



BHARATIYA VIDYA BHAVAN

Sardar Patel College Of Engineering

SARJANIKA



VOL. II



JUNE 1966

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Sardar Patel College Of Engineering
SARJANIKA



VOL. II



JUNE 1966

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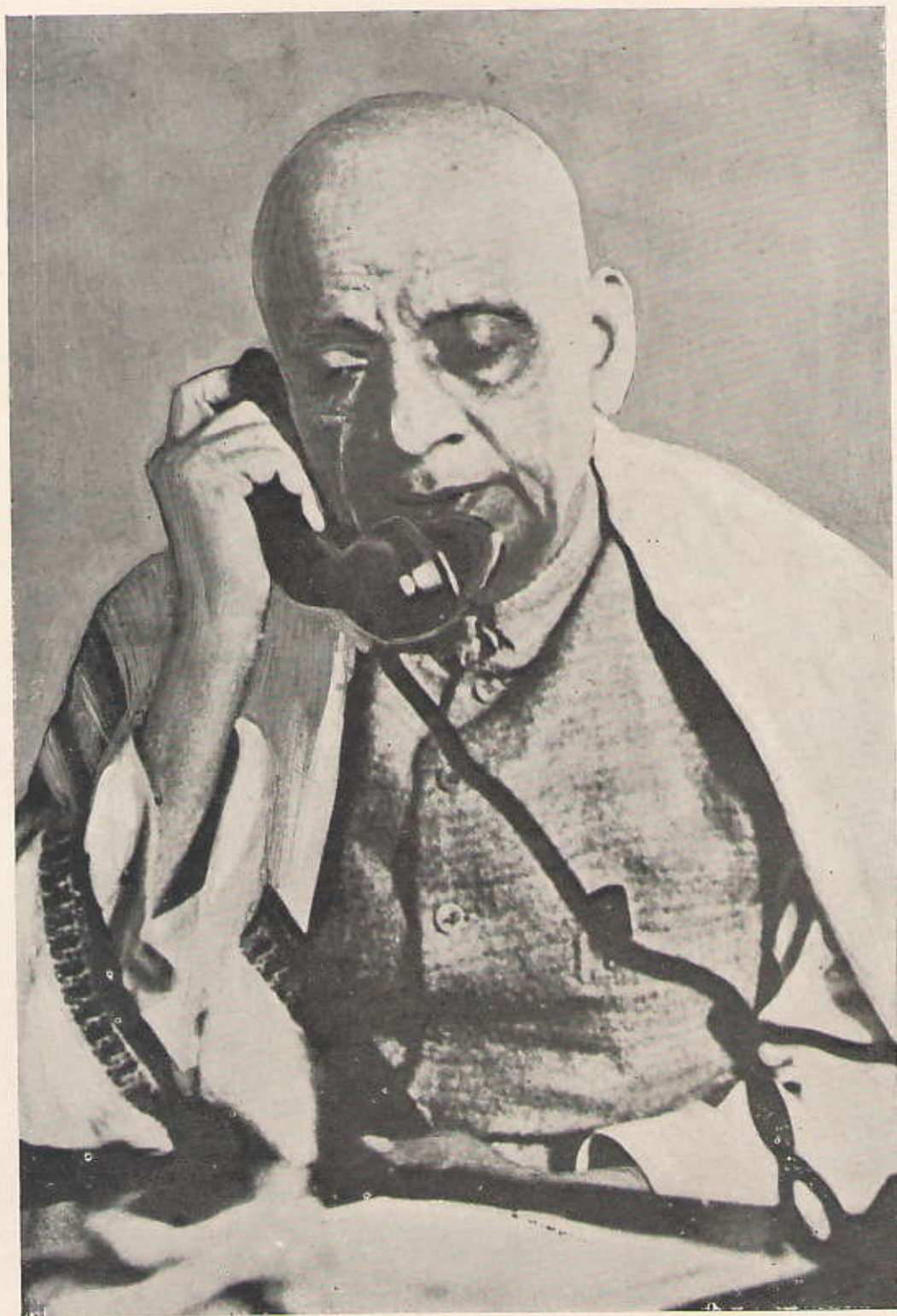
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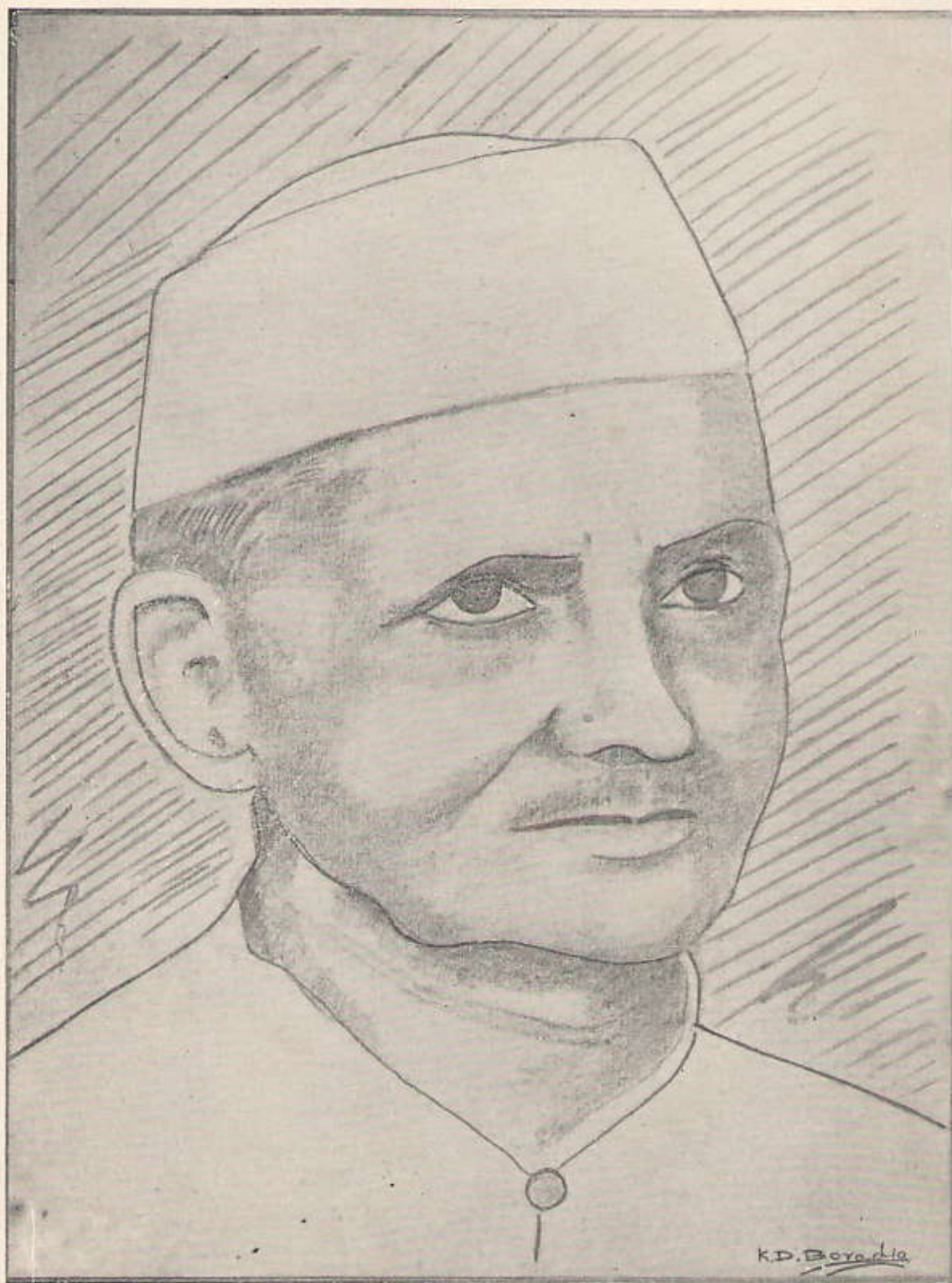
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(1875—1950)



OUR BELOVED LATE PRIME MINISTER
Bharata Ratna—LAL BAHADUR SHASTRI
(1904 — 1966)

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Editorial

We have great pleasure in placing the second issue of our college Annual Magazine SARJANIKA in the hands of our esteemed readers.

The success of the first issue of our magazine and the wide appreciation it had from the distinguished readers and prominent men in all walks of life, have inspired us to bring this issue with a note of confidence in our efforts. The magazine SARJANIKA aims at achieving something really good. It is our earnest desire that it should help our students to develop their literary talents and encourage them to take a keen interest in this forum. It also brings in the lively picture of the various activities of our college students and shows also the development of the college in various directions; academic, social and cultural. It is really gratifying to note that our students have contributed quite a good number of articles on varied subjects this year. We hope that our readers will find them interesting.

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

NEWS FLASHES FOR 1965-66

The academic year 1965-66 is remarkable in the sense that we could record an appreciable development in our academic as well as our Gymkhana activities. The activities of the Gymkhana Committee have brought better understanding between the teachers and the taught.

The college under the Presidentship of our Kulapatiji Dr. K. M. Munshi has been expanding to be a centre of Technical Edu-

cation. In a short period of 4 years the college has achieved a remarkable progress. Our college has been permitted to run post graduate classes in the Structural and Mechanical Engineering from the coming academic year. The efforts of our Principal R. H. Chokhavatia in this respect should be lauded. With the Post graduate classes to commence from the next session, the college is bound to make a much more rapid pro-

gress and develop into one of the well known centres for Technical Education and Research.

The college Hostel was inaugurated by Hon'ble Minister for Railways, Sri S. K. Patil on 26-6-65. While welcoming the Chief guest Dr. K. M. Munshi stated how the Bhavan has grown into a mighty institution devoted to the reintegration and revival of ancient Indian Culture i.e. Bharatiya Vidya and attributed to God in all humility the phenomenal progress, it has made all these years. He said that Sri S. K. Patil has been a close associate of the Bhavan's in all its activities and recalled the services he had rendered to the Bhavan in the establishment and development of Sardar Patel College of Engineering.

Sri S. K. Patil, delivering his inaugural speech, complimented Dr. K. M. Munshi in having the centre of Technical education in the culturally saturated serene atmosphere of the campus. While appreciating the need for technical education and development of the country, he curbed the tendencies of those who ignore the Arts and Cultural education. He warned that Science and Technology without a back ground of cultural and human values would be a failure in the great task of national development.

During the Indo-Pak conflict, the whole nation stood as a man and our students did not fail to rise to the occasion. Our Vice-President Smt. Lilavati Munshi issued a personal call to all the students and staff of the Bharatiya Vidya Bhavan for mobilising all our efforts to help our Jawans and their families, and to make our brave Jawans feel that the whole nation was solidly behind them. The splendid success of our Jawans in defending the honour of the country, brought up the spirit of patriotism at its zenith. The students donated blood and contributed to the welfare of the Jawans in various ways. The Fun-Fair—a novel item of this year's annual function was a

great success in collecting a handsome amount for the national defence fund.

The 28th Foundation day celebrations of the Bhavan were held from 18th December 65 to 1st January 66. The conference of the office bearers and staff of the Head Office, Kendras and all the Heads of the Departments of the Bharatiya Vidya Bhavan held on 18th and 19th December 1965 discussed the need for knitting the kendras, institutions and departments of the Bhavan more closely by adopting certain measures, such as conducting all Bhavan's meeting in a common pattern by using the same prayer, Bhavan's song and taking suitable steps for spreading the message and ideals of the Bhavan.

The 19th Convocation Address of Bharatiya Vidya Bhavan took place on 19th December 1965 at the Bhavan's campus. The function started with the ceremonial procession. The Chief Justice Sarvasri Tambe who had kindly consented to deliver the convocation address was welcomed by the President Dr. K. M. Munshi. In his welcome speech Dr. Munshi said, "Justice Tambe has been a friend of the Bhavan; he has been associated with one of our committees as a member and is keenly interested in our activities". Dr. Munshi referred to the activities of the Bhavan and said, "The work of the Bhavan is being appreciated all over the country and even abroad and requests to open its Kendras are coming from several parts of the country and abroad". He thanked all the members, office bearers, friends, workers, staff and students for their sincere efforts in establishing the tradition of efficiency, enthusiasm and integrity to make the Bhavan a moral force. He dilated upon the necessity of dedicated work in the present situation of the country and added, "The attraction of the Bhavan lies in the fact that in spite of the hedonistic impact of the west, sensitive men everywhere are awakened to the call of the spirit. They are groping to acquire faith in the universal order—mate-

OUR VICE-PRESIDENTS



Sri H. V. Devatia



Smt. Lilavati Munshi

OUR PRINCIPAL



R. H. Chokhavatia

rial, moral and spiritual. They are being drawn towards a consecrated life dedicated to God. In this process the Bhavan has a destiny to fulfil".

Delivering the convocation address Justice Tambe said, "The magnificent progress achieved by the Bhavan in a short period of 28 years is a witness to the dedicated and incessant efforts made by the Kulapati and his associates to foster its growth. He observed, "The great and rapid expansion of the Bhavan's activities is also indicative of the present need for such an institution devoted to the re-integration of our ancient culture i.e. Bharatiya Vidya. He said that loss of faith in the basic values of the Indian culture would lead to the decay of the society and the weakening of social fabric. The spirit of Satya and Sahisnuta are the primary values distinctive to our culture. He reminded that the preservation and fostering of these values have to be our conscious and constant endeavour. He pointed out how the modern Industrial and technological revolution which arose in the West had brought an indelible impress in our nation and stressed the need to strive for them without losing our basic values. He emphasized that the primary objective of our higher education should be to assimilate the new orderly and fruitful economic and political forces in the main stream of Indian Culture and Ideals. He paid tributes to Kulapatiji of the Bharatiya Vidya Bhavan and his associates and said, "The role of the Bhavan has become a vital one".

We are fortunate in having the blessings of our president Dr. K. M. Munshi in all our activities. His 79th birthday felicitation function held at the Bharatiya Vidya Bhavan on 7th January 1966 and largely attended by prominent men and the members of the several institutions of the Bhavan's offered us an opportunity to pay our humble homage to our Kulapatiji and Mrs. Lilavati Munshi and pray to almighty for their health and long life.

The new year began with the most tragic events for our country. The news of the sudden and unexpected demise of Bharat Ratna Shri Lal Bahadur Shastri, our beloved Prime Minister stunned the whole country. The cry went up from every Indian "Shastri Amar Rahen!" His tactful and successful leadership during the recent Indo-Pak conflict won him the admiration of our people from all walks of life and of all shades of opinion. His dexterity and forthrightness in implementing firm decisions earned him and the country the respect of the entire world. He was humble and considerate yet tough and firm. He was a great Lover of peace. As one of the architects of the epoch making Tashkent Declaration for the lasting amity and peace between India and Pakistan he will be remembered as a dedicated and sincere peace-maker.

The tragic death of Dr. H. J. Bhabha in an air crash at Mont Blanc on January 25 is a great loss to the Science. Dr. Bhabha was internationally recognised for his successful research in the field of Cosmic Radiation, Theory of Elementary Particles, Quantum theory of Electronic Showers. He was the President of the International conference on the Peaceful Uses of Atomic Energy at Geneva in 1955. He was a passionate advocate of the cause of Atoms for peace and also a conscientious scientist exploring the avenues for utilisation of atomic energy for peaceful purposes. His death has left a void in the country's life and more so in the field of science and technology.

The death of Sri N. V. Gadgil, Vice Chancellor of Poona University, removed a staunch patriot, valiant fighter and true educationist from amidst us. His intellectual faith and unwavering liberalism made him a leader of the masses. "Kaka Saheb" as he was reverently and popularly called, was a true democrat and always placed his services to the people before power for self. He served unto the last breath and the whole country is poorer by his death.

The death of Veer Savarkar on February 26, 1965 removed one of the greatest fighters of freedom from amidst us. He was a prince among revolutionaries, renowned historian, gifted orator and a great epic poet. He was an *Apostle of Fearlessness*. He was "a legend in his own time", as our Rashtrapathi Dr. S. Radhakrishnan has described him.

The assumption of the office of the Prime Minister by Smt. Indira Gandhi brings true that prophetic vision of late Sarojani Naidu: "The high traditions of the Nehru brand of patriotism created by an illustrious father and illustrious son will be duly honoured by the younger generations that succeed them". Her choice is indeed a tribute to the liberated womanhood of the Sub-continent. Her achievements over the past three decades as a leading fighter for freedom, social worker, president of the congress and more recently as a cabinet minister should make her a worthy successor to the great illustrious leader, Late Lal Bahadur Shastri, in carrying out the unfinished task of establishing amity between India and Pakistan and further peace among the nations of the world.

The flower exhibition was arranged at the Bhavan's campus under the able and inspiring guidance of Smt. Lilavati Munshi, Dr. K. M. Munshi who opened the flower show said, "If we want freedom from foreign food we must learn to change our dietary habits and grow and consume more vegetables." Beautiful and colourful flowers from Israel, Nairobi, Cairo, Singapore, Bangkok and Hongkong, besides flowers and vegetables from different parts of the country and also from the local gardens, proved a great attraction to a big holiday crowd that had come to witness the show.

The college had the privilege to be associated with all the cultural activities of the Bharatiya Vidya Bhavan. The Shibir con-

ducted in the Bhavan's campus has been a very effective medium in bringing into a commonfold, the staff and students of the various sister institutions under banner of the Bharatiya Vidya Bhavan. This has created a sense of oneness, promoting mutual regard and co-operation as if all are members of a single family.

College Activities:—

The reports of Prof. R. H. Chokhavatia, our Principal and Sri K. K. Katkar, our General Secretary leave ample grounds to be proud of our achievements in this academic year. Principal R. H. Chokhavatia with his characteristic nature of hearing the difficulties of the students and offering his best services to help them in both the curricular and extra-curricular activities, has been responsible for the large measure of success. Our Secretary Sri Katkar with his zealous and amicable approach has been instrumental in making the Gymkhana Committee undertake some constructive work for the benefits of the students.

It is a matter of pride to state here our staff members Sri D. N. Desai, Sri S. Toprani, Sri H. Sevak, Sri Cherian, and Shirsat have gone abroad to pursue their post graduate studies. We hope that at their completion of the advanced studies they would be back to serve our institution. Sri V. D. Khatri, Asstt. Prof. in Structural Engineering, left for Japan for advanced studies in Earthquake Engineering. He is expected to join us after his post graduate course in the middle of 1966, soon after the college re-opens after summer vacation.

