of the powder must be insulated by dielectric techniques.

Ferrites: A magnetic material is useful only when the losses accompanying the section of the material into an inductor are sufficiently low. The losses which are common in high frequency magnetic core materials are: (1) Hysteresis Loss which is proportional to frequency. (2) Residual Loss which is predominant at lower frequencies. (3) Eddy Current Losses. (4) The Power Loss which is known only by its manifestations and found in coils of unusually high distributed capacity. The loss is proportional to (frequency)².

In view of these losses, ferrites play an important role. Nature has provided prototypes of ferrites in the form of magnetite (Fe_3O_4) or lodestone. Ferrites are produced by using pure iron oxide

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-2 voltage

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Fig 1

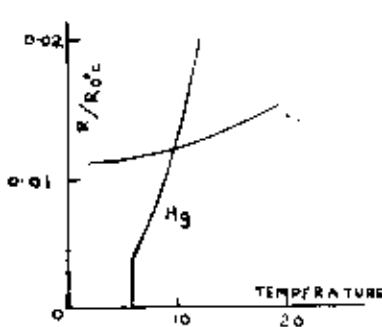


Fig 2

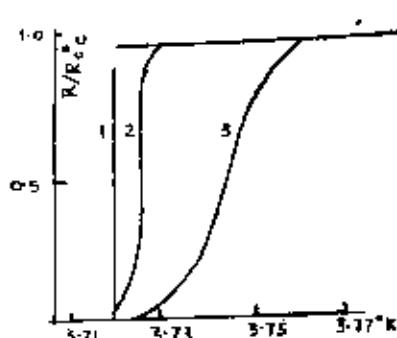


Fig 3



Fig 4

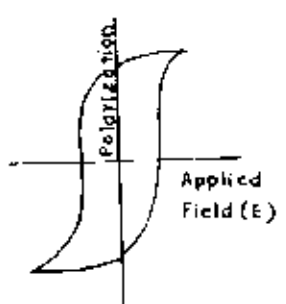


Fig 5

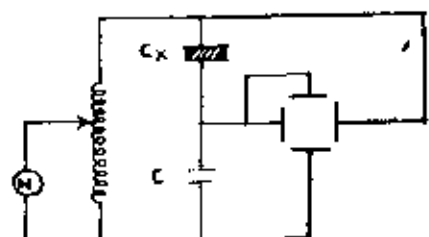


Fig 6

C, Ferroelectric crystal
C capacity.

Incident Photon	Initial state of molecule	Final state of molecule	Emitted Photons
	E_2 — — E_2 E_1 — — E_1	E_2 — — E_2 E_1 — — E_1	

Fig 7

E_1 - Lower Energy level
 E_2 - Higher Energy level

Zno and one of the following divalent metal oxides such as magnesium, manganese, nickel, copper, etc. The outstanding characteristics of ferrites are, high initial and maximum permeability, high volume resistivity sometimes approaching that of insulators. Further they have low eddy current losses and they do not require laminations and yet have magnetic manifestations comparable with those of metallic solid core materials.

Applications of Magnetic Materials

- (1) Magnetic attenuator.
- (2) Magnetic delay lines.
- (3) Pulse transformers.
- (4) Ferrite Memory Cores: Ferrites are used for "magnetic memory" and switching in digital computers and data gathering circuits.
- (5) Microwave Gyrotors: A microwave gyrotor is a new circuit element for net work synthesis which causes a linearly polarized wave travelling in one direction to rotate 180° while one passing in the reverse direction is not rotated.

Masers and Lasers

(Microwave Amplification by Stimulated Emission of Radiation and Light Amplification by Stimulated Emission of Radiation). These are devices based on the stimulated emission principle. This concept can be represented as in Fig. (7). When a photon is absorbed by an atom, the atom is raised to an excited state. Later on, the atom may radiate this energy spontaneously reverting to the ground state or to some intermediate state. During the time, the atom is in the excited state, it can be stimulated to emit the photon, if struck by an outside photon having precisely the same energy as the one that would otherwise be spontaneously emitted. As a result, the incoming photon is augmented by the one given up by the excited atom. Upon release, the photon falls in phase with the one which triggered its release.

Now for stimulated emission to take place we must ensure that there is an excess of molecules in the upper energy state, in a system. The process of creating an excess of molecules in the higher energy state is called "inverting the population". For the stimulated action must be intensified. This can be done by using resonant cavities (ammonia maser) or by a new mode of resonance in which mirrors are utilized for repeated reflections.

At present, at least 15 crystals involving 13 types of doping materials have been harnessed for maser and laser action. Thus we have ruby masers, ruby lasers, semiconductor junction lasers etc.

The output of an ideal optical maser (laser) would be extremely directional, very powerful, essentially monochromatic and coherent. However, the output is pulsed, rather than continuous (ruby laser). In short bursts it delivers a power of 10,000 watts for a beam measuring less than a square cm. in cross-section. By focusing an optical maser beam by a lens of focal length 1 cm., we get a spot of diameter $\frac{1}{100}$ cm. i.e. an area of $\frac{1}{10,000}$ sq. cm. In this spot optical maser beam delivers a power at density 100 million watts/sq. cm.

Applications of Masers and Lasers:
Maser represents the ultimate of high fidelity amplifiers. It generates practically no noise and can detect much weaker signals than other amplifiers. Hence it can pick up radio waves from far more distant points in space. (2) Ammonia maser is an extraordinarily stable oscillator. Its virtually unvarying sine wave can be used as a pendulum to regulate an almost perfect clock. (3) Laser beams can be used to melt, weld, perforate or ignite metals. Laser can provide the intense beam needed for the photography of extremely fast moving objects.

take place. In excess of 100,000 cells are eliminated in the retina. In the case of detached retina, the laser beam can be used to weld the retina back. (4) Power transmission. We may think of a laser beam as a low power transmission line. With repeaters inserted at sufficient intervals in the absence of atmosphere, it would be possible to achieve a loss of 1 dB per 20 miles. (5) Communication. A laser beam can carry enormous amounts of simultaneous information—therefore it can transport voices five times the capacity of U.S.A. It is known that the amount of information which can be transmitted is proportional to the band width of the carrier. The step from micro-wave to optical regions expands band width by a factor of 10,000 or more. (6) Satellite communication. We know that a laser beam exerts a pressure of several pounds per square cm. over a very small area. When a satellite begins to drift away from the earth, a laser beam projected from the earth

may be used like a giant finger to prod it back into higher orbit. (7) Laser beam can be used for interplanetary signalling and in radar.

Conclusion: Thus we find that by departing from uniform, homogeneous materials, it is possible to produce new effects and improved performance.

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★★
★

"True Science and True Religion are two sisters and the separation of either from the other is sure to prove the death to both."

—Huxley

Lasers: (1) Lasers of high fidelity can pick up practically no noise. (2) Lasers can pick up weaker signals. (3) Lasers can pick up signals from distant points. (4) Lasers are an extra-ordinary tool. Its virtually perfect clock. Lasers can be used to melt, weld, cut, and for the photo-lithography of moving objects.

★ ★ ★

Those who fear
to face facts
need not read
this

"I AM writing at a dark moment (March 1967), and it is impossible to know whether the human race will last long enough for what I write to be published, or, if published, to be read. But as yet hope is possible, and while hope is possible, despair is a coward's part.

The most important question before the world at the present time is this: is it possible to achieve anything that anyone desires by means of war? Johnson and Kosygin say YES; sane men say NO. On this supreme question Johnson and Kosygin are at one. If one could suppose them both capable of a rational estimate of probabilities, we should not have to believe that both agree that the time has come for Man to become extinct. But of course, this is not what they are both think-

The Future of Man...
is no more a discussion of the next century
or of the arriving decade
nor is it a prediction about the coming year
not even about a to-morrow
it is actually a restless pre-
into the possibilities of the next moment

It is bitter to accept...
but, we have to accept...
--that Science can spell an END to Man...
--it can deny us our Future...
it can close Man's History

We are not helpless...
if we can realize and comprehend...
it needs courage to make such a compromise...
only the Saviours of Mankind can do it

If we can't settle our Future...
the future is decided...
"A Global Suicide"

By P. N. KRISHNA

ing. Pride, arrogance, fear of loss of face and ideological intolerance have obscured their power of judgment." These are the words rolling out of the ad-dipped pen of a famous philosopher Bertrand Russell, at the age of 80. Can you guess what is the reason behind this rampant outflow from one of World's de-est thinkers? Well, it is *an immediate concern for the continuance of the human race*. If one reads the above passage a bit more closely, it should not be difficult to know that this is the silent-screaming-cry of a weary-world asking for a *re-evaluation of the worth of Science*.

If we roughly condense the last 5000 years of Man's recorded History, in a time span of half a century, we can conceive how far and how fast he has achieved. Analysis

Man...
century...
ng decade...
ming year...
to-morrow...
endless prob...
next moment...
accept...
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END to Man...
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Man's History...
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On this scale, we know very little about the
50 years, except that towards the end of
Man learned to use skins of animals
to cover himself. Then about 10 years ago,
the standard of time, Man emerged
from his caves to construct other kinds of
buildings. Only five years ago Man learned to
use the cart with wheels. The printing
press came this year and less than two
centuries ago, during this condensed 50 years
of Human-History, the steam engine
provided a new source of power. Last month,
airships and telephones and automo-
biles and airplanes became available. Only
last week did we develop Penicillin and Nu-
clear Power and now if we proceed in this
pace we are scheduled to reach the stars
at midnight to-night! This is a breath-
taking pace; it just baffles any brain that
tries to grasp it. What Man's future is going to
be, it is puzzling; but, it seems to
be dangerously mysterious too!
Man is already having in his mortal hands
the power to end all life on this planet. Still,
the race is on. The medical men are
struggling with Nature's role with a test-tube
and an operation. Scientists believe that death
is an inevitable end of life. They
believe "death is a disease" and that they will
soon be able to find a remedy by which
death will be postponed and finally be avoid-
ed. All these constitute a challenge to the
MIGHT OF NATURE.
Man made science to explore the wonders
of Nature. But today, we are able to foresee
the day when science might rule Nature.
It is a precarious situation, for, science
must then cease to be Man's servant; it
must become Man's Master.
All this calls for an urgent investigation
into the power of science to the entire mankind- "tolerate
or cooperate; or die".
As knowledge wipes off ignorance, it also
creates new ills and new problems. All the
progress in science and technology that
Man made till today, has brought us now

to a stage when, we are confident of our
success in the further pursuit of knowledge,
but are shaky with regard to the effect of
that pursuit. In the midst of all hopes, the
future seems to be full of a disastrous
dazzle, threatening to tumble down the en-
tire COSMOS. This maddening vertigo of
the future is the burning problem of the
20th Century.

The savage strides that we are having in
science and technology have got to be halt-
ed; we have a pause and to survey the dan-
ger of the journey ahead; otherwise we will
have a deadlock and evolution may well
collapse. Knowledge is Power; but Power,
without Control, will retaliate on the Posses-
sor. Before we march further with science,
we are therefore called upon to answer the
question; Man made Science; but should
Science END Man?

The science that threatens to spur the en-
tire mankind into a campaign of suicide-
the science that boasts of an end in freezing
life on this planet - the science that pulsates
between existence and extinction of life on
the earth - the science that sways our lives by
events that take place half a world away-
can no more be called Man's friend. It is
time we re-evaluate our relation to science
-may be SCIENCE IS SIN henceforth.

So long as science is a matter of mutual
rivalry between Nations, it cannot be for
the common good of Man. So long as sci-
ence is the authority, justice cannot be sus-
tained and the world will linger between
peace and war, moment to moment. We are
breathing today an air of fear and animus;
our thinking and actions are controlled by
the tension that has been screwed by science;
life has come to an impasse where, time
trickles down in suspense and anxiety.
With these 'rewards of science' at hand, let
us decide:

Science has seduced our lives; but, should
we succumb to science? This will answer
Man's future.

THE



APOLLO PROJECT

HERMOGEO H. VIEGAS S.E. (Mech.)

$$V^2 = 2GM/r$$

THIS is a basic formula that will help transport man to and from the moon.

It's the formula that will carry man to the other planets in our solar system and to deeper exploration of space than we have even dreamed of.

$V^2 = 2GM/r$ is the formula for escape velocity, the speed at which a spacecraft must travel after launching to escape the earth's gravitational pull. This speed amounts to seven miles per second or 25,200 miles per hour. The flight to the moon in the Apollo spacecraft will require this velocity to hurl a three-man spaceship on its round trip to the moon.

No one has ever held in his hand a chunk of material known to have come from the heavenly planets. Our knowledge of the composition of the celestial bodies is infinitely small, that too being educated guesswork, except in few cases, where unmanned probes have been sent.

The Apollo programme scheduled during the 1967-69 period will ride on the giant booster called the Saturn C-5. Its first stage is a cluster of five J-1 engines delivering a total thrust of 7,500,000 pounds at launch. The second stage consists of five J-2 engines, each of which delivers 200,000 pounds thrust. Sitting on these two stages of the Saturn launch vehicle is the Apollo payload—18 feet in diameter and 60' in length, powered by a single J-2 engine. All told, the three-stage Saturn C-5, with its Apollo payload will stand 364 feet high and will weigh 3,000 tons at launch. The Apollo

manned capsule—the Command Module, is the tiny conical tip of the rocket being only one-thirtieth its height and a fraction of its weight.

The three astronauts will lie in this chamber with inward sloping sides that terminate in a low ceiling. It encloses 365 cubic feet of space. But about a third of this is crammed with equipment. The *astronauts* are to be supplied with an atmosphere of pure oxygen at five *p.s.i.*

The sequence of events for this historic mission is as follows.

The whole complex lifts off the launching pad with the burning of the first stage. Next the second stage burns, giving it added velocity. The third stage burns briefly and then shuts down. This puts the third stage and the craft into an earth-orbit about 100 miles high. Whilst orbiting the earth, its systems are checked out by the astronauts. Ground base computers will calculate the exact trajectory required to *rendezvous* with the moon. They will also be able to get up and move around their spaceship inside the 12-foot tall conical "command module". Among the items contained in it are potable water, food, space-suits, some high pressure oxygen bottles, reading material, more than half a dozen radios, two television cameras, first aid equipment and medicines, repair tools and inflight test equipment, the inertial guidance equipment and general purpose computer, a telescope and sextant, and other scientific instruments.

This versatile "command module" sits on top of the "propulsion module", also called

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E. AS S.F. (Mech.)

and Module, is
rocket being only
a fraction of its

in this cham-
that terminate
365 cubic feet
if this is cram-
astronauts are to
of pure oxy-

for this historic

the launching
st stage. Next,
it added velo-
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stage and the
000 miles high.
systems are
Ground based
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moon. They
move around
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are oxygen
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repair tools
aerial gui-
pose com-
and other

le" sits on
also called

VARIETY ENTERTAINMENT MARATHON DRAAMA

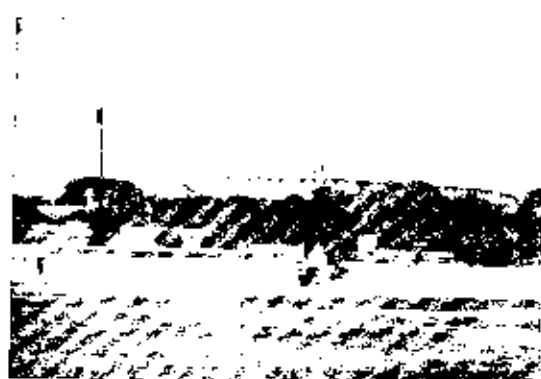




Secretary House—Chandigarh.



Laxman Jhoola (Rishikesh, (Suspension Bridge).



Parliament House, Delhi.



"OUR B.E. CIVIL TOUR BATCH"

the "service module". This is a simple cylinder having the same width as the "command module". Its function is to house all the hardware and rocketing. Its principal component is the re-startable main propulsion engine. This all purpose engine is used to make mid-course corrections during the flight from the moon, to "deboost" the vehicle into a circular orbit about the moon and then to boost it out again and back to earth. One side of the propulsion engine will have an opening to permit a large space communications dish-shaped antenna to fold out and aim itself at the earth.

The third compartment will be the Lunar Module (LEM) or the *bug*. This will detach from the mother craft in orbit around the moon and land with two of the astronauts on the lunar surface, whilst the third remains with the orbiting Apollo spacecraft. Many of LEM's components will be identical to those of the Apollo mother

craft as well when the favourable launching point is reached, the third stage fires to hurl the spacecraft on an escape trajectory to the moon. Now the lunar mission begins.

There comes the first sophisticated maneuver in space that the astronauts must make with their craft. When the C-5 lifts off the pad at Cape Kennedy, the bug which will be used for the lunar landing, is the rear-most component of the spacecraft, riding just behind the third stage of the launching vehicle. For its ultimate mission however, it must be linked nose-to-nose with the command module at the "front" end of the vehicle. Also, the service module's rocket propulsion must be freed for possible emergency

maneuvers. To achieve these ends, the service module and command module separate (see figure) and the rest of the vehicle, move off a little and then come back so that the nose of the

command module can "dock" with the nose of the bug. The launching vehicle's third stage now separates and is discarded. The stage itself automatically fires braking rockets that pull it out of the astronauts' trajectory and buck into an earth orbit where it will ultimately burn into the earth's atmosphere. The bug breaks free nose-to-nose with the command module.

The astronauts check the airtight seal between the two craft, open a valve to equalize the pressures, and then swing open the two hatch doors. One of the astronauts pulls himself along the ladder into the bug and switches on its navigational and computational facilities. Though cramped, the bug with its bulbous windows, gives the crewmen a much better view of the universe than is possible from the command module.

During their trip the spacemen will encounter several hazards. The Van Allen belts* around the earth appear to present little danger, since the Apollo will pass through their most intense areas in a fairly short time. The vastly powerful deep space cosmic rays are also not greatly feared, though they have managed to turn gray a few hairs of men who have drifted to the edges of the earth's atmosphere, in high altitude balloons. The real problem comes after traversing the Van Allen belts when the craft enters the deep space freeways of the particles from the solar flares—the high speed nuclei of hydrogen atoms, called protons. They come slamming in through space in long tongues that lick out from the bright solar flares occurring near sun spots. During the worst flares occurring on an average of once in four hundred days, the radiation particles can penetrate heavy shielding many inches thick. Frantic efforts have been going on at NASA's (National Aeronautics and Space Administration) space laboratories to improve flare forecasting ability.

Then there is the problem of meteors—billions of them hurtling through the earth-

moon void everyday, travelling at enormous speeds. Fortunately, almost all meteors appear to be dust—or sand—sized particles that at worst, can be stopped by the ingenious "meteor-bumper" spaceship construction.

As the spacecraft approaches the vicinity of the moon, nearly 65 hours later, the rockets in the service module fires a long braking burst to cut down the celestial speed of the craft from 6300 mph to 4000 mph, so that it can be captured by the moon's gravity and begin a circular orbit around the moon, nearly 100 miles above its surface.

Now the astronauts check again the "health" of their craft and prepares for the landing on the moon. Communications from the moon to the earth and back again require a time interval of two and two-thirds seconds, as the coded messages have to travel a round trip bounce of half a million seconds.

Two men transfer to the bug, separate it from the mother craft by opening the latches on the docking attachment that has clamped the two capsules together. The two crafts then gently drift apart. The bug is then put into an elliptical orbit with the same period as that of the mother craft but with a perigee** only ten miles above the lunar surface. This will allow the astronauts to take a fairly close look at the pre-selected landing site.

When they decide to go down to the moon's surface, the bug's rockets will be fired to reduce the orbital speed and allow the moon's gravity to take hold and start them downward. As the moon has no atmosphere, parachutes cannot be used to reduce the speed of the falling bug. Retro rockets will therefore be used to slow it down to a near halt, bringing the bug down close to the surface where it can hover for a minute or more about (like a helicopter on earth)

before deciding to land, at almost zero velocity.

Temperature considerations make it necessary that the landing be made during the 'lunar night' when the landing area is illuminated only by earthshine.

After landing on the moon, the two astronauts will collect rocks and samples and take scientific measurements to bring back to earth. They will not wander very far from the bug. One astronaut will be in the craft, whilst the other moves about the lunar soil. They will go out in turns so that one astronaut is always in the bug. At the same time they will keep radio contact (via the earth) with the mother-craft orbiting above.

After exploring, the two men will re-enter the bug, recheck their vehicle, and wait for a favourable launching period. They will launch it with a 3000-pound thrust engine leaving behind the bug's legs, together with the large base pod (containing the descent engine and fuel tanks) which it has used as a launch pad. The two astronauts will guide their craft into a curving course so as to intercept the orbiting mothercraft.

When the two spaceships rendezvous and dock, the astronauts will transfer back to the command module to rejoin their third fellow spaceman. Then they close the hatches between the two craft. A little later, with a short burst on their control rockets, the command and service modules drift away from the bug, which will be left orbiting the moon. Apollo will then be rocketed back to earth with the blast from its 200,000 pound thrust J-2 engine—enough kick to put it in a rendezvous trajectory with earth.

Five hours or so before the craft re-enters the earth's atmosphere, the service module is cast off. The command module will be provided with a heat shield, one and a half inches thick on the cone's slightly convex bottom surface. This surface faces the blazing six-thousand degree gases, during d

zero velocity

it is necessary during the area is illuminated

the two astronauts and samples and bring back very far from the craft, the lunar soil. That one at the same time (via the antenna) will re-enter and wait for them. They will burst engine, together with the descent stage, has used as a guide so as to in-

careful and back to the third fellow hatches here, with a view, the command away from the moon. back to earth around thrust it in a re-

it re-enters the module will be and a half fully convex the blast-during the

re-entry into the earth's atmosphere. At about 15,000 feet the slow-opening parachutes will open out. The chutes are supposed to carry the gently swaying machinery to a tumbling landing.

The trip to the moon (which will last a week) is a voyage into an outrageous environment. This cone-nosed little space is to be tossed amid planetary by the spasmodic urgings of several engines. It proposes to commence its most audacious stunt to date—the exit of a small fraction of the solar sys-

* The zone of high-intensity radiation surrounding the earth beginning at altitudes of approx. 500 miles.