Sri Chawla who passed B.E. (Mechanical) in 1965 with a first class honours from the college is amidst us as a staff member. We are happy that Dr. Maneck, Sri S. C. Sri Fatehi, Sri V. S. Chandrasekhar, M. H. Kalra and Sri S. W. Bhagwat have been promoted as Asstt. Professors. Sri Vaidya and Sri K. N. Soni have been promoted as Lecturers.

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Sri Thakore, Prof. and head of Department in Elect. Engg., Sri S. S. Nagaraju, Asstt. Prof. in Civil Engineering, Sri Mehta, Lecturer in Mechanical Engineering, Sri V. R. Raddi, Lecturer in Mathematics, Sri E. M. Pareira, Tutor in Mathematics and Sri Sidhwani, Asstt. Lecturer in Structural Engineering and Sri Shah, Asstt. Lecturer in Elect. Engineering have joined us during the current year. We extend our hearty welcome to all the new staff members.

Prof. K. V. Kardile, Head of the Electrical Engineering Dept. retired during this year. We extend our respectful regards to him and pray for his health and long peaceful retired life.

A few of our promising young staff members resigned during this year. We wish all of them success in their new sphere of activities.

It has been aptly stressed by Principal R. H. Chokhavatia that there should be a separate section in the college annual magazine NIRMANI for the ex-students of the college. The need for such an effective medium to bring the ex-students and present students of the college to a sort of get-together to bridge the past with the present and the future can hardly be overemphasized. We hope that our ex-students will take interest in this activity and help to establish the noble relationship with the college and their juniors.

We once again thank all the staff members and students for their willing cooperation in all our activities and hope that the college will register a grand spectacular progress in the coming years under the guidance and patronage of our Kulapatiji, Dr. K. M. Munshi.

FORGET NOT

O INDIA, Forget not that the ideal of thy womanhood is Sita, Savitri, Damayanti; forget not that the God thou worships is the great Ascetic of ascetics the all-re-nouncing Shankara, the Lord of Uma; forget not that thy marriage, thy wealth, thy life are not for sense pleasure, are not for thy individual personal happiness; forget not that thou art born as a sacrifice to the Mother's altar; forget not that thy social order is but the reflex of the Infinite Universal Motherhood; forget not that the lower classes, the ignorant, the poor, the illiterate, the cobbler, the sweeper, are thy flesh and blood, thy brothers. Thou brave one, be bold, take courage, be proud that thou art an Indian, and proudly proclaim, "I am an Indian, every Indian is my brother". Say, "The ignorant Indian, the poor and destitute Indian, the Brahmin Indian, the Pariah Indian, is my brother". Thou, too clad with but a rag round thy loins, proudly proclaim at the top of thy voice; "The Indian is my brother, the Indian is my God. India's gods and goddesses are my God. India's society is the cradle of my infancy, the pleasure garden of my youth, the sacred heaven, the Varanasi of my old age." Say, brother: "The soil of India is my highest heaven, the good of India is my good", and repeat and pray day and night, "O Thou Lord of Gauri, O Thou Mother of the Universe, vouchsafe manliness unto me, O Thou Mother of Strength, take away my weakness, take away my unmanliness, and Make me a Man".

—Swami Vivekananda

ATTITUDE TOWARDS RELIGIONS

Accept not a religion because it is the oldest; its being the oldest is no proof of its being the true one. Sometimes the oldest houses ought to be pulled down and the oldest clothes must be changed. The latest innovation, if it can stand the test of reason, is as good as the fresh rose bedecked with sparkling dew. Accept not a religion because it is the latest. The latest things are not always the best, not having stood the test of time. . . . Believe not in a religion on the ground of its being believed in by the chosen few. Sometimes the small minority that accepts a religion is in darkness, misled. . . . Believe not in religion because it comes from a very famous man. Sir Isaac Newton is very famous, and yet his emissory theory of light is wrong, his method of fluxions does not come up to the Differential System of Liebnitz. *Accept a religion and believe in a religion on its own merits. Examine it yourself.* Sell not your liberty to Buddha, Jesus, Muhammad, or Krishna. . . . Be free, free to look at everything by your own light. . . . *Truth is nobody's property.* . . . If anybody basked in the sun's rays before, you can bask in the sun today. If one man drinks of the fresh waters of the spring, you can drink of the same fresh water. Such should your attitude be towards all religions.

—Swami Ramathirtha (from his American Speech)

NOTICE

The next issue of this magazine will appear in March 1967. 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 30th September, 1966.

Sitting L. to R.: Sriyuts, A. P. Karle, P. K. Popat (J.S.), Prof. S. S. Dighe, K. K. Katkar (G.S.), Sri J. G. Bhode (Chief Guest), Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar, Prof. V. S. Chandrasekhar, Prof. R. H. Kulkarni, Standing L. to R.: Sriyuts A. L. Shinde; G. B. Shah; S. V. Pendharkar; G. B. Chokshi; N. N. Pandhi; S. N. Pandhi; S. L. Mody; K. H. Mehta; P. M. Kotecha.

ANNUAL COLLEGE GATHERING



Chief Guest Sri J. G. Bodhe being received at the College



Invocation

Report for the year 1965-66

By PRINCIPAL

22nd Dec. 1965.

Shri J.G. Bodhe, Respected Chief Guest, my colleagues, young friends, ladies and gentlemen,

It gives me great pleasure to welcome you all on the occasion of the Third Annual Social Gathering of the Sardar Patel College of Engineering and offer you my heartfelt thanks to you all for accepting our invitation to participate in this function. My pleasure is all the while more to have Mr. Bodhe, the renowned sports man, the foremost consulting engineer, and architect and partner in the firm of Messrs K. R. Irani & Company, Bombay.

Shri Bodhe needs no introduction and it will be impudence on my part to say anything about him since he is known to you all as the president of the Institution of Engineers, Bombay Centre. Still for the information of some of the non-engineers, I consider it my duty and privilege to say a few things about our scholar engineer. He has hundreds of works to his credit, the outstanding among them are the Brabourne Stadium, Kalbadevi Cotton Exchange, Several Buildings on Reclamation, National Sports Club of India, Factories of May & Baker, Merck Sharp & Dhome, well known Hindustan Lever House, Nehru Bridge of Ahmedabad, Water Storage Tanks scattered all over India.

He is the full member of Institution of Engineers in India. He is a member of Institution of Structural Engineers, London, a Fellow of the American Society of Civil Engineers, Member of the French Society of Civil Engineers, Fellow of Incorporated Association of Architects and Surveyors,

Justice of Peace and Honorary Presidency Magistrate.

He is the representative of Institution of Structural Engineers in India, and has represented Indian Standards Institute. He is a member of Commonwealth Standards Institute, Ottawa and as a member of the Prestressed Concrete Group, he had attended as an Indian delegate, the International Prestressed Conference in Berlin, Rome, Naples and Amsterdam. He has gone round the world several times and visited all the outstanding bridges in the world. He is a member of the Advisory Committee of development plan of Bombay. Besides his professional activities he is connected with several educational, social and charitable institutions, such as Prarthana Samaj, Pandharpur Orphanage, Budhjayanti Association etc.

He is pioneer of Chess Game in India and President of the Chess Club of India. He as a Captain of Chess Team, for the first time went to Russia to take part in the International Tournament in Moscow. He has taken keen interest in Indian Classical Music and Dancing and to my great surprise I learnt that he has studied Classical Music for nine years and conducted Indian Musical Circle for fourteen years.

Mr. Bodhe is therefore, a man of versatile genius taking interest in almost all walks of life wherever it may be. It is no secret, therefore, that he accepted our invitation to be the Guest of Honour for to-day's function at a very short notice, despite his busy engagements. I am highly thankful to you Sir, for accepting our invitation and regret very much that Smt. Ushaben Bodhe has not

been able to come because of her previous engagement in other social field. Both husband and wife are taking very active part in social functions and it is a matter of great pride that we have you Sir, in our midst to guide the proceedings of this College.

With this brief introduction of our Chief Guest, I would like to give a short history of our institution, Sardar Patel College of Engineering, which came into existence in June, 1962.

1. *The work of constructing the Engineering College Building* commenced from the beginning of January 1962, immediately after the necessary preliminaries were gone through. By June 1962 the office wing, two class rooms, drawing hall and a part of electrical laboratory in the Western Wing were partially covered and finished. The University of Bombay was therefore approached to grant permission for starting the First Year classes with an intake of 120 from June 1962. The Workshop Building was gradually coming up to the roof level but due to the Chinese invasion it could not be covered up till July 1963. The Western Wing with the Electrical Laboratory on the South was ready by December 1963 and the Eastern Wing of the College, including additional drawing hall and material testing laboratory block connecting the two wings was taken up in April 1964 and has been now completed in all respects. The building work has been fully completed now and the work for additions to the college for the intake of 180 sanctioned by the Government of India and the University of Bombay from June 1964, has now been taken up. The total amount of the project excluding the cost of land and development of land as sanctioned by the Government of India is Rs. 24,62,680 for 120 intake and an additional Rs. 4,02,600 for increased intake, making a total of Rs. 28,65,280. Against this, the expenditure incurred so far is Rs. 25,91,800.

2. *Equipment:* When the First Year classes were commenced all equipment required for instructions in that class was obtained by October 1962, and orders for equipment required for Second Year and Third Year were placed, by the end of December 1962. As the equipment needed for the Third Year was very precision type and required foreign exchange, it took us three years to get all formalities completed to obtain necessary import licences and obtain the materials for Electrical Laboratory, Geology Laboratory, Public Health Laboratory and Material Testing Laboratory. In January 1965, more than 90 per cent equipment was already obtained. In April 1965 the Government of India sanctioned Rs. 7,53,000 in addition to Rs. 17,60,000 already sanctioned previously for the first years' course for 120 intake, towards additional equipment required for increased intake of 180. By March 1965, an expenditure of Rs. 15,00,190 was incurred and at the end of November 1965, a further amount of Rs. 3,35,014 has been spent, thus making a total expenditure of Rs. 18,35,204. Due to the shortage of foreign exchange in a tight exchange crisis, the Government of India have issued instructions not to grant any application for import licences making it impossible for the College to purchase a Gas Turbine and Steam Turbine and a few Electrical precision instruments for the Final Year classes.

3. *Hostel:* The sanction of the Government of India for an interest free loan of Rs. 3,77,500 for constructing Hostel for accommodation to 112 students was received in February 1963 and the construction thereof was begun in April that year. By end of December 1965 this work was completed including construction of dining hall, kitchen and servants quarters. Sanction for additional hostel accommodation for an overall total amounting to Rs. 6,96,400 was received.

the Government of India in December 1964 and the further construction work for the increased facilities was undertaken from March this year. This work is almost completed so that by the beginning of the next academic year i.e. June 1966, the college will have hostel facilities for 204 students. The total expenditure to date on the hostel is Rs. 6,26,650.

4. It will thus be seen that from January 1962 to end of December 1965, i.e. in four years, this college which made a small beginning with 120 students has been able to complete all requirements for building hostels and equipment, and spent Rs. 61,82,000 including land and development of project and is making strenuous

efforts to complete all the remaining needs for the additional strength of 60 seats.

5. *Academic:* The college has made great strides in the academic matters. In June 1962 there were 120 students. In June 1963 the strength of students was 200 (First Year and Second Year) and in June 1964 the strength rose to 383 (First Year 180, Second Year 130 and Third Year 80). In June 1965, this strength has increased to 491 (196 First Year, 196 Second Year and 99 Third Year). In June 1966 this would rise to about 600. Thus within four years of the establishment of this college there has been the phenomenal growth, without any lowering of academic standards. The results of the various examination from First Year to Final Year are given below:—

	1963 April	1963 October	1964 April	1964 October	1965 April	1965 October
<u>F.E.</u>	82	53	94	69	144	103
	119	68	140	81	211	119
PERCENTAGE	69	80	67	85	68	86
I CLASS	3	..	6	1	14	2
<u>S.E. (M)</u>	..	..	24	17	39	12
	..	..	31	17	48	13
PERCENTAGE	..	..	77	100	81	92
I CLASS	..	..	1	1	3	..
<u>S.E. (E)</u>	..	..	8	19	20	25
	..	..	27	23	46	28
PERCENTAGE	..	..	30	83	44	89
<u>S.E. (C)</u>	..	..	19	21	20	29
	..	..	37	26	50	34
PERCENTAGE	..	..	52	81	40	85
I CLASS	..	..	..	..	..	..
<u>B.E. (M)</u>	..	..	..	..	21	9
	..	..	..	..	33	11
PERCENTAGE	..	..	..	..	64	81.8
I CLASS	..	..	..	..	6	2
<u>B.E. (E)</u>	..	..	..	..	3	5
	..	..	..	..	11	6
PERCENTAGE	..	..	..	..	27	83.33
I CLASS	..	..	..	..	..	2
<u>B.E. (C)</u>	..	..	..	..	11	7
	..	..	..	..	19	9
PERCENTAGE	..	..	..	..	58	88.88
I CLASS	..	..	..	..	..	1

These results are good enough for a new growing institution. The first batch of Engineering Graduates in Civil, Mechanical and Electrical courses has already passed out. From 120 students who were admitted in 1962, the number of Graduates is 56. Eighteen civil, 30 mechanical, 8 electrical with 11 First Classes in Civil, Mechanical and Electrical courses.

Names of first class engineering graduates from this college, this year are:—

B.E. (C): Karnik Y.S. (731).

B.E. (M): Chawla D.K. (903), Advani P.P. (840), Agrawal B.G. (858), Ashar N.T. (840), Churi P.G. (852), Gokhale R.S. (859), Gajria B.R. (840) and Walwalkar M. V. (840).

B.E. (E): Kamat S.G. (846) and Tham D.A. (840).

Miss M. B. Gandhi, has been awarded Kulapati's Gold Medal for being the 'First Best Student' for year 1965-66 and *Miss A. K. Kolhatkar*, has been awarded Kulapati's Silver Medal for being the 'Second Best Student'.

Shri Chawla D.K. is awarded the Gold Medal for securing the highest marks in B.E. Mech. Examination and passing in First Class with honours. He secured the Fourth Rank in the University. *Shri B.G. Agarwal* has been awarded the Silver Medal for securing Second Rank from this Institution and passing in First Class in B.E.

Kumari Shobhana Shah has been awarded 'Killawalla Prize' for having passed First Year Examination in First Class and joined Second Year Elect. Engg.

Shri Vora B. B. has been awarded 'Killawalla Prize' for being First in B.E. Elect. of the college.

Shri Mandania A. M. has been awarded 'Killawalla Prize' for having secured highest marks in B.E. Elect. Examination this year.

The college has today 43 members on Staff list and made steady progress in developing this Institution from a small body with small strength of Staff Members in 1962.

6. *General:* The Institution has decided to encourage Staff Members to pursue further studies either in India or abroad to enrich the quality of our Staff. This has been due to the foresighted and sound policy and guidance of our respectable Kulapatiji K.M. Munshi who is inspiring us every day with his spiritual message. I shall be failing in my duty if I do not mention the name of Principal S.B. Junnarkar who stood by our side in the initial stages of the building up of this college and helped us to guide the destiny of this newly born child. The campus that you see is so fine and charming, now converted into a veritable garden beauty spot for all lovers of nature and people from all walks of life visit this place to receive the Darshan of Lord Venkateshwar, receive continuous inspiration and guidance from Smt. Lilavati Munshi in expanding this garden campus.

The achievements are big and so is the contribution of all our Staff Members who struggled hard to make the Institution as popular as possible and co-operate with another to build up a very healthy atmosphere. I am deeply indebted to them for co-operating with me in this hard task of building up a national institution in the period of national emergency. I also thank my students for understanding the difficulties of our institution and the Bharat Vidya Bhavan in providing several amenities in this great and lovely city of Bombay.

7. *Sports:* This college has been taking an active part in the inter-collegiate tournaments and sports organised by the University of Bombay and this year the students participated in the inter-collegiate T

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Table



Principal R. H. Chokhavatia, welcoming the Guest



Chief Guest Sri J. G. Bodhe addressing the gathering



General Secretary Sri K. K. Katkar offering flowers to Chief Guest



Vice-Principal S. S. Dighe proposing Vote of Thanks to Chief Guest and distinguished gathering

Tennis, Badminton, Chess, Cricket, Kho-Kho, Kabaddi and Athletics Tournaments and they gave a very good account of themselves, particularly in Table Tennis where this College reached upto semi-final stage in the team Championship and our Ace player Shri S.K. Doshi beat last year's Champion in the quarter final in the individual Championship. In Cricket this College reached upto Third round and Shri B.K. Shete had the singular honour of performing the hat-trick. The performance of Shri S. G. Date at Chess also needs special mention. He had the honour of beating the Maharashtra State Junior Champion. It gives great pleasure to inform you that Shri R. G. Gadkari won the inter-collegiate D.M. Purandare's Elocution Prize for standing First in the competition.

8. *N.C.C.*: This year the strength of the Engineering unit of the N.C.C. has been raised to 400 with the result that all of our N.C.C. cadets of F.E. & S.E. classes for whom the N.C.C. is compulsory have been enrolled to the 2, Maharashtra Engineering Regiment N.C.C. In this college to-day there are 378 cadets attached to the said Engineering Regiment.

9. *Conclusion*: In the end I thank you all very much. Let me welcome you once again on my behalf, on behalf of my colleagues and students and trust this occasion will be remembered as the memorable one in the history of our institution for having completed the first stage of the development. We are in the midst of the second stage and very soon we shall enter the third phase with the introduction of 4 years' course from June 1966.



WANTED

Reformers: Not of others, but of themselves.

Who have won: Not University distinctions but victory over the local SELF.

Age: The Youth of Divine Joy.

Salary: God head; Infinite Peace of Mind.

* * *

APPLY SHARP

With no begging Solicitations but commanding decision to—The Director of the Universe;

YOUR OWN SELF

Om! Om!! Om!!!

—Swami Rama Thirtha

General Secretary's Report

I TOOK over the charge of the General Secretary for the year 1965-66 with high hopes and lofty ideas. I intended that Gymkhana Committee should do some constructive work and carry its activities harmoniously with the co-operation of the staff and students, so that the Gymkhana Committee would form a common platform for the staff and students to understand each other better. How far, I have been successful in my modest ambitions, the readers can only judge and decide from this brief report of the Gymkhana Committee for the year 1965-66, placed hereunder.

At the very first sitting of the committee I strongly pleaded for the formation of the Students' Aid Committee with the sole object of helping unfortunate poor students with the little funds we could raise from the Gymkhana General Fund and the Poor Boys Fund. It is really worth noting that this committee could award maintenance Scholarships to 15 students to an extent of Rs. 2,025 in all. The need for such a committee could hardly be over emphasized and I hope that the committee will be able to render better service in the coming years.

The Gymkhana Committee with its various spheres of activities such as sports, literary, library, etc. needs a willing band of workers. It is a big problem to distribute the work to all the committee members. This year we had for the first time, a joint secretary and the honour of being the first joint Secretary went to my friend Sri Popat B.E. Mechanical class.

The present system of elections in the college left me with no choice but to somehow carry out the work with the members. I hope I will not be mistaken if I suggest that those who would like to take some responsible posts such as secretaries of the

games and other sections, should be interested and have good organising ability. Every one admits that there is a vast difference between an admirer of sports and a real sportsman; The games secretaries should at least have adequate knowledge of the games. It was due to this that Shri. K. Shri. Shinde and Shri. Cumbatta had to work this year. It is unfortunate that out of 20 Gymkhana Committee members above three had to look after several games although it does not escape the notice of the readers that each game like foot ball and hockey requires an efficient secretary.

Shri Karle: Foot ball, and hockey.

Shri Shinde: Indian games, swimming, weight lifting and athletics.

Shri Cumbatta: Volley ball, basketball, tennis and badminton.

One of the special features of the Gymkhana Committee was the formation of a department for "Cultural Activities" with four secretaries to look after the activities of the department as follows:-

Shri Mehta: Dramatics (Marathi Section).

Shri Mody: Dramatics (Gujarathi Section), elocution and debating.

Shri Choksi: Picnics, Dramatics (English Section).

Shri Shah: Pictures, celebrations such as Independence Day etc.

I have to state that the activities of the committee could not make an impressive progress despite the sincere efforts of the secretaries concerned. The cultural activities are very essential for bringing a sense of oneness and help understand one another better. But the students should also be interested to make the activities successful.

let me hope the much needed co-operation of the students will be forthcoming the next year.

The library was given the top priority in our Gymkhana Committee activities. The number of books has been almost doubled during this year and the students must be enjoying the benefits of this small but very useful contribution of the committee.

I am glad to hear that the staff and students of the college stress more on the academic activities. But I feel at the same time that the extra curricular activities need definitely a better encouragement from all. Despite this our sportsmen have brought a good name to our institution. Notable amongst them are Shri Shailesh Doshi and Shri Date who took part in the inter-collegiate tournament. Shri Shailesh, our table tennis player defeated the former table tennis champion Shri Dileep Lakhani and earned a well deserved personal triumph and brought a triumph to the college. Shri Date our chess player had a glorious moment in making the university champion test his intelligence in this game. With proper training and encouragement, it will not be a surprise if our college wins several trophies and prizes in the coming years.

In cricket we are making a steady progress every year. This time we just missed the appearance in the quarter finals in the inter-collegiate cricket tournament. The success of the cricket team was due to our ACE players Shriyuts B. K. Shetye, Ashar and Kumta, so ably led by our captain Shri R. S. Mandrekar. Next year we can hope to have a stronger team when Shri Rane and Shri Commeseret join us.

Our College Day Functions:

The main activity of the Gymkhana Committee was the celebration of the annual college day functions. The main features of the functions were a full two-day program-

me, preceded by the athletic and college sports activities.

The college day sports this year was a great entertainer to all of us. I think for the first time the staff members took some keen interest in the college day games and a festival cricket match was arranged between the staff vs. students. The students were much delighted to see our principal, putting pads and gloves probably for the first time and leading the staff team against the students team led by General Secretary. Shri Ashok Pradhan was on the mike giving an excellent running commentary of the match. But we could not enjoy fully as the mike went out of order after about 45 minutes. However, our thanks are due to the staff of the electrical department for kindly arranging the mike service on that day. The results of such a festival game should be in favour of the staff members who were made to win. The other festival games went almost in the same way much to the delight of the students and staff.

One of the main attractions of the 1st day functions of our two-day programme of the college annual day celebrations, was the organisation of the Fun Fair by the General Secretary in order to raise the funds for the N.D.F. The Fun Fair was inaugurated by our Principal R. H. Chokhavatia. It goes without saying that the Fun Fair was a success beyond our expectations and I must be thankful to Miss Devanani who could sell 1000 coupons in less than an hour. The stall coco-cola arranged by me brought a good return and helped me win a prize. All were much impressed by the stalls "Strike a Patton Tank", "Kiss Miss", "Prove Your Sex" etc. The colourful posters of Shri Pradeep Shah attracted a large number of people and boosted our collections for the N.D.F. Miss Shobhan Shah deserves our special thanks for donating Rs. 5 she won in the Fun Fair.

After the well deserved refreshments, the next part of our days programme "Fish

Ponds—a hot favourite of all students” started. Shri Rajan Gadkari who had recently won the 1st prize in the B.M. Purandare Elocution Competition was introduced to the students on this memorable occasion. Shri Rajan Gadkari joined me in fishing and the very first fish was naturally to our Principal and then to our Vice-Principal Shri Dighe. On the whole the fish pond brought the much expected, humorous, spicy at times sarcastic titles awarded to fellow students and staff. Shri Rajan Gadkari conducted himself most apt to the occasion and while I join all the students in admiring his ability in proposing spicy fish ponds with his inimitable style, I wish he should have refrained from making some of the personal remarks that would hurt the feelings of a section of the audience.

The widely advertised movie “Mr. Hobb Takes a Vacation”—a most hilarious comedy, was screened in our college open air theatre, as the concluding main programme of the 1st day. The picture was a successful one in sending all of us on a vacation to a place from where we could not return to witness how Mr. Hobb enjoyed his vacation. The end of the picture was a great relief. After seeing the picture most of us could not help but draw the conclusion that either we must be too immature to enjoy that hilarious comedy for full three hours or it must be one of the *bumpers* of these days.

The second days’ programme was practically the last and most important activity of our Gymkhana Committee. Shri Bodhe, president of the Indian Institute of Engineers (Bombay Centre), was our chief guest. The function started with the Bhavan’s Invocation. Our Principal read the report of the college for the year 1965-66. His report inspired all the students to look back at the academic results. Mr. Bodhe, the chief guest, who rose to address the gathering in the midst of loud applause of the students, stressed the need for extracurri-

cular activities and congratulated those who could successfully take part in these activities. He pointed out that the students to-day are the leaders of tomorrow and ded that the engineering students in particular have a great task ahead of them bringing nation-wide development to the betterment of all. The Vice Principal proposed the vote of thanks to the distinguished guests and all those who helped to make the functions a success. The general secretary thanked all on behalf of the students and the Gymkhana Committee.

This part of the second days’ function came to an end with the national anthem followed by the Variety entertainment and Drama to be followed after the light refreshments to the students.

The variety entertainment offered a great variety to the gathering with choice to taste. Rajan’s monologue was a very nice item represented in our college. Verhar Farce reached climax when he sprayed in that manner. Marathi drama was a great success. Shri Baban Gokhale, our Marathi drama director, spared no pains in achieving our success and our thanks are due to him. The Gujarati drama was a “Masala piece of Common Love Affairs”. Shri Bax orchestra did not make us feel the absence of Shri Sanjeeva Pawar, the wizard of college in orchestra. Miss Asha Kolhatkar was at her best.

The report will be incomplete if I fail to mention how my friend Arun Karle helped me. Right from when he seconded my candidature for General Secretaryship to the end of this major activity, he had been a great support to me. His willingness to take up any work leaves me with all appreciation for him. He used to collect the tickets on his way to college and return them to me while returning home even at such odd times of the midnight.

PRIZE DISTRIBUTION



Sri Nakhwa M. N.
—Athletic Champion
receiving the prize



Shri Shailesh Doshi
Our College Table Tennis
Champion receiving the prize



Sri Date
Our College Chess Champion
receiving the prize



**Sri Rajan Gadkari
receiving the prize
(Stood First in the
Purandare Elocution
Competition)**

**Miss S. G. Paranjape
receiving
prize for the Marathi
article in Magazine
(The first
girl student to receive
the prize)**



**Sri K. K. Katkar,
receiving prize for the best
Social Service as General
Secretary**

Before concluding my report, I would like to submit that what little success I could achieve is not my real own, but it is all due to those who helped me in my work. I must consider myself fortunate, because I aspired to be General Secretary, got it and did my best and have the privilege of enjoying as the former General Secretary of my college. The words fail to express my heartfelt thanks to all those who could ap-

preciate my work and honour me by awarding a special prize for meritorious social service. I sincerely hope that this gesture of the Gymkhana Committee, Principal, and some staff members will serve as an incentive to the General Secretaries in the coming years to strive for something really constructive in the larger interests of the students.

Beauty Lies Everywhere

By R. D. Shial, F.E. III.

A single star and the starry sky,
Which looks better and why?
A star rather more beautiful
When in the sky, above it lies.

A bunch of roses and a single rose,
Which would be liked, when one comes across?
Know I not, but still I'm sure,
A single one would be worthier for pure.

If one thing be concentrated at a time,
Oh! it becomes full of charm and shine,
If one looks at dust and blinds to else,
One finds there beauty and kisses it at once.

Thus beauty lies there, everywhere on the earth,
One finds in the death, one in the birth,
Oh! beauty in the sky, everywhere in the world,
Just you concentrate—*beauty—comes there forward.*

LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION

PRADIP AJMERA, B.E. (Elect.)

LASER

(This article is written with an intention of giving readers an idea of Laser, the most talked about triumph in the recent history of science. The data has been collected from 'Laser' by B.A. Lengyel, Popular Science etc.)

THE Subject Laser is very recent, but the roots go deeper. The use of microwave amplification was proposed simultaneously by Weber at University of Maryland, by Townes at Columbia University and by Basov and Prokhorov in the Soviet Union during the year 1953&1954. The speculations concerning the possibility of extending the principle of microwave amplifiers (MASERS) to amplification and generation in the optical region arose thereafter. After a considerable analytical work, the first light amplifier was constructed by Maiman in 1960. The general physical condition necessary for the operation of a laser in either gaseous or solid state was explored by Schawlow and Townes.

The Laser, by definition, is a device that amplifies light by means of stimulated emission of radiation. In the initial stages the laser was made of Ruby. The trick lies in the fact that the ruby atoms, excited in the proper way, produce a very special kind of light. It is coherent: The light waves,

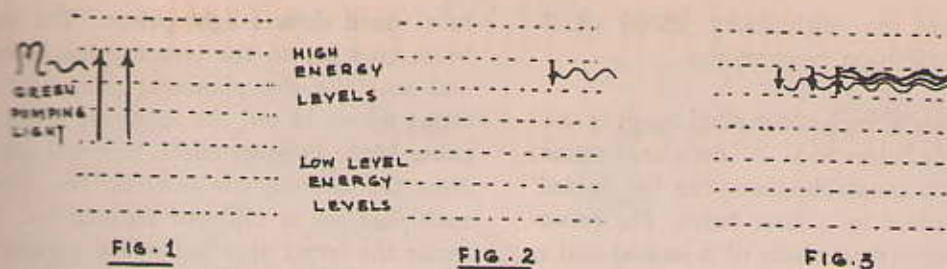
unlike those in ordinary light, are all in step.

The coherence of light can well be understood by comparing with the water waves. Suppose you pitch a handful of pebbles into a pond. Each pebble sets up its own ripples. The pond is covered with a jumble of wavelets, travelling in all directions. Regular light is like that. But suppose you drop in a single stone. Then smooth ripples spread out evenly from the centre, that's like coherent light.

Most solid-state lasers are made of artificial ruby—crystalline aluminium oxide with a small percentage of chromium. The ruby is cut into a cylinder between $\frac{1}{2}$ and 1 cm. in diameter and 2 to 10 cms. long. The ends are silvered, one of them partially, so that light can be reflected back and forth down the cylinder's length. Then the chromium atoms are hit with a tremendous burst of light. A large number of electrons are pumped to the high energy level and some begin falling back to the lower level immediately releasing light. Some of this light released by the electrons strike other high-energy electrons, triggering them to radiate their energy too. Incidentally they release in exactly in step—in phase, with the light that sets it off. This reinforced energy now hits more electrons at the high energy level, triggering them to give up more in-phase energy.

ED

EE (Elect).



Within a few millionths of a second, huge pulses of radiated energy rush from one end of the cylinder to the other. Finally the signal gets so strong that it bursts forth from the partially silvered end of the crystal. A tremendous burst of eye-dazzling coherent light is then seen coming out of the crystal.

The working element of the ruby laser is a cylinder of pink ruby containing 0.05 percent chromium. This cylinder is usually $\frac{1}{2}$ cm to 1 cm in diameter and 2 to 10 cms long. The end faces are plane and parallel to a high degree of accuracy. The ruby is irradiated on its side by light from a flash-lamp operated usually for a few milliseconds at a time with an input energy of 1000 to 2000 joules. The diagram shows the essential parts of ruby laser. Most of the input energy is dissipated as heat; a fraction of it, however, is emitted by the flash-lamp as blue and green radiation which is absorbed by the ruby. This energy, which it absorbs over a broad spectral region radiates into a narrow emission line of the trivalent chromium iron around 6943 Å.

The radiation emerges coherently through the partially reflecting end of the ruby.

Actually, this coherent radiation does not appear immediately at the beginning of the excitation. Unless the exciting radiation is sufficiently intense, this fluorescent radiation will be the only one emitted from the ruby. When, however, the exciting radiation exceeds a certain threshold, coherent radiation appears approximately after 0.5 m.sec. after the start of the irradiation.

Many applications of laser have so far been found out and many more are being worked on by more than 500 research teams in the U.S.A. The laser's light will map the moon. MIT scientists bounced a laser ray off the moon's surface; found that it could be focussed so sharply that it covered just two miles in diameter. The tightest conventional microwave radar beam would spread 25000 miles or so.

The ruby ray may open vast new realms of the spectrum—far larger than all bands presently used for radio, TV. Just one

laser beam can easily carry 25000 simultaneous television programmes.

The laser's finely controlled beam is useful in medicine too. A detached retina, which may cause blindness, can be 'welded' back in place by a laser beam. The procedure takes a thousandth of a second and is completely painless.

A super-powered version of the laser's electronic lighting may burn holes in attacking missiles, turn them into flying scrap metal. Laser can also be used to ignite the solid-propellant rockets with lasers built in the launching pad. Clustered rockets could be fired simultaneously by splitting a single beam into several parts with mirrors; so the usual tricky firing circuits could be eliminated.

The energy packed in the high-powered laser beam can produce tremendous heat, which can pierce through 1/8-inch steel in split of a second to make a hole of diameter of 0.005 inch.

Research workers are using the ruby ray to build a speedometer to allow space ships to rendezvous in orbit with hardly a bump. The problem here is to measure accurately the rate at which the two ships come together. From speeds of thousands of miles an hour, they'll have to slow down until they meet gently. The laser speedometer works on 'Doppler's Effect'*. In the laser speedometer, the coherent light is split into two beams. One is routed into photomultiplier

tube which detects light pulses. The other beam goes out to the target, bounces back and also hits the photomultiplier. As the target moves closer, the returning echo, because of the Doppler effect, becomes higher. Now the two signals reaching the photomultiplier are at different frequencies. The faster the target approaches, the greater the difference. A special circuit computes from this the speed of the approaching target.

Apart from the ruby, the solid state laser there is also the Gas Laser. The common gas combination used is Helium-Neon. The gas laser's beam is far more coherent than the best solid laser, and the frequency is more precisely fixed.

The third basic type of laser is the transistor like Injection Laser. This laser is a chunk of gallium arsenide smaller than a pinhead. Two sides are mirror bright. When a direct current is applied, a beam of coherent infrared energy shoots from the mirrored surfaces. The important thing is that the output varies in proportion to the DC input, so it's easy to modulate.

Thus we see that this incredible ray which can map moon, steer satellite, pierce diamonds or measure distances smaller than the diameter of an atom, will bring a new era in the history of science.

(* This Doppler effect is what makes the whistle of a train coming towards you seem higher in pitch than it actually is—the train is little nearer as each cycle of the whistle's sound wave begins, so the waves squeeze together and sound higher.)

FUN FAIR



Sri R. H. Chokhavatia inaugurating the Fun Fair



Strike a PATTON Tank



Selling of Coupons to boost N.D.F.



A View of the Crowd enjoying Fun Fair



Sri S. M. Verhani reaching the climax of his Farce

F A R C E



Sri Rajan Gadkaris' Monologue

CAN - WE - NOT - AVOID - THE WAR?

By

RAJAN GADKARI, B.E. (Mechanical)

NOWADAYS, war is not just restricted to the battlefield. Even a common man thousands of miles away from the battlefield is effected in his daily walk of life. Naturally, there is a problem before everybody, can we not avoid war? This problem is being discussed at all the levels in the society. As far as the highest authoritative level is concerned, all nations have also tried to seek an answer to it through UNO or Security Council. These big nations have tried a lot. They always speak of very sweet and fascinating words such as disarmament, peaceful co-operation etc. But the most wonderful part of it is that these are the same nations that are manufacturing explosive weapons. These are the same nations that are trying to increase the production of atom-bomb or nuclear bomb. Naturally, the dark tearful shadow of war never diminishes, and the problem remains unsolved. On the contrary I feel, it is getting more complicated. That is why, I find the problem more important and thought provoking as well.

When we try to have a basic look at the problem, we will have to know whether war is a human tendency or a defect. If it is a defect, we can think of some cure for it, but if it is a human tendency like love or anger or hatred, the cure appears to be doubtful, for they are all human feelings. They are always present in our mind. They may be in a different form, they may change accordingly, but we cannot deny their fundamental existence. Any of such feelings can never be fully abolished. Therefore, we will have to see whether the urge for war is a similar feeling.

For an on looker, the reasons for war may change according to time and person. In very old days, there were fights amongst the jungle tribes. At that time, the reason was of self defence or the urge for owning. Then there was a so called cultural progress. The wars that took place they say between Roman and Greek or Arya and Dravid carried the sense of vanity of the superiority of one's own culture. If we look back in the Indian history we find that the wars that took place in India were because of religion. The two world wars in the twentieth century were fought because of the extreme nationalism or tremendous ambition of a person. With this back ground, if we think of future, we can say that the war in future will be fought for a particular principle. Britain still claims that the second world war was fought for the principles of democracy. In short, the reasons for war change from a personal wish to a particular principle. They may vary from a political level to a cultural level, but if we restrict ourselves to the subject, we can just say that the reason for all these wars is essentially the human nature, because all the reasons stated above carry the sense of ego. This sense can not be abolished. We may be able to make an end of the reasons that seem to change with time and person. In fact, we have done it; every time it was felt, the war is over. But the end of one war was the beginning of another. Many attempts were made to avoid war. Right from Shrikrishna in Mahabharat to the UNO, The League of Nations of today, all have tried best. But none of them was able to abolish the incident "War" totally. On the contrary, we find that there was tremendous destruc-

tion to avoid destruction. Ashok, the sincere devotee of God of Peace was also ready with an army and that too very powerful.