** Nearest distance between the craft and the moon during elliptical orbit.

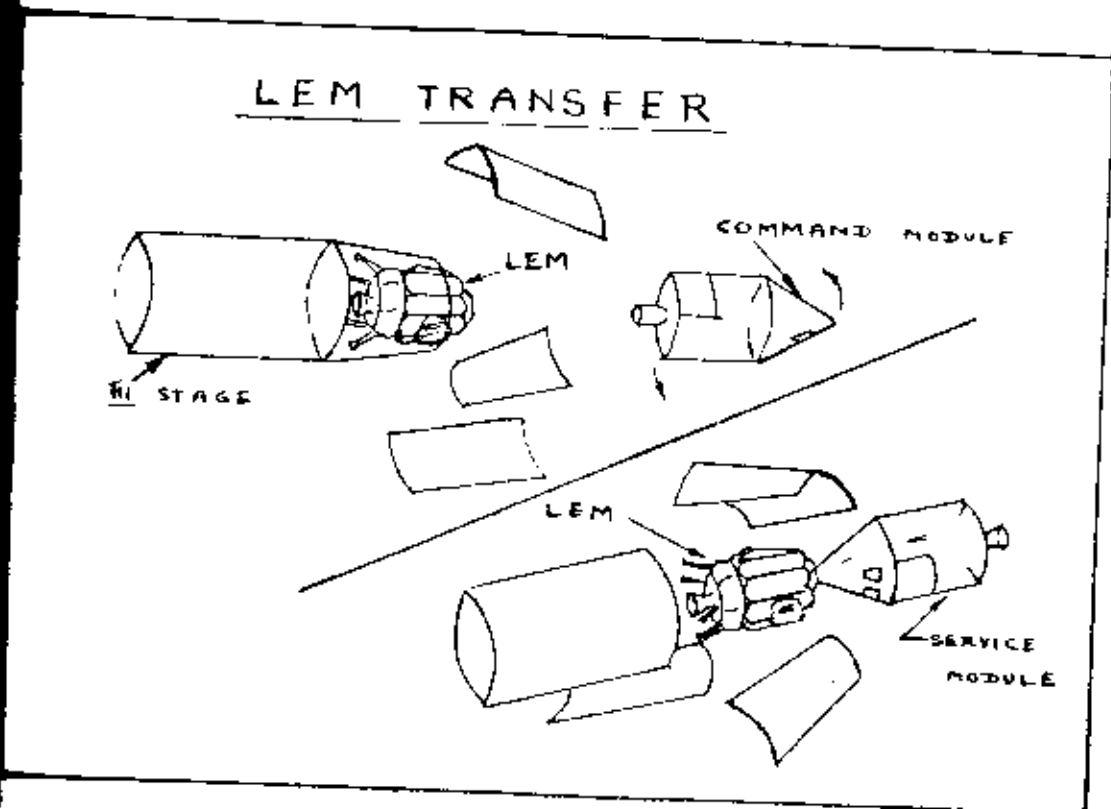
Adapted from:

(i) Project Apollo—Man to the Moon, by Tom Alexander

(ii) Guidance and control of spacecraft, by Edward Hymoff

(iii) America's Race for the Moon.

The New York Times Story of Project Apollo Edited by Walter Sullivan, Science News Editor.



SOLID-STATE SEMICONDUCTOR DEVICES

By Shri S. C. GOYAL

(The aim of this article is to enumerate and explain in brief certain effects which have been used to practical advantage in solid state devices. For details regarding construction, manufacture and uses an inquisitive reader can refer to various references given at the end of the article).

Conduction in semiconductors has attracted the attention of research worker since long back. However the discovery of transistors by Bardeen and Brattain etc. in 1948 led to a great spurt of activity in the semi-

conductor field. It is the aim of the physicist of the present day to co-relate the thermodynamic, magnetic, electrical, optical and other properties of materials via the molecular and crystal arrangement in the material. This success has not been achieved but the process led to quite a few devices.

A number of Solid-State devices have been listed in table I. Out of these we have chosen those devices which use semiconductor material.

Table. I.

Some solid state phenomena of interest in circuits

Electrical only	Energy conversion
A. Conduction process 1. Normal metal 2. Superconductors 3. Semiconductors (a) Thermistors (b) Junction devices (c) Hall effect 4. Photo-conductors B. Dielectric phenomena 1. Normal dielectric 2. Ferro-electric (a) Electrets (b) Modulators (c) Storage devices C. Magnetic behavior 1. Conventional magnetic metal 2. Ferrites (a) Storage devices (b) Gyrotrons 3. Other spin resonance devices, Masers etc.	A. Mechanical-Electrical 1. Piezo-electric effect. 2. Electrostriction. 3. Magnetostriction. 4. Strain effects. B. Thermal-Electrical 1. Ohmic heating 2. Thermoelectric effects (a) Generation of Electricity (b) Heat pumping and cooling C. Radiation-Electrical 1. Photovoltaic 2. Electroluminescence 3. Recombination processes 4. Particle bombardment (a) X-Rays (b) Cathodoluminescence

Micro-miniaturisation and integrated circuit techniques have not been listed above but have made very good progress and the modern day computer engineer talks of

table top and throw away computers.

1. *Hall-effect devices*:—Fig. 1 shows a rectangular piece of semiconductor material situated in magnetic field of intensity H . A

VICES

C. GOYAL

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It is made to pass through the spe-
A current is equivalent to the move-
of positive charges in the direction of
It is well known that positive
moving in the direction of V under
influence of magnetic field B will be deflect-
ed downwards. As a result a voltage will be
developed between two ends of the semi-
conductor. The voltage is in a direction at
right angles to both current and magnetic
field and is known as the Hall voltage. If
contacts are applied on these Hall electrodes
a current may be drawn.

The effect is observed both in metals and
conductors but in semiconductors the
voltage may be many millivolts whereas in
metals it is in microvolt range.

The Hall voltage developed is propor-
tional to the factor $\frac{H}{j}$ and the proportiona-
lity constant is known as Hall constant. Hall
constant is inversely proportional to electron
concentration in semiconductor (with cer-
tain approximations).

Flux-meter.—Since Hall voltage is pro-
portional to intensity of magnetic field if the
current is held constant we can measure the
flux and flux-density by measuring
the voltage developed. An amplifier is used to
increase the voltage level for measurement.
As compared to a flux-meter and search coil
method this method is more convenient
to measure flux density in air gaps of per-
manent magnets and machines.

D.C. Clip on meter.—A magnetic ring is
placed round the d.c. bus bars. In the air
gap of the magnetic ring a Hall specimen
is placed. The Hall voltage developed will
be proportional to H which in turn is pro-
portional to the amount of direct current
flowing in the bus bars. At present such a
measurement without connection of amme-
ter to bus-bars is impossible on direct cur-
rent. On alternating currents a current trans-

former can be used. This device fulfils a long
felt need. (see Fig. 2).

Power meter.—If the load current is
passed through the Hall specimen and the
load voltage used to produce a proportional
magnetic field intensity, the Hall voltage de-
veloped will be proportional to product of
load voltage and load current i.e. power.
Such a power meter can work from low fre-
quencies to very high frequencies which
is not possible for other types of power
measuring devices.

Other possible applications of Hall-effect
are compass needle, multiplier for compu-
tators, modulator with suppressed carrier, am-
plifier, motor-torque measuring device, fre-
quency spectrum analysed, gyrator etc.

Magnetoresistance.—If the Hall elec-
trodes are short circuited the resulting cur-
rent will be at right angles to the initial cur-
rent I and this current will set up its own
Hall-voltage. This voltage will oppose the
flow of current I . Thus by short circuiting
the Hall electrodes the resistance to flow of
current I increases. This increase in resis-
tance depends on the flux density. A typical
relation between H and R , the change in
resistance is shown in Fig. 3.

Thus a potentiometer having no contacts
can be constructed the amount of resistance
being changed by changing the flux density.

In fact any movement of the specimen
described above in a non-uniform magnetic
field will result in a changing resistance.
This can be therefore used as a displace-
ment gauge and microphone pick-up as well.

2. Semiconductor Photo-devices.—The
phenomena of photo-emission from cathodes
is quite well-known to the reader however it
does not strictly rely on semiconducting na-
ture of cathode. There are three other types
of devices (a) photoconductive (b) photo-
voltaic and (c) photoelectromagnetic.

All these devices generate charge-carriers
when an energy more than threshold energy

is imparted to produce electron-hole pair. The subsequent movement of the carriers depend on the operation of the device.

(a) *Photoconductive*:—If light falls on a sensitive surface it gives rise to generation of new electron-hole pairs. Depending on the energy in light quanta therefore, the conductivity of the surface increases. Very sensitive visible radiation detectors have been prepared using cadmium sulphide coating. Infra-red photoconductors are widely available.

(b) *Photovoltaic device*:—The charge carriers produced by incident radiation reach the junction by diffusion and are extracted by the local electrostatic field to conduct current.

The photovoltaic device produces a current which increases with the intensity of incident radiation. Generally the output terminals are nearly short circuited. The resulting current, which is of the order of microamperes increases with incident light.

Photovoltaic cells are widely used in lightmeters for photography. Reference may be made to Fig. 4 for typical circuit and characteristics.

(c) *Photo-electromagnetic effect*: It is a recently discovered principle used to advantage in photocells. The incident radiation produces a current of electrons and holes from front to back (see Fig. 5). If a magnetic field is applied perpendicular to the plane of paper as shown by cross on the diagram, the positive and negative charges are deflected in opposite ways. Thus a voltage difference is produced between the two ends of the semiconductor. In the present case the left hand side will be positive.

The advantage of this device is that it requires no supply, easy to manufacture and more sensitive as compared to photoconductive devices.

Other devices which depend on photoelectric action are phototransistor and photo-

diodes and it will be presumed that the reader is quite familiar with these devices in details.

3. *Mechanical-electrical conversion devices*

(a) *Piezoelectric devices*: Certain crystals when under compression or tension produce electric charges at their faces the amount of charges produced depend on the amount of elastic deformation. The piezoelectric properties can be explained by the presence of electric dipoles situated in definite crystallographic directions. In case of compression the dipoles approach each other and their total electric moment changes which gives rise to charges on the surface of crystal. Under tension the charges on the faces reverse their signs.

(b) *Electrostriction*:—It is a property complementary to piezoelectricity and takes place in the crystal producing piezoelectricity. When a potential difference is applied between the faces of a piezoelectric crystal compression or tension is produced in the crystal.

Thus what takes place in a crystal is conversion of elastic energy in electric energy and vice versa, the efficiency of conversion being close to 100%, since no irreversible processes are involved. If a crystal is imparted a small amount of energy it will vibrate at its natural frequency of vibration. An excitation at this frequency or its harmonic will produce resonance with vigorous vibrations of the crystal.

The frequency of vibration of piezoelectric crystals fall in the ultrasonic range and is amazingly constant. With normal temperature variations a frequency deviation on one part to ten parts in a million is obtainable.

These crystals are used in ultrasonic oscillators and detecting devices. Ultrasonic energy has been recently used for quick cleaning of metal parts, washing crack-detect-

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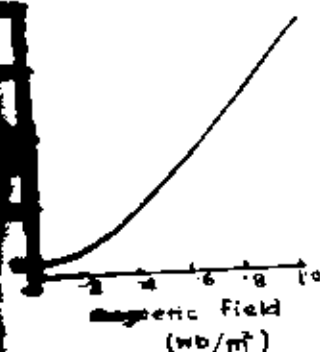
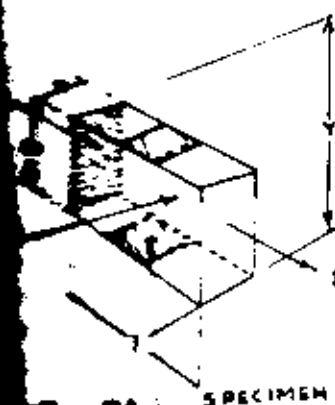


Fig 3 - CHARACTERISTIC OF A MAGNETOPHOTO RESISTANCE

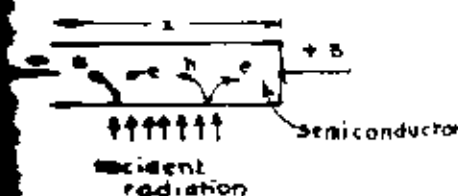


Fig 4 - ELECTROMAGNETIC EFFECT.

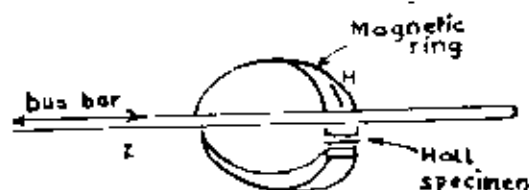


Fig 2 Principle of D.C. meter.

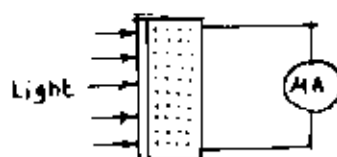


Fig 4(a) Photovoltaic device - circuit

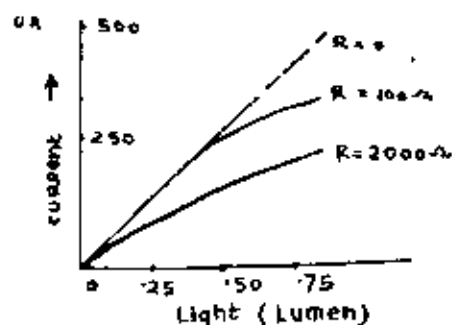


Fig 4(b) - Typical characteristic of selenium photovoltaic cell with different loads

tion, depth measurement by sonar beams, diagnostic uses in medical therapy etc. and one may expect crystals in associated equipment.

These are also used in radio transmitters and precision clocks and timing networks and standards. Piezoelectric crystals can be used in displacement pick ups as well.

(c) *Magnetostriction*: In case of magnetic materials if the flux associated with the material changes compression or tension is produced in the material. Magnetostriction is observed in cores of a transformer under normal operating conditions.

4. *Thermoelectric effects*

(a) *Seeback effect and thermocouples.*

In 1821 Seeback noticed that a closed circuit made up of two dissimilar metals produces current if the two junctions of the dissimilar metals are at different temperatures. If the temperature difference between the hot and the cold junction is increased the current increases.

Thus heat energy converts itself into electric energy, however the efficiency of conversion never exceeded 0.5% in case of junctions of metals! This is because as difference of temperature increases, heat is directly conducted from hot to cold junction metals being good conductors of heat. The effect was therefore used for measurement and control of temperature rather than for direct conversion of fuel energy into electric energy without intermediate conversion to mechanical energy i.e. without using boilers, turbines, engines and generators etc.

With semiconductor junctions it seems possible to obtain efficiency of 7 to 8%. Considering the overall efficiency of 4 to 10% of locomotive steam engines and 10% for stationary steam engines this seems fairly close

technical possibility which will open up a new age for semiconductors.

At present however, this method has been utilised for solar batteries where the power for space vehicles is required for transmission of telecommunication signals and control signals etc. Experimental solar sets for radio have also been produced.

(b) *Thermoelectric refrigeration or Peltier's effect.* - Peltier in 1834 observed that if a current is passed from external source in a junction of dissimilar metals heat is either produced or absorbed at the junction. In 1938 Lenz at St. Petersburg conducted an experiment and placed a drop of water on the junction of two metals and froze it by passing current. The heat produced in the process is proportional to the current and the absolute temperature of the junctions.

The current that arises due to Seeback effect due to this heating or cooling in case of two junctions of dissimilar metals will be such as to aid the Peltier effect. Thus in practical semiconductors a cooling unit is obtainable where one calorie equivalent electric energy is required to remove two calories of heat from the cold junction. Trials are being made so that the performance can be improved. Thermoelectric refrigerators are already in use in U.S.S.R. Practical refrigerators consist of a group of cooling junction elements arranged in a suitable formation. With large amount of semiconductor material at cheap cost being available such refrigerators will be much cheaper as compared to present day refrigerators and further will not have any moving parts and special cooling fluid.

Due to limited space other devices listed in the table is not being described in this article. Reports regarding microminiaturisation are available even in non-technical journals.

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CONCLUSION

Semiconductor and solid-state devices
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in high power devices us-
of energy, like traction,
and power generation are under

and associated devices have
their superiority in many
communication and electronic field

as compared to vacuum and gas devices and
use of such devices in instrumentation is on
increase at such a tremendous rate that their
knowledge is indispensable for any modern
day engineer.

References:

1. "Future circuit aspects of solid-state phenomena" by Edward W. Harold. Proceedings of I.R.E. 1957.
2. "Semiconductor technology" edited by G.K.T. CONN, Butterworth scientific publications, London, 1960.

★★
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"A country is strengthened not by great men
with small views but small men with great
views."

Swami Ramatirtha

TRY THIS

By HARCHARAN SINGH, B.E. (Mechanical)

ENGINEERS! here are some novel experiments for you. These experiments require some knowledge of electricity and electrical components but, I am sure, the Electrical Engineers are not the only one who possess this knowledge. You all can do this.

Experiment 1

Turning a Transistor Radio into an Amplifier

You can turn your transistor radio into an amplifier in which if you speak, you hear your voice amplified.

For this, you require a small speaker and an input transformer. Speaker can be had from any old transistor radio and the input transformer (used for transistor radio) can be had from any shop for about Rs. 2/-.

Open out the back cover of your radio and look for the volume control. You will see a disc type volume control, or some other type. This volume control will have five terminals. See the figure below. The transformer will have two wires on one side and three on the other. Remember that the middle wire on the three wire side is not to be connected anywhere.

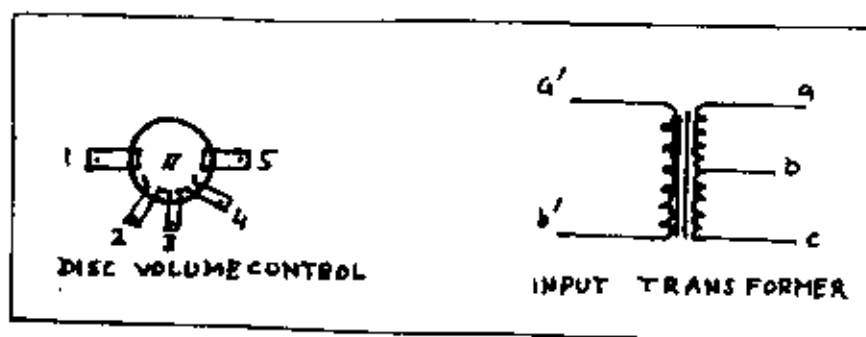


FIG. 1.

Connect the transformer to the volume control of your radio as shown below.

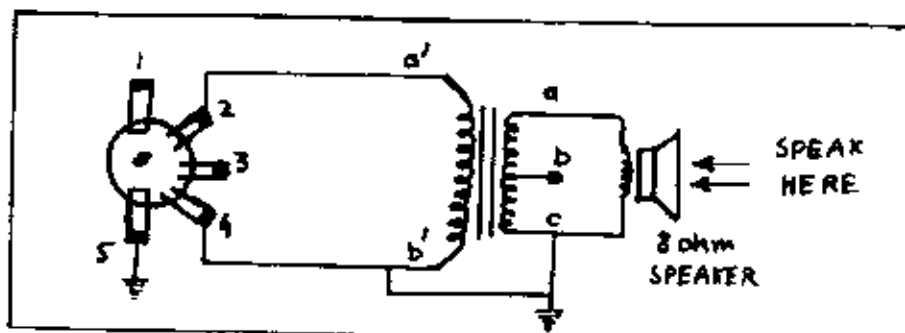


FIG. 2.

E.E. (Mech.)

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Also connect the speaker to the transformer as shown. Put the radio "ON" and turn the volume to full. Speak in the speaker and have connected. You will hear your voice much amplified in the radio.

Experiment 2

Jumping Rabbit

Here is a rabbit who will jump on your radio. Take some soft iron wires. Wrap ~~some~~ turn of paper on each wire. Put all the wires together and on this "rod" of wires, put another single turn of the paper. In an insulated wire, wind a coil round this rod, on half of the length of the rod. Take a 230 volt 20 volt step down transformer and connect the secondary of this to

the coil. Fix a mains plug to the primary leads.

Buy a small, light, plastic rabbit. Make a through hole in this so that it fits loosely on the upper half of the rod. Adhere an aluminium ring at the bottom of this toy by some adhesive. Slip the assembly on to the rod. It will rest on the coil. Put the mains plug in 230 volt supply socket. The rabbit (feeling the shock) will fly away. If he is stopped at the end of the rod, he will come back to his seat again but still shock being there will again jump. Take care that he doesn't pierce through your room's roof.

The stronger the current in the secondary, the more will be the jump.

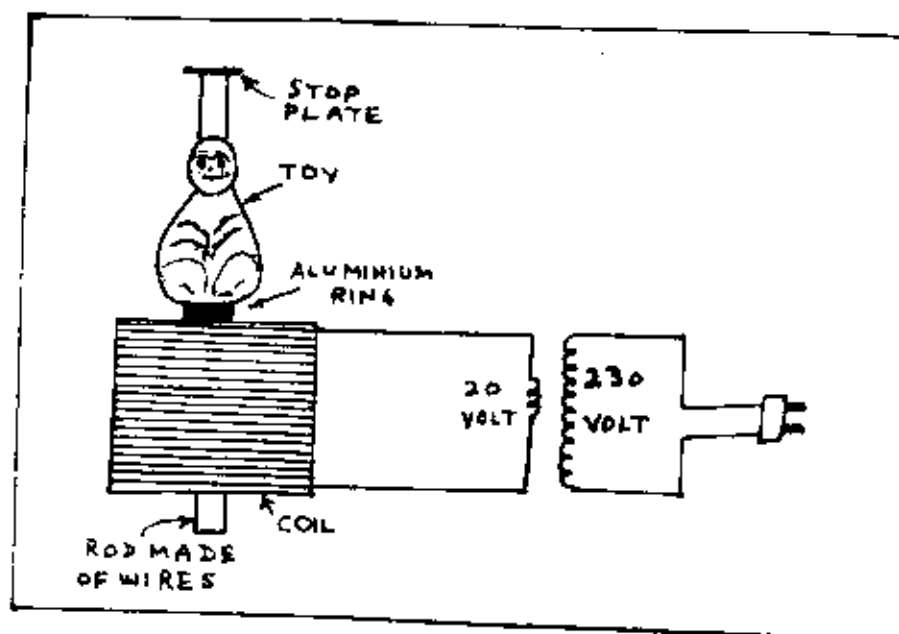


FIG. 3

Experiment 3

Transistor Amplifier for Record Player

The audio amplifier described in another article in this magazine, or the one described at the beginning of this article can be

3. A bar magnet got from an old pair of head phones or else.
4. Insulated wire etc.

Wind two coils on a form of card-board or thick paper with the insulated wire. One

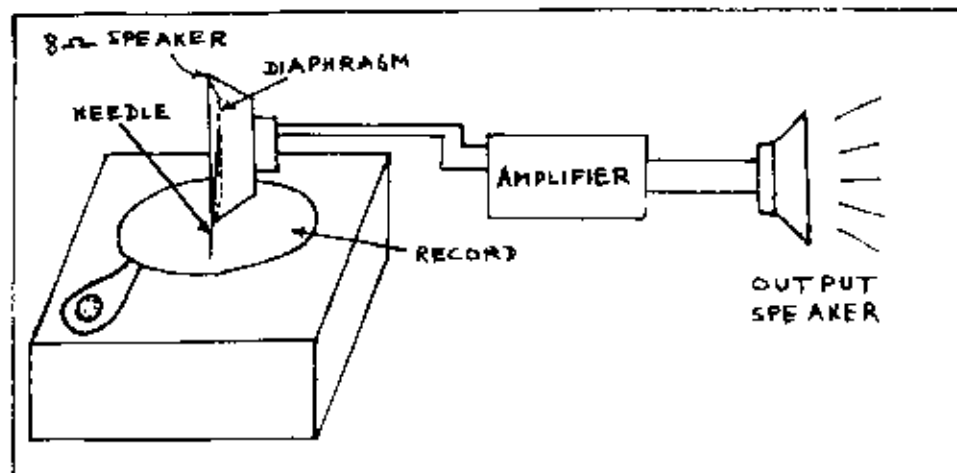


FIG. 4.

used with a record player. If your record player works on a radio, and if you do not have a sound box, this amplifier will help you in case your radio is out of order.

The only thing you have to do is to take a long sewing-needle with very fine point; fixing this needle to the vibrating diaphragm of the input speaker by means of adhesive tapes, so that the needle is projecting a little from the edge of the speaker and to work this speaker as a sound-box. A very good volume is obtained at the output speaker.

Experiment 4

Untiring N. C. C. Cadet

Here is another interesting experiment by which you can prepare a young cadet always saluting his officer.

The cadet will salute only if you provide the following things for him.

1. One transistor OC 71 (2 SB 75)
2. A torch cell 1.5 volts.

coil should have 2000 turns and a resistance of 300 ohms while the other of 600 turns with a resistance of 90 ohms. These values by no means are critical and may be allowed a little fluctuation on either side (2 to 5 ohms). The 300 ohms winding is base-emitter winding while the second winding is emitter earth winding. C is the coil. MN the magnet, T the transistor and S the cell.

Rod R is resting on two smooth thick wires. F is a frame of light aluminium wire or of any other light material, which is rigidly connected to the rod R which also is very light. The bar magnet MN is fixed at the lower end of the frame F. This end of the frame is of an arc shape. Bar magnet passes through the former on which coil is wound.

Finish the circuit as shown. Switch on the circuit. Give a little push to the frame. The frame will start oscillating and with the frame will oscillate the rod R. Connect the shoulder pivoted arm of the N.C.C. Cadet

an old pair of

card-board
and wire. One



FIG. 4.

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These values
may be allowed
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and S the cell.

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MN is fixed at
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Bar magnet
which coil is

Switch on the
the frame. The
ed with the
Connect the
C.C. Cadet

As the rod oscillates, the cadet
and will go on saluting until his
the cell) is exhausted.
interesting toys may be pre-

pared from this.

(Note: If you cannot do, get the coil
wound by an electrician)

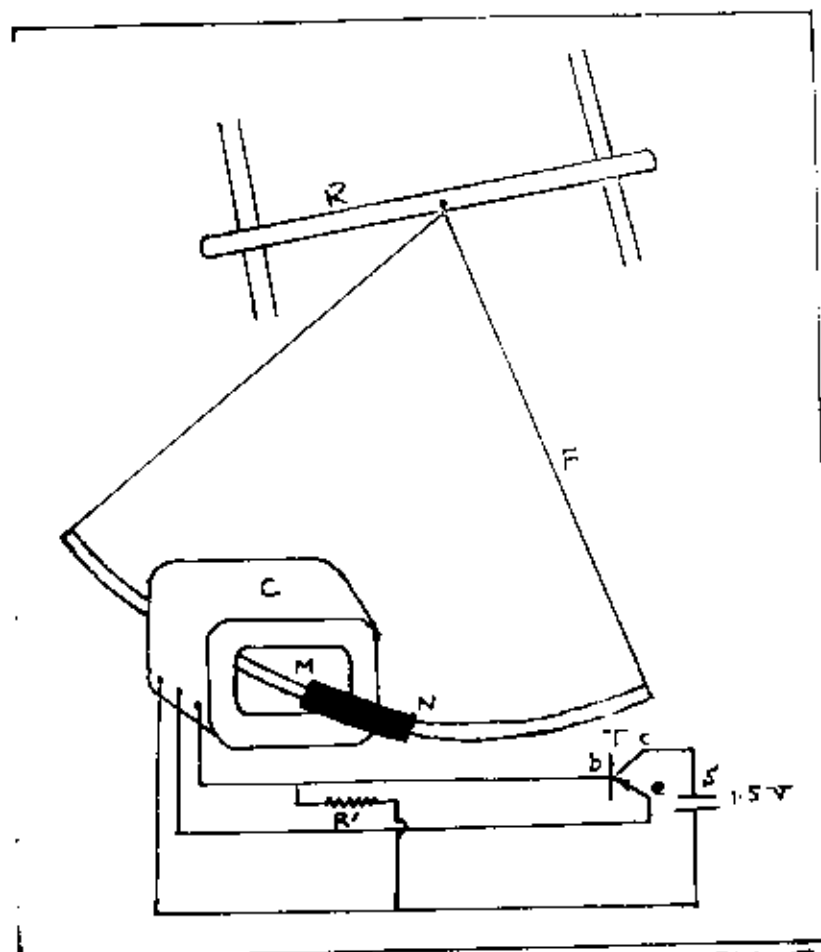


FIG. 5

Everybody seems to think but.....

KANTI PUROHIT B.E. (Elec.) Student B.E. (Mech)

The other day Dr. D.S. Kothari, Chairman, Univ. Grants Commission told in his speech on 'Man, Atom and Galaxies': "... Science is advancing at such a pace that a graduate is almost obsolescent on the day of graduation, a research paper is out of date on the day of its publication and imported research equipment is often out of fashion by the time it produced. ..."

Due to this ever mounting fear of obsolescence a firm in U.S.A. has introduced a strikingly novel programme.

On the basis of the estimates that about one half of what a graduate knows will be obsolete within ten years, the Westinghouse Electric Corporation of U.S.A. has come up with programme to keep its engineers up-to-date on the current science and its application to engineering.

The men at the top level think that, according to above estimates, in 1976, half of what an engineer must know to perform effectively is not available to him today.

The engineers at management level who supervise upto 100 engineers and are graduate engineers themselves, take part in a four-week programme designed to up-date their educational background.

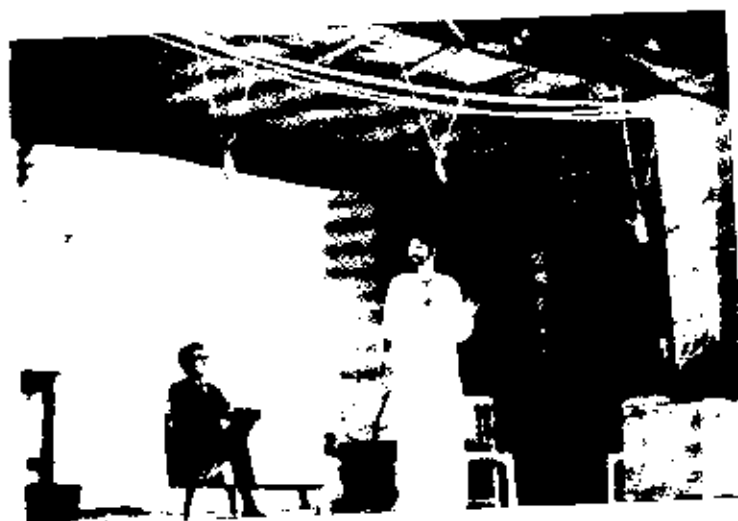
Objectives of the programme are to encourage self-education in new-fields by providing understanding and familiarization with new concepts and developments; encourage application of modern techniques; to provide rapport between management and the new and young professionals to strengthen the managers ability to evaluate new ideas and proposals; and to show managers why staff members should be encouraged to look into unrelated fields for solutions to engineering problems.

Yet another report (NPC report no. 4 "Role of Industrial Engineering in Productivity") says "The American economy is such that Business and Industry operate in a highly competitive market; unless there is a continuous search for improvements in methods resulting in reduction in cost, they cannot survive. Every year, thousands of companies go bankrupt only because they do not keep abreast of the technological progress and management techniques."

In next 20 years, the man will go to moon and come back. Nuclear power will be used for every thing big or small. The world will change beyond recognition. But it is a surprise if our Indian Universities remain unchanged and lag far behind the advancement in every field of science and Technology.



VARIETY ENTERTAINMENT (GUJARATI DRAMA)

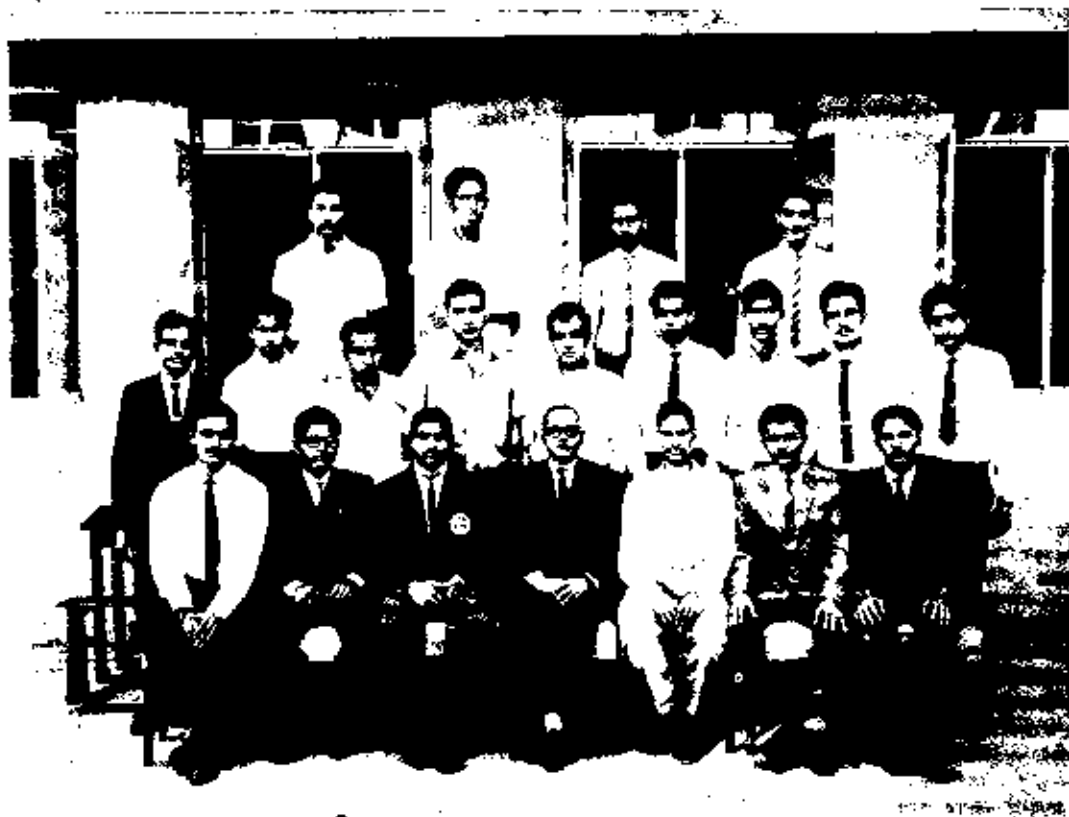


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BOILERS In Modern Industry

By K. D. DESAI M. E. (Mech.)

THE requirements of modern power station is tremendously bigger than that required by the Edison power plants of the 1880's. It was predicted in 1956 that a unit of 500 mw would be achieved by 1960. Actually this had occurred two years before the schedule. Successful operating experience will indicate that the boilers in modern industry will require to generate 2,500,000 lb. of steam per hour to supply a 500 mw unit operating at 3500 psi and 1050°F with double reheat at 1050°F. The present 500 mw turbine size may well increase to 1000 mw. The modern steam generation plant must therefore operate at high pressure and high temperature steam. Operating pressures have increased from 200 psi to above 1000 psi with the standard generally accepted minimum at 2400 psi at the turbine throttle i.e. we are face to face with the critical pressure and the next logical step is to go above it. The pressure higher than the critical pressure may be termed as sub-critical or super critical pressure. It can be noted that in an enthalpy-temperature diagram, the saturated water line and saturated steam line meet at the critical point of approximately 3206 psi and 705°F. For pressures of steam above critical pressure will lead quickly to the conclusion that conventional boilers are not suitable. A boiler of once through type is required.

Once through Boilers:—

Once through steam generators should be more numerous since they have advantages in lower weight, control of steam

temperatures over full load range, possibility of variable pressure and temperature operation. On the other hand their selection over the more conventional types of boilers involves economic consideration of requirements for more sensitive control equipment, greater pump power, high purity feed water, more condensate storage and the necessity for a bypass line heat exchanger system.

The important factors in correct design of once through generators for supercritical or sub-critical pressure are:

- (a) Provision for frequent collecting, mixing and redistribution of fluid along the complete flow path from inlet to outlet.
- (b) Low furnace heat-absorption rates and uniform heat distribution to fluid circuits.
- (c) Final evaporation or conversion zone located in low gas temperature sections.

Circulation:—

High purity of feed water is a requirement of all once through boilers. This can be satisfied by an additional water treatment plant with provision for filtration and demineralization of some portion of the condensate. Basically there are two types of circulation.

- (a) Natural circulation (b) Controlled circulation.

In a natural circulation boiler feed water is pumped through the economizer into the

boiler drum, the addition of heat causes boiling and the decreased density of the boiling mixture creates circulation. The mixture of steam and water returns to the drum. Steam is separated from water and forced through the superheater to the outlet of the unit. As the circulation here depends on the difference in density between steam and water, the method is not much useful for high pressure steam. An answer is provided by the controlled circulation where circulating pumps are provided to produce positive circulation independent of the heat absorption or relative density of steam and water mixtures. Controlled circulation can be of considerable advantage in establishing positive flow through all furnace and boiler tubes prior to firing the unit. Controlled circulation also makes possible the uniform heating and cooling of the thick walled heavy drums in these large high pressure units which are so important in both normal and emergency starting and shut down. The use of small diameter relatively thin wall tubes is a natural development in the use of forced circulation.

Multi-fuel Design:—

Areas of high fuel cost usually have more than one fuel which can be economically justified. Designs are now available which minimize this additional investment and provided for the efficient use of a variety of fuels with no expensive alternations when changing from one fuel to another. In these, the same furnace performance is available with different fuels and consequently the same range of steam temperature control is possible without costly auxiliary equipment. The designer's problem when designing for two or more fuels begin with the furnace, continue with the superheater and reheater and on through the unit to the air heater gas discharge.

Furnace:—

The furnace requires sufficient cooling to

reduce the furnace exit gases well below the ash softening temperature. The increase in steam temperatures to 1000°F.-1050°F. and even higher focuses attention on the variation in tube-metal temperatures across the width of a furnace. If the metal is to have a long life this variation must be kept to an absolute minimum and the methods of firing must produce a uniform gas distribution. The problem is more pronounced as the capacity of the units increase and the furnace become wide requiring close attention to the average.

One satisfactory solution is the use of water cooled platens within the furnace section. These platens are formed by rows of tangent tubes spread across the upper furnace to form a number of passages which can be variously disposed to suit the design requirements. The location is above the zone of active burning so there is no interference with combustion. The platens also absorb heat at interval across the furnace between the walls, thus reducing the amount of gas temperature variations and the possibility of slagging superheater tube metal, temperature measurements with this type of construction range from 1035 to 1050°F. with 1000°F. final temperatures even in wide furnaces.

Furnace volume is important in providing sufficient space for flame development and completion of combustion. It is also important in providing the necessary time for the water cooled surface to cool the gases before the furnace exit. The designer when confronted with two or more fuels must design a furnace for the one requiring a greater volume.

It is essential to design the superheating surface for approximately the same temperature range with all available fuels. This problem is simplified by the use of intermediate radiant surface in the form of a platen superheater in the furnace. The superheater

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surface is disposed as radiant platens widely spaced across the width and water cooled platens are used in the upper furnace.

Heat Recovery:—

The design of heat recovery equipment particularly the air heaters requires special care where two fuels are available. The high cost fuel makes low air heater exit temperatures mandatory but the heater surface must be protected against corrosion especially the resulting from attack by sulfur compounds. If oil with sulfur as high as 3% is burned larger amounts of air recirculation requiring larger fans, larger heating coils or possibly a combination of both will be required.

Conclusion:

As the demand of high pressure and high temperature steam increases in the modern industries, it is essential that there must be adequate circulation, careful selection of superheater and reheater metals, and wide spacing. It is also necessary that interesting steps be taken towards the achievement of automatic data-collection system for controlling the huge plant with high pressure and temperature. In boilers operating at or above critical pressure practically all of the feed water changes at once into steam.

LOOK AT THESE PENALTIES:

5% over voltage shortens electronic tube life by 50%.

3% over voltage may be burning out incandescent-lamps after 700 hours instead of 1000 hours or making motors fail after 5 years instead of 15 years.

Therefore feed water supplied should be ultrapure otherwise any solid dissolved in the water will deposit out on the tube surfaces. As the industrial development in India has taken place since just 8 to 10 years only, the country has not yet reached the stage for the demand of a power plant with very high pressure. "Benson" and "La Monte" boilers are quite sufficient to supply the country's present day demand of about 1000 psi but it cannot be neglected that the rapid industrial development will one day or the other will demand the high pressure steam power plants.

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★ 10% under voltage may destroy thyatron tubes (unless protected) in a matter of minutes!

Better analyse one by one, the effects of wrong voltages on different equipments or devices, below, alongwith some typical examples considering some of them in particular.

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OFF NORMAL VOLTAGE AND PRODUCTIVITY

By K. A. PUROHIT, B.E., (Elect.) Student, B.E., (Mech.)

Perhaps you have not given a thought to the hidden costs of off normal voltage which show up all over the plant—in low productivity, poor quality and down-time.

Here are the facts, ... for you, ... for every Engineer:

(1) **MOTORS:** Squirrel-cage, wound rotor, synchronous, special purpose in three-phase designs; fractional hp, special purpose in single phase-designs.

(2) *The Effect:* Starting torque and running torque varies as the square of the voltage. Low voltage increases starting time; over voltage increases starting shock.

(3) At 10% undervoltage—a squirrel cage motor has 19% less torque available for starting and overloads. Motor runs 7 degree C hotter (Statistics show that electrical equipment running 10% hotter than the normal has its insulation life reduced by 50%).

At 10% overvoltage: Surplus torque may overstress the shafts, gears, or equipment. Starting current is up 12%, power factor 5% and motor noise increases.

RECTIFIER LOADS: Electroplaters, battery chargers, static d.c. supplies for cranes, drives, rectifier arc, stud welders.

The Effect: Rectifier out put voltage falls at slightly greater rate than input voltage, rises slightly faster. Excess voltage overstresses metallic rectifiers.

At 10% undervoltage: Plating rate drops 10 to 20%; battery charging rate falls 15 to 25%; magnetic chuck holding power, 19%.

At 10% overvoltage: Metallic rectifiers

stand 50% less transient surge than with normal voltage.

MAGNETIC DEVICES: Solenoids for clamping, ejecting; magnetic clutches, brakes; solenoid valves; motor starter contactors; a.c. relays.

The Effect: Magnetic field strength varies as the square of the voltage. On serious overvoltage, iron-cores saturate, current (and subsequent heating) increase drastically.

At 10% undervoltage: Solenoids may take much longer to open a valve, eject a part, or close a relay or starter. Holding power is so reduced that vibrations or a minor dip will drop out contactors.

At 10% overvoltage: Wear and distortion of solenoids is substantially great.

LIGHTING EQUIPMENT: All types of fluorescent, incandescent, mercury-vapour lighting; infra-red lamps; gas lamps for photo-etching or reproduction; ballasts starters, and capacitors for fluorescent, mercury-vapour, and special purpose lamps.

The Effect: Incandescent lamp life changes as '13.1 power' of the voltage; light output as '3.4 power', light output per kwhr as the '1.8 power'. Off voltage shifts heating abilities of infra-red sources, colour-matching characteristics of incandescents.

At 10% undervoltage: You need 30% more incandescent luminaires to provide normal light, 15% more fluorescent units. Eye sensitivity to flicker (caused by cyclic changes in supply voltage) is greatly increased.

At 10% overvoltage: Incandescent lamps must be replaced 'two and a half

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as often. Ballasts for fluorescent, mer-
vapour and special purpose lamps are
dangerously close to maximum safe operat-
temperature. Infra-red produce 21%
heat - enough to scorch some surfaces.

ELECTRONIC EQUIPMENT: Ultra-
cleaners; photocell and proximity
paging and intercom systems; in-
and dielectric heaters; electronic
of all types, two way radio; high
counters; X-ray equipment; compu-
security systems.

The Effect: Electron emission in both
and gas-filled tubes is very sensitive
changes. Tube life falls off quickly
shifts more than 2 to 3% from
Output capability of oscillators
approximately as the square of the
Some electronic equipment is so
sensitive to voltage fluctuations that regu-
has to be built-in. However, built-in
may not handle excessive voltage
Dips may cause counters or controls
function.

10% undervoltage: Thyatron tubes
protected) may be destroyed within
of minutes. Ultrasonic cleaners and
heaters output is off 20% or more.

10% overvoltage: Cathode-ray tubes
about 25% normal life. Precision con-
over processes is jeopardised. Failures
tubes, capacitors, resistors, amplifiers, and
systems will cause downtime several
as often.

WELDING EQUIPMENT: Single
resistance, spot flash, gun seam, stud,
and butt welders.

The Effect: Current in welding circuit
is the square of the voltage. Voltage
jeopardize weld quality control un-
expensive control is installed.

10% undervoltage: The weld opera-
lengthen weld-time cycle by 20%.

Otherwise weld will be under heated.

At 10% overvoltage: 20% excess heat
is produced (even more, when welder is
cold at start of shift).

PORTABLE TOOLS: Drills; grinders,
polishers, saws, impact wrenches, sanders
pipe threaders, shears.

The Effect: Torque and speed of Uni-
versal motors vary approx, as the voltage.
increasing pressure to offset the speed loss
raises current, causing more voltage drop.

At 10% overvoltage: Bearing life is re-
duced; excess speed may burn workpiece
surfaces.

RESISTANCE HEATING: Strip, ra-
diant, or immersion heaters, soldering irons
and pots; heat-treating furnaces; baking,
enamelling and drying ovens.

The Effect: Available heat varies as the
square of the voltage. Undervoltage causes
long warm-up times, slow production. Over-
voltage may damage heater or product.

At 10% undervoltage: Furnaces (melt-
ing and heat-treating) will take 5 hours in-
stead of 4 hours, thus causing an overall loss
of plant out-put by 25% on a production
line.

At 10% overvoltage: Heater elements
deteriorate from excessive oxidation regard-
less of thermostatic control.

DISTRIBUTION EQUIPMENT: Light-
ing, power transformers; power factor cor-
rection capacitors, instruments; cables.

The Effect: Transformer core losses
(usually 24 hours a day) increase as approx.
the square of the voltage, as do the losses
in controls.

At 10% undervoltage: A 25 kva. capa-
citor is only supplying 20 kva. of correction.