So we find that in the history of man there was no such period when there was no war. I would say that the story of man is the story of war only. Thus, in the life of man the incident "War" has taken place uptil now continually and is taking place even today. Therefore we can conclude that it will also take place in future.

But this is an inductive conclusion. Many may not agree to it, because an inductive conclusion does not prove to be always correct. Therefore it is essential to look at the problem in a scientific manner.

Once we accept that the basic reason for war is human nature, we will have to look at the problem from a psychological point of view. When this angle is adopted we find three psychological reasons for war.

The first reason is "self defence". To defend oneself, one's own family and nation—it also being a family in a broad sense—is a basic human tendency; and it has got to be there. This tendency originates from fear. If we are not afraid of anything, the idea of self-defence would never occur to our mind. e.g. If we are not afraid of the tiger we will never feel like defending ourselves from him or kill him. Thus this tendency is essential.

The second reason is the urge for power. This is also essentially a human tendency. Man is an egoistic animal. The urge for power develops through this ego. The nature of this ego may vary from owning some land or a property to the superiority of one's own principle, but the idea is basic and is a fundamental cause of war.

The third reason is the enjoyment in a victory. This intoxicates man. Such an en-

joyment can reach the peak when it comes to kill the enemy. It may seem a little absurd but it is a fact. Man enjoys such an enjoyment in war only. Why does a drunkard go to a bar, knowing all the ill effects of drinking?

When we look at all these three psychological reasons we can very easily understand why man is apt to the war, though he is aware of all the terrible effects of it.

At this stage a new idea comes in the picture. Is war just useless? Is war just a nuisance? Or is it essential? This also is an important factor when we think of the problem.

Look at the problem within this angle. Now, we find that Malthus' theory of population calls war as an essential incident. It may be very hard to accept war as a tool to solve the problem of population. But we cannot deny the truth. This is not the only advantage of war. It is war only that can change the values of all the things. Nitshe also claims that for the sake of revaluation of all values, war is essential. He feels all the human and financial losses in war are far negligible before such a profit.

If a nation has to prove its value it has got to appear in a war. Do you think that today only India has made its real value known to the world? Why should we find the war with Pakistan as just a calamity? Is the war curse or a boon? To an onlooker, it will appear just a curse. That is because of the critical condition in war. But think a little deeper. You will find that the war is promising a bright future for India. It has made a revolutionary change in the ideologies of our leadership and the common man as well. I am not describing the future like a fortune teller. You can find living examples for it. Germany and Japan, these two countries were reduced to ashes in the

second world war. They have now built up a heaven out of it.

Many great philosophers while speaking about the form of life have said, "Life is nothing but a conflict"; war is just a side of conflict. Heraclitus said, "The idea of ultimate reality can be best predicted by fire". Naturally, the life of man will be always like a fire. Then, how are we going to avoid war?

At this stage, we will have to accept that war takes place because of some natural human tendencies. So, till there is man, there will be this tendency and till there is this tendency, there will be war. We simply cannot avoid war, and why should we be sorry for it? On the contrary, why should not we accept this truth and then face life? Does it not give the real sense of a 'lively life'?

THE MYSTERY OF LIFE

By

Professor L. L. BHIRUD

To live but a second
In a state of humility
In which alone descends All Power
Is to live unto Eternity.

To live from moment to moment
In a state beyond comfort
In a state beyond sorrow
Is to taste the Joy of Life.

To live beyond emotions
To live beyond thoughts
Is to partake the Real
Spring of Life Eternal.

To live and to die
From second to second
In an everchanging state
Is to know the meaning of Life.

To die only for a moment
To all praise and blame
To all success and failure
Is really to live young.

Die to the Past
Dream not of the Future
Live in the solid Present
And realise the richness Within.

Life not a chance
Though everchanging
Clean thyself
To know its Freshness.

Money can't take you there
Prayer but a broken vehicle
You have not to walk
The Blessing comes by Itself.

MAKE YOUR RADIO

By

HARCHARAN SINGH, S.E. (Mech.)

[Original as assembled by the author]

THE present world of electricity will be incomplete without the name of transistors. The transistors are not used in radios only, as we all know, but in hundreds of electrical devices. With the passage of time, transistors are finding more and more use in electricity. However, transistor is not the subject, we are to discuss here but a small, simple transistor radio which can be prepared even by a school boy knowing little about electricity. So let us start with the know-how of a set, which will give us a very clear reception of our three stations viz. "Bombay A", "Bombay B" and the choice of all of us, "The Vividh Bharti".

Below is given a sketch, known as the Circuit Diagram. This diagram gives us all the details and the components required, in a conventional way. The conventional signs used in the diagram are explained in the adjoining figure. For convenience, a complete list of the components required is given here. It will be better to hand over the following list to the shopkeeper, if the mistake of purchasing a wrong component is to be avoided. The components are:

(a) Hitachi Transistor OC 72 (2SB77)
—One.

(b) Hitachi Transistor OC 44 (2SA15)
—One.

(c) Germanium Diode OA 150—Two.

(d) Input Transformer (Driver) 45:1—One.

(e) Output Transformer matching OC 72—One.

(f) R.F. Choke 25 mH—One.

(g) Variable Single Gang Condenser 400 pF—One.

(h) Resistors: 1 M, 8.2 K, 2.2 K, 27 ohms, 150 ohms (One each)—Five.

(i) Capacitors (i.e. Condensers): 5mF, 10mF, 50mF (Each 6V), 100pF—Four.

(j) M.W. coil Antenna wound on a former—One.

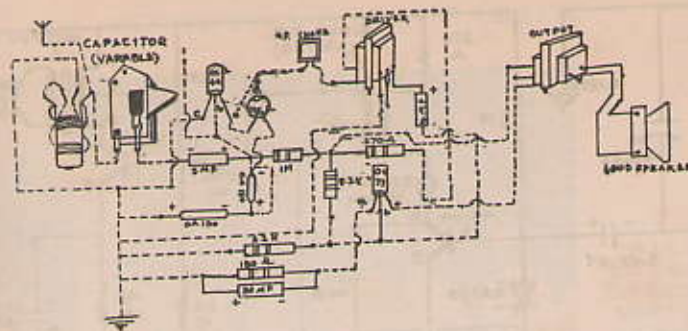
(k) 6 V Battery (Or two 3V cells connected in series)—One.

(l) Ebonite board with holes for fixing the components—One.

(m) 2.5" speaker—One.

(n) 6 feet thin flexible plastic wire—One.

If a component of the above value is not available from one shop, it must be searched for from the next shop. The symbols used in circuit diagram are explained below

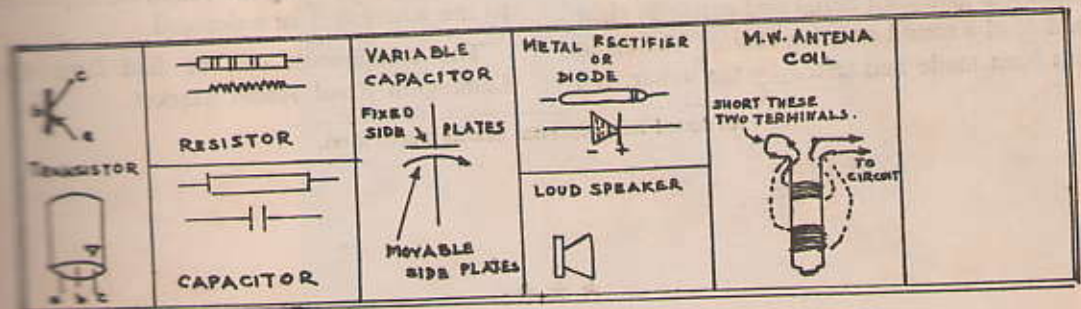


All dotted lines represent flexible plastic wires.

Special attention is essential while connecting capacitors, diodes and transistors. All the capacitors (except 100pF), and the diodes have negative and positive terminals. In capacitors, the positive side is marked either by a positive sign, or by a red mark. The other terminal will be negative. On diodes, the positive side is marked either by the positive (plus) sign or by a white line

ing you. The order is, then, collector, base and emitter (c, b, e) when counted anti-clockwise, the collector (c) being marked by a triangle. This is shown in the previous figure.

The M.W. Antenna coil has four terminals. There are two coils on the former, two terminals being used for each coil. So the

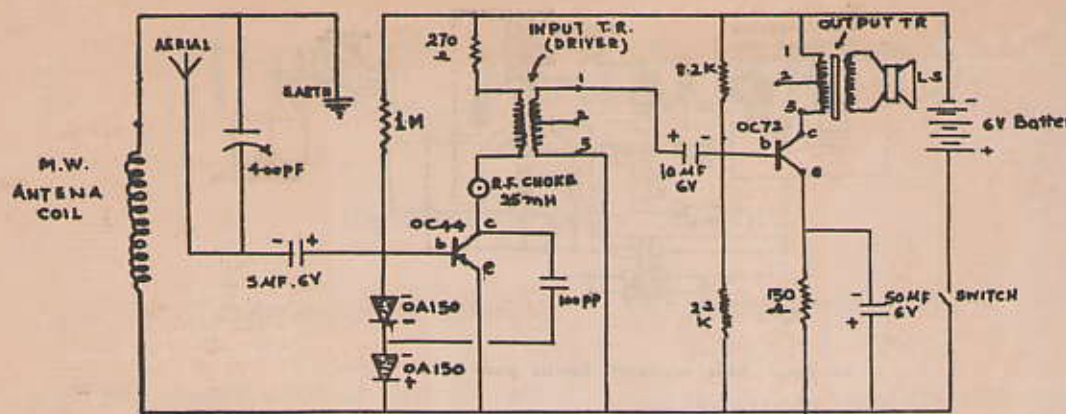


marked round the diode. These negative and positive terminals should be connected as shown in the diagram, the radio may not work otherwise. All the resistors, the R.F. choke and the 100pF capacitor do not have any positive or negative terminals, so they can be connected anyway.

For connecting transistors, care should be taken to put the Collector (c), Base (b) and the Emitter (e) in the proper place. To get the 'c', 'b' and 'e' of the transistor, hold the transistor horizontally, the three wires fac-

four terminals correspond to two different coils. As we want only two terminals, as is clear from the circuit diagram, one terminal of one coil should be connected to the one terminal of the second coil. Thus the two coils will be connected in series. This can be very easily done if one knows what a series connection is. The two terminals of the coil are thus used up and the remaining two terminals can be used for the circuit connections. This is also shown in the figure.

Both the transformers, output and input, have two terminals on one side and three on



CIRCUIT DIAGRAM.

the other. On the three terminal side, the middle terminal should not be connected anywhere. This is clear from the circuit diagram. The wire going from battery to the circuit, can be plucked anywhere and a switch be connected. See the circuit diagram.

If the connections made are correct, the radio will give with aerial and earth, as clear and loud a sound as a big radio. The radio has been made and tested by the writer. It's

approximate cost lies between rupees thirty and forty.

For an engineering student it should not be difficult to make the connections for such a simple radio, however, a simplified diagram is given above. If still some difficulty occurs in assembling the radio, an approach to the writer will be welcomed.

The components can be had from Lamington Road Radio Market.

• All dotted lines represent flexible plastic wires.

★ ★ ★

SCENES FROM MARATHI DRAMA



Left to Right:
Sri Lad; Sri Ingle;
Sri Karle;
Sri Heroor;
Miss Kolhatkar;
Sri Katkar; K. Karnik;
Sri Chittal.



Sri Nakwala,
Miss Athawale,
Miss Shah,
Sri Pradhan,
Sri Heroor,
Sri Bakshi,
Sri Chittal,
Miss Kolhatkar



Sri Karle., Sri Lad, Sri Ingle
Sri Heror, Sri Pradhan,
Miss Kolhatkar, Sri Katkar,
Karnik K., Sri Chittal,
Sri Bakshi

SCENES FROM GUJARATI DRAMA

Sri S. P. Sawala
Sri A. K. Bhatt,
Sri P. J. Desai,
Shri S. N. Mody,
Miss M. K. Shroff



Sri S. P. Sawala
Sri P. J. Desai
Sri S. N. Mody
Miss M. K. Shroff

Sri S. P. Sawala
Sri P. J. Desai,
Shri S. N. Mody



Role of Defence Science in India of The Past

By

SUSHIL PANDHI, S.E. (Elect.)

SINCE the beginning of the Creation, Man began to develop weapons to protect himself from other animals, and to get his food. As people began to live in groups, they feared attacks from other groups of people and so arose the need for development of weapons—and of the art of war, and this can be called the beginning of "military science" or "defence science".

The need for the knowledge of military science began to be felt more and more as the time passed. Evidence of this fact is found in the Harappa and Mohen-jo-daro excavations. Harappan relics disclose that when Harappa was first built, the citadel was defended by a great wall, 40' wide and at least 35' high. At Mohen-jo-daro a fine copper axe has been found with a very strong shaft-hole and an adze blade opposite to that of axe, adapted for war and peace. Swords with strengthening midribs also made their appearance.

These earlier people were subsequently replaced by squatters who had superior tools and weapons, and there is a clear evidence also that they used horses. The cycle of invention went on repeating, and each time the people equipped with better weapons triumphed.

Then the Aryans entered India. They were well-equipped, and their bronze-smiths were highly skilled, and produced tools and weapons much superior to those of the Harappan culture. They used chariots, which proved to be of immense help. This was the

beginning of the use of the cavalry in warfare.

As the Aryan civilization advanced, some rules to be observed on the battle-field were laid down. In the age of the Epics, rules of fair fighting were laid down. To Manu, a battle was ideally a gigantic tournament with many rules, e.g., a warrior fighting from a chariot might not strike one on foot, an enemy wounded or asking quarter, or running away from the battle might not be slain, the lives of enemy soldiers who had lost their weapons were to be respected, poisoned weapons were not to be used, and so on. It is doubtful if any other ancient civilization set such humane ideals of warfare.

During the time of the Ramayana, "bow" was the usual equipment of the soldier. The use of the chariot had in the meantime developed a great deal, and often more than four horses were employed to draw a war-chariot. The mysterious and magical weapons described in the Epics, the Ramayana and the Mahabharata, seem to be rather the product of poets' thinking and imagination to a great extent, because there is little evidence left which can show that these weapons did actually exist. Modern examples of such thinking can be found in Jules Verne's wonder stories in which he described the use of the submarine, the air-craft, etc., before they were developed, and also in the science fictions by some other authors.

However, the Mahabharata, which describes the battle of the Kurukshetra, fought

amongst the Kuru tribes in which practically the whole of ancient India took part, gives some idea about the weapons and the rules that existed at that time. The day and time of battle were usually chosen by astrologers, whenever possible. Battle-hours were fixed and acts of hostility at night were forbidden. All the four classes (castes - वर्ण) used to participate in battles. Usually, a brahmin was given charge of teaching princes the use of weapons. Swords of various types were used; the most dangerous being the nistrimsa. Lances and javelins were the usual equipment of the soldier. Shields of bent cane covered with leather or of metal were used. References are made in the Mahabharata also to the deadly weapons, slaying hundreds at a blow and releasing fire and death all around them. These descriptions seem to be somewhat exaggerated and to be the product of authors' imagination, inspired by incendiary missiles, fire arrows, etc., which were no doubt employed. Indians possessed the ancient world's equipment of artillery—ballistas (a military engine anciently used for throwing or hurling darts and stones) and siege-engines.

Earlier, in the 3rd century B.C., defence science in India was much enriched by Vishnugupta Kautilya or Chanakya, adviser and preceptor to Emperor Chandragupta. Kautilya gives an account of the ancient Indian civilization, in the "Arthashastra". The book deals with every phase of government as regulating all matters of worldly life and sections are devoted also to Science and Technology.

To Chanakya, fortification was an important branch of military science. The ideal "durga" or fortified city as described by Kautilya in the "Arthashastra" was encircled by three very wide moats, within which was an earthwork covered with spiny shrubs and surmounted by a wall thirty-six feet high with square towers and roofed balconies for archers.

The ancient Indian army had six categories: the hereditary troops forming backbone of the army; mercenaries; troops provided by corporations; troops supplied by allies; deserters from the enemy and tribesmen for guerilla war-fare in hills and jungles.

Traditional divisions of Indian army were four: the elephants, the cavalry, the infantry and the navy. Then there were spies.

Elephants were specially trained for the army. They acted like tanks in the modern warfare, breaking the enemy ranks, smashing the gates of forts and a line of elephants could also act as a bridge to cross shallow rivers. But the disadvantages of the use of the war-elephants overshadowed the advantages. The great reliance placed by Indian tacticians on the war-elephants proved unfortunate practically. The elephants were easily demoralised by fire-arms and at times would turn from the battle-field, throwing the soldiers of their own side.

Cavalry was not upto the standard of other early people. This was the main reason for the defeats of Indian armies at the hands of Alexander and Muhammad Ghory.

Ships were used for conveying troops usually along the rivers, but the Chalukya Pulakeshin II employed a navy to capture Puri, and the Chola king Rajaraja I declared a positive maritime policy. Men-of-war were used to put down many pirates who infested the Indian Ocean.

Chanakya also gives a detailed picture of the functioning of the secret service of Imperial Magadha. Spies were organised through the "Institute of Espionage" which they delivered information.

The Arthashastra envisages a cordon of physicians in the rear. It also mentions employment of women to cook for the troops, in the rear of the battle-field.

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Indian army were infantry, the infantry were spies etc.

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ailed picture of service in In- were organ- of Espionage" to

ages a corps o- also mentions the cook for the battle-field.

The Arthashastra mentions an unit as consisting of 45 chariots, 45 elephants, 225 horses and 675 foot men. Five of these detachments formed a full battle array. It advises the employment of heavy and light infantry in the centre, cavalry and chariots on the wings and elephants in the vanguard. It suggests the kings to direct the war operations from the rear and also suggests the use of gases and chemicals but they were hardly ever used.

In the inter-state relations also Chanakya advises the use of some tactics. He suggests the doctrine of circles—a king neighbour was the natural enemy and the king beyond the neighbour was his natural ally. The working of this rule is seen throughout the history of India. But the fact that this was used to conquer the states within India was unfortunate. If the same tactics had been employed with foreign neighbours, by having alliance with people beyond the neighbours, the history would have been different.

But in later time, much of the Chanakya's advice seems to have been forgotten. In the early times, all the four classes took part in the war, but as the caste ideas strengthened, responsibility for war-fare fell solely on the shoulders of the Kshatriyas who monopolised the administrative and military services, and the other castes, viz., the Vaishyas and the Shudras lost interest in military and defence. Internecine wars between tribes and principalities took place so often that common people got tired of wars and they began to become indifferent to these wars.

The Sakas, the Hunas, the Gurjaras and other invaders took advantage of this during the period of political and social decadence in India after the 7th century A.D. and entered India. New warrior classes came into existence after the political decadence that set in after Harsha, collectively called the Rajputs who practically displaced the old Kshatriyas. The Rajputs, however, in-

herited weaknesses of the old Kshatriyas in a more acute form. They were a chronically disunited and disorganised lot engaged in internecine tribal wars. In the 9th and 10th centuries A.D., the Gujara Pratiaras succeeded in establishing their short-lived empire in Kanauj. They successfully resisted the Arabs in Sind, but they were subsequently weakened by the Rashtrakuta onslaughts from the Deccan. At about this time in what is now Afghanistan, Islamized Turks established power and Mahmud of Ghazni embarked on a policy of raiding rich but divided India. Between 1001 and 1027 A.D., he made seventeen raids. The reason for his success was the disunity among the ruling Rajput tribes and their conservatism which made them base their strategy and tactics on ancient precepts.

In 1191 A.D., Shahabuddin from Ghor in modern Afghanistan entered India. This time, however, Prithviraj, the Chauhan king of Delhi, received help from other Rajput kings and they were able to defeat and capture the Ghor invader. But the Indians who practised Manu's battle-rules released him, as he was a defeated king. Shahabuddin again entered India. This time the Rajput kings were not united, and one of the Rajput kings helped the enemy. Prithviraj was defeated, captured and killed.

Learning something of foreign invaders' military strategy from the Muslim invaders and profiting by it, the kingdom of Vijayanagara in the South, later on maintained its independence for three centuries.

When Moghuls invaded India, they made successful use of the fire-arms and field-guns which proved decisive in the battles of Panipat and Fatehpur Sikri, the latter fought against the Rajputs under the indomitable Sanga. The Rajput kings were, as a rule, divided. In the battle when a king or senapati fell a victim to the enemy, the army got generally demoralised and became dis-

organised. The Rajputs, however, considered flight as the deepest shame. Running away from the battle was considered to be an act of cowardice, and the Rajputs chose death to flight. Such ideals culminated in the "Jauhar", the final holocaust of many a Rajput king. It would have been a wiser policy on their part to retreat in an organised manner when defeat was inevitable and then to prepare for the next round.

The surviving Hindu kings, however, borrowed some new military techniques from the invaders, learnt to use heavier armour and new type of weapons and guns. The Marathas with their new tactics and the guerilla war-fare learnt by them from the Deccani general Malik Amber of Ahmednagar and later developed and perfected by the great Shivaji, successfully threatened, demoralised and overthrew the Moghul Empire. But the history repeated again. The disunity among them and the superior tactics employed by the new invaders from overseas brought about their downfall.

Early in the 16th century the Portuguese founded European settlements in India. They were followed by the British, the French and the Dutch. India fell into the hands of the British. Their strength lay in their technological superiority and their disciplined army. The British also knew that Indian Princes were not united and took advantage of this and built up a big colonial empire. The basic principle of their policy was 'divide and rule'.

From this it will be clear that inter-state and inter-tribal rivalries and internecine wars were the weakest aspects of the Indian polity. The intense militarism did not lead to the development of any permanent empire over the subcontinent but the ordinary masses of the people got tired of wars and they became so meek, submissive and demoralised that they rarely offered stiff re-

sistance to foreign invaders. In the late times also, Rajputs, Marathas and even Muslim rulers developed rivalries among themselves and never cared to learn from others. In the result, although the Rajputs considered warriors par excellence, producing their war-heroes, they rarely produced equally great general or a military genius like Alexander or Napoleon. They were incapable of waging an organised war and resisting the Turks and the Moghuls, and so were the later Indian rulers who succumbed to the British conquest, also because conquerors' military science unlike that of the Indians was not overburdened by pedantic theories and ancient traditions. This was perhaps the reason why ancient India repeatedly failed against their unscrupulous invaders.

Indian army was slow and ponderous. Even the "Arthashastra" declares that a good army can march two yojanas (9 to 10 miles) a day, which is a very small distance. This is not surprising when we consider its cumbrous organisation in the Arthashastra. No wonder it was easily defeated by small but more mobile invading armies employing cavalry with greater effect.

Marathas who learnt much from the conquerors in statecraft and military science, made effective use in the beginning of their war, but they too later succumbed to pompous traditions and lost their mobility and ability for manoeuvre.

The later division of the population into traditional martial and non-martial castes also made the latter indifferent to the idea of war and helpless cowards and turned the former into arrogant, ignorant and irresponsible bullies.

Too much stress over centuries on caste duty and non-violence also had a demoralising effect on the ordinary population which rarely participated in any national

leaders. In the later Marathas and even rivalries amongst them to learn from the Rajputs, whose excellence, produced a military genius mean. They were in organised war and of the Moghuls, and, leaders who succumbed, also because the discipline unlike that of the Marathas, was undermined by pedantic traditions. This also explains why ancient Indians were so unscrupulous

slow and ponderous. declares that a distance of two yojanas (9 to 10 miles) was a very small distance. When we read the Arthashastra, we are easily defeated by the invading armies emphasizing the effect.

much from foreign military science, made them of their art of war succumbed to the lack of their mobility.

the population into non-martial castes different to the art of war and turned the warrior and indolent

centuries on spirituality. had a demoralized population in any national or

popular war of independence against invaders, who were numerically much weaker, and often looked unconcerned and helplessly on the sack and sacrilege of their homes and places of worship and the dishonour and rape of their womenfolk before their very eyes. They were too stupefied to act. The caste system which had outlived its earlier purpose, no doubt, also had the most demoralising effect. The conservatism also played its part.

New India is keen to learn from its past mistakes and is determined to preserve its freedom won after several centuries of foreign domination. The Nation will have to be ever vigilant to guard its freedom and will have to make continuous progress in the art or science of war-fare and defence. In order to achieve this, the Nation must take more and more interest in Science and Technology in which the study and research must be encouraged not only by the Government but also by the Industry, the armed forces, high academies and universities and, last but not the least, by the population. All the universities in the country must start courses in defence science. In view of the large size of our country, its huge popula-

tion and its long border and coastline, a number of high academies should be set up in different parts to train officers and tacticians for the army, the navy and the air-force. We cannot also ignore our programmes for rapid industrialization and for self-sufficiency in agriculture, especially in foodgrains. But the most important of all, we must achieve national integration which we have lacked for centuries in the past. All centrifugal tendencies must be discouraged and curbed. Sense of discipline must be instilled in the minds of the young, by incorporating training in discipline in education from school, by expanding the N.C.C. and giving it practical training in defence by making one year's military service compulsory for all healthy young men on attaining the age of eighteen years and conscripting all graduates on completion of their studies for social service for one year and making the award of all Bachelor's degrees subject to this service. Nationalism and patriotism, in which we as a people have been lacking, must become our cult, resting on four pillars: Democracy in government, Brotherhood in society, Equality in rights and privileges, and last but not least of all, Universal education.



When I walk, I feel it is India Walking.

When I breathe, I feel it is India breathing.

When I speak, I feel it is India speaking.

I am India, I am Shankara, I am Shiva.

This is the highest realisation of Patriotism and that is practical vedanta.

—Swami Rama Thirtha

* * *

The taking in of knowledge which we cannot carry out in practice is spiritual constipation, mental dyspepsia.

—Swami Rama Thirtha

VERTICAL SAND DRAINS

By

Shri B. H. PANCHOLI

Necessity:—

IN the case of common constructional materials such as steel or wood, the strain occurs simultaneously with the application of stress. But in the case of fine grained soils there is a definite measurable time lag between the application of stress and the resulting strain. The phenomenon is called consolidation. In the case of saturated or nearly saturated soils of low permeability, this process of consolidation takes a very long time and settlement of structures constructed over such soils continues for a number of years, say ten years or more. This is bad and has to be remedied. And, as we know, the rate of settlement of a structure can be increased by reducing the length of the drainage path along which the soil water has to travel to reach the drainage layer as it is squeezed out of the soils. One way by which this can be effected is by the installation of vertical sand drains.

General:—

The late Mr. Daniel E. Moran, then consulting Engineer for the San Francisco Oakland Bay Bridge, suggested the use of sand piles for stabilizing the foundation for full construction of the approach road way of the above bridge in about year 1936. Though the method was not adopted for that, it stimulated interest in this type of construction. Vertical drains of sand or porous soil can be used to move water up or down. They are often made by drilling or blasting holes in an impervious layer lying over a pervious one such as the ground in which opening up

the hard pan would allow water to drain into underlying gravel or porous materials. A pond of water exists above the water table in a previous soil because of silt and organic matter deposited from the water has sealed all spaces in a thin layer on its bottom and sides. Breaking this layer by constructing vertical drains will also cause the pond to drain.

Vertical drains through which water rises, because of water being displaced by the weight of fill, are used to stabilize deep layers of saturated peat, or marsh lands on various High Ways. Such soils may contain 50 per cent or more water, and behave like viscous fluids under pressure. Fills placed on them sink, owing in part to water being squeezed out of the mud and partly to the mud being displaced to each side. This settling of the fill, as pointed out earlier, may continue for a great many years and become so uneven as to make pavements or other structures on the fill become unusable.

The squeezing out of the water may be accelerated and the sideward movement of the mud be practically, eliminated by making vertical holes in the mud, filling them with clean sand and connecting their tops with a drainage system. The fill is then placed and its weight causes the water to enter the sand column and rise into the drains. If the columns are properly spaced, sufficient water can be removed to stabilize the mud enough to carry the intended load.

Interest in the vertical drain method of relieving hydraulic pressure under highway

VARIETY ENTERTAINMENT

Miss Kolhatkar feasting the audience with her rich & melodious voice



Sri Bakshi & his party.

College Orchestra group
Bakshi & his party



FISH POND



Principal thanking
Mr. Katkar K. K.
for the compliment—
P.H.D. "Principal on
hard duties"

It pays to know
Who is a real Ustad



A fish pond to Girl Student
of our College

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embankments and thereby accelerating the rate of settlement and reducing the displacement and consequent embankment yardage followed observations of numerous projects constructed over marsh land where considerable displacement had occurred during construction and on which subsequent settlement had continued for many years thereafter, the length of time and extent of settlement depending on the depth, nature, consolidation and saturation of the underlying strata in U.S.A.

That experience suggested the possibility of greatly reducing the normal settlement period of embankments over deep mud deposits by construction of 18" to 24" diameter, sand filled vertical drains spaced approximately ten feet on centre, thus providing a short distance horizontal flow through saturated clay and similar type soils into the porous vertical drains. Even only a partial dewatering of the oversaturated low bearing value foundation material increases the shear resistance and reduces the pore pressure to such an extent that under a proper rate of application of the fill load, the foundation acquired such stability that there would be no serious displacement during construction. Further more, the period of major embankment settlement is materially reduced with resultant less inconvenience to traffic and lower maintenance costs. The consolidation rather than displacement of the saturated foundation means less fill quantities, thereby at least partially offsetting the cost of the vertical drains.

Methods of construction:—

The technique of sand drains construction is new and has not yet been reduced to a formula. Extensive preliminary investigation is essential for the proper application of vertical sand drains method of treatment. Borings are made to determine the depth up to the solid material. Undisturbed samples are obtained for such laboratory tests as moisture content, density, grain size, consolidation,

cohesive strength and angle of internal friction. From these data, are determined the required spacing and depth of the vertical drains for the design height of fill and anticipated ultimate settlement.

As the ground surface is frequently too soft to support the required construction equipment, the first order of work, under such conditions, is the placing of a blanket of suitable quality material of sufficient depth to provide adequate support for the equipment. This blanket is known as the "working platform".

Sand drains can be placed by getting a double shelled 19 in. diameter pipe with necessary length, having a ring of water jets at the foot of the annular space and fewer air jets on the outside. As the tube is withdrawn, sand from a hopper fills the hole.

The jetting methods has proven to be fast and are capable of readily cutting through various formations, including cohesionless sand which causes difficulties with other types of equipment. Moreover with the jetting methods the vibrations are eliminated.

The principal objectionable features are the large supply of water required for jetting and the difficulty of disposing of the water and jetted material.

In another method, an 18 in. diameter jet tube with a perforated plate at the bottom is driven as a mandrel inside a casing, then pulled and sand placed after which the casing is pulled. The plugged mandrel method has been used considerably, it consists of driving a closed end mandrel in a casing and pulling the mandrel then filling the sand and pulling the casing.

If the casing is pulled by conventional methods, the sand may stick to it and be raised sufficiently to allow mud to enter crevices in it and interrupt the drainage. This may be avoided by attaching an air tight head to the casing after the sand has been placed, and pumping compressed air bet-

ween the head and the sand. This raises the casing but exerts an equal downward force against the sand and holds it in place.

Special equipment for installing sand drains is made by the M. Kiernan Terry Corp. . . . Sti. Light weight compression leads guide the pipe and pile hammer and resist the pull exerted when withdrawing the pile. The pipe is from 12 to 24 in. in diameter and is closed with a hinged plate or conical point. Lengths of the piles vary from 10 to 100 ft. Coarse sand is dumped into a sand skip which is hoisted up to empty into the pipe through a trap door. This door is then closed, air pressure applied and the pipe withdrawn. Sand columns are usually placed at 6 to 20 ft. centres, depending upon the time for consolidation and type of soil. A sand blanket is usually placed on the ground first to support the driving equipment and to provide weight for consolidation. Silt has been consolidated 20 ft. without mud waves. The sand blanket becomes part of the fill necessary to replace the displaced water.

A multiple driving machine for installing sand drains more rapidly and economically might be advantageous. Compaction takes place both while the casings are being driven and when additional sand is being placed in the casings and tamped as they are withdrawn. Existing types of driving machines, driving one drain at a time, are too slow for compacting large areas of fills to the usual 7 to 15 ft. depths required for air port sites. The multiple driver is suggested as it is able to drive a double row of drains simultaneously over a 25 ft. width.

To assure that the backfill material is sufficiently pervious to provide rapid drainage of the saturated soil as the moisture is squeezed out by the embankment load and to ensure that the material does not contain such large size voids as to permit a silting of the drain material by the surrounding soil, the backfill should be properly graded with

due consideration to the locally available materials. In addition to the requirement for a clean permeable sand, it is essential that all excessively muddy water should be pumped from the hole before back-filling.

Observations of the operation of the vertical sand drain, both during construction and subsequently, include the measurement of hydrodynamic pressure and subsidence. Progressive settlement of the foundation material is determined by installing platforms on the original ground prior to any fill placement. Changes in elevation of the platforms are measured in pipes attached to the platforms and extended as the embankment is built up.

Hydraulic level methods have likewise been used. Hydrodynamic, or pore pressure, in the foundation soil is measured by well points placed at various depths and connected to pressure gauges outside the fill area.

A sudden increase in the rate of settlement as the embankment is placed may indicate that the shear resistance of the soil has been exceeded and plastic flow of the foundation is occurring.

Excessive pore pressure is a warning of the imminence of foundation movement or displacement. When high pressures are observed the rate of fill loading is slowed down or temporarily discontinued to permit consolidation of the foundation by the release of moisture through the vertical drains. When the pore pressure drops to a safe point the loading is resumed.

Sand Drain Projects:

Sand drains were constructed to expedite the consolidation of the embankment for the Eastern Express Highway near Bombay. The mud flats are of about 20 ft. thickness and the height of embankment for the Highway is 10 ft. It is claimed that without sand drains this embankment would have taken 15 years for 70 per cent consolidation, but by using 15 in. diameter sand drains at 12 ft.

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centre to centre the same consolidation is achieved in about one year only. On the same express highway where the clay is 10 ft. thick, normal 50 per cent consolidation would have taken 11 years and 90 per cent consolidation 46 years. But by the construction of sand drains, the same percentage of consolidation was achieved in 6 and 12 months respectively. A number of projects with vertical sand drains have been constructed in California (U.S.A.). Two other sand drain projects in the Territory of Hawaii (1) at the crossing of Kalanianaʻole Highway over Kahanaiki Swamp and (2) Haleiwa Cut off Road across Kiikii swamps are also studied by Mr. K. B. Hirakawa, Testing Engineer, Territorial Highway Department, Honolulu and his analysis for the cost data came out to be about one dollar per lineal foot. The unit cost, of course, varies considerably as it depends on a number of factors such as number, spacing, depth of drains, availability of back-fill material and the prevailing costs of labour and materials.

CONCLUSIONS

The study of various projects on vertical sand drains has conclusively demonstrated that plastic foundations can be economically stabilized and embankment settlement materially be accelerated by providing release of the trapped water in the foundation soil through vertical drains of the sand filled type.

The success of this method of construction depends on the size and spacing of the drains, the construction procedure, nature of sand backfill and superimposed sand blanket and the rate of application of the embankment load.

Proper design and rigid enforcement of the specifications are essential for success.

In a properly designed structure the rate of release of excess foundation moisture and the subsequent settlement is sufficient-

ly rapid that there is no undue delays in construction operations. The settlement during construction is usually of such extent that there is very little subsequent settlement, particularly when accelerated during construction by the application of an overload which is subsequently removed.

Too small a diameter of sand drains is probably not advisable because of possible difficulties in filling the mandrel with sand and of the arching of the latter due to friction of the sides. The 18 in. diameter sand drains are of satisfactory size in this respect.

In general compressed air must be used to force the sand out of the mandrel, and both the pressure of the air and rate of withdrawal of the mandrel must be carefully regulated.

The spacing of the sand drains can be varied so that reasonably complete consolidation will have taken place by the time project is completed.

EXPERIENCE ON PEAT

From the study of two earth filled concrete barricades 1200 ft. long, 10 ft. wide and 20 ft. high on a site reclaimed from a tidal marsh from 1945 to 1951 Mr. L. A. Palmer has come to the conclusion that it is futile to stabilize a stratum of a very typical peat soil with sand drains which are very efficacious in stabilizing other types of relatively impervious and soft soils.

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N. N. PANDHI
B. E. (Elect.)

Science and Technology

Ancient India

THE technical and scientific achievements of ancient India were far from negligible.

Perhaps we may best begin by taking a glance at the excavations in Harappa and Mohen-jo-daro, on the right bank of the Indus. In the early part of the 3rd millennium, civilization flourished here.

(1) *Architecture:*

These cities were built to similar plans, and they had buildings, often of two or more storeys. The houses had square courtyards, around which were a number of rooms, containing bathrooms provided with drains which flowed to sewers covered with large brick slabs, leading to soak pits. The material used for building were standardized burnt bricks of good quality and wood. The streets and roads crossed at right angles. These and many other striking features are found in these wonderfully planned cities.