At 10% overvoltage: The running cost

of power transformer due to increased idling losses increases.

Now you must be thinking—What are the causes of such departures from the normal? How to locate them? And of course, its remedy? Well, here are some guidelines (merely guidelines: no details, for, space does not permit).

It is physically impossible to maintain perfect voltage at all points in a plant system. In a typical plant, power may enter at 22 kv, or 11 kv, fed to one or more substation transformers which transform the voltage to, say, 460 V; to feed bus duct or cable feeders. Some of these feeders supply smaller transformers that provide power at 110 V or 220 V to controls. Any load on the system drops the voltages everywhere along the circuit. Under full load, assuming incoming voltage steady (which it may not be) primary feeder loses 2%, load center transformer accounts for 3%, the bus duct feeder 2%, and the branch circuit transformer and conductors another 3%. That is a total of 10%. Thus, equipment using power at the end of the bus gets only 93 volts out of every 100 supplied, and the branch circuit end 90.

Electrical equipment, according to standard specifications, are expected to operate at any supply voltage within plus or minus 5% of rating. Actually you can operate most plant equipment over a wide range of input voltage. But you do so at the sacrifice of either life, economy, or optimum performance, or all three together. So, above variation is not as bad as it sounds because equipment is designed to operate at branch circuit voltages. *However, if circuits are badly designed, overloaded, or operating at very light loads, equipment voltage may be 10% or even 20% off normal voltage levels.*

Voltage losses are caused by the resistance of the conductors plus their reactance to the flow of alternating currents. Reducing the current or the length of conductor, increas-

ing conductors size will cut resistance voltage drop. Reactance voltage drop is reduced by shortening conductors, raising load power factor, enclosing conductors in non-magnetic conduit or ducts.

We can have excessive voltage drop in any circuit in the plant without conductor heating. High conductor reactance, or long circuits, or poor power factor causes voltage at the load end to sag even though the conductors are carrying much less than their normal rating. They may not even feel warm.

TYPES OF ABNORMAL VOLTAGE

The problems can be divided into three types—chronic, sag, and dips. Each may require a different cure. The existence of one condition can accentuate another.

Chronic of voltage exists where voltage is abnormal continually or over long periods of time. Usually the voltage is too low, but chronic high voltage can be a problem. This is sometimes easier to cure for instance, by changing the transformer taps or power company may be approached to make the needed changes in their system.

Voltage sags are the most common of all off-normal voltage conditions. They can originate within any part of the plant system or may be inherent in the incoming power. There may be a long term overvoltage than a sag. The magnitude of the abnormality, its duration, and the harm it does vary widely. And so must the measures we take to cure it. Corrective methods may vary from simple rearrangement in load schedules to automatic voltage regulators in critical feeders.

Voltage dips are annoying (frequently *trouble-some*) drops in voltage that may last from few cycles to several seconds. They are caused by switching or other transients in the systems. Or by heavy short time overloads within the plants such as across-the-line starting of large motors or arc fur-

ances, or short-circuit in one part of the plant system. Dips may be impossible or too expensive to eliminate, and the only answer is to isolate the equipment sensitive to it.

The existence of any one of these will increase the effect of either of the other. For instance, if voltage at plant entrance or on any particular feeder is chronically 5% low, sags during motors starting will be greater percentwise, and will take longer. Too, the margin for drop-out of mercury-vapour lighting or holding solenoids would be reduced, (a dip of a few percent may cause malfunctioning). *Clearing up chronic low voltage may shift plant-caused voltage sag or dip problems from the serious level to a point where they are only minor annoyances.*

Search for the problem

Stringing up the problems usually requires a study of voltage readings throughout the plant. Recording instruments are invaluable for any survey. Regardless of the methods used to locate the problem and trouble source, finding cure can pose the biggest problem of all. This calls for adequate data on motor characteristics, relationships of voltage drops, type and arrangement of conductors, length of line, load, and load power factor. All such information has to be 'coordinated' with a knowledge of actual plant operating conditions. Otherwise cure may be worse than disease. Take, for example, a substation that feeds a load made up primarily of motors. Tests show that voltages range from 450 volts to about 400 volts during day-production. On a 24-hour basis, voltage is only seriously low about a third of time. Yet perhaps 90% of the production takes place during this period. Raising transformer taps 7½% might seem to be the answer. It would benefit motor operation and productivity. But this oversimplified solution would jeopardize the life of lights, conductors and other equipments, fed by the sub-

station and connected to the same line around the clock.

Remedy

The best way of solving any off-voltage problem often has to be a compromise between time and money available, likelihood and direction of future system changes. Often, the advice sought from a competent consultant may be worthwhile during the blue-print stage of the plant or when caught into the trouble. Here are six of the most common solutions, not necessarily in order of importance or usage.

1. Get the supply company to improve its system. If plant's problems are directly traceable to bad incoming voltage, it is foolish to spend plant money until every effort has been exhausted in getting the company either to strengthen its feed to your plant or install voltage regulating equipment.
2. *Improve our own system*—Wide voltage swings between no load and full load are often a sign of inherent shortcomings in the system. Conductors may be too small, run over too long a distance, or have too high a impedance. The answer may lie in bringing high voltage power closer to the load centre, larger conductors using load center substations, high distribution voltage or reactance bus duct. When circuits are overloaded, no amount of patching will mask the need of system improvement.
3. *Shift the load*—When a plant system has grown in a topsy-turvy manner, much can be accomplished by shifting the loads from one feeder to another, or by extending an under loaded feeder into an area of electrical overload. Isolating troublesome loads to separate feeders can be even more effective. Loads like resistance welders, furnaces and large high-starting torque motors may be fed through special low-resistance feeders, or moved closer to transformer to improve performance.

The converse of this practice is to isolate the sensitive loads. Carefully isolating the lighting and sensitive supply to labs and controls always makes a sense.

Sometimes what is needed is to get people to change. Big motors (or, at times groups of smaller motors) can raise havoc with voltage if operators insist on starting them simultaneously.

4. *Modify the equipment*

- * Switch to high-temperature motor insulation for motors that are overheated because of undervoltage.
- * Use high-starting torque motor design to offset starting problems.
- * Use clutches, unloaders, or adjustable speed drives to cut starting or running overloads.

- * Use three phase equipment for heating or welding instead of single phase.
- * Use d.c. rather than a.c. controls for motor starters.
- * Match available voltage lamps.
- * Switch to non-electric controls lifting or holding methods (pneumatics, vacuum, hydraulic) where voltage problem cannot be overcome economically.

5. *Improve power factor* -Voltage drop may be even 25 to 100% higher when power factor is low.

6. *Use automatic voltage regulators*—They can cure almost any voltage problem although they may not be the most economical way. Before choosing them, compare their economics with the above methods.

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THE VOICE OF THE SADHU

By P. N. KRISHNAN

(Sadhus and Mahatmas, all round the country, are pleading on behalf of the Hindus for banning cow-slaughter. The feelings of the Hindus and of other revered lovers of the country and its culture, in this matter, have long been rejected and disrespected, by saying:

...that this is a scientific era and not an age when we can afford to listen to Sadhus and Mahatmas....

...that economics demand that we do away with everything unproductive; we, therefore, should slaughter the cows and buffaloes that have come to be unproductive....

...why depend on cattle for agriculture: let us mechanise agriculture....

...if the Hindus are against cow-slaughter, it is mere fanaticism....

These are the arguments given by some of the most educated people. But let us analyse....

HOW did the Berlin-Wall arise? Why did 'a difference in the shade of human skin' spur men into a shooting spree, in the most fashionable streets of America? How did a London prostitute rock the British Parliament and sweep the world-press with chapters on the 'Porfumo-scan-dal'? Again, why did a Pope leave the Church to talk on Vietnam and World-Peace? If these could be in keeping with our time and age, why not the appeal of the Hindu Sadhu, who says: "Hands off our COWS in the Indian Soil"?

The Hindu Sadhu is not unheard or uncared for. He speaks for Bharat and with him is the voice of millions of Hindus in this vast country. With him is the strength of the World's most ancient order of Monks and in him is the spiritual genius of the Orient. He belongs to the Aryan race—the race of Vivekananda, Aurobindo Gosh and Mahatma Gandhiji. His is patriotic blood of Bahgat Singh, the compassionate heart of Buddha, the peace of the Himalayas and purity of the Ganges.

Betray not the Indian Farmer

The cattle is the most loyal servant of the Indian farmer. He ploughs with that. The cow-dung is his cherished manure. To him 'mechanisation of agriculture' has no meaning; and it ought to be equally meaningless in a country with devalued currency, even after the laborious calculations of the economic experts. At such a time, the patriotic Hindu Sadhu shouts: 'preserve the cattle wealth of the country to protect the agriculture of this Nation'.

The economics of it all

The cow-dung is the best manure available for agriculture. It is available to the farmer right at the site, round the year. In a vast country like ours, which is nothing less a continent, and with the present inefficient distribution-system of ours, even twenty Sindhri fertilizers cannot replace this cattle-given manure. Apart from being an effective fertilizer, the cow-dung gives us what is called the 'Gober-gas'. This requires a small plant costing about Rs. 250/- involving a pot and a couple of tubes. With a

negligible maintenance cost, this plant can generate the harmless Gobar-gas, which cater to the lighting and heating needs of our village families. A dozen such units can keep a village go without having to use the kerosene. The processed cow-dung from this plant, after it has evolved the gas, is even a better manure than when it was in its original raw state.

The cows abroad are supposed to be capable of 13 lactations, whereas the Indian cow is capable of 19 lactations. But Alas, 90% of the cows coming to the slaughter houses in our country are after the fifth lactation. And lo! we say that we don't have sufficient milk to meet our needs. Again, it has been found from informal surveys, that about 70% of the so called 'absolutely unproductive cows', coming to the slaughter houses after total rejection by the owners and with a veterinary surgeon's certificate, come back to lactation within three years, if maintained under proper conditions.

Now, in the market of free competition, the supply and demand are supposed to get adjusted to bring about maximum utility. But, in our country, why is it that the demand of the city slaughter house is more than that of the village farmer, while the higher demand is at the cost of utility? It is because of the vast difference in the economic conditions of the cities and the villages, which is, in turn, the consequence of imbalance between the agricultural and industrial developments of the country. For example, the buying capacity of an ordinary city-peon is much more than that of a farmer of the same status in the village. Moreover, the former has ready cash round the year, whereas the latter's money is always invested. This is also the reason, why many agriculturists from the villages are fast leaving their profession and crowding the cities.

Now the question is: 'Whether it is advisable to set right the economic defect and preserve the cattle wealth to meet the agri-

cultural and milk demands of the country, or to allow the malfunctioning economy to wipe away our cattle wealth through the medium of 'cow-slaughter'. A similar domestic situation would be, 'whether one should kill the bugs in the house or burn the house itself'.

Where man-made concept has to compromise with human-conscience

The machine-age erred when a living organism was equated with a machine. As Bertrand Russell puts it, "We are in the middle of a race between human skill as a means and human folly as an end, resulting in strife, insecurity and sorrow". We have therefore, to check this de-humanising outgrowth on materialism. That alone can heal a disturbed humanity. As Sri Aurobindo has said, "What is there new that we have yet to accomplish? Love, for, as yet, we have only accomplished hatred and self-pleasing knowledge, for, as yet, we have only accomplished error and perception".

Stop this Sacrilege

The COW is a symbol of the Hindu Culture. The Aryans revere the Cow as a Sacred animal. To the Hindu child, the calf is one of the earliest acquaintances to play with. The baby in a Hindu home learns from the calf to call its mother as "AMMA" or "MAA...". The Hindu mother sings on the 'Cow-herd-son' of Yashodha as the 'playboy' of the cattle; and this leads her child in the cradle to pass into sleep with a smile of divine innocence. Again, when the Hindu boy prays to Lord Krishna, he sees that charming prince of Brindhavan as 'Govardhanodhari', the benefactor of the COW.

Now the Sadhu comes to ask: "How can this soil be drenched with the blood of this sincere and sacred animal? How can the Hindu boy, after hugging and fondling with it, see this play-mate of his being slaughtered and roasted? How can the Hindus bear this 'Mother of the Hindus' being butcher-

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ed? It will be directly feasting upon the Aryan blood, openly trampling over the Hindu Culture. It will be an outrageous attack on the guardian of Hindu-Sanctity, the COW.

Respect the Patriot

The Historic 'Sepoy Mutiny' of 1857 sowed the seeds of Indian upsurge against the British rule. This was the beginning of the great freedom struggle and it was the COW which began this. The Britishers tickled the Hindas' reverence towards the COW and there began the Sepoy Mutiny and the burning freedom movement- inspired by the COW. Now the Sadhu only says, "Respect this great patriot. The COW, the Hero of the freedom struggle; save the symbol so loyally chosen by the ruling party and so disgracefully put to throb under the butcher's blade."

The Hindu Dharma

Professing to be a highly advanced civilisation, the world is today blinking as to how a global suicide could be averted. At such a time, it will be a self-mockery to interfere with the unshakable Hindu-Dharma, which is nothing but a Universal Code of Conduct. It preaches 'oneness of creation', 'unity in diversity' and 'universal compassion'. The

Hindu Culture is not a book of religious fanaticism or a bundle of superstitions, but is a way of life based on the experience of ages and the research of sages who went up from the finitude of human faculties and the fringe of human fancies, to the infinitude of supra-human potentialities and the fields of super-human possibilities.

Secularism may be a concept in politics; and a polity, torn by ideological intolerance, may require legislation for secularism, or even for humanism among human beings. But, to the Hindu, his conscience bears humanism, his outlook is secular and his Culture maintains magnanimity and dignity. He believes that human spirit is essentially divine, unique and eternal. He is addressed in his scriptures not as 'sinners', but as 'Oh! you sons of Immortality - AMRITHASYA PUTHRAHA'. His tradition teaches him not 'the way to Heaven', but the ways to have Heaven on Earth. His fore-fathers have sung: 'JANENEI JANMABUMFESCHA SVARGADHAPE GAREEYASE'. Mother and Motherland are to be adored as higher than even Heaven'. It is this spirit that lies in the VOICE OF THE SADHU and in the thought of the HINDU. It can never betray India or Indian interest.

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LIBRARY • TEMPLE FOR SELF-EDUCATION

By Shri J. G. PANDE

There is a changing concept of existing things in this world. Nothing is *static* in relation to the object we perceive. If it is to move with the changing times, it must be *dynamic*. This equally applies to the library. There was a time when the library was considered to be a storehouse of books. The use of books in pre-twentieth century was considered to be the privilege of the select few or at the most scholars, and the use of books was allowed on the library premises, and that too at the discretion of the Librarian, who was charged to be the custodian of the treasure of the library. With the lapse of time, this outlook underwent a revolutionary change and now the time has come, when the Library is considered to be the temple of learning and an information centre for the pleasure and profit of the young and the old. In India, the first step towards this dynamic policy was adopted in the old Baroda State, by Mr. W.C. Borden who spared no pains to make the library a living organisation in the State, by establishing a network of libraries. The enlightened Ruler of the Baroda State, Late Sayajirao Gaikwad gave the fullest encouragement to implement Mr. Borden's dynamic ideas. It was only after Dr. S.R. Ranganathan (who has been rightly called the father of the library movement in India) gave the world his famous *Five Laws of Library Science* that the library movement has spread its wings in India. The western world acclaimed as the most valuable contribution in the field of Library Science. These five laws are as under:

1. *Books are for use:* i.e. the books are meant not for preserving but for use.
2. *Every reader his book:* i.e. every

reader should be able to find a book of his or her choice in the library. The library must cater to the needs of all.

3. *Every book its reader:* i.e. every book in the library as far as possible appeal to the reader. An unused book is a burden to the library.
4. *Save the time of the reader:* i.e. the books should be easily accessible and quickly administered.
5. *Library is a growing organism:* i.e. the books are to be added year after year, keeping pace with the time. A unused and out of date books weeded out to make room for growth.

To implement these five laws of Library Science, every library should primarily be organised on the basis of the following requirements:

- (a) *Good Counter Service:* A counter service implies the inward and outward movement of the books. It is at this place where library functions are mostly carried out. Some persons think that counter service is a very simple affair which can be mechanically carried out and requires least intelligence. It is a grossly mistaken notion that the counter service only means the issue of books and accepting the books returned by them. It is the only thing assigned to the counter service, even an ordinary library person without any requisite training can discharge the counter service. The library single handed, and untrained staff would be required.

EDUCATION

Dr. J. G. PANJI

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so many persons need be employed in the library. In a Library, counter service is a multifaceted job, viz: guide the readers to the books, provide ready reference service, explain the intricacies of the catalogue and classification scheme, etc. etc. In short, counter service is a liaison arranged by the staff between the materials possessed by the library and the reader. If the service is not rendered properly, the reader may have to suffer, even though the library be rich in the materials wanted by the reader.

- (b) *Open Access*: It is now an established fact that the readers should have a direct and unhampered access to the books. The good olden days, when the treasure was guarded from the readers, is now a past history. The readers are not to be viewed as pilferers to books. One should remember well that the *thirst for knowledge has to be quickly quenched, if the self-education is to be given full and free encouragement*. Open access libraries in the west have become far more popular and useful. Mr. Borden, Library Adviser to the old Baroda State too boldly experimented with the open access system in the Central Library at Baroda in the first decade of this century, and the scheme is still in force with all its benefit fully enjoyed by the avid readers. Mrs. Hansa Mehta Library of the M. S. University of Baroda is also working with the open access system. Our hats are off to the authorities who by adopting this system have upheld the progressive principles to make their library effective. A common doubt that has been raised by many is with regard to the danger to the valuable stock of the library and to the possible losses that may happen by the open access systems. But with pro-

per precautions, adequate staff, and suitable safeguards, the pilfering of the materials from the premises can be avoided so that open access system can work very efficiently. It is worthy of consideration and needs to be followed as far as possible in all libraries.

- (c) *Library Staff*: It has to be understood that the library staff need a special training. *Library service is not a clerical job but a job demanding the right aptitude, and good technical training*. Lack of well trained workers in a library and the lack of appreciation of the difficulties of the librarians have been to some extent responsible for the unsatisfactory working of good many libraries. With limited prospects that this profession of Librarianship offers, it has always been a problem to find well trained workers. The untrained workers do take a fairly long time to learn the library routine and it is no wonder that they leave the job to find better prospects elsewhere even before they learn the work properly, being dissatisfied by the service conditions and the miserable emoluments they receive. Dr. Ranganathan has rightly said that "the library staff would not work up the enthusiasm necessary for the carrying out of its mission, when the scale of pay had become inferior to that of a peon, or a mistry or a wireman". Thus the trouble in most of the libraries arise by lack of understanding and appreciation of the difficulties of the Librarians by the authorities. The Librarian has thus a sacred duty to perform. It is to give all possible help to the reader who turns to the library to satisfy his thirst for knowledge. *For this he needs full encouragement of his authorities, full*

cooperation of his staff, and good understanding by the readers.

DIFFICULTIES OF THE LIBRARIANS: It is a known fact all over the world that there are losses of books and allied materials from the library, howsoever the authorities may guard the library premises. Even the veteran librarians are unable to find the reasonable clue to solve this knotty problem. Even it has baffled the authorities as to how the loss can be made good and as to how it should be recovered? Bigger American libraries have employed full time detectives to watch the culprits but they too could not fully negate the tactics of the light fingered uncivic artisans. Mr. K. B. Dixit, Librarian, Willingdon College, Sangli, in his article 'College Libraries in India' suggests that some instances have occurred where the library staff is asked to pay for the loss, despite the best safeguards, vigilant eye over the readers, the loss of books is inevitable. This is mainly due to the unethical and mischievous tendencies of some readers or students. But the library staff should not be asked to pay for the loss of books. In this respect, Mr. V. S. Rastogi of the Punjab University Library, hits very hard in stating "when many Librarians have to make good the loss from their petty salaries and their every voice, explanation, and every appeal for mercy has been turned a deaf ear to, rejected with this unhappy treatment, and getting the reward of their faithful service in such an unusual way, they made good bye to the profession to seek fortune elsewhere".

CONCLUSION: The authorities in general should not take a rigid attitude in penalising the library staff. On the other hand, efforts should be made to recoup the loss out of the funds collected from the readers as subscription or otherwise, as it is a fact that the losses are mostly due to the unethical attitude of the readers especially it is more so in the students libraries. This is customary and rampant even in most civilised

countries and the authorities have now learnt to ignore these small losses and recoup them without least grudging. If readers lack the sense of responsibility and moral obligations, the library services demand of them, it is regrettable that the Librarians should alone be made to pay and thus suffer for no fault of theirs. A beginning may be made at least in Educational Institutions to save the Librarians from this awkward situation by making the Students Union or Gymkhana Committee take a little more interest in making the students more conscious of the library service and its incidental responsibilities and thus help to check the unfair ways and means of some of the students. It should be remembered that efficient working of the library mainly rests on the cooperation from the readers. It is therefore necessary that our Educationists and Administrators must apply their minds to these problems. If a Library has to render effective service and help promote self-education, it has to be given all help, scope and consideration. The library is no more a dead appendage but a living entity adequately fostered, to make it grow unhampered and yield its full crop for the hungry citizens who solely depend upon its resources for their allround development. In academic world, libraries supplement the curricular teaching and in non-academic commonplace life, books alone are one's teachers and the public library, the only alma-mater.

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OUR HOMAGE TO NATIONAL LEADERS



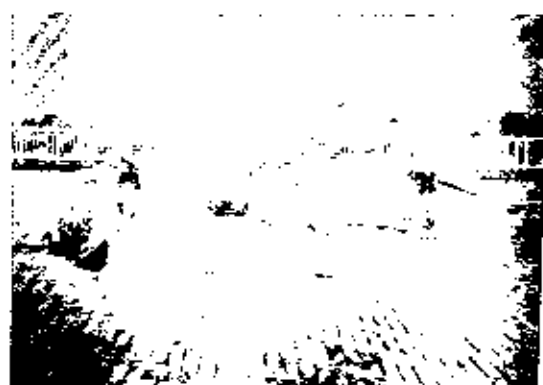
RAJ GHAT



Statue of Sardar Vallabhbhai Patel at Simla.



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WRESTLING CHAMPION



OUR COLLEGE FIRST
NAVAL CADET
Mr. Merchant



ATHLETIC CHAMPION
V. Fernandes



MUSIC MASTER
S. C. Pawar



General Secretary
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Joint Secretary
Sri Gandhi

GUIDED MISSILES

By SUSHIL PANDHI, B.E. (Elec.)

A GUIDED missile is an unmanned vehicle that travels above the earth's surface; it carries an explosive war-head or the useful payload; and it contains within itself some means for controlling its own trajectory or flight path.

Modern military aircraft can fly so high and so fast that conventional antiaircraft-guns are ineffectual against them.