Coming to the other earliest remnants of the Indian Architecture, we find the old Sanchi Stupa built in the second century B.C., having a hemispherical dome of about 120 ft. diameter, and its surrounding gateways beautifully decorated with their carved ornamentation having a remarkably good finish.

The architecture of the period was still of wood and sun-dried bricks. Yet, we come to know from Ajanta frescoes, of another magnificent architecture, spacious and colourful, full of the contrast and change of light and shade. The divine caves of Ajanta

and Ellora are as many as 27 and 36 respectively, some cut 100 ft. deep in the rock. Distinctive and important details are the verandah and the arrangement of pillars, the heavy cave-mouldings, and the details sculptured doorways. These caves are cut into the horseshoe curve of a hill side, and have many a horseshoe arch of sunwindows, which was to become a characteristic feature of the later architectural structures. These caves are a world in themselves; aloof and shining, one of the finest monuments of India's glorious past. There are other caves to be found at Karla, Bhaja and other places.

(2) *Metallurgy and Chemistry:*

Let us turn to some more significant technical achievements of ancient India in the fields of metallurgy and chemistry. The iron pillar of Delhi, the big bronze statue of the Buddha and the blocks of sandstone 50 ft. long, 4 ft. square with perfect roundness and wonderful polish which cannot be duplicated even today, are some of the things found.

The iron pillar is about 23 ft. high, weighs about 6 tons, and consists of a single piece. An iron casting of such a huge size and weight would have been an impossible feat in the largest foundry of the world, as remarked by V. Ball in his *Economic Geology of India*, "Even now there are comparatively few foundries in the world where such a huge pillar can be turned out as a single piece of casting."

The other most remarkable feature of the pillar is that even after experiencing torments

Technology in India

and 36 respectively in the rocks. The details of the pillars, the details of the caves are cut in the rock, and have windows, which are a feature of the caves. These caves are roof and shut doors of India's caves too in places.

significant ancient India in chemistry. The bronze statue of the sandstone perfect round- which cannot be one of the things

23 ft. high, consists of a single huge size impossible world, and Economic are com- world where out as a

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that rains of 1500 monsoons, it shows no signs of rusting! This is not because it is made of some steel alloy, but on the contrary it is due to the fact that the pillar consists of iron almost chemically pure. The process of oxidization must have demanded a wonderful catalyst, immense care and labour and great technical proficiency in preparing and heating metal. This adds another memorial to India's technical skill.

The greatest and the most triumphant achievements of bronze castings are manifested in dancing Shiva (the Nataraja), the figure of Parvati and other beautiful delicate castings found in Tamilnad.

The process of producing these castings lay in designing the wax figure, coating it with clay, and then heating it. Eventually the wax melted away, leaving the mould to be filled with molten metal. Large figures of the Buddha, weighing nearly one ton or more, were made in two pieces and then welded together.

Chemistry in ancient India was the handmaid of medicine and not of technology.

(3) Cosmology and Geography:

In the Vedas and the Puranas, the Earth was postulated to be flat, but Indian astronomers recognized it to be incorrect. Brahmagupta (7th century A.D.) gave the circumference of the earth as 5,000 yojanas, i.e. $5000 \times 4\frac{1}{2}$ miles; this figure is not far out and is as accurate as any given by ancient astronomers.

Like all ancient astronomies, Indian astronomy too did not develop much due to the people being ignorant of telescope, but methods of observations were fairly perfected and aided by the decimal system of numerals developed in India. Aryabhata in the 5th century A.D., suggested that the earth revolved round the sun and rotated on its axis.

The earliest astronomical texts which have been preserved are the Vedic Jyotish-Vedanga and the Jain Suryaprajnapti. Their dates are unknown, but they must be earlier than the Christian era. These texts deal with the calendar, describe the five-year cycle, the places of the new and the full moon in the 27 nakshatras, and give rules for the calculation of these places.

The Sindhind (distorted name of Siddhanta) and astronomical tables based on it, were brought to Bagdhad in A.D. 773 by an Indian Pandit from India to the court of al-Mansur, which influenced Arabic astronomy. Indians reckoned longitudes from Ujjayini; this name was distorted to Ozein which became Azin and finally Arin from where Arabs used to reckon longitudes. This idea was continued in a book by a Cardinal, which might have later on influenced the thoughts of Columbus.

(4) Mathematics:

Mathematics was very much developed in the Gupta times. An unknown Indian mathematician devised the simplest method of numerals and introduced zero as the tenth numeral. "His achievement, though easily taken for granted, was the work of an analytical mind of the first order and he deserves much more honour than he has so far received." "Most of the great discoveries and inventions of which Europe is so proud would have been impossible without this system of numerals", says Prof. Basham in his book 'The wonder that was India'. Truly, this unknown mathematician can be said to be the greatest son of India; only next to the Buddha.

Indian mathematicians, Brahmagupta (7th century), Mahavira (9th century) and Bhaskara (12th century) made discoveries which were not known to Europe at that time. Aryabhata gave the usual modern approximate value of $\pi = 3.1416$ as a frac-

tion $\frac{62832}{20000}$ which was improved to nine decimal places by later Indian mathematicians.

Walter Eugene Clark notes in his brilliant essay on 'science', "Aryabhatta deals with the following matters: square root and cube root, area of circle and volume of sphere, area of triangle and volume of pyramid, area of trapezium and length of $\perp$ " from intersection of diagonals to parallel sides, area of any plane figure, relation of circumference of circle to diameter, methods of constructing sines by forming triangles, calculation of table of sine differences from the first sine, construction of circles, triangles and quadrilaterals, shadow problems, hypotenuse of right angle triangle, relation of half-chord to segments of diameter which bisects the chord, calculations when circles intersect, arithmetical progressions, sum of series formed by taking sums of terms of an arithmetical progression, sums of series formed by taking square and cubes of terms of an arithmetical progression, to find two factors when product and difference are known; interest, rule of three, inverse methods, general solution in whole numbers of indeterminate equations of the first degree; this is substantially equivalent to Euler's method of solving equation $ax+by=C$ in whole numerals by the use of continued fractions.

"Brahmagupta gives formulae for the area and diagonals of any cyclic quadrilateral, rules for operation with zero, a partial solution in whole numbers of indeterminate equations of the second degree (with particular treatment of the special case $ax^2+1=y^2$ or the so-called Pellian equation). He knew negative numbers, and by using negative terms in algebra reduced all quadratic equations to one form. He solved the equation $ax+by+c=xy$ in whole numbers by reducing $ab+c$ into $m.n$ and putting $x=m+b$ and $y=n+a$."

W.E. Clark further notes, "Bhaskara tends into a general rule for quadratic equations; a rule quoted from Sridhara, whose arithmetic has been preserved but whose algebra has been lost, special treatment of Pellian equation $ax^2+1=y^2$, a solution of the general Pellian equation $ax^2+bx+c=0$ by completing the square and then applying the method for solving the Pellian equation. Solutions of several other types of indeterminate equations of the second degree, and of some special equations of 3rd and 4th degree. Of this cyclic method of solving determinate equations Hankel remarks that it is the finest thing in theory of numbers before Lagrange."

Our whole trigonometry today is based on the foundation of sine tables first used by Aryabhatta. The word *jya* or *jiva* used by Aryabhatta to give his sines at intervals of $3^\circ 45'$ was further developed until the time of Bhaskara, who gives the table of sines by degrees. 'The word *jya* or *jiva* was transliterated into meaningless Arabic *jiba*, and later writers substituted *jaib*, and this was translated into Latin as *sinus*, from which is derived the 'Sine'."

Thus the free communication of ideas from Indians to Arabs and from them to Europe accelerated the progress of science in the West. Indeed the world owes much to India in the realm of mathematics.

(5) Physics:

Universe was classified in five elements—earth, water, air, fire and ether—by ancient Indians. Atomic theories were postulated by the Sankhya philosophers and by the Buddhist and Jain monks. Atom was conceived as the minutest object, occupying minimum possible duration of time, coming into being and vanishing to give way to another following it. By some mere coincidence the theory put forward by the Indian rishis coincides in a part with the modern

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theory. "These theories were never-
much to the credit of intellect
and the imagination of Indian thinkers," ac-
cording to Prof. Basham.

Physiology and Medicine:

The basic texts of medicine are Charaka
(2nd century A.D.) and Sushruta (4th cen-
tury A.D.). Bone-setting, plastic and other
surgeries were highly developed and remain-
ed ahead of the European medicine until
the 18th century. "Surgeons of the East
India Company were not ashamed to learn
the art of rhinoplasty from the Indians in
the 18th century," says an English histo-
rian.

This, in short, is the wonder that was In-
dia. But what happened to her afterwards,
where were these and many other achieve-
ments lost? The Indian scientists and think-
ers lost sight of the simple fact that mere
spirituality, without material exertion and
scientific advancement, cannot make a nation
dynamic.

The inflow of new ideas and thoughts from
Europe in the 19th century, stimulated great
churning of the ocean of thought in India.
Indians, intent on learning from their past
mistakes, look forward to building a new,
democratic, secular and modern society
making rapid strides in the field of science
and having deep roots in the soil of spiri-
tuality.



"Education is not the amount of informa-
tion that is put into your brain and runs riot
there, undigested, all your life; you must
have life building, man making character-
building, assimilated fine ideas and make
them your life character; you have more
education than any man who has got by
heart a whole library".

—Swami Vivekananda

Face-lifting of Building Industry



By
Prof. L. L. BHIRUD

MAN is endowed with a creative faculty and is ever at work. Civilisation which is the product of human endeavour never remains static. Now-a-days it is advancing not in 'steps' but in long 'flights', the unmistakable sign of the atomic age in which we live. Building industry is being subjected to greater and greater impacts as a result of which man is able to live in more comfortable houses constructed at low costs in less time.

Improvement of existing materials, invention of new materials, new methods of construction, evolution of new patterns of construction, emphasis on mechanisation and mass production mark the beginning of a new era in the building industry. An aerial survey of a few materials and processes is presented in this article.

We are now able to produce cement with a strength of 700 Kg/cm^2 ; a plasticized and water repellent cement; quick hardening, sulphate resisting, acid resisting, low heat, expanding, white and coloured cements for multifarious uses in various types of construction. Light weight concrete made with porous aggregates, blast furnace slag, power plant fly ash is being used for roofs and floors very satisfactorily. Improved technology of foam and gas concrete has led to cellular concrete construction of high strength and low density. Expanded clay perlite concrete is being used for wall panels. Autoclaved silicate concretes made with lime, siliceous and slag binders are found to be very economical. Crack resistant concrete has solved the knotty problems of water percolation and fire-proof construction. Heat resistant concrete has replaced the fire brick lining. Precast reinforced concrete is replacing

wood, in-situ-concrete in floors and stairs, rubble and rubble concrete in foundations. In cities where construction goes on in a number of places, concrete well and properly mixed is delivered at site ready for use as and when required.

Prefabrication on site is found suitable for medium-sized building projects of not more than 200 houses. For construction of more than 200 houses, prefabrication in factories is resorted to. Stanchions and beams are commonly precast, but panels are invariably cast and transported over long distances, even 150 Km. The use of concrete panels for various structural parts has done away with many load bearing elements. In addition to concrete, large ceramic panels are made of extruded hollow blocks. They are not only very light but also serve the double purpose of thermal insulation as well as in construction. Concrete floor slabs are cast on site and lowered into place. Completely prefabricated rooms are installed with ease in houses.

In France, concrete is cast in situ in large work reaching dimensions upto storey height. The width of formwork is considerable. Floor slab and walls are cast together. In such cases, concrete is specially treated to accelerate the hardening process.

Aerated concrete is being widely used in prefabricated houses. The Japanese have succeeded in removing all the defects of pumice concrete such as cracks, permeability etc. They use hollow concrete blocks in the construction of load bearing wall structures upto 3 storeys.

The U.S.S.R. manufactures large prestressed reinforced concrete structures.

SHIRUD

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the defects of
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large size
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30 m. length with continuous reinforcing with the help of self-propelled machines. A very simple and cheap method of electro-thermal tensioning of reinforcement with pre-stressing forces carried by the steel forms has been evolved. It is possible to save as much as 300 kg. of steel by using 1 m³ of precast reinforced concrete.

Multi-ribbed thin walled panels of the shell type are being produced by means of continuous vibro-rolling. Such panels are being used for non-continuous floors. The total weight of large panel buildings is found to be only half of that of brick masonry structures.

A type of full size precast wall has been developed by making use of a slab of cast concrete 2 1/2" thick reinforced with a steel grid. The individual slabs are locked into a single structure by twisting together the projecting from the slab. Such construction has proved to be easy and cheap.

Polymers are being used increasingly either alone or in combination with other building materials. We have polymer tiles for flooring or wall covering, washable wall paper and films, fibre boards impregnated with synthetic resins, varnishes, lacquers and paints based on synthetic resins, glues, mastics, emulsions, pipes and sanitary wares, window and door fittings, electric fittings, organic glass etc. etc. The use of these materials has not only cut down the cost of construction effectively, but also improved

the appearance of the dwellings considerably. Foamed plastics and wood wool are used to cover masonry for thermal insulation. Expanded polystyrene is also used for thermal insulation for prefabricated concrete units. Non-load bearing walls are constructed as sandwich panels consisting of a cellular case, generally of expanded polystyrene; or poly-vinyl foam between two sheets of thin material such as asbestos cement with a polyester sheet finish, glued directly to the core.

A large number of heat and sound insulating materials are now available in the market. Mineral wool and felt, fibre glass, foam glass, expanded perlite boards, reed mats, foamed polystyrene boards, glass wool and flex fibre boards are rendering excellent service in various types of buildings.

For roofing the buildings the place of tiles and cement asbestos boards is being taken by bituminous asbestos boards, water proof rubber-backed felt, reinforced bituminous felt made from plastics and glass fabric etc. Spraying water proof mastics and fibre glass on roofings is eliminating the use of roll materials. Resin impregnated tar paper and bituminous hemp cloth are also used as water proofing materials.

Thus do we see the spectrum of the building industry unceasingly expanding and assuming more colourful shades. Time may come and go, but an Engineer will ever be busy in inventing new materials and processes to lend charm to the drama of existence.



Autobiography of a 6J5 Triode

ANANDAN VIJAYAKUMAR, B.E. (Elec.)

C CLICK!.....and there works, the 6.3 V A.C.—filament-heater with full capacity. They don't know, they have let loose pandemonium at my brain-cathode. Heat bites into the criss-cross crystal lattice of the coated cathode, which knocks out the loose electron in the external orbits of the atoms. But the electrons—the most of them—cloud around cathode, suffocating me, since the D.C. supply is not yet switched on. The ionisation forwarded by the cosmic radiation does make the electron flow towards anode but not enough to relieve me of suffocation. Click!.....Oh!.....what a great relief. The tension dissolves, as H.T. is made on. Activity buzzes around me. Inquisitive eyes pass from dial to dial of the voltmeters and milliameters and the kind connected in the circuit. I am an important person in the circuit. The students perform the experiments to find out how I behave at various characterising circumstances and plot graphs and calculations follow. When they are over with it, they switch off the mains and go away without even looking back at me!

Perhaps, you might have been carried away by the trend of my thoughts and the narration given above and might be wondering about who I am. Well, I am a triode. In the vast world of electronics I am known as 6J5. In the "who is who" you will not find me. But, if you refer to the RCA tube manual you will find me there!

I was born in one of the adequately equipped, lush-looking electronic labs of Radio Corporation of America, in States. Though I am stranger to the common man, I am quite familiar to students of Engineering, researchers, industries and so on. I can am-

plify weak signals fed at the grid. My close relatives are Diodes, Thyatron and Pentode. My friends are those bigshots in the field of electronics—Audiofrequency Signal generator, Cathode ray oscillator, Colpitts oscillator, Dynatron, Magnetron, Excitron, Ignitron and Senditron.

We share the same laboratory pervaded in serene haunted silence brought in, when deserted by the students. We belong to the category of life with no past and future.

Students know everything about me. They know the technical details and the structure. But they are unaware of the fact, that interior to my cathode, anode, grid coils and lead wires, I have a tender heart with *tethered* feelings. I don't blame them. They cannot see through my opaqued glass wall. The high frequency induction heating given to me causes magnesium to evaporate and condense on the inner surface of my glass dome. This advanced scientific process cuts me off from the external world. There seems to be a one-way traffic. I can see the world and feel it. But the world cannot see me!

The heat from the heater tortures me at extremes. The negative space charge suffocates me. Over-drawn-currents at self maintaining discharge uproot my brain—"brain-cathode". I cannot express my disliking. I am proud of my silent sacrifice which accelerates the progress of science.

When I am in a serviceable condition, I am looked upon with care because I am an expensive element in electronic circuit. But once the "life" is out or the vacuum is punctured I am no more cared for. Then I land in the dustbin with a thud and crash.

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My glass-dome is shattered as my heart, revealing the ugly looking skeleton. I am injured and my feelings are wounded. To add to the injury, I am picked up by some students and cut open completely, like a specimen at the hands of a medical student in an exercise in anatomy. They are eager to go through minute details of my structure. I feel low—lower than death. Even in the dustbin I have no peace. On my fall they build up the mansion of successful future, painted in flying colours.

I serve the world with keen interest. I can act as an amplifier or an oscillator. At high frequency I cannot act as an amplifier. Nobody could solve my secret. But Professor Millman beat me. He found out that at high frequencies the inter electrode capacitance leads to a feed back and hence the circuit oscillates. I prefer vacuum. But then human mind works the otherway. They fill me with inert gases, which hurts me due to the high resulting currents. I raise silent objections. But it is like a silent shout in a deaf ear. For decades, this was what had been happening. Well, some of you students can make my life different from what it is now.

You have to find out from research work, an everlasting cathode coating material and the things to go with it. This will fix me in the electronic world for ever. I will be soul and whole of it for ever. I will not be scrapped and thrown into dustbin. Currently life starts from the lab and ends in dustbin. If you take up initiative, and just pull me up to better living conditions I will be thankful to you.

My life is of periodic tedium. It repeats periodically without any change. During day activity peaks around me and at night I breathe desolation.

Laws of humanities do not extend to our world. Now psychologist knows our psychic and emotional problems. We are in constant contact with students. They don't exhibit interest in our psychic problems. They are interested only in their own problems and are quite indifferent about what is happening within the opaque glass dome.

Well that is the end of it. Do you feel for me. Do you shed a drop of tear of remorse. I take leave of you and never to meet again. Good-bye.



"Even idiots may stand up to hear themselves praised, and cowards assume the attitude of the brave when everything is sure to turn out well, but the true hero works in silence. How many Buddhas die before one finds expression".