Guidance system

The missile guidance system keeps the missile on the course that will cause it to intercept the target. It does this in spite of the wind or other forces acting on the missile, and in spite of any evasive action the target may take. The guidance system may be provided with certain information about the target before launching. Additional information are transmitted by radio from control station when the missile is in flight.

Types of guidance systems

1. **Command Guidance:** A computer continuously calculates the course that the missile must follow to reach the point of intercept. Throughout its flight, it is steered along the desired path by radio commands from the ground.

2. **Side-winder homing Guidance System:** It is sensitive to infrared (heat) radiation, and will steer itself to any strong source of infrared. The exhaust of a jet aircraft is such a source, and sidewinder can steer itself "right up the tail pipe" of an enemy jet.

A missile can be designed to home on light, radio, or radar energy given off by, or reflected from the target, and it can be

designed to home on a source of sound waves, too.

3. **Navigational Guidance System:** The missile determines its own position in relation to target, and it may be designed to navigate with the help of radio or radar beacons, just as a ship may navigate with Loran.

Thus a missile may have more than one type of guidance system.

WAR-HEADS

A guided missile may carry one or more war-heads and one or more fuses which are devices to cause the warheads to detonate in such a position that maximum damage is inflicted on an average target.

Different Types of War-heads

- (1) Blast-effect war-head
- (2) Fragmentation war-head
- (3) Chemical war-head
- (4) Biological war-head; etc.

Telemetering system

A missile-telemetering system consists of measuring devices and radio-transmitting equipment, the purpose of which is to measure the performance of various missile components throughout the missile flight and to transmit this information to recording instruments on the ground.

Phases of guidance

- (1) Launching or initial phase
- (2) Mid-course phase
- (3) Terminal phase

Missile may be launched from a point at some distance from the guidance equipment. The flight controls in the missile are locked

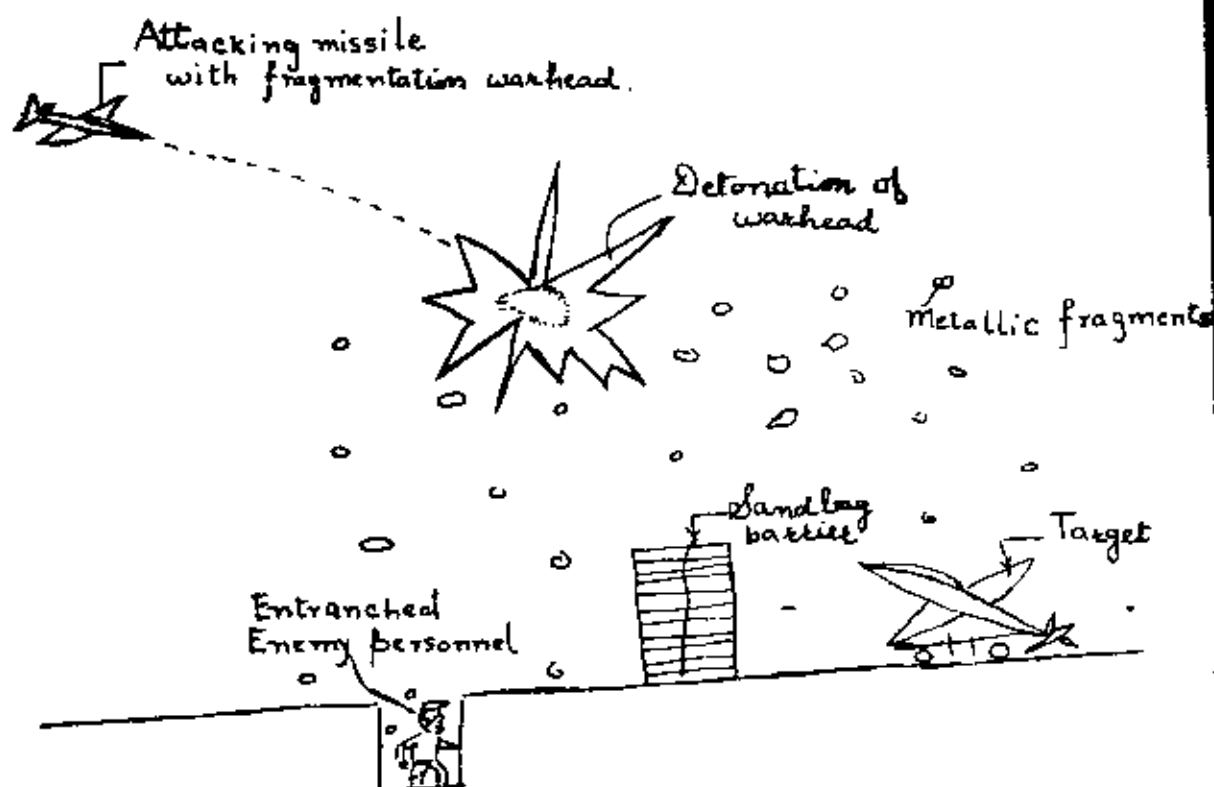


Fig :→ {Effect of Fragmentation war head
on Surface Target

for sometime after launching, because missile does not have aerodynamic stability when it is first launched. As soon as the controls are unlocked and the guidance system assumes control the initial phase of guidance is completed.

During mid-course, phase guidance system is used to put the missile near the target.

The terminal phase is of great importance because it can mean a hit or a miss, therefore the last phase of guidance must have high accuracy as well as fast response to guidance signals.

Components of Guidance System

1. **Sensor:** Antena or receive installed in the missile is called sensor.

In some respects, the sensor unit is the most important section of the guidance system because it detects the form of energy being used to guide the missile. If the sensor unit fails there can be no guidance.

KIND of sensor that is used is determined by the following factors: (i) Maximum operating range (ii) operating conditions (iii) kind of information needed (iv) accuracy required; etc.

Type of Sensors

- (a) Heat or infrared sensors use thermocouples.
- (b) Sensors that respond to light use an active photo electric cell, or a tele-

vision camera to pick up information and to send it back to the launching sights by TV transmitter in missile.

- (c) Electromagnetic sensors use radio or radar antennas as active elements.

For initial and mid-course guidance, antenna is normally streamlined into the tail of the missile. For final phase guidance, it is located in the nose of the missile.

2. *Amplifiers:* Each of the sensor unit discussed above produces an output; in most cases this output is voltage. A computer is used to find the sensor output voltage with the reference voltage. If the missile is off course the two voltages will not be the same. The computer will then generate an error signal, which will be used to operate the missile control surfaces and bring the missile back to course.

But the computer output signal is usually too small to do the actual work of moving the control surfaces. And the output of a sensor unit is too small for accurate comparison with a reference voltage. In such cases the missile uses an Amplifier to increase the signal voltage or power to a useful value.

3. *Computer:* An important function of a computer is the coding and decoding of information relating to the missile trajectory. Computer uses discriminator circuits

to select pulses of the proper width, amplitude, frequency, phase or time difference, and reject all other pulses.

A second important function of computer is to compare the signals from the sensor and reference units, to compute the missile position with respect to the desired reference planes, and to generate error signal voltages required to bring back the missile on course.

4. *Controls and Actuators:* The error in the altitude of the missile and the one in the flight path are corrected by moving the missile flight control surfaces. Movements of these surfaces are governed by controllers and actuators.

Controller include such devices as relays, solenoids, magnetic transfer valves, and amplidyne. The actuators that apply power to the control surface may be electric, hydraulic, pneumatic, or a combination of these.

5. *Feedback System:* The final section of a guidance system is known as the "feedback" or "follow-up" unit. This unit measures the position of the flight control surface in relation to the reference axis of the missile, and compares this value with the error signal generated by the computer.

This in short is the picture of the guided missile.

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Introducing THE UNIVERSE

By Shri GIRISH V. MEHTA, S.E. (Elect), S.P.C.E.

IT is rather hard to give the complete concept of the Universe even in thousands of pages but some basic ideas may be cleared by this article.

Universe is very much complicated by itself that many human generations have tried to understand it but still we have not realized it fully or whether we will, in future or not is a difficult question to answer.

From the time of Copernicus (1473-1543), various theories about the Universe were put ahead but a realistic theory of satisfactory nature has not been arrived at. We know something about satellites, Sun, along with its planets and their moons, is one of some 40 billion stars in our galactic system—the Milky Way. How much 40 billion is? If we give every star one new name per second, we should need about 1700 years to complete the list! Milky Way is only one of the millions of other galaxies. All such million galaxies form the Universe.

Our planetary system contains, planets and their moons, asteroids, meteoroids comets and so on. Sun is responsible for all of them except comets. There are stars quite bigger than our sun—Red Giants, and the stars smaller than our sun do exist and are known as white Dwarfs. There are thousands of nebulae which are made up of thin gases and are known as galactic nebulae. Those are the members of the Milky Way. Planetary moons revolve round their mother planets and in turn planets move round the sun. Sun and other stars move about randomly in the galaxy and the galaxy spins about its axis with a speed of 7 angular se-

conds per century.

Extra galactic Nebulae (which are not nebulae at all) consists of stars packed very close to each other. Their shapes may be elliptical or spiral. To differentiate them from galactic nebulae they are also known as "Island Universes".

How much the Universe weighs? Theoretically unimaginable infinity. To give an idea here I give an illustration. In the book "Between stars and Atoms" Elbert H. Bunte writes "It has also made a supposition concerning the amount of matter in the Universe. That amount is estimated by some scholars as three times ten to the seventy-fourth atoms, which is expressed briefly 3×10^{74} ."

So much of matters is there but the density of the Universe according to the recent figures obtained by Dutch astronomer T.H. Oort is only 3×10^{-11} gms/cm³ or 0.2 hydrogen atoms/m³. The best man-made perfect vacuum contains, however, billions of atoms/m³. Thus the Universe is virtually empty.

Now density is mass per units volume when the Universe is having tremendous mass and the density is very very low, obviously it accounts that volume should be very very large and here we are!

It is rather inconvenient to express the distance in space, in terms of miles and kilometers. And hence we use a unit as Light-Year i.e. The distance travelled by the light with the speed of 299,776 km/sec. in one solid year. A light year is equivalent to 9,463,000,000,000 kilometers or 5900 billion

miles. Our sun's nearest neighbour the star 'Alpha centaur,' is about 4.2 light years away from us i.e. 40 billion kilometers away. Our Milky Way's nearest companion extra galactic Nebula 'Andromeda Nebula' is about at a distance of 680,000 light years i.e. light emitted from it takes 680,000 years to reach us! According to Hubble, the large telescope of the Mount Wilson observatory penetrates into regions of space 500 millions of light years away. But it is estimated that we can reach 1.5% of the Universe with these instruments. Thus one can imagine how big our Universe is. To get an idea that how big is our observable Universe, consider the star Sirius being 8.8 light years away from us. And as Bunte says "What is a journey to Sirius compared with the size of the Universe? One tenth of a millimeter in a total of 10 kilometers."

What can be the shape of the Universe? Einstein believed that a spherical surface represents the two dimensional analogy of our Universe which is finite and unbounded. Dutch astronomer Willem de-Sitter gave another special features to Einstein's Model, main feature being that the space time continuum existed by itself alone, independent of existence of matter. But both of them have failed to convince the scientists fully and so we will discuss some more interesting theories;

- (1) Evolutionary Theory-Lemaitre Model,
- (2) Steady state cosmology.

We are all familiar with the Doppler effect in sound the pitch of sound increases as it travels towards the listener and the pitch decreases as sound travels away from the listener. Similar effect is there in case of light and is known as Red Shift. Thus frequency of light decreases or wave length increases if source of light and the observer are separating and vice versa. It has been observed that this phenomenon occurs when we analyse the light coming from the galaxies. If we know the change in wavelength

$\delta\lambda$ for a particular wavelength λ for a galaxy, then we can predict the velocity of recession and as further away the galaxy greater will be the velocity of recession. If V is the velocity of recession then $V = \frac{\delta\lambda}{\lambda} C$

where C is the velocity of light. Thus amount of red shift determines velocity of recession of the source. Thus obtained V gives us the distance (d) of a galaxy from the Earth by the law $V = Hd$ where H is the Hubble's constant. And as James A. Coleman writes in his book "Modern Theories of the Universe", "In 1956 Baum obtained a velocity of about 75,000 miles a second, or two-fifths the velocity of light. And in 1960 R. Minkowski obtained velocity of about 86,000 miles a second or about 0.46 of the velocity of light for what may be two galaxies in collision. The distance corresponding to this highest velocity, yet obtained, can be determined from Hubble's law using the present accepted value for H ; the result is 6 billion light years". Now it is a doubt whether those collided galaxies are now existing or not after 6 billion years.

Thus galaxies are running away from each other proving that the universe is expanding with abnormal rate. But the galaxies themselves are not expanding i.e. the stars forming the galaxy are not receding from each other. Some galaxies form a cluster and they remain together and as much cluster as a whole runs away from other galaxies. Some clusters are supposed to contain 10,000 or more individual galaxies e.g. Virgo and Coma galaxy clusters.

Now let us consider the Lemaitre model in the evolutionary theory. This is the best gravitational theory and is based on Einstein's General Theory of Relativity. The main feature of this theory is that the Universe is *AS A WHOLE* undergoing changes along with time.

In this model the Universe is finite and unbounded.

In the very beginning the universe was in much denser state known as 'primeval atom.' Then some sort of nuclear explosion occurred and the Universe started to expand rapidly but due to gravitation the expansion force slowed down. According to general theory of relativity, there was a universal force of repulsion—cosmic repulsion—increasing with the distance. But in the early stages the universe being small, only gravitational force was predominant and hence original expansion slowed down. A stage came when gravitational force and the force of repulsion exactly balanced each other and the system nearly reached a standstill stage. This was equilibrium stage known as Einstein's Equilibrium Phase. About in this phase stars and galaxies formed, as a result of condensation of matter. But this stage was unstable and again expansion started and due to increased distance gravitational force became weaker and weaker and cosmic repulsion now become predominant resulting in ever expanding state of the Universe. Now we are in this second stage of expansion. Density went on decreasing and eventually expansion will stop when the density will be nearly zero. Another theory Gamov Theory has been also proposed under this head.

Steady state theory has a main feature, "There is a continuous creation of matter in the space".

Here the Universe is, as a whole, not changing but in detail changes do occur. Individual galaxy ages and does move away from other galaxy but in increased space newly created matter condenses and form galaxies so that the average distance remains the same. Although galaxies age in this manner, the bird-eye view of the Universe remains the same i.e. the universe is in a steady state.

Yet the tug-of-war exists between these proposed theories.

Can man conquer the Universe? Possibly not. Our own galaxy measures One Lakh Light Years from end to end i.e. light emitted from one end reaches the other end after one lakh years. Our highest speed achieved is 8 miles/sec. Compare it with the speed of light amounting 1,86,000 miles/sec. In future we will achieve a higher speed but not equal to the speed of light and beyond that according to Einstein it is next to impossible. So for large distance, while journeying only an astronaut may end his life in the space-ship. Today, it is only a matter of imagination to reach even the distant members of our planetary system. Of course, as the journey lengthens there are so many other problems to be solved like fuel, trajectory and other space hazards.

More interesting problem is the existence of life in other parts of the Universe. One can not say that planetary system exists for sun only when there are billions of other stars like sun are in existence. Those 'Earths' may be having the surroundings which can support life. Some scientists believe that even more advanced life is in existence. But how can we know that? From here we send radio signals of particular frequency which an intelligent life may pick up and answer us. But how much time it should take? It depends upon the distance between us and that intelligent life under consideration.

As a story goes on, a farmer answered the question of a king that he was planting a mango tree so that his future generations might have the fruits. Similarly for very large distances, send a radio signal so that our future generations may have the answer from the intelligent life. But there lies a tragedy as well. Your signal may reach for deep in the Universe, say about 200 million light year, by the time answer is sent back, the Earth may not be in existence even, or for the better side, after another 200 million light years that intelligent life may not be in existence.

HISTORY OF CENTRAL WATER & POWER RESEARCH STATION, POONA.

We all know,

"The enlightened attain self expansion beyond worldly limitations." On the same principle a small beginning in a rightway expands into a well established dignified piece of work. A small beginning of C.W.P.R.S. (central water and power research station) was made at Hadapsar along Distributory 5 of the Mutha Right Bank Canal 11 K.M. east of Poona early in 1916. Its purpose was to study the Engineering problems and to find out their solutions, for tackling major problems a number of models were gradually located below lake five at Khadakwasla 18 K.M. from Poona, between 1925-34. By about 1937 the station covered an area of more than 7 hectares with water requirements met upto 1400 litres/sec. Now the station entered in its early part of youth and hence the financial and administrative management was taken over by the Government of India in 1937.

Sir Claude C Inglis was appointed as the first Director of C.W.P.R.S. He developed the station with leaps and bounds and contributed his services upto 1945.

In 1945 Dr. A. N. Khosla assumed the charge both as Consulting Engineer and Chairman of the Central Water ways, Irrigation and Navigation Commission. Dr. Khosla visited the Station in Feb. 1945 and it was decided to expand its activities to undertake solution of many Hydraulics Problems. The re-organisation of it into the central waterways and Irrigation and Navigation Research Station was sanctioned by the Government of India on May 22nd 1947.

The Government of India sanctioned a capital expenditure of Rs. 23.91 lakhs of various works connected with re-organisation of the station and 7½ lakhs a year for

By Shri K. N. SONI, Civil Engg. Dept.

establishment and contingency charges. Research in various Hydraulics Problems is now carried out at this station which has named recently as "Central Water and Power Research Station". At present it has covered an area of 296 acres for different Research Sections and 124 acres for staff colony. Each section has its chief Research officer, totally there are 50 Research officers, 30 Asstt. Research officers and 80 Research Assistants with 1200 to 1300 staff members of other categories helping in administration and working for Research problems. Now-a-days except Rajasthan and Assam all other states have own Research station. Minor problems of the state are tackled by the state Research station while major problems of all the states are referred to C.W.P.R.S. at Khadakwasla.

The present director Sri C.V. Gole has been carrying out the great task that has been set before the nation in an illustrious manner like his eminent predecessors, K.K. Framji (1945-48) Dr. Jogalekar (1948-57) M.G. Hiranandani (1957-62).

Central water and Power Research Station has covered up various fields such as:

1. Flood Control,
2. Barrages,
3. Hydro Power Structures,
4. Spillways,
5. Outlets and gates,
6. Cavitations,
7. Bridges and River Training,
8. Canal Hydraulics,
9. Ports and Harbours,
10. Ship model Testing,
11. Photo elasticity,
12. Model Engg.
13. Soil Mechanics and Foundations,
14. Rock Mechanics.

15. Earth-quake Engg.
and many other important sections of
Engg.

Now we shall have a glance to some of the major interesting problems studied at the station.

The most mischievous river in India one can say is river Kosi. It runs in sandy alluvial plain. The bed of the river is being raised every year by the huge quantity of sand brought by it. The river has shifted by 70 miles during the last 100 years in westerly direction. The problem was how to prevent or minimise this movement of its course. The problem was studied by the station with the help of four different models and solutions were given to the state Government. Thus the station helped a lot towards the success of Kosi project and thereby there will be an annual saving of 6 to 10 crores as a result of avoiding damage to the standing properties.

Another important recent project study was about the protection of Dibrugarh town on the Brahmaputra river. During 1954 floods, the river eroded about 1/7th of the town taking away with it many important buildings. Model tests were studied at the station and as a solution construction of 5 stone spurs and 13 permeable spurs was suggested. Thus the cost of protection force will be considerably less than the damage and permanent solution was found out with the help of expert Research Officers of C.W.P.R. Station.

For training Mahanadi to save damage that every year it causes to Orissa the station recommended the construction of spurs.

Problems of Navigation, Ports and Harbours were also studied by the station. In the case of Calcutta, ships leaving it takes 2 to 3 days to go a distance of 100 miles from the port, as there are many acute bends and shoals in the harbour. Ships have to

wait for high tide. Expts. are in progress to find the measures for this difficulty.

In the case of Cochin harbour there is considerable erosion along 12 miles length of the coast south of Cochin harbour due to waves in monsoon, with the help of model study the station recommended short groynes at right angles to the coast.

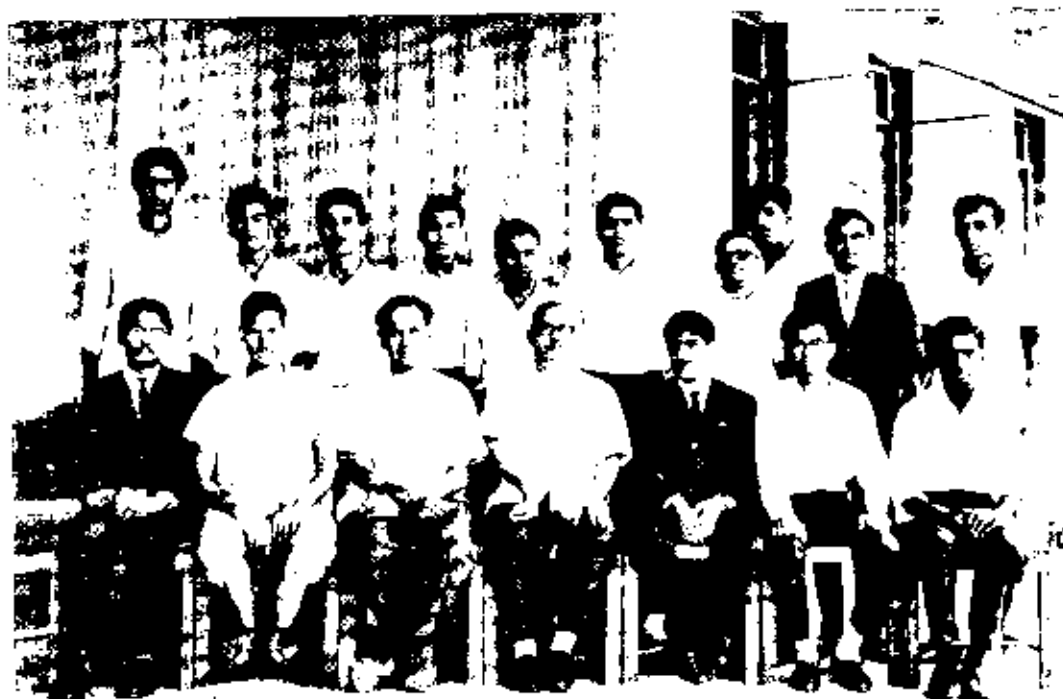
The station has also studied the problems of length and alignment of break waters for development of Porbandar port; development of Veraval as fishing and all weather port. Experiments are being carried out to reduce ranging in Madras harbour due to cyclonic storms and for developing Mangalore as an all weather port. One important problem of Cochin harbour was about Kuttanad area, granary of Kerala State. It suffers damages due to floods and salt water intrusion. The scheme of constructing a barrier at 25 miles south of Cochin harbour to cut off the penetration of tidal water has been modified and suitable alignment of the barrier was recommended by the station.