—Swami Vivekananda

—Collected by Patel Ratna M., F.E. III.

FOUNDATIONS FOR BUILDINGS ON BLACK COTTON SOIL

By

S. S. NAGARAJU

[Foundations for buildings on black cotton soils have remained a problem for engineers from a long time. There is a large amount of literature on the subject. This is yet another attempt to summarise the treatments now available for this 'problem'. The aim is to review the existing practices and give details of design and construction of the most promising type; which it is felt will be of some help to those who may not have much time to go through the voluminous literature available.]

GENERAL

The term black cotton soil is generally used to describe heavy clay soils which exhibit unusual swelling and shrinkage with change in moisture content. This name is a recognition of its suitability for the growth of cotton. Although the soil is well suited for agricultural use, it remains a problem for the Civil Engineers.

FORMATION AND OCCURRENCE

Black cotton soils are formed by the decomposition of basic volcanic rocks under favourable conditions. These are also found as transported soils, deposited in low lying areas. The transporting agencies may be wind and water. These soil deposits are found to overlie the parent rock when formed in-situ when transported they will be on sand or clay depending on the local formation before they were deposited. The depth of such soils does not exceed 25 ft. but 2 to 10 ft. being more common. They occur only in shallow layers when formed in-situ, which act as protective covering against further weathering. The deposits are quite thick when transported.

It is estimated that the black cotton soils in India cover approximately 0.2 million square miles mostly confined to Deccan plateau and Madhya pradesh.

PHYSICAL AND ENGINEERING PROPERTIES

In an attempt to classify the Indian black cotton soils the C.R.R.I. has carried out an analysis of a large number of soil samples from the former Bombay, Hyderabad and Madhya Pradesh States. The following ranges for the physical properties are revealed:

Fine Sand	3 to 10	per cent
Passing 200 mesh	70 to 100	"
Colloidal clay	40 to 50	"
Liquid limit	40 to 100	"
Plasticity index	20 to 60	"
Volumetric shrinkage (on wet basis)	40 to 50	"
Hygroscopic moisture	12 to 18	"

However, it is pointed out that this analysis is mainly concerned in assessing the suitability of the soil as a sub-grade material. Thus, the result of the analysis shows that these soils can be grouped in general under the A-7 group of the U.S. Public Roads Administration Classification 1945. The characteristics of the materials of this group are that they are highly elastic and have a high volume change between wet and dry states.

OPENING CEREMONY OF THE COLLEGE HOSTEL

By

Hon'ble Minister for Railways, Sri S. K. PATIL, on 26-6-1965



Arrival of Sri S. K. Patil



Principal, garlanding the guest



Sri S. K. Patil delivering the speech

ATOM FOR PEACE



The late Dr. H. J. Bhabha, F.R.S.
(1909—1966)

EX VICE-CHANCELLOR OF POONA
UNIVERSITY

AN APOSTLE OF FEARLESSNESS



N. V. Gadgil



Veer Savarkar
(1883—1966)

It is the latter property that causes all the problems for the foundation engineers. Because of the high percentage and the nature of the clay minerals present, these soils have a great affinity for water. These soils can absorb a percentage of water greater than they can hold in their voids and swell enormously in volume. With the evaporation of moisture they develop wide shrinkage cracks. Dry strength will also be great. The soils are thus characterised by their brittle behaviour when dry, and their stickiness and swelling when wet. When dry, they have a high bearing capacity but develop wide shrinkage cracks. They lose their bearing capacity almost completely when wet. Because of this property of shrinkage and swelling exhibited by these soils some authorities prefer a general name such as "shrinkable soils" or "expansive clays". These terms appear to be more logical from the Civil Engineer's point of view.

The susceptibility to shrinkage and swelling increases with increase in clay content. But as the clay content increases there is a decrease in the permeability with the result the depth of soil involved in swelling due to continuous supply of moisture during monsoon is considerably reduced. Similarly the duration of summer is not sufficient to induce drying to large depths. Thus the depth of zone influenced by seasonal moisture variation is very much reduced. The variation in moisture content in our country is generally small at a depth of 5 ft. and at a depth of 8 to 10 ft. it is negligible. However, it is suggested that this depth be determined for the locality before any construction is taken up.

The swelling capacity of these soils depends upon the fineness of clay particles and the nature of clay minerals present. A highly active soil may fully expand at the end of a rainy season. If the same soil is immersed in water at the end of dry summer, it may be capable of developing expansive

pressures followed by increase in volume. It has been reported by the Indian Railways that this expansive pressure is of the order of 3.5 tons per sq. ft. although other investigators suggest a value of 2.0 tons per sq. ft. These figures are based on confined tests on clays. The pressure is considerably reduced if slight expansion is allowed.

EFFECT ON BUILDINGS

The development of wide shrinkage cracks in the dry season aids in the accumulation of rain water during monsoon assisting further the swelling. The swelling causes an important rise of the ground surface. Beneath areas covered by buildings the loss of moisture by evaporation is very much smaller than the corresponding loss beneath the adjacent areas. Hence the water content of the clay located beneath covered areas increases for several years at a decreasing rate and causes a heave of the central part with respect to their outer boundaries. The amount of heave is practically independent of the weight of the buildings. The result is very similar to that of unequal settlement causing unsightly cracks. It is interesting to note that the cracks appear developing in two main periods—at the end of rainy season due to swelling, and at the peak of summer due to shrinkage.

From the above discussion it will be clear that the cause of damage to structures founded on black cotton soils is the seasonal volume change caused by alternate wetting and drying.

REMEDIES

The following methods suggest themselves for treatment:

- (1) Direct treatment of the soil with suitable admixtures to reduce the susceptibility to swelling and shrinkage.
- (2) Removing the black cotton soil completely from the area to be occu-

pied by the building and replacing by non-cohesive soils.

(3) Suitable structural methods.

Direct treatment of the soil includes admixtures of non-cohesive soils, limes, cements and other chemical methods. Heating or burning the soil as a method of stabilization has also been suggested. Although these methods may be useful in the construction of roads, any treatment to improve the bearing capacity for large depths is not practicable. Moreover, the durability of such a treatment is still questionable. The method is not generally economical.

Removing the black cotton soil completely from the area to be occupied by the building and replacing by suitable soil is a good remedy, provided it is economical. If the depth of black cotton soil involved is very shallow replacement by selected soil is a most effective remedy. However, care should be exercised in filling. The fill material should be carefully selected and properly placed in small layers and well compacted.

Almost all the structural methods tried so far attempt at preventing or reducing the cracks in the super-structure by observing the following precautions:

- (i) By taking the foundation, as far as possible to the stable zone and avoiding direct contact between floors, walls and footings.
- (ii) By preventing the entry of moisture to the area of the building.

FOOTINGS

When buildings are constructed on conventional footings in black cotton soil areas, the footings should be taken to the stable zone, the zone not affected by seasonal moisture movement. It has been pointed out before that the depth of stable zone is to be found for each locality.

If construction is carried out when the soil is at its peak moisture content, interior footings may be located at a shallower depth compared to exterior footings. If, however, the construction is in the dry season, when the soil is dry the depth of both interior and exterior footing should be same.

Continuous footings appear to have certain advantage over isolated footings in black cotton soils in that the continuity has some effect in diminishing the seasonal moisture movement in the foundation soil.

The foundation pressures to be adapted should be as high as possible if the effect of swelling is to be counter acted. The safe bearing capacity of black cotton soils has always been assumed to be $\frac{1}{2}$ to $\frac{3}{4}$ ton per square foot. A swelling clay exerting a swelling pressure of up to 3.5 tons per sq. ft. can easily lift up footings transmitting this small pressure. Hence, deep and narrow footings with foundation pressures equal to the swelling pressure of clay offer themselves as a remedy. But care should be taken to keep the foundation pressure within the allowable soil pressure as determined from shear strength and settlement considerations.

In order to reduce the settlement due to shrinkage it has been suggested that the construction should be started towards the end of the dry period when major part of the shrinkage will have taken place.

Other precautions suggested in this connection in order to reduce the cracks in walls, is the provision of butt joints between walls transmitting different foundation pressures. Provision of R.C.C. beams at the foundation, plinth and lintel levels in the walls has also been suggested and used by various authorities.

Measures to prevent moisture penetration into the foundation soil must be very efficient. As this precaution is essential in all the structural methods, it is discussed under separate heading.

The methods discussed above in addition to being expensive have not proved very successful in practice. Failure is partly on account of failure of methods adapted for the control of moisture movement. Provision of R.C. beams at various levels has also not met with success as it is not always possible to find the moments and shears induced in these beams when soil movement occurs.

The other successfully tried and adapted methods include.

- (i) Under-reamed pile foundations.
- (ii) Short bored pile foundations with plinth beams standing clear of the ground and
- (iii) Raft foundations.

Under-reamed pile foundation consists of bored R.C. piles with wider bases anchored in the stable zone of the soil.

The pile acts as a short column throughout its length when the soil in the unstable zone shrinks away from the pile in the dry season. When the soil swells up after the rains the uplift forces on the pile are resisted by the wider base.

This type has been found very successful in Central Texas where similar shrinkable soils occur and is also found to be promising for our conditions. It is also found to be economical.

Details of design and construction is given in the appendix.

The principle involved in the adaptation of short bored piles is the same as that of under-reamed pile foundations. Function of under-reamed base is performed by an additional length of straight pile anchored in the stable zone. In shallow black cotton areas such piles can have a good anchor in the murum below.

The design and construction is very similar to the under-reamed pile foundation.

Where practicable it is advantageous to provide basement floors. The raft should be laid over a layer of murum well compacted. The layer of murum should extend slightly outside the building and should be protected from entry of moisture as explained further. These precautions in addition to reducing the swelling pressure will protect the soil below the building from swelling and shrinkage.

APPENDIX A

DESIGNING AND CONSTRUCTION OF UNDER REAMED PILE-FOUNDATION

Before proceeding with the design and construction of any foundations it is necessary to carry out subsurface exploration in order to determine the nature and distribution of materials in the earth. The data to be obtained before proceeding with the design of the under-reamed pile foundations in any locality are (i) the depth of the stable zone and (ii) strength characteristics of the soil. A profile of strata to a depth of at least 30 ft. is desirable. This can be obtained by

using a post-hole auger. A few undisturbed samples will be necessary to determine the strength characteristics of the soil in which the piles are anchored.

DESIGN OF PILES

The length of piles depends on the depth of stable zone. The pile should be carried to a depth of one foot into this zone in order to ensure good anchorage.

Spacing depends on the plan of the building, the superstructure load and bearing

capacity of the soil. It is recommended that the loading on each pile should be limited to about 10 tonnes from considerations of economy. As far as possible piles should be loaded uniformly. Spacing should be so adjusted as to have openings mid-way between two piles. Piles should be provided at the junction of two walls or nearer to it. Spacing varies from 5 to 10 ft.

Piles may be designed as ordinary columns for the top 7 ft. and the same section taken right through. A minimum diameter of 8 in. for main walls and 6 in. for boundary and other lightly loaded walls should be provided. Isolated piles without any plinth beams, as for pillars, should have at least 9 in. diameter unless the height of the pillar is small. The ratio of the diameter of the enlarged base and the pile should not exceed $2\frac{1}{2}$ from practical considerations.

Steel reinforcement in the pile may be equal to $\frac{3}{4}$ per cent of the area of concrete or as computed from the tension induced in the pile due to anchorage, which ever is greater. The tension induced in the pile may be calculated by multiplying the surface area of the pile by skin friction which is assumed equal to $\frac{1}{3}$ to $\frac{1}{2}$ shear strength of the soil. The algebraic sum of this force and the load on the pile will give the tension induced in the pile. In the absence of any data on the skin friction a value of $\frac{1}{3}$ ton per sq. ft. may be assumed.

The diameter or size of the base is governed by the safe bearing capacity of the soil or the anchorage provided which ever gives a higher value. The anchorage provided is roughly proportional to the diameter. Tentative values quoted from the result of pull out tests carried out by CBRI being 4.7 and 3.5 tons for 22 in. and 15 in. diameter piles at 11 ft. depth. Values for intermediate sizes may be interpolated.

In the design of the beams economy can be effected by adopting the following values

for the bending moment instead of the usual $WL/12$ based on a triangle of masonry above the beam;

When there are openings near the supports the value of the B.M. for design may be taken as $WL/50$; when there are no openings, or there are openings at the centre of the span it may be taken as $WL/10$ where W is the weight of the rectangular brick work immediately above the beam plus the superimposed load on the span. When these values are used, the ratio of depth to span of beam must lie between $1/15$ and $1/20$. With this reduced bending moment the design stresses in the concrete should not exceed 7 tons per sq. in. For negative bending moments near the supports, equal number of bars should be provided at the top and should be taken up a quarter span on each side.

Walls to curtain off the free space between the ground and the beam may form part of the beam itself. These should be 3 in. thick and should be taken down about 6 in. into the ground on an average.

CONSTRUCTION

Vertical holes for the piles may be bored with a post-hole auger to the required depth. The under reamer (a special tool used to enlarge the base of bore holes consisting of hard steel blades hinged so that when lowered to the bore hole and pressed together the blades widen out) may be used to widen the base.

The hole should not be kept open for long. Reinforcing cage should be inserted and concrete poured in gently and rodded.

The bore hole should be vertical, its centre coinciding with the centre of the pile.

MEASURES TO PREVENT MOISTURE MOVEMENT

The satisfactory performance of a building in black cotton soil area depends

on the efficiency of the means employed to prevent moisture movement from the area occupied by the building. Methods employed should include.

- (1) Preventing increase in moisture content.
- (2) Preventing desiccation.

If the rate of horizontal movement of moisture in black cotton soil in the region is known, entry of moisture into the area occupied by the building can be arrested by providing an impervious apron all round the building, of a width in excess of that required for the entry of moisture during monsoon. This apron should be necessarily a flexible construction so that it will not crack up and allow the surface moisture to penetrate. Tar coating the surface, stone flagging or even pre-cast concrete pavement set in lime concrete may be suitable.

The effect of moisture change below the floor can be eliminated or minimised by

- (1) removing as much of the soil as practicable and replacing by selected soil properly compacted.
- (2) separating the floor slab from direct contact with walls and footings. This is achieved by the use of plinth beams as already pointed out.

Desiccation of black cotton soil can be caused by large trees and shrubs that with-

draw water from the soil. Hence such vegetation should not be allowed near buildings. Maintenance of a small garden around the building may help in preventing desiccation, but this should be used with discretion.

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SMILE A WHILE

Patient: 'Doctor, What I need is something to stir me; something to put me in fighting trim. Did you put any thing like that in the prescription?'

Doctor: 'No, you will find that in the bill'.

—Collected by N. N. Pandhi,
B.E. (Elect.)

* * *

Once a German, an English man and an American met in a bar. They had quite a number of rounds, and soon they started boasting about their country's progress. Reaching the climax the German said, "Now to tell you about our buildings, on one Saturday afternoon a carpenter went on top-most floor of tallest building in Berlin to make some repairs outside the front window. Somehow a hammer fell down from his hand and on Monday morning when an executive was entering the building the hammer fell on his head and he died."

"Ah! that is nothing" said Englishman, "Once on the tallest building in London a woman went on the terrace with a baby in hand. Somehow the baby fell down from her hands and when he came down, what do you think? he had grey beard".

"That's nothing", snapped American, "Once on the terrace of tallest building in New York there was a big circus going. A boy fingered a monkey and monkey jumped down and when he came down he was Man".

—Collected by Mehta P.R.,
S.E. (Civil)

* * *

A professor commented on a student's thesis: "Your work is both good and original. Unfortunately, the good things in it are not original and the original things are not good". The student in an application for a

post quoted his professor's remarks: "Your work is both good and original".

—Collected by S.N. Pandhi,
S.E. (Elect.)

Chemistry Professor: "Come, come give me the answer, Please".

Student: "I can't say it, but it is on the tip of my tongue".

Another Student: "Gracious; Don't swallow; it; it's Arsenic".

—Collected by S.N. Pandhi,
S.E. (Elect.)

* * *

The Preacher came along and wrote up on the sign-board, "I pray for all".

The lawyer wrote underneath, "I plead for all".

The doctor added: "I prescribe for all".
The plain citizen wrote, "I pay for all".

—Collected by S.N. Pandhi,
S.E. (Elect.)

* * *

"WAIT... LAUGH... GO"

—Collected by Harcharan Singh,
S.E. (Mech.)

"Sorry to bring you here out of the town at this hour of night", said he. "But my brother is seriously ill".

"Never mind. I've another patient nearby. I will kill two birds with one stone".

* * *

Patient: "Doctor, my memory is very bad. I can't remember a thing more than a few minutes. Please help me".

Doctor: "How long has this been going on?"

Patient: "How long has what been going on, Doctor?"

* * *

Ramu: "Sham, how will you weigh the heart of a boy?"

Sham: "Very easy, Ramu. Weigh the boy. Take him to a girl. He will give his heart to the girl. Weigh the boy again. Find the difference".

A VISIT TO DHUVARAN

By

B.E. (Elect.) Students

AJMERA AND N. N. PANDHI

OUR group of twenty-five students visited Dhuvaran Thermal Power Station, on 6th August 1965. This was a short educational tour arranged by the Electrical Association of the college.

Dhuvaran, a modern thermal power station, is situated on the banks of the Mahi, about 70 Km. from Baroda. It has been constructed under programme of USAID (U.S. Agency for International Development) for the Gujarat State Electricity Board.

Dhuvaran power station has 4 turbogenerator sets each of capacity 63.5 MW, which means a total capacity of 254 MWS. The layout work began in 1961 and the erection started in 1962. The first generator was commissioned in December 1964, the second in February 1965 and by June 1965 the full capacity was achieved.

It is the first thermal station to use as its fuel either 100% residue oil, or 100% coal, or 100% natural gas, in its nine boilers. It can use any of these fuels or even gas and coal together at a time. The gas for Dhuvaran is obtained from Cambay gas field, which is linked by a 14 mile pipe line. The station also has big capacity storage tanks for heavy oil and light oil. The coal used is first crushed into small pieces and carried

by the conveyor belts to the plant, where it is pulverised and then fed to the boilers.

The new "Temple" on the banks of the Mahi will bring new life to the tracts of power hungry Gujarat and will give a great fillip to industrialisation. Among the proposed major industries which will see the light of the day as a result of the Dhuvaran project are two factories producing electrical machines, pumps, etc, petro chemical complexes, fertilizer and insecticide producing concern, a glassware factory and steel and stainless steel factories.

Out of the 18,000 villages in Gujarat, only 1600 have been electrified, and 4000 more will be electrified by the end of the Fourth plan. Dhuvaran will contribute a lion's share in electrifying rural areas, particularly when its output is to be doubled in subsequent years.