Over and above the major problems discussed above several other important problems were studied at the station. Model studies for testing Hydraulic design features for Hirakud dam spillway sluices, Kakrapar weir and Channels, Gandhi Sagar and Vaitarna Spillways, Gangapur dam canal outlets, remodelling of the Ghataprabha canal regulators, Koyna dam spillways etc. were carried out by the research officers and economical measures were recommended in each case.

Thus central water and power research station, Khadakwasla, Poona has completed 51 yrs. and it has rendered marvellous service to the nation. Let us hope that some students of S.P.C.E. Join C.W.P.R.S. and take the benefits it offers serve to the nation.

"Let the worldly factors spoil whatever it can, Engineers shall rebuild with their own intellectual."

ATHLETICS AND INDOOR GAMES



COLLEGE CRICKET TEAM



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OBITUARY



Late Sir C. P. Ramaswamy Iyer
1966



Late T. A. V. Dikshitar,
Principal, Mumbai



Ramesh Radhakrishnan
(B.E. Elec. Student)

Technical News Report:

(i) *Fatigue Control Bracelet*

A Belgian inventor has perfected a "fatigue control bracelet", working on transistors, which will stop a motor vehicle when the driver is too exhausted, ill or drunk, to drive with proper care.

It sends signals to instruments on dashboard and a device affixed to the carburettor. As the driver's fatigue or state of nervousness increases the petrol supply is cut down, and the vehicle slows down. When a really dangerous point is reached a light goes on to warn the driver, and a second or two later the vehicle stops dead.

(ii) *The Cost of Muscle Power*

Mr. W. T. Singleton, senior lecturer in economics at the school of Aeronautics, Cranfield speaking at a conference organized by Management Studies Centre, threw a new light on the competitive cost of man power and machine power. He said: "The cost of human muscle power in British industry is about £ 7 per kilowatt hour as opposed to 2 d. if an electric motor is used.

The moral in this situation is clear: never use human muscles for any job which could be done equally well by machine!"

(iii) *The Cost of Smoke*

The Report on fuel conservation issued by the Anglo-American Council on Productivity has an interesting passage on the cost of smoke which is reproduced below.

"When coal was cheap and plentiful in Britain, the apologists, with full knowledge of its wasteful use, were fond of quoting Yorkshire saying: "Where tha's muck, tha's money." Today wiser men know that where there is smoke, there's a waste, and that smoke abatement and fuel efficiency go hand in hand. Much smoke is simply unburnt fuel—that is, lost heat. It is estimated that in Great Britain the entire output of 10,000 miners is wasted each year in form of unnecessary smoke, apart from which the dirt and damage caused by smoke ties down a great deal of manpower on non-productive work."

USE OF ELECTRIC - NETWORKS

IN ANALYSIS OF STRUCTURES

By Shri D. S. JOSHI, M.E. (Structures).

[This paper describes simple applications of A.C. Electric network for the solution of Indeterminate pin joined structures. A few applications are described and the required circuit diagram for each of them is given.]

STATICALLY determinate structures are those where the entire analysis, that is the calculation of the reactions and internal forces, can be done solely by using the statical equations of equilibrium. Knowing the internal forces, all the deformations of the structure can be calculated and the structural design completed. Indeterminate structures on the other hand cannot be completely analysed on the basis of the equilibrium equations alone. More unknown forces or moments, external or internal, will be present than can be calculated by the equations of equilibrium. These "extra" quantities are termed as "redundants" for which additional equations will have to be formulated so that finally as many equations are available as there are unknowns. Therefore it is laborious to analyse indeterminate structures.

Looking to the amount of mathematical work involved while solving indeterminate structures, any quick and fairly accurate method must always be welcomed.

For equilibrium the algebraic sum of the forces meeting at a point must be zero; can be compared with Kirchhoff's current law, which states, that, the algebraic sum of the currents meeting at a point must be zero in any circuit. Therefore, the forces can be considered as current in the circuit and thus

the equilibrium conditions of the forces can be represented by the Kirchhoff's current law.

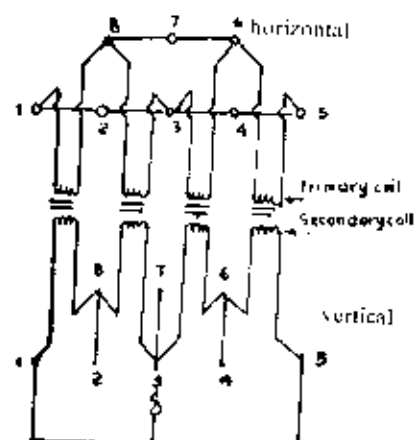
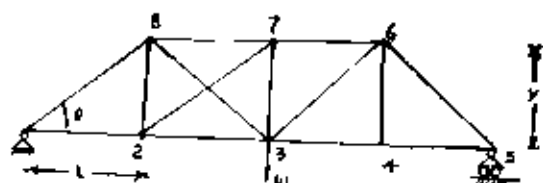
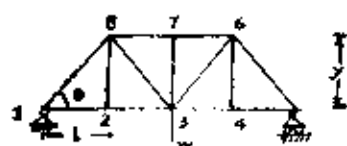
With this idea in mind, we can draw the circuit for any pinconnected statically determinate structure. Consider the Pratt truss shown in Fig. 1.

$$\begin{aligned}\text{No. of members} &= 2 (\text{Number of Joints}) - 3 \\ &= 2(8) - 3\end{aligned}$$

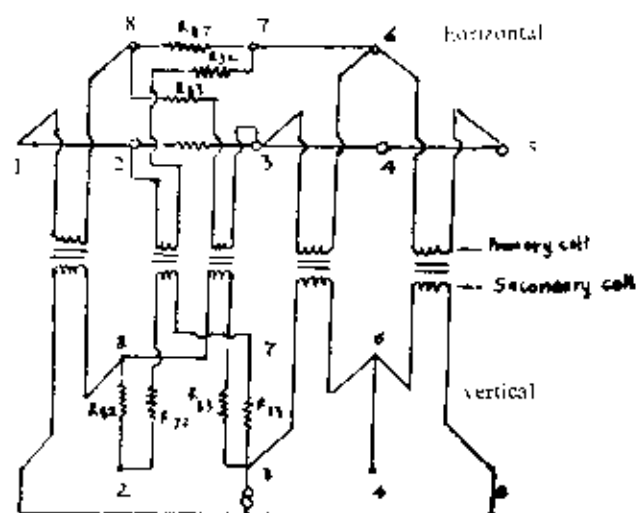
1. Determinate truss.

Here we require two net works. One for horizontal members and the other for vertical members. We do not require any separate network for diagonal members, as an inclined force can always be resolved into horizontal and vertical components.

To construct the electrical analogue of the above truss, first layout two sets of eight terminals, representing eight panel points. One set of eight terminals is for horizontal forces and the other set for vertical forces. In the horizontal network, connect each pair of terminals which correspond to panel points that are connected by a horizontal member in the structure. In the same way, connect each pair of terminals, which correspond to panel points that are connected by a vertical member, in the vertical network.



Analogous network for determinate pratt truss.



Analogous network for indeterminate pratt truss.

Fig. 2.

Fig. 1.
Members 7-2 and 7-4 are redundants.

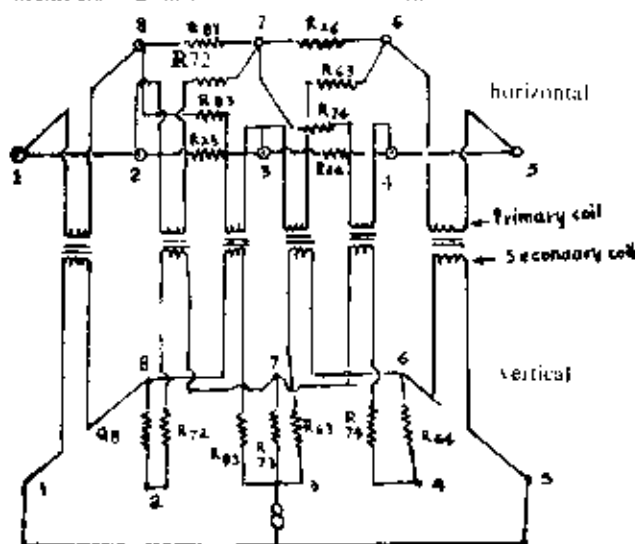


Fig. 3

In both networks, connect each pair of terminals, which correspond to the ends of a diagonal member, but interpose a transformer with its primary coil in the horizontal network and its secondary coil in the vertical network. The reason for this arrangement is to consider the inclination of the diagonal members with the horizontal. The transformer ratio is the ratio of secondary current to primary current and therefore if this ratio is adjusted equal to the tangent of the angle between the horizontal and the diagonal, we get the current in the proper proportion.

Here, $\tan \theta = y/l$ $\therefore$ Transformer ratio $= y/l$. This completes the circuit. Now the forces are applied by inserting alternating currents at the load and support points. The currents should be in proportion to the external forces and should all be in phase. In our case the load is applied at 3 and reactions are at 1 and 5. If the ratio of external force to current inserted is γ , the force in a horizontal or vertical member is equal to γ times the current measured between the appropriate terminals. The force in a diagonal member is obtained by measuring the current between the corresponding terminals in the vertical network and multiplying it by $\gamma \operatorname{cosec} \theta$ or by measuring the current between the corresponding terminals in the horizontal network and multiplying it by $\gamma \sec \theta$.

Now we shall consider the equilibrium of pin connected Pratt truss with redundant members.

In case of pin connected structure having redundant members, the forces in the members are influenced by their changes in length. In a single member, the relation between axial force P and change of length Δ is given by

$$\Delta = \frac{Pl}{AE}$$

where, l = length of member

A = Area of cross section of member

E = Modulus of elasticity of the member.

To have the analogy, the force can be taken proportional to current.

$$\therefore p = \gamma_1 I$$

where, p = axial force

γ_1 = scale factor

I = current.

Change in length Δ is taken proportional to the voltage drop (V) between terminals.

$$\therefore \Delta = \gamma_2 V$$

The analogous eqn. is Ohm's law : $V = IR$

$$\therefore \Delta = \gamma_2 IR = \frac{PI}{AE}$$

$$P = \gamma_1 I$$

$$\therefore \gamma_2 IR = \frac{\gamma_1 I l}{AE}$$

$$R = \frac{\gamma_1 l}{\gamma_2 AE}$$

Thus the circuit is constructed exactly as in the statically determinate case except that, wherever two terminals were connected before, the appropriate resistance $R = \frac{\gamma_1 l}{\gamma_2 AE}$ is inserted between them.

Network for truss having one redundant member (Fig. 2):

Member 2-7 is a redundant member.

Number of members > 2 (numbers of joints) $\rightarrow 3$

$$14 > 2(8) - 3$$

$\therefore$ 1 degree Redundent.

The energy considerations can be applied

to the extension of such networks for more than one degree of redundancy.

The strain energy stored in a member is $\frac{P^2 l}{2AE}$. If subscripts h, v and d refer to horizontal, vertical and diagonal members respectively, the total energy of deformation of the structure is

$$\Sigma \frac{P_h^2 l_h}{2 A_h E_h} + \Sigma \frac{P_v^2 l_v}{2 A_v E_v} + \Sigma \frac{P_d^2 l_d}{2 A_d E_d}$$

The forces in the members always try to assume such values as to make the total energy of deformation a minimum.

$$\therefore \delta \left\{ \Sigma \frac{P_h^2 l_h}{2 A_h E_h} + \Sigma \frac{P_v^2 l_v}{2 A_v E_v} + \Sigma \frac{P_d^2 l_d}{2 A_d E_d} \right\} = 0$$

$$\Sigma \frac{P_d^2 l_d}{2 A_d E_d} = 0$$

In any electric circuit the power dissipated in an element is $I^2 R$. The total power dissipation in the horizontal network will be a minimum,

$$\therefore \delta \left\{ \Sigma I_h^2 R_h + \Sigma I_{nd}^2 R_d \right\} = 0$$

Where I_{nd} is the current in the n^{th} diagonal element of the horizontal network.

Similarly total power dissipated in the vertical network will be a minimum.

$$\therefore \delta \left\{ \Sigma I_v^2 R_v + \Sigma I_{nd}^2 R_d \right\} = 0$$

Where I_{nd} is the current in the n^{th} diagonal element of the vertical network.

Now $\gamma_1 I_h = P_h$, $\gamma_1 I_v = P_v$

$$\gamma_1^2 (I_{nh}^2 + I_{nv}^2) = P_d^2$$

$$\gamma_1^2 R_h = \frac{l_h}{A_h E_h}; \quad \gamma_1^2 R_v = \frac{l_v}{A_v E_v}$$

$$\text{and } \gamma_1^2 R_d = \frac{l_d}{A_d E_d}$$

Hence substituting these values in eqns,

$$\delta \left\{ \Sigma I_h^2 R_h + \Sigma I_{nd}^2 R_d \right\} = 0$$

$$\text{and } \delta \left\{ \Sigma I_v^2 R_v + \Sigma I_{nd}^2 R_d \right\} = 0$$

and then adding and cancelling the scale factors, we get

$$\delta \left\{ \Sigma \frac{P_h^2 l_h}{2 A_h E_h} + \Sigma \frac{P_v^2 l_v}{2 A_v E_v} + \Sigma \frac{P_d^2 l_d}{2 A_d E_d} \right\} = 0$$

Therefore it completes the analogy and we can get the forces by merely inserting appropriate resistances. (For network for truss having 2 redundant members see Fig. 3.)

The voltage drops those due to leakage reactance and internal resistance should be very small. These circuits give results in the range of 5% accuracy. It is desirable to use for highly indeterminate structures. This method can be extended to multistorey multi bay rigid frames but it is out of the scope of this paper.

COLLEGE NEWS BULLETIN

Our Meritorious Students

The list of the students who passed the B.E. Examination in 1st Class held in April 1966.

1. Sri Pavaskar Chandragupta P., B.E. (Mech.)
2. Shri Patel Asit Gordhandas, B.E. (Mech.)

The list of the students who passed S.E. Examination in 1st Class held in April 1966.

S.E. (Civil)

1. Shri D'Souza Albert Joseph.
2. Miss Devanani Meera Chandiram.
3. Shri Evani Sunder R.M.
4. Shri Lathia Hamukhlal Meghji.
- *5. Miss Madhuri Bhudanmal Gandhi.
6. Miss Paranjpe Sunanda Govind.

S.E. (Mech.)

1. Shri Agrawal Yashpal Gianchand.
2. Shri Bagga H.S. Singh.
3. Shri Banka Ratanlal Hanuman-Prasad.
4. Shri Bhatt Suhas Harishchandra.
5. Shri Borkar Ulas Jaivant.
6. Shri Dande Arun D.
7. Shri Gupta Rajkumar H.
8. Shri Ingale Shantaram M.
9. Shri Iyer Mohan Narayanshiv.
10. Shri Joshi Arunkumar D.
11. Shri Khumbatta Hashang.
12. Shri Lad Dattatrya Jagannath.
13. Shri Lokhande Suresh B.

*Secured first Rank in the University at S.E. Examination April, 1966.

14. Shri Merchant Mohamed I.E.
15. Shri More Vijay S.
16. Shri Mulani Laxman P.
17. Shri Muni Dilipkumar M.
18. Shri Nadkarni Arun B.
19. Shri Pradhan Vilas Sadashiv.
20. Shri Raje Niranjan R.
21. Shri Sudhakar Uday Hari.
22. Shri Shah Indravadan Ratilal.
23. Shri Shah Lalitkumar Rupsi.
24. Shri Shah Pradip K.
25. Shri Shah Pradipchandra H.
26. Shri Sharma Laxman M.
27. Shri Shrinivas Balsubramaniam.
28. Shri Surve Sudhakar S.
29. Shri Taswala Mahar D.
30. Shri Thakur Harihar A.

S.E. (Elect.)

1. Shri Athavle Suranga.
2. Shri Berjjwatta Ashok K.
3. Miss Kolhatkar Asha K.
4. Shri Kothare P.M.
5. Shri Murgadi Mahadev I.
6. Miss Rajani Sarlal Vashdev.

The list of students who passed F.E. Examination in 1st Class held in April 1966.

1. Shri Agashe Vijay Vishnu.
2. Shri Ajmera Ashok Vrajlat.
3. Shri Anandkar Jatin M.
4. Shri Bhide Manohar J.
5. Shri Chaudhary Jagdish S.
6. Shri Chhabriya Amar L.
7. Shri Churi Sreenivas K.
8. Shri Dang Geetaram S.
9. Shri Dhond Vishram Y.
10. Shri Furia Ratilal Khimaji.

OUR COLLEGE HOCKEY TEAM

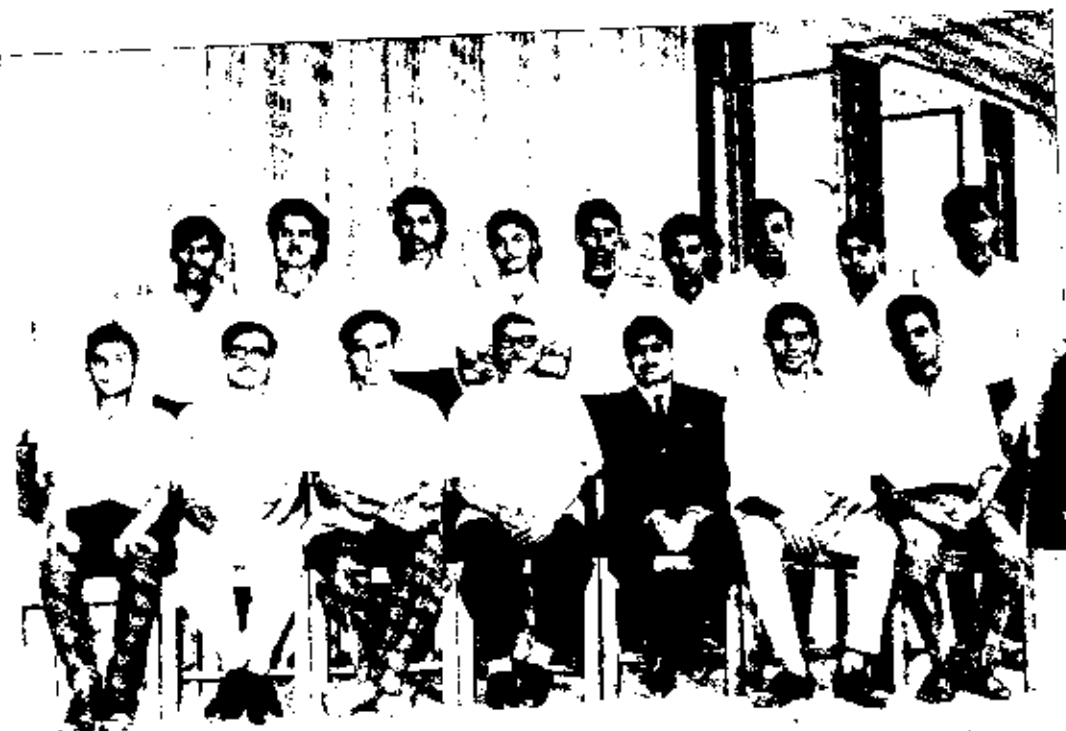


OUR COLLEGE WINNERS OF TUG OF WAR CLASS F.E.



E. F. 1966.

COLLEGE ATHLETIC COMMITTEE



COLLEGE SOCIAL GROUP



11. Shri Gandhi Bipin C.
12. Shri Gore Dilip V.
13. Shri Jadav Ambubhai B.
14. Shri Jain Virendra V.
15. Shri Jumanji Kamalkishor T.
16. Shri Kapadia Dilip A.
17. Shri Kare Jayprakash D.
18. Shri Karve Subodh P.
19. Shri Khalap Rawko V.
20. Shri Kotwal Madhukar V.
21. Shri Kowdle Venkateshyas.
22. Shri Kurlawalla Rohinton M.
23. Shri Kurwa Ismail Siraj.
24. Shri Lathia Durlabhaji N.
25. Shri Manjora Indukumar H.
26. Shri Maniar Thyagurajan.
27. Shri Mehta Hemandra B.
28. Shri Mehta Lalitkumar S.
29. Shri Mody Satish Ushakant.
30. Shri Nagarsenker Nilknath.
31. Shri Naik Vithal V.
32. Shri Parekh Jayantilal P.
33. Shri Patel Ratan Mavaji.
34. Shri Paymaster Ashwin C.
35. Shri Revenkar Anil M.
36. Shri Shah Mulchand K.
37. Shri Shah Suresh J.
38. Shri Shete Rajkumar D.
39. Shri Shial Ramesh D.
40. Sri Tendulkar Dilip V.
41. Shri Verma Kishnagopal J.
42. Shri Viegus Hermogio H.

KULAPATI MEDAL WINNERS

THIS YEAR

1. Kulapati's Gold Medal for the best allround student 1966-67.
- Miss A.K. Kolhatkar.
2. Kulapati's Silver Medal for the Second best student 1966-67.
- Shri K.C. Patil.
3. Kulapati's Gold Medal for securing the First Rank in the University at S.E. (Civil) examination.
- Miss M.B. Gandhi.
4. Kulapati's Gold Medal for the student who passed B.E. (Mech.) examination in First Class standing First from this college.
- Shri Chandragupta P. Pavaskar.
5. Kulapati's Gold Medal for the student who passed B.E. (Elect.) in First Class standing First from this college.
- Shri Asit G. Patel.
6. Kulapati's Gold Medal for the student who passed B.E. (Civil) examination in First Class standing First from this college.
- Shri Y.S. Karnik.
7. Kulapati's Silver Medal for the Second student in B.E. (Mech.) examination from this college.
- Shri M.V. Walawalkar.
8. Kulapati's Silver Medal for the Second student in B.E. (Elect.) examination from this college.
- Shri S.G. Kamath.
9. Kulapati's Silver Medal for the First student in B.E. (Civil) examination from this college.
- Shri A.K. Sahijwani.

Kulapati's Merit Medals for I and II students of each class :

1. Shri Mathakia C.K. (I)
F.E.
2. Shri Parikh K.L. (II)
S.E. (Civil)
3. Shri Lathia D.N. (I)
4. Shri Vakharia N.K. (II)
S.E. (Mech.)
5. Shri Churi S. K. (I)
6. Shri Mantora I.H. (II)
S.E. (Elect.)
7. Shri Varma K.J. (I)
8. Shri Shah U.A. (II)
B.E. (Civil)
9. Miss Gandhi M.B. (I)
10. Miss Paranjpe S.G. (II)
B.E. (Mech.)
11. Shri Joshi A.D. (I)
12. Shri Ingle S.M. (II)
B.E. (Elect.)

13. Miss Athavale S.V. (I)
14. Miss Kolhatkar A.K. (II)

Pruthvish Naralndas Khillawala Prize

1. *Shri Varma K.J.*— for being the First student of S.E. (Elect.) and securing I Class marks in F.E.
2. *Miss Athavale*—for being the First Class first student at S.E. Electrical examination.
3. *Shri Patel A.G.*— for securing First Class at the B.E. Electrical examination.

Shripada Rao Dubhasi Prize for 1966

Shri Rupawate P.M. (B.E. Civil student now)— for securing highest percentage of marks in Design and Drawing of S.E. Civil at the University Examination held in April 1966.

COLLEGE DAY 1966-67

LIST OF PRIZES & TROPHIES

Inter Class Championship

Foot Ball: B.E. Team.
Cricket: S.E. Team.
Badminton: B.E. Team.
Tug-of-War: F.E. Team.

Best performance in Inter-Collegiate Cricket Tournaments:

Best Batsman:
Subnis N.K. (F.E.).
Best Captain:
Ramath A.S. (S.E.E.).
Best All Rounder:
Desai R.M. (F.E.C.).
Best Fielder:
Mahadevia S.B. (S.F.C.).
Best Bowler:
Nagarkatti P. (S.E.E.).

Best performance in Inter-Collegiate Hockey Tournaments:

Best Player:
Cherian C.K. (S.F.).
Second Best Player:
Dalal K.J. (S.F.M.).

INDOOR GAMES:

Inter Class championships:

Chess:
Ghate A.A. (F.E.I.).
Dalal S.N. (B.E.E.).

Inter Class Championship:

Table-Tennis:

Singles:
First Prize:
Doshi S.K. (B.E.M.).

Second Prize:
Cherian K.C. (S.F.).

Doubles:
First Prize:
Cherian K.C. & Karve S.P.

Second Prize:
Doshi S.K. & Desai P.J.

Jumbled Doubles:
First Prize:
Cherian K.C. & Shah N.V.

Second Prize:
Paymaster & Agarwala K.

Best performance in Inter-Collegiate Volley ball:

Best Player:
Samant, (S.F.M.).

Second Best Player:
Nadkarni, (S.E.E.).

Inter Class Championships:

Carrom:

Singles:
First Prize:
Hattangadi V.S.

Second Prize:

Mulla A.S.H.

Doubles:

First Prize:

Fernandes & Irani.

Jumbled Doubles:

First Prize:

Mulla A.S.H. & Bhadkamkar V.S.

Second Prize:

Lalka Z.J. & Shah (F.E.).

ATHLETICS:

BEST ATHLETES SPECIAL PRIZE

V. Fernandes (S.E.)

100 Metres Race:

- (1) Dalal K.J. (S.E.M.).
- (2) Banan C. (S.E.).
- (3) Cherian C.K. (S.E.).

200 Metres Race:

- (1) Dalal K.J. (S.E.M.).
- (2) Nagarkatti P. (S.E.).
- (3) Cherian C.K. (S.E.).

400 Metres Race:

- (1) D'Souza R. (F.E.).
- (2) Chavan D. (S.E.).
- (3) Nagarkatti P.K. (S.E.).

800 Metres Race:

- (1) Fernandes V. (S.E.).
- (2) Jadav A. (S.E.).
- (3) Chavan D. (S.E.).

1500 Metres Race:

- (1) Jadav A. (S.E.).
- (2) Fernandes V. (B.E.).
- (3) Desai R.J.

5000 Metres Race:

- (1) Jadav A. (S.E.).
- (2) Dalal K.J. (S.E.).
- (3) Desai R.J.

Long Jump:

- (1) Banan C. (S.E.).
- (2) Fernandes V. (S.E.).
- (3) Nagarkatti P.K. (S.E.).

High Jump:

- (1) Khatri R. (B.E.).
- (2) Avasekar L. (S.E.).
- (3) Fernandes V. (S.E.).

Shot Put:

- (1) Avarsekar K. (S.E.).
- (2) Patil K.C. (F.E.).
- (3) Bhende A.

Discus Throw:

- (1) Fernandes V. (S.E.).
- (2) D'Souza R.J. (F.E.).
- (3) Avarsekar K. (S.F.).

Javelin Throw:

- (1) Avarsekar K. (S.E.).
- (2) Samson S. (S.E.).
- (3) Cherian C.K. (S.F.).

TEAM EVENTS:

4 × 100 Metres Relay Race: (S.E. Team)

Dalal K.,
Banan C.,
Cherian C.K. and
Nagarkatti P.

Best performance in Inter Class Badminton Tournaments:

Singles:

First Prize:

Heroor A.G. (B.E.E.).

Second Prize:

Balasubramaniam (B.E.E.).

Doubles:

First Prize:

Heroor A.G. and Bharatkumar.

Runners Up:

Balasubramaniam P. and
Laxman (B.E.M.).

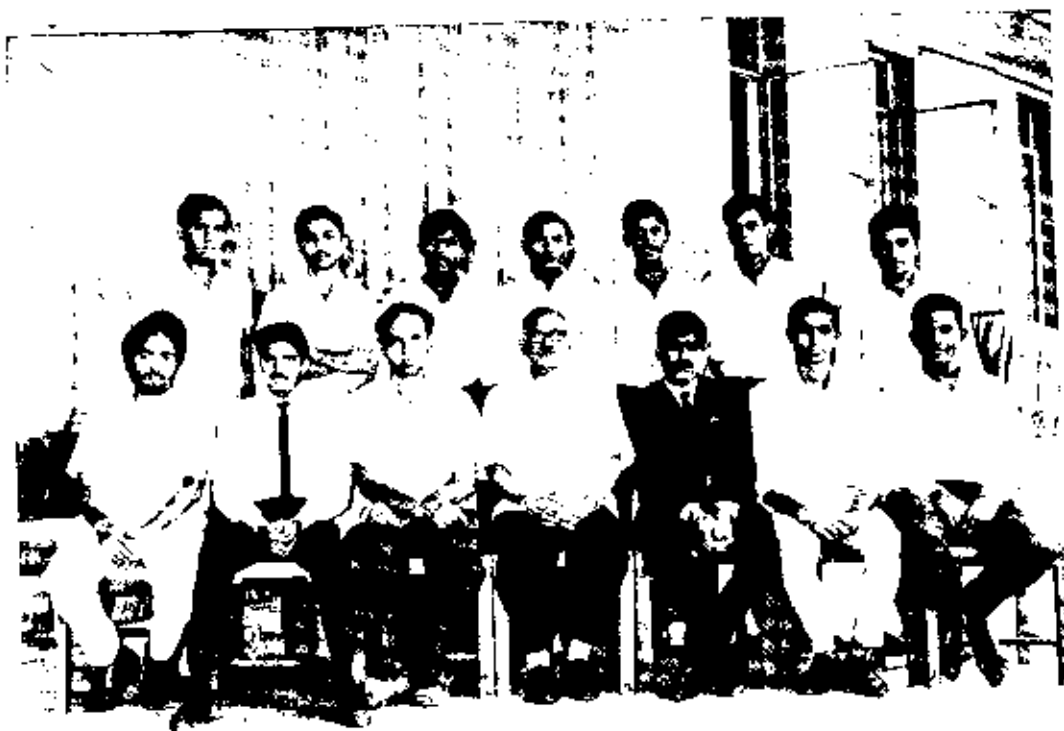
COLLEGE DRAMATICS WINNERS



COLLEGE MAGAZINE COMMITTEE



COLLEGE FOOTBALL TEAM



OUT GOING STUDENTS OF B.E. (ELEC) CLASS 1967



abled Doubles:

First Prize:

Heroor A.G. and
Shuh Girish (S.E.M.).

Runners Up:

Balasubramaniam P. and
Mumaya (S.F.E.).

Inter-Class Doubles:

Winners:

B.I. Team:

Heroor & Balasubramaniam.

Runners Up:

F.E. Team:

Jain V.C. & Khanke D.E.

**Best performance in College Dramatic
and entertainment programme:**

Marathi Drama:

First Prize:

Simkar Sunil.

Second Prize:

Nagarkatti Pravin.

Gujarati Drama:

First Prize:

Dave Pankaj.

Second Prize:

Desai Rajen.

Instrumental Music:

First Prize:

Pawar S.C. (B.E.E.).

**Special prizes: for outstanding performance
in Inter-Collegiate extra-curricular activities**

K.C. Patil, for Feather Weight Wrestling.
Miss Asha Kolhatkar, for Music.
Rajendra Gadkari, for Elocution.

*

**The list of students who have passed the Graduate in Engineering
Examinations during the following years:**

1965—April.

B.E. (Civil):

Shri Bhagtani Jetho Lokumal.
Shri Bhatia Jetho Tejumal.
Shri Deshpande Anil Govind.
Shri Jhurani Shyam Assudomal.
Shri Mami Kannurpatti Krishnaswami.
Shri Manjrekar Ashokkumar Hareshwar.
Shri Mehta Rohit Bhupatrai.
Shri Padwal Suresh Madhavrao.
Shri Patil Mahadevgouda Ramangouda.
Shri Rajadhyaksha Satish Vithal.
Shri Shah Nalinkumar Liladhar.

B.E. (Elect.):

Shri Chopra Chandrasen Mangalsain.
Shri Mandania Ashokkumar Maganlal.
Shri Shete Bhausaheb Kisanrao.

B.E. (Mech.):

Shri Advani Chandru Pahlajrai,
(First Class)
Shri Agrawal Bajranglal Gangaram. ..
Shri Ashar Narayandas Trikamdas. ..
Shri Chawla Doulat Kanaylal. ..
Shri Chhugani Suresh Sadhuram. ..
Shri Chiplunkar Damodar Anant.
Shri Chokhani Satyanarayan Babulal.
Shri Churi Pramod Gajanan,
(First Class)
Shri Daswani Murli Dhalomal.
Shri Gokhale Rajaram Shivram,
(First Class)
Shri Iyengar Laxman Gopal.
Shri Iyer Subramanian Ranganathan.
Shri Kadakia Jayantkumar Punamchand.
Shri Mehta Manojkumar P.
Shri Shah Arvindkumar Hathisang.
Shri Shah Dipak Manilal.
Shri Shah Kirit Manubhai.
Shri Tahiliani Jetho Gurmukhdas.
Shri Tejuja Ashok Hargunlal.
Shri Vadhan Pravin Govindji.

1965 October

B.E. (Civil):

Shri Chabria Kishan Tikamdas.
Shri Karnik Yatindra Shankar,
(First Class)
Shri Soni Pramod Lalubhai.
Shri Thacker Jayantilal Shamji.
Shri Dixit Vijay Anant.
Shri Morjanla Pradip Gokaldas.
Shri Shah Mahendrakumar Kantilal.
Shri Shah Manharlal Bhaichand.

B.E. (Mech.):

Shri Gajria Bharat Ratanchand,
(First Class)
Shri Gandhi Rajnikant Vakhatchand.
Shri Ganu Suresh Mahadeo.
Shri Karve Vasant Mahadeo.
Shri Kudalkar Kishor Narayan.
Shri Tibrewala Satyanarayan Matadin.
Shri Upadhyay Dhiren N.
Shri Walawalkar Mohan Vasudeo,
(First Class)
Shri Shertukde Vijay Sitaram.

B.E. (Elect.):

Shri Paranjpe Hari Keshav.
Shri Thom Denzil Anthony, (First Class)
Shri Borkar Suresh Maruti.
Shri Chokshi Suresh D.
Shri Kamat Sitaram G., (First Class)

1966 April

B.E. (Elect.):

Shri Ajemra Pradip K.
Shri Gandhi Ramesh C.
Shri Ghelani Kishor L.
Shri Hattangady Vijayanand S.
Shri Karnik Ashok T.
Shri Khemaka Vinodkumar R.
Shri Lauel Bhalchandra A.
Shri Marathe Ravindra D.
Shri Masad Hari P.
Shri Pandhi Narottam N.

- Parmeswaran Rajmani.
- Pardhanani Ramnik G.
- Patel Asit Gordhanbhai.

(First Class)

- Purohit Kantilal Ambulal.
- Sane Suresh Shankar.
- Sanghvi Kiritkumar J.
- Swami Nathan D.
- Vig Gurubux Amarnath.
- Vishwanathan P. Krishnan.
- Vora Ramesh Bhailal.

(Civil):

- Doshi Jagdish Manordas.
- Gata Dhanji Bhavanji.
- Hulbatte Mohan Rameshchandra.
- Kannan K. A.
- Kale Avinash Ballal.
- Kunta Ashok Rohidas.
- Mandrekar Ravindra S.
- Mehta Dilip Jayantilal.
- Paradia Monohar K.
- Parikh Ashok Girdhardas.
- Redkar Subhas M.
- Shah Jitendra Rasiklal.
- Shah Nemchand K.
- Shringarpur Vijaykumar A.
- Verhani Srichand M.
- Parikh Bharatkumar D.

(Mech.):

- Achrekar Narayan B.
- Advani Manohar P.
- Borde Vijaykumar S.
- Budhbraja Rajkumar Jagdipsingh.
- Chhatrola Madhusudan G.
- Gadkari Rajan P.
- Ginani U'tam D.
- Jain Kevalechand G.
- Joshi Shashikant A.
- Katkar Kiritkumar K.
- Kiri Narendra.

- Shri Maheshwari Murlidhar.
- Shri Maniar Ramesh V.
- Shri Naik Sunil B.
- Shri Nayakwari Anant D.
- Shri Pai Ghanashyani D.
- Shri Patadia Bharat Chimanlal.
- Shri Patel Shantilal Khushaldas.
- Shri Patil Jaiprakash Shripad.
- Shri Pavaskar Chanragupta Purushottam.

(First Class)

- Shri Pendharkar Subas Vasuden.
- Shri Popat Pravin Khimji.
- Shri Raval Dhananjay Harshadroy.
- Shri Rijhsinghani Ramesh Harbuxrai.
- Shri Subramanian Parameswaran.
- Shri Sukhrani Santosh Sunderdas.
- Shri Goradia Dharamdas Shamaldas.
- Shri Shete Bhausaheb Kisanrao.

1966 October

B.E. (Civil):

- Shri Tilve Shashikant Ganpat.
- Shri Dighe Ashok Balkrishna.
- Shri Gandhi Mulchand V.
- Shri Hatle Madhusudan S.
- Shri Shah Harshad J.

B.E. (Elect.):

- Shri Dawada Narendrakumar G.
- Shri Desai Subhaschandra M.
- Shri Deshmukh Ivan L.
- Shri Dighe Rameshchandra G.
- Shri Patel Mohamed Ismail.
- Shri Churi Arvind G.

B.E. (Mech.):

- Shri Desai Rameshchandra M.
- Shri Gupta Kiritkumar S.
- Shri Mahale Ravindra G.
- Shri Mathani Lal K.
- Shri Meisheri Ramesh V.
- Shri Parekh Jaykumar V.
- Shri Gandhi Mulraj P.
- Shri Soares Alvito G.

★★
★

विद्यार्थी असंतोष : एक समस्या

विवेक पांडुरंग घुमाले

प्रथम वर्ष

सध्याचे हे दिवस नाही म्हटले तरी थोडे क्षमधुमीचे आहेत. सार्वजनिक निवडणुका जवळ आल्यामुळे सर्वत्र एकच धुळी उडून राहिली आहे. इतर राजकीय हंगामी जरी आपल्या निवड नगराच्या असल्या तरी हल्ली भारतभर पसरलेला विद्यार्थ्यांच्या असंतोषाचा उद्रेक मात्र आपल्याला तथीतच आहे. तरुणीयांजली जरी हा असंतोष इतर राजकीय अंगोपांगां गमावतामी भारत असल्या तरी त्याच्या मूलभूत प्रवृत्ती मात्र पूर्णतः भिन्न आहेत. राष्ट्राची मदत ज्यांच्यावर आहे त्यांच्या असांतर्भावयोगी आज संमीरणे विचार करण्यांची वेळ येऊन ठाणू आहे.

जेव्हा काही दिवसांची वृत्तपत्रे आपण वाळवी तरी हे सहन करूने की हा भडका सनत पसरतच चालला आहे. दिवसाआड एक तरी मखळा ह्या धमणीवावन असतोच. एखादे दिवशी कानपूरची महाविद्यालये बंद पडताना तर दुसऱ्या दिवशी बमनगट्टे उत्राड होताना. काही ठिकाणी तर ह्या निदर्शनांचे स्वच्छ एवढे उग्र होणे की तेथील पोलीसांना व न्यायिक सुरक्षा दलात गोळीबार केल्या लागला. व त्यांत दोन विद्यार्थ्यांचा बळी पडला. मध्यप्रदेशात इंदूर म्हाल्लेर येथे अशोच गन होऊन तेथील माणस विद्यापीठ बेमुक्त बंद करावे लागले. जेव्हा आपण अशा बातम्या वाचता तेव्हा आपण आश्चर्यचकित होतो: काय होतं. ह्या आश्चर्यात उडेलानाच भाग घेतत आलो.

बरीच सर्व वर्णनायुक्त गौर्वाजक आपली अशी भावना होणे की सर्वसामान्यतः आजचा विद्यार्थी बेगवा-बदार होत चालला आहे. सर्वत्र बळाचा, शिंगाचा वणवण करण्यास तो उद्युक्त झाला आहे. त्याला गुरुजनांचे उद्गार आदर नाही वा कायद्यांविषयी भीती वाटत नाही. तेव्हा आजचा विद्यार्थी भरणे नमोर जे जे वेईल ते जाळून मुण्यापासून भगवानाच्या आहे नरेंद्र विध्वंसाची स्वप्ने तो पाहतो आहे. जनमानसात आज विद्यार्थ्यांची प्रतिमा उमटून राहिली आहे की अशी.

विद्यार्थ्यात ही अनिष्ट प्रवा बळावन चालली आहे; हे कट्टे मध्य मात्र आपणांस नाइलाजाने का होईना पण स्वीकारावे लागते. मग त्याची कारण काही का असोत ! सध्या हल्ली येणाऱ्या वृत्तावस्त तरी करील विधानांना पुष्टीच मिळते. मग असेच जर अनेक तर त्यामागील तेरणा कोणत्या आहेत ? किंवा कोणत्या परिस्थितीमुळे विद्यार्थ्यांचे अने वतन करण्यास प्रवृत्त झाला त्याचा विचार करणे उद्बोधक ठरेल.

ह्या संदर्भात सध्या समाजपरिस्थितीची पाहणी करणे आवश्यक ठरेल. दीर्घ वर्षांच्या वृत्तामगिरीमुळे आपण जगाच्या कायच मागे पडलो होतो. ही सरपार्ड करण्याकमिता ते प्रयत्न चालू आहेत त्यामुळे आपला गमाव आज एका संक्रमणवस्थेतून जात आहे. एकूण माणसत्वेणामुळे त्यांची व्याप्ती व तीव्रता कायच वाढली आहे. जुनी मूल्ये दासळून गेली आहेत, पण त्याची जाणा घ्यायला नवीन मूल्ये नाहीत किंवा असली तरी त्यांचा स्वीकार आपल्या समाजास पडकत करत नाही. अशा ह्या विशंक-अवस्थेत आपला समाज एकापासून विद्यार्थ्यांचे चांचपटने आहे. अशा ह्या दोळ्यायमान परिस्थितीमुळे विद्यार्थ्यांमधील मूलभूत पायाळाच प्रकट बसला आहे. अर्थात येथे हा प्रश्न उपस्थित होतो की-ह्या प्रकारच्या परिस्थितीचा विद्यार्थ्यांवर का एवढ्या नोत्रतेने व्हावा ? ह्याचे उत्तर सरळ आहे विद्यार्थ्यांसोत माणसाचे मन अपरि- एत असते. त्याची मस्कारभमता दांडगी असते. त्यामुळे कोपनेही संस्कार, चांगले अगर वाईत, त्यांच्या- वर फार ब्रकर होताना. तेव्हा बदलता समाज हे एक कारण होईल.

दुसरे कारण ह्याहूनही महत्त्वाचे आहे. आणि मग वाटते की ह्या अनिष्ट प्रवृत्तीचे मूळ त्यांतच मिळेल. हे कारण म्हणजे आपल्या समाजात सध्या चाललेले विकृत, भाष्ट आणि किल्लनवाणे सार्वजनिक

— आणि तेवढेच गलवान असे शासन होय !

कूनना खेडघोपाडघोपासून ते थेट दिल्लीदर-
जान मरून राहिली आहे. स्वातंत्र्यापूर्वीचे जे एक
मरलेले वातावरण होते ते आता संपूर्णपणे
नवे गेले आहेत. सर्व नवाकसित नंते स्वतःविषयीच्या
मन आहेत. सर्वच वसिलेवाजीचा, कांच-
नेचा अगदी कळस झाला आहे. अगा वेळी
विद्यार्थ्याला आपल्या प्रामाणिक बडपडीचे
होईल अशी खाशी वाटत नाही. सर्वच गुन्हेगार
मान आहेत. काममागीं आज समाजांत प्रतिष्ठा
आहेत हे पाहिल्यावर, चांगल्या मुयंकारित
प्लोचामुद्धां धीर सुटू लागतो. तो विचार कं कामनां
चेवर्जन हे माझे उच्चतम ध्येय वरे ! पण एवढी
कसम विद्यावन केव्हांतंर मुद्धां जर निचे नीज
तसेल तर मी मुद्धां काममागीं कां चोवाळू नये ?
तो लोकतंत्र एकेका मंथ्यांची लकतरे वेशीवर
जात असतांना विद्यार्थ्यांचा सदाचारवरील
अडळ रहावाच कसा ? ह्या गोष्टी अनेक वर्षे
शाल्या आहेत व पुढे मुद्धां न्या बदलण्याची अंभ-
मुद्धां आशा तमगता विद्यार्थ्यांनी कुठल्या आधारावर
रहावे. ह्यामुळेच त्याला आपला भविष्यकाळ
मानत नाही. आपल्या भविष्याविषयी तो
बोवू शकत नाही. आणि मला वाटते की ह्या
मच किंवा ज्याला आपण Eternation
न्या स्वल्पाच्या भावनेंच विद्यार्थ्यांच्या ह्या
न बंडाचे मूळ दडले आहे. जोपर्यंत विद्यार्थ्यांच्या
जांचा वाव मिळत नाही—आणि मध्याचे सरकार
जवळच्या तो वाव मिळवून देण्यास असमर्थ
आहेत—जोपर्यंतही अज्ञातता राहणारच. कारण
ह मक्ती मग वेड्यावांकड्या मार्गाने आपले
अगत करत. मध्याच्या दंगली ह्यां त्याच्याच
आहेत.

समीर प्रस्ताची ही एक बाजू झाली. ह्यांत
विद्यार्थ्यांच्याच मानसिक प्रक्रियांचा विचार
आ. ह्यांनीच दुसरी बाजूही समजावून घेणे
आगत्याचे आहे. “ह्या बाबतींत विद्यार्थीही
निर्दोषी नाहीत.” वेगवान जीवनक्रम आणि
एक प्रकारे शाळेत यांत्रिकीकरण ह्यामुळे

विद्यार्थ्यांत एक प्रकारची अनिष्ट बंडखोरी वृत्ती वाडत
चालली आहे. आधुनिक जीवनक्रमाचा तो एक अपरि-
हार्य परिणाम आहे. ह्या ताचेबंदपणामुळे विद्यार्थ्या-
नीहि एक प्रकारची Mob Mentality वाडीस लागली
आहे. पाश्चात्य नवयुगस्कृतीचे (१) वारे लामक्याने
दिसेल त्याला विरोध करण्याची प्रवृत्ति वाडायली आहे.
कडवेपणाचा लोप झाला आहे. मनाचा जो एक पीळ
असतो तो, सुखामीन आयुष्याच्या अवास्तव कल्पनेमुळे
अपेक्षेमुळे, जात चालला आहे. एकच कुटुंबपद्धतीचा
अभावामुळे उाजनच निर्माण होणारी शिस्त अभावानेच
दिगु लागली आहे. मोठमोठ्या शहरांतून पालक मनन
घराबाहेर अनल्याने विद्यार्थ्यांत एक स्वर वृत्ती आली आहे.
त्यामुळे विद्यार्थ्यांना कोणतीहि बंधने आवडत नाही
आहेत. अर्थात ह्यांत पालकांचा दोष नाही. वाडत्या
महागाईमुळे आणि उच्च जीवनक्रमाच्या अपेक्षेमुळे
पालकांचा (ह्यांत आई आणि वडील ह्या दोघांचाहि
समावेश होतो) सनन घराबाहेर राहणे कमप्राप्तच
होते. ह्या सर्वांचे परंपरान विद्यार्थ्यांच्या वेगिस्त
व स्वर वागणुकीत झाले आहे.

ह्यावरून हे स्पष्ट होईल की विद्यार्थ्यांची ही अज्ञा-
तता ह्या एक रोग नाही तर विद्यार्थ्यांना होऊ घातलेल्या
एका दुर्घट रोगाचे ते एक वाह्यात्कारी दिमणारे लक्षण
आहे. तेव्हां ह्यावर जो काय उपाययोजना करावयाची
आहे ती मूळ रोगावरच झाली पाहिजे. सध्या पोलिस
आणि स्थानिक सुरक्षा दले ती उपाययोजना करीत
आहेत त्याने हिमकता कमी होईल हे खरे असले तरी
मूळ रोग त्याने बरा होणार नाही. तेव्हां ह्या प्रकरणांत
विद्यार्थ्यांनीहि समजुनदारपणा दाखवावा आणि प्रस-
गाला लागणारे अनिष्ट वळण थांबवावे हे उत्तम. त्याच-
बरोबर समाजावेहि विद्यार्थ्यांच्या मनात आत्मविश्वास
पैदा केला पाहिजे ते त्यांनीच त्यांना स्वार्थत्यागांचे बडे
घालून दिने पाहिजेत. सार्वजनिक व्यवहारांनील शुचिता
वाढविली पाहिजे. एकुण काय समाजाचा मोहाराच
बदलला पाहिजे. शेन्ती बाजूंनी विचार करून मगच
पाकले टाकली पाहिजेत. केवळ विद्यापीठे बंद करून
ह्या प्रस्न मुटणार नाही हे राज्यकर्त्यांनी व समाजांत
ओळखले पाहिजे. आणि विद्यार्थ्यांनीही हे जाणले

पाहिजे की केवळ मार्गजनिक मालमत्तेचें नुकसान करून आपले कांही हित साधणार नाही. अर्थात जास्त जबाब-दारी समाजावरच आहे कारण शेवटी समाजच विद्या-ध्याला बडवीत असतो. हा रोग जसा दुर्घट आहे त्या-प्रमाणे उपाययोजनासुद्धा किचकट होईल. तेव्हा विचारवंतांनी व समाजपरीक्षणांनी वेळीच सर्व गांष्टीचा

मागोपांग विचार करून उपाययोजना निश्चित करावी व त्या दिशेने पावले टाकावीत हे उत्तम ! अन्यथा ही मोकाट मुटू पाहणारी प्रचंड शक्ती इंद्राय तक्षकाय स्वाहा ! ह्या न्यायाने जें जो आणत्या आठ पेईल त्याचा त्याचा नाश करीत सर्वत्र पसरले हे निश्चित !



जागे व्हा ! जागे व्हा !!

— विद्यादत्त

मुजला ही मुफला भूमि, गतकाळी कनकभूमि !
आज परि पुत्र हिचे, करिती अन्न पाणोपाणी ! !

निसर्गान्ना कोप म्हणे ! कां असे शोधा मनीं
जागे व्हा जागे व्हा, दुःखी आज हिंदभूमि !

क्रियेविना रसवंती, साजवी हा कंठगोष
स्वेवाने फुलवी घरा, त्याचा परि रक्तशोष !

दारिद्र्य-दुःख-वंत्य; नित्य घाजला भूमि
जागे व्हा जागे व्हा, दुःखी आज हिंदभूमि !

अन्याय धोमंत असे, न्यायाला स्थान नसे
अन्यायी पायी असो, न्यायगृही गुन्हा नसे !

सत्य सर्व लोपूनिया, जाहली असत्य भूमि
जागे व्हा जागे व्हा, दुःखी आज हिंदभूमि !

ग्रासादया खंडखंड, टपकले हे रिपुदंड
बघूनिया भेमा भूमि, घाबती ते कश्चि वंड !

शूरभूमि वीरभूमि, हाय परि अवालभूमि
जागे व्हा जागे व्हा, दुःखी आज हिंदभूमि !

निरंगा आज उंच जरी, निदळल स्तंभापरी
खळाचार भ्रष्ट मनें, देखूनिया खिन्न मनीं !

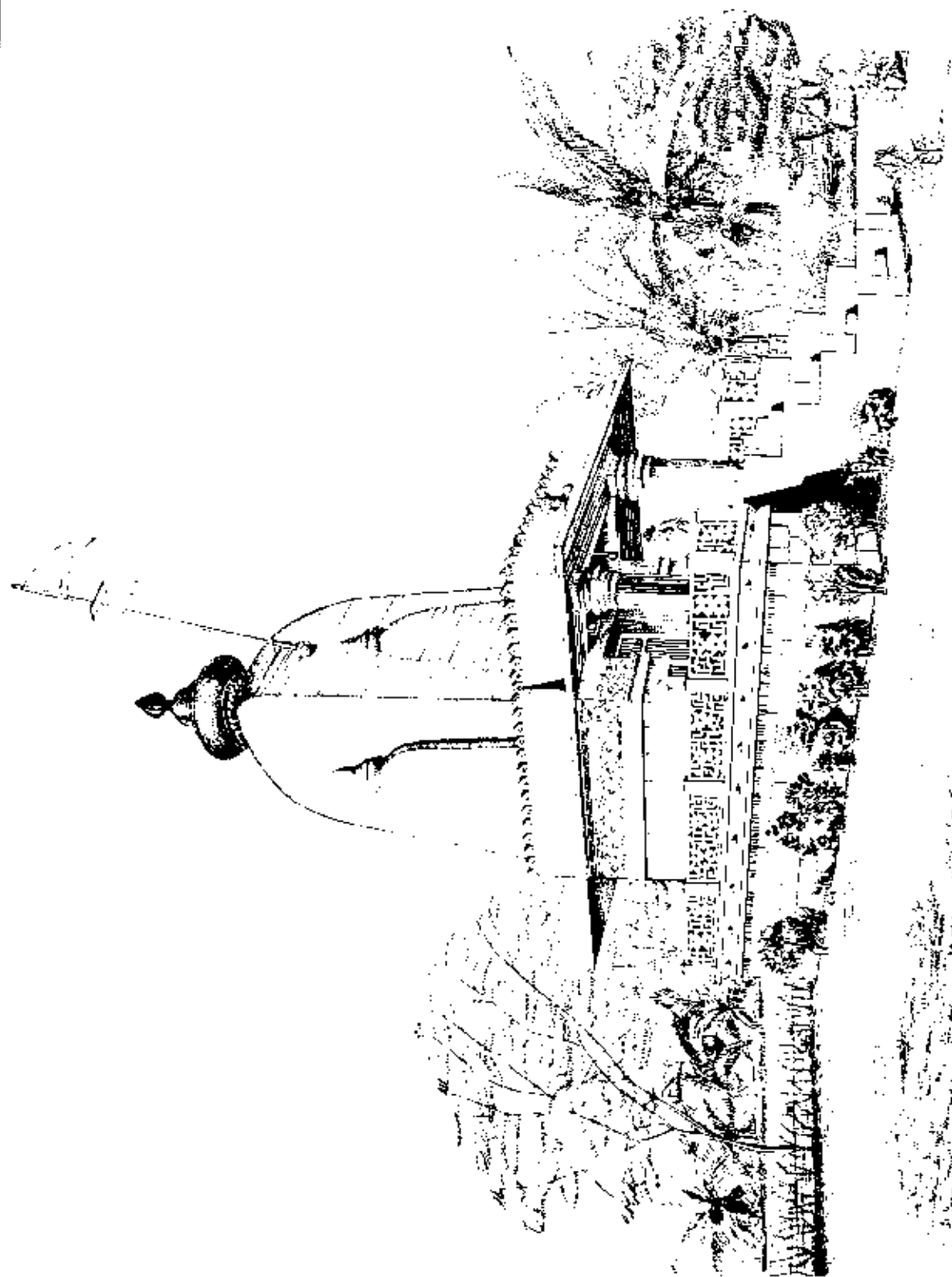
अधन आज अधोगति, धुंव घनीं घनपति !
जागे व्हा जागे व्हा, दुःखी आज हिंदभूमि !

OUT GOING STUDENTS OF B.E. CIVIL CLASS--1967



OUT GOING STUDENTS OF B.E. (MECH) CLASS--1967





Lord Chandra Shekhar Temple
Bhuvan's College-Campus,
Andheri.

“हँसना मना नहीं है”

हरचरन सिंह

एक व्यक्ति किसी समाधीपर बैठा बुरी तरह रो रहा था—“तुम क्यों मरे? तुम क्यों मरे.....?”

पास में गुजरनेवाले एक व्यक्ति ने दुःखित होकर उससे कहा—“धैर्य रखो, जानेवाला कभी नहीं लौटता। किसीकी समझधि है यह?”

शोकाकुल व्यक्ति ने उसी प्रकार रोते हुए कहा—“मेरी पति के पहले पति की। हाय तुम क्यों मरे, क्यों मरे...”

* * *

एक घर में कुछ मेहमान आए। छतपर खोर सुनकर उन्होंने मेजवान के बच्चे ने पूछा—“यह ऊपर क्या हो रहा है?”

बच्चा :—“शायद मानसही पिताजी की पत्नयुत छिटक रही है।”

मेहमान :—“लेकिन उगमे तो इतना शोर नहीं हो सकता।”
बच्चा :—“शायद पत्नयुत में पिताजी भी हैं।”

* * *

टप्पू (अपनी बहन से) :—दीदी! पापा के बाल इतने क्यों झड़ गए हैं?

बहन :—बढ़िमान लोगों की यही निशानी है।

टप्पू :—ओह अब समझा मुम्हारे बाल इतने लम्बे क्यों हैं।

* * *

मृन्ना :—सम्मा, क्या हमारी पड़ोसिन का नाम डाकिय है?

मो :—नही तो, उसका नाम तो सीला है।

मृन्ना :—लेकिन अभी जब आप गुमल-जाने में नहीं रही थी तो डैडी ने उसे डाकिय कहकर पुकारा था।

* * *

शिक्षक :—तर्बुज के फायदे बयान करो।

एक विद्यार्थी :—तर्बुज एक ऐसा फल है जिसे हम खा भी सकते हैं, पी भी सकते हैं, और उसमें हाथ मूँड़ भी लो सकते हैं।

* * *

शिक्षक :—तुम्हारे नाता का दमाद तुम्हारा क्या हुआ?

विद्यार्थी :—ऐसा सम्बन्ध हमारे यहाँ नहीं होगा।

* * *

छेडी टीचर :—“मे मुन्दर हूँ” यह कौनसा काल है?

एक छात्रा :—भूतकाल!

* * *

शिक्षक :—तुम्हारा किसे कहते हैं?

छात्र :—उसे, जो बाँधी-ध्याह के मोकेपर नजाबत के लिए इस्तेमाल किया जाता है।

* * *

मेजवान :—यह कबोर्गिया खाइए, खास तोरधर बनवाई है।

मेजमान (बल्ब से) :—आप लाइए, हम तो रोज ही खाते हैं।

मेजवान :—लेकिन यह शुद्ध घी की है।

* * *

एक आदमी :—“सरकार ने वह अजीब कानून क्यों पास किया है कि एक पत्नी के होते हुए आदमी दूसरी शादी नहीं कर सकता?”

दूसरा आदमी :—“जो अपनी रक्षा आप नहीं कर सकते उनकी रक्षा सरकार नहीं करेगी तो कीत करेगा?”

* * *

“मेरी बीवी ने तो हदकर दी। गुम्मे में आकर कपड़ों का एक जोड़ा सिड़की से बाहर फेंक दिया।”

“चलो कोढ़ी बात नहीं। एक जोड़ा ही तो खराब हुआ।”

“एक जोड़ा” अरे भाई, वह जोड़ा मैंने खुद पहन रखा था।”

* * *

मालिक का अंधेरे में किसी ने मुँह चूम लिया। उन्होंने पूछा—“कीन है?”

मादम हुआ, तोकर है।

“क्यों वे राते, यह क्या हरकर की?”

“गलती हो गई हज़ार। मैं समझा था मालकिन है।”

* * *

दौत का डॉक्टर (रोगी से) :—ब्रम-ब्रम, और ज्यादा मुँह खोलने की जरूरत नहीं। मैं बाहर खड़े होकर ही दौत निकाला करता हूँ।

* * *

सम्पादक :—क्या बहु देखि आपने स्वयं लिखे हैं ?

कवि :—जी हाँ ! क्यों ?

सम्पादक (तपाक से हाथ मिलाने हुए) :—संत कबीर धानजी, आपसे मिलकर बड़ी प्रसन्नता हुई। मैं तो यही समझ रहा कि आप स्वर्ग सिवार चूके हैं।

* * *

वकील :—जब मैं छोटा था तो मेरी बड़ी इच्छा थी कि बड़ा होकर नामी लूटेरा बनूँ।

मुखविक्र :—फिर तो बघाई हो ! बड़े भाग्यशाली हो। तुम्हारी इच्छा पूरी हो गई।

* * *

हॉटेल मैनेजर :—आपने कमरा नं० देव लिया, बाथरूम ऊपर की मंजिल पर है। आपने बस एक ही मित्र-रत है कि महाने समय दूरा जूनी आधान में गाना गुनगुनाना न भूलिएगा।

मुसाफिर :—लेकिन क्यों ?

मैनेजर :—क्योंकि बाथरूम के दरवाजे की अन्दर से बंद करने के लिए कुँडी नहीं है।

* * *

प्राहक : क्या तुम वही बूरे हो जिसे मेरे ज्वाना को कहा था ?

बूरा :—जी हाँ, साहब !

प्राहक :—कसाल है, तुम तो धिगुल नहीं बढ़ते, कैमे

ही जवान लगते हो। मुसाफ़ी, पोने पानिशी का क्या हाल है ?

* * *

बहुत अस्वास्ते देतेपर भी जब बीरे ने कान न धरे तो प्राहक ने जाकर मैनेजर से शिकायत की।

मैनेजर ने क्षमा माँगकर तुरन्त बीरे को बुलाया और गरजकर बोला—“प्राहक एक घण्टे में बुलने की तरह मरिंक रहा है और तुम्हारे कान पर जू तक नहीं रेंगी। अगर यही हाल रहा तो आखिर कौन सान्दा यही आएगा।

* * *

फिलामफर साहब किसी नाई की दूकानपर हजामत करा रहे थे कि किसी ने चिल्लाकर कहा—“ब्रजमोहन जी, आपके घर में आग लग गई है !”

फिलामफर साहब चौंखलाकर उठ बैठे। नाई को परे धकेला, गले का सफेद कपड़ा एक तरफ फेंका। तबरे को साबून पोंछकर एक साहब के मुँहपर दे मारा और मड़कपण कूद पड़े। फिलाने, फिरे, फिर उठे। एक दही बड़ेवाले से टकियाए। उछलकर भागे। फिर एकाएक रुककर बड़बड़ाए—“लेकिन मेरा नाम तो रामनारायण है !”

* * *

“बघाई हो।”

“किस ज्वान की ?”

“तुम्हारी खादी हो रही है।”

“लेकिन मेरी तो खादी नशी हो रही है।”

“तो फिर और भी बघाई हो।”

एक शहीद की समाधि पर....

हातिम कानोरवाला

एक शहीद की समाधि पर.....

मे फूल चढ़ाऊँ, तो वे काँपते हैं;
कलियाँ चढ़ाऊँ! वे भी थरती हैं,
मेरे अश्रुओं ने कहा, यह सब है,
तुमने जवानों कांटों से खेली है।

जब मैं इस समाधि को देखता हूँ;
शहीद 'भगत सिंह' की याद आती है,
आजादी की शमशानि-होंने जलाई,
उनकी नीज-शानों की याद आती है।

यह वीरान रात, जहाँ तू है सोया,
यहाँ से जो भी गुजरा बहुत वो रोया।
'ए अमर शहीद! मेरे लाखों प्रणाम,
तू जिसका सपूत है उसे मेरा प्रणाम!'

ए बुलबुल, तुम और मत भवाना,
यहाँ सोई है भारत की एक आत्मा।
जिसने तोषों, बाणों की आवाजें सुनीं,
दंको, जेंट और वन्च की सावें सुनीं ॥

इसी आवाज के बीच शहीद हो गया,
जिगर हुआ छलनी, प्रभु का प्यारा हो गया।
बहन का प्यार, मौकी समताओं को-
सौने से लगा कर, जंग में सो गया ॥

जवानों में भी कई अरमान होते हैं,
मचलते हुए कितने तूफान होते हैं।
पर तुझे इनमें क्या निस्वत थी?
जंग में जाना ये तेरी किस्मत थी!!

वह दिन शायद तुझे याद होगा।
माता और बहन से जब दूरमत माँगी;
मोने जिगर थामा, बहनने आँहि भरी,
अश्रु से नववध की आखरी माँग भरी।

एक कब्र बाहर रतना मुक्तिल था,
अभयान मौ का तू एक ही सपूत था।
मूल चुभ कर बोली, आखरी प्रणाम,
आज इस द्वार से घेरे, अंतिम प्रणाम!

मौ का वीर लाल जंग की ओर बढ़ा,
बुदमन भी बढ़े, और एक तूफान भी उठा;

धूल उड़ी, जंग में शोले उड़ने लगे,
कश्मीर, शोलों में जलने लगा ॥

फिजाओं में विषैली जेंट उड़ने लगे;
कश्मीर पर बम्ब घरोँघे फूटने लगे,
जिन्दगी मौत के संलाव में बहो,
इधर लाशें, उधर लाशें गिरती रही।

हर जवान ने दस दस को मारा;
पर यह समों कब तक रहे?
अंत समय आया, साँस छूट गई।
'जयहिन्द कहा' जिंदगी खुसा हो गई ॥

हवा के सोंके ने दी मौत की खबर;
दोष बुझ गया, हुआ मौ का खूने जिगर,
सब चुड़ियाँ दूधपड़ी, मिथगया सिन्दूर;
हाय! बिछड़ गया हमारा अहले नूर!!

ओ भता, तेरे सपूत को लाखों प्रणाम;
लाशों बहनो को भारत जन का प्रणाम।
जिन्होंने घेरे, भाई पति को गैवाये,
शहीदों के साथ होगा अमर तुम्हारा नाम!!
ए अमर शहीद, करूँगी याद आनेवाली सदियों तुझे।
चझता हूँ आज कुछ अजक भरी काबिताकी पंक्तियाँ तुझे ॥

दिलगीर की दिलगी

शिआल रमेश

यी नज़र जहाँ भरी, वह आज बिलिप्त क्यों?
रंगभरी दिशाएँ आज, रंगहीन अति शून्य क्यों?
यी लिया एक आचमन, भय कंफियत चली रही,
घुंटे घुंटे में पी रहा, पर अविस्तृत तृप्ति क्यों?
प्रभात रंगों से भरी, दयामल शाम भीगी रही,
बहुरंगी भुज मेघबनुष, रंगहीन वन प्रद्विप्त क्यों?
आज शमाएँ गुंज उठी, समीर भी कुछ कह-कहे,
गुंजते मेरे गीनोंमें हाय, शब्दों की कमी है क्यों?
दावानल जल रहा जो, समंदर पेट जल चूका,
मन जला जा रहा तो, तन पे ईतनी ठंड क्यों?
जीवन-मृत्यु अनुकमित, एक पृष्ठ दो है पास,
मृत्यु में जो तजे नहीं, तो जीवन से विशाद क्यों?

रुपया गिर गया ...!!!

हातिम कानोरवाला

हाहा ! रुपया गिर गया ?
साथ इन्सान भी गिर गया ?
रुपया तो भाई आज गिर रहा है ।
इन्सान तो बरसों से गिर रहा है ॥

यह गौतम और मसीहा की धरती,
उन्होंने कहा रखो प्रेम, न्याय और श्रुति ।
बेईसानी, स्वार्थ को छोड़ो मेरे साथी,
दुनिया सो रही, बात रह गई बाकी ॥

सतं बल बसे, पर कोई न चला;
इन्सान ने जुग जुग तक हाथ मला,
पेदा किए बम्ब, और गिरा दिए ।
मनवता रोई पर वो मुश्कराता रहा ॥

धरती पर पाप घरोघे फूटने लगे;
यहां आग लगी, वहां बम्ब गिरने लगे ।
'विप्लवनाम' की धरती आज कोपती है,
निर्दोष औरतें, मासूम बच्चे मरने लगे ॥

यह आग कुछ चिन्मारी में डली;
ब्रिज, पाक से होकर भारत में गिरी ।
एक गरीब देश पर जंग की नौबत आई,
खून बहा, रुपया बहा, और रहो भर्तृहार्य ॥

भारत पर सिर्फ लड़ाई के बाबल नहीं;
बादल और भी हैं नफरत और वहाशत के,
झूठ, बेइमानी काले धंधे और बगावत के ।
सोना जवाहिर बिकता बिना शराफत के ॥

इन्सान को गिरते देख हिंद के रुपये ने,
करवटे बदली और वो भी गिरने लगा ।
स्टेरिलाग सोने की तब पूजा होने लगी,
समाजवाद बेत रहा, पूंजीवाद रोने लगा ॥

'रुपये' ने नया इतिहास रचाया,
आज जहां में अपना डाम गंवाया ।
डोलर और पाउन्ड की मोंग हुई,
रुपया अपने भाग्य पर शरमाया ॥

पूँजी पतियों ने कहा, ए रुपया !
इन्सान चाहे गिरे, तू क्यों गिर गया ?
इन्सानों को तो सदा गिरते देखा है,
रुपया ! हमने आज तुझे गिरते देखा है !

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