Power is life and blood of industry. For thousands of people this will mean new and steady employment, increasing national income and easing India's dependance on imports. Power for industry, power to illuminate India, power to raise the standard of living make a principal factor in India's transition to economic security.



Role of Forests in the Control of Erosion

By

PARADIA M. K.
B.E. Civil

SIR JOHN BOYD ORR, Director of F.A.O. has aptly remarked in his forewording note to the publication "Soil Conservation, and International Study" by F.A.O. as follows:—

"If the soil, on which all agriculture and all human life depends, is washed away by erosion, then the battle to free human kind from want is certainly lost".

The soil erosion is due to action of wind and water. Erosion due to water may be (a) Sheet erosion (b) and Gully erosion.

In Sheet erosion soil layers are removed gradually in layers after layers. It is slow and difficult to detect.

Gully erosion is the result of formation of small trenches like gullies due to high velocity of run off. Gullies become wider and wider and rapidly convert land into innumerable gullies. It can be easily detected.

Wind erosion is found in sandy areas. Due to high velocity of wind fine sand particles are deposited on fertile lands and make the lands unfit for cultivation. Formation of dunes are an example of wind action.

In the past 1000 years, Floods and Famine have come regularly in India. But history tells that civilization flourished on big rivers and reached its zenith. Increase in population and general rise in standard of living of its people resulted in dearth of lands and forest products. So large tracts were gradually cleared of growth. Even the sloping lands and hills were not spared and were striped off their protective layers.

Rainfall in India is mostly limited to short period and confined to certain seasons in a year. Therefore it takes the form of high concentrated shower. It is an important feature deserving careful consideration both in the appraisal of expected run off and in determining the frequency, duration and intensity of floods.

Where deforestation and clearance of vegetative growth is followed by cultivation along hill slopes in catchment areas, the erosion is brought about by surface run-off. The surface run off rushes down too rapidly along the denuded slope with increasing velocity and intensity carrying heavy load of silt. Regulation of run-off is therefore necessary in the flood control.

Even the great Himalayan rivers, though originating from glaciers in high mountains mostly in zone of perpetual snow above the upper limit of forest growth, receive the entire drainage from their lower catchments. So deforestation in lower catchments causes flood. This flood upsets water regime of rivers and causes heavy damage to life, crops, bankments, roads, buildings and railways. The Control Board of Irrigation had pointed out in 1938 that evils of denudation in India are so serious and wide spread that action for its further prevention should be taken without delay.

Further pointing towards dangerous effects of deforestation on irrigation, it said that the deforestation causes.

(i) Increase of intensity of floods.

- (ii) Decrease of flow of river in dry weather.

In addition to above siting of reservoir also results.

Prosperity of millions of people depends upon our river valley projects; so the need for focussing attention to these river valley projects regarding erosion of land needs hardly to be emphasized.

Compare run-off of a stream after a shower of rain inside a canopied forest with that bare area adjoining the forest. The canopy of trees and bushes break the speed of raindrops. It sprays on to porous humus layer which absorbs it like a sponge and helps it to infiltrate into subsoil below, where it is stored before it is released in the form of springs. Water in stream runs clear and shining. This conveys the sense of cleanliness, brightness and happiness.

In open areas, raindrops beat hard on the exposed soil, rush down the slope and join stream. Its momentum is increased and it causes flood, carrying large quantities of earth, shingle and boulder. Thus water gets muddy. This conveys a sense of frustration, loss and fear.

This indicates that dense vegetative cover can only provide check against flood.

The absence of vegetation accelerates the velocity of run-off and erosive power of stream which varies as square of velocity. i.e. $P \propto V^2$ where P is erosive power of stream and V is its velocity of flood. Thus if velocity is increased to ten times, its power to cut and destroy the bed and banks increases 100 times.

A popular belief in people is that destruction of forest leads to decrease in rainfall. Although it cannot be definitely proved, G.S. Puri in his article in Indian forester for February 1959, says that "During years 1962-1930 rainfall had steadily decreased from 36.70 to 26.61 inches.

The destruction of forest in any catchment area is followed by floods of high intensity in streams. Tract gets desiccated, springs dry up and water table falls.

This is categorically true in Hoshiarpur district of PEPSU. The deforestation condition in Shiwalik hills in PEPSU led to drying up of streams and springs, with a fall of water table throughout the district in plain area over a strip of 80 miles in length and 25 miles in width from Hoshiarpur to Jullunder district. Hills are badly cut up into gullies and they are further widened.

In Hoshiarpur Shiwaliks, between 1900-1942 water table continued to fall by 9 inches to 1 foot annually and then it had fallen to 20-30 feet in various tracts. Large numbers of wells dried up in this period. Similarly as a result of destruction of forests in Mahendragarh District of PEPSU, water-table has fallen to 20-30 feet in the past 50 years.

Anti erosion work relating to regulation of run-off should start from top of the catchment and proceed downwards. Taking the case of Bhakra Dam, as catchment area is too great, it would take a long time. Alternative is the treatment of each catchment of stream forming tributary of Sutlej above Bhakra Dam simultaneously. Bhakra Control Board has estimated that half of cultivated land needs intensive soil conservation measures. Similarly whole of areas of private forests and waste lands will have to be properly treated.

The afforestation should be taken on top up the questions of closing areas to grazing and browsing, cutting of trees and bushes and afforestation. From 1936 onwards to 1947 more than 4 lacs acres of private forests were under control of the forest department.

The afforestation to be taken on top priority in all the projects and careful well planned growing of plants along the cultivable tracts should be recommended for storing the nutritious soil layers from being washed off.

THE situation in the world of to-day is not reassuring to lovers of peace. Wherever they look, they are confronted with the spectacle of nations pursuing a mad policy of armament, inventing deadly weapons and spending major portion of their budget on schemes of so called defence. There is a hectic atmosphere of fear and suspicion all round and each nation is seen to align itself with one or other of the Power Blocks that are forming themselves in the world of international politics. On the face of it, with such a world situation, the possibilities of a third global war are only too possible.

When we refer to the obvious blessings of science, we say that they made life comfortable and promised plenty for all. But when we look at the world of today with its cold and hot wars, its racial hatred, its mass poverty and unemployment and above all, an atomosphere which is tense in the preparation for a third world war, we cannot help questioning the very idea of progress as it is popularly conceived and propagated.

Many evils have come to effect our civilization since the days of so called scientific progress. The most serious evil, however, is to be seen in the growth of huge armaments and deadly weapons which scientists have been able to create in the wake of their researches. The world is groaning under the weight of these armaments and instead of serving the world, they are on the verge of destroying it. The spectacle of a modern war is a sight to make the angels weep. If this is the result of the progress of knowledge, one would think that ignorance indeed is a bliss.

The greatest sensation of the twentieth century has been the discovery and use of atomic energy. The destruction of Hiroshima and Nagasaki during the last days of the last world war has been an unforgettable event in the history of mankind. On that fateful day began a new era—the atomic age. The

IS NUCLEAR ENERGY A CURSE ?

(*"There is no evil in the atom, only in men's souls"*).

By K. H. MEHTA
S.E. Civil



world became aware of a new energy of staggering force and significance. How man was going to react to it became the burning issue of the day.

Investigations into the nature and potentialities of the atom had engaged the attention of scientists for many years before the second world war. But it was a strange irony of fate that those researches culminated only during the war. Worse still was the fact that the tremendous energy released by nuclear fission was used primarily for purposes of destruction. The highest achievement of modern science was thus at once an offspring and hand-maid of war.

The use of the atom bomb was an epoch-making event. It created an unprecedented stir all over the globe. On the one hand, it was acclaimed as boon, for it had put a stop to the greatest armed conflict the world has known. The atom was hailed as the redeemer of mankind, as the harbinger of peace. The world, grown weary of the war, wanted to get rid of it at any cost. The use of the atom bombs, ruthless though it was, was welcomed by a large section of mankind.

On the other hand, it sent a wave of horror and indignation on account of the human mass-slaughter and indescribable havoc caused in Japan. Large sections of thinking people, including the Archbishop of London, denounced the use of the monstrous weapon as a most immoral and barbaric act and demanded that it should

TUG-OF-WAR CHAMPION TEAM (F.E. CLASS)



Standing:—Sri Cherian, Sri C. M. Banan, Sri Chittal, Sri V. D. Baindoor, Sri S. M. Ingle.
Sitting:—Sri K. J. Dalal, Sri G. B. Shah, Prof. S. S. Dighe, Sri Patel, Sri K. K. Katkar (G.S.).

DRAMATICS COMMITTEE



Standing:—Sri K. H. Mehta, Sri G. B. Choksi, Sri S. L. Mody.
Sitting:—Sri K. K. Katkar, Prof. S. S. Dighe, Sri J. G. Bodhe (Chief Guest), Prin. R. H. Chokhavatia, Sri G. B. Shah.

COLLEGE VOLLEY BALL TEAM



Standing:—Sri A. P. Karle, Sri V. Ramaswamy, Sri A. R. Kumta.
Sitting:—Sri Mahajan, Sri Joshi, Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar,
Sri K. K. Katkar, Sri A. D. Naikwadi.

COLLEGE MAGAZINE COMMITTEE



Standing:—Sri S. V. Pendharkar, Sri K. H. Mehta, Sri S. N. Pandhi, Sri P. M. Kotecha.
Sitting:—Sri K. K. Katkar, Prof. S. S. Dighe, Sri J. G. Bodhe (Chief Guest), Prin. R. H. Chokhavatia, Prof. V. S. Chandrasekhara.

completely banned. Peace had been purchased but at a devilish price. The price consisted of not only the countless victims of Hiroshima and Nagasaki, but of something far more staggering and sinister. Man had added the darkest chapter to the long catalogue of his follies and sins in exploiting and abusing the innocent fruits of scientific research. Now a new energy, the most powerful hitherto known to man had been used for the destruction of the most horrifying and hellish character.

Today, however, when the war is over and no peace is established the atomic bomb is no less destruction of peace, too! There is already a talk about the next war in which the atomic bomb will destroy everything including those who created it. No one knows what is going to be the future of the atomic bomb, but there is absolutely no uncertainty about what will happen, if the atomic bomb is not controlled. The whole mankind is at the mercy of the new monster, which it has taken so much trouble to create.

The very idea of atomic warfare fills one with indescribable horror and disgust. Modern wars, even without the use of atom bombs are devastating beyond measures, but to use atomic bombs would spell sure and complete annihilation of mankind. Any atomic conflict on a large scale would result in the destruction of the principal cities of the world within a few days, if not in hours. Civilians would suffer far more than soldiers. Even the atomic scientists cannot precisely predict the extent and nature of the damage which an atom bomb might cause.

The devastation in second world war seems to be nothing when compared with what the Hydrogen Bomb could do. The experimental explosion of an H-Bomb in Bikini in the Pacific in March 1954, was no doubt successful, but this success bodes ill for mankind. We have heard what happened to some Japanese fishermen on whose boat

the radio active ashes of this exploded H-Bomb rained down. These victims were reported to be blind and suffering from a painful torture which was slowly killing them. Medical science has not been able to diagnose this strange disease which the H-Bomb has let loose on humanity. A French scientist has said that the whole atmosphere of the universe will be charged with nitric acid enough to effect vegetation and animal life. It is reported that the use of H-Bombs raises the general level of the earth's radio activity. This is the most dangerous form of the effects of the H-Bombs. When these bombs are exploded on the ground, they are said to throw into the air millions of tons of pulverised materials that float in the upper atmosphere for several years obstructing sun light. In short it may be said that the advent of the Hydrogen bombs spells an age of darkness and death.

Because of this, science is denounced as the villain of the peace, the source of all sorrow and suffering of man. Curses are heaped upon scientists who discover and invent theories and machines which make the tasks of slaughter and destruction easier and quicker. No wonder then that the most sensational development of science, the power to split the atom has provoked the loudest and bitterest denunciation of science and the whole tribe of scientists.

This is certainly not a good attitude. Science in itself is good. Scientists are usually pure lovers of truth. The self-interested persons and groups of persons have not only exploited the fruits of science for selfish purposes but have also tried quite successfully, to buy or force scientists to use their knowledge for subversive purposes. The evil lies in the hearts of men who do not know how to work great truths discovered by science. Scientific discoveries are nothing but truths. Every new truth is a new revelation, and But people with vested interests and nations

seething with discontent will not realise the great truth that science is innocent.

There is a bright side of the history of the atomic energy. It can be used for constructive works as effectively as for destructive ones. The constructive uses of atomic energy are no longer a secret to mankind. This new discovery, it is estimated, can mark miracles far greater than man has ever imagined. A fraction of this energy is sufficient for running all the mills and factories of a city like New York, London or Bombay. Thus if atomic energy is available it will replace all other forms of energy, such as water power, wind power, steam and electricity. Consequently the speed and output of machines will increase tremendously. Besides, this will solve the problem of the decreasing supplies of coal all over the world. With this marvellous energy at his disposal, man will be able to explore unknown worlds and regions. The mysteries of the unfathomable

ocean, of the countless stars and planets, of infinite space will be unravelled. The dream of flying in rocket planes to moon, venus and other heavenly bodies might become a reality. Possibly, many other species of living beings similar to or different from man with their own civilization and culture may be discovered. All this may read like a fairy tale, but the series of sputniks launched into space by Russia and America has brought high hopes of turning this fairy tale into a reality.

Let us hope that the people will imbibe the lesson of "LIVE AND LET LIVE". The gospel of peaceful co-existence is the only solution of the night-mare of war which haunts the world today. Let there be charity in our hearts, regard for others, respect for truth and justice. Then only we deserve enjoying the four types of freedom—freedom from want, freedom from fear, freedom of speech and freedom of conscience.

CLASS SONG

By PATEL RATNA M., F.E. III

Good morning don starts our day
Professor Raddy reflects the knowledge ray.
Dandekar talks generally in Engineers' language
Opens the doors of destiny for voyage,
Force, Friction and Tension are trio in Mechanics
Which shock brains but controlled by Fatehi.
Professor Shah sprinkles sagacious Molecules
Which constitutes Heat Engine in polished brains.
How can we forget Professor Dighe
Who stammers about pressure and volume
And hence derive the Heat Engines volume.
Lime, Cement and Mortar are friends of Joshi
Who serves us like a dish of fricassee.
Professor Pancholi starts with a prologue
Who feeds surveying and levelling like pedagogue.
Electrical Technology which is really a mystery
But by wise guidance of Goyal it is merely history.
Well, that is all we want to say
and pray,
Chokhavatia's kingdom be happy and gay.

"MATHEMATICS CAN ENTERTAIN"

By HARCHARAN SINGH, S.E. Mech.

DEAR Friends! If you know a bit of mathematics, you would do well to scratch your head a little on the following problems and puzzles. If you fail to reach a solution, you may turn to page (51) for ready-made answers.

- (1) A rope passes over a pulley. At one end is a weight of 40 lbs. and at the other end a monkey of weight 40 lbs. is holding the rope. Monkey and the weight are at the same level above the ground. The monkey now tries to climb the rope as if it were a tree. Will he be able to climb? What will happen?
- (2) Customer: "What is the price of this?"
Shopkeeper: "It costs 10 P. per piece; therefore if you want 100 it will cost you 30 P."
Customer: "I want 49."
Shopkeeper: "That will be 20 P."
What could the customer possibly be buying?
- (3) Some persons took their meals in a restaurant. By a curious coincidence each had the same bill to pay. The total amount of all the bills was Rs 17.03 np. How many persons were there?
- (4) A person has eight coins. One of the coins is counterfeit and therefore is

slightly heavier than others. The person has a good pair of scales and he wants to find out the counterfeit coin in *only two* weighings. He has no other weights. How will he do it?

- (5) Two men agree to saw a pile of logs which are 3 feet long in 1-foot lengths for Rs. 5. How much would they have charged to cut the same number of logs into 1-foot lengths if the logs had been 6 feet long?
- (6) Which will cost more: A dozen dozen balls at half a dozen rupees a dozen OR half a dozen dozen balls at a dozen rupees a half dozen?
- (7) A and B are boys and C is a girl. C is the sister of A as well as of B. But A and B have no blood relations at all. How it is possible?
- (8) A man has 15 bags full of gold-coins. In one bag there are counterfeit coins, which weigh an OZ. heavier than others. The man has got a weighing machine which reads correct upto an OZ. The man has also got a 10 P. coin to put into the machine for getting the weight-card. How with this single 10 P. coin can he find the counterfeit coins bag? (Weight of each good coin is 1 lb.).

SCIENCE TODAY

Collected by
PATEL S. K.
B. E. (mech) Role No. 28

(a) *Explosive can Blow Metals Together Instead of apart:*

In a new industrial process developed in the United States precisely controlled explosions are joining dissimilar metals and alloys into solid plates embodying qualities of both metals. The shock waves of detonating explosives cause the two metals to collide and unite in a metallurgical bond without the use of heat or adhesives or other intermediate materials.

The resulting plates are uniform in composition and lend themselves readily to fabricating processes such as shearing, sawing, flame cutting, powder cutting, abrasive wheel cutting, planing, milling, bending and grinding. The layers do not separate during such fabricating processes and the properties of the component metal and alloys remain unchanged by the explosive bonding process.

The process is especially useful for what the manufacturer calls "cladding"—coating one metal with a thin layer of another to add corrosion resistance or other useful property. Cladding combinations produced so far include stainless steel, nickel, copper or "Hastelloy" alloy on carbon steel; special grades of stainless steel on alloy steels; refractory or noble metals on steel, stainless steel or other metals depending on the combinations of properties desired. The new process resulted in the United States for constructive applications of explosives. Forming, cutting and hardening of metals by explosives are processes which have been in commercial use for some time.

(b) *Materials Behave Strangely under very high Pressures:*

Subjecting materials to high pressure changes their properties in bizarre ways.

When compressed under about 35,000 Kg/cm², ordinary liquids become solids. Gases become liquid. Some rocks stretch like rubber. Insulating materials conduct electricity. Water freezes at room temperature into dense, lead heavy cubes which explode violently when the pressure is suddenly released.

The most spectacular discovery to emerge so far from high pressure research is the artificial conversion of graphite to diamond. The interior of the earth itself is a high-pressure laboratory. Graphite subjected to the tremendous heat and pressure generated deep below the earth's surface turns to diamond in the course of thousands or perhaps millions of years.

Though not of gem quality, synthetic diamonds are often preferred over natural diamonds for industrial cutting and abrasive uses because their shape and surface can be made to order. Metals become increasingly conductive under increasingly high pressures. This has led some scientists to suggest that pressures of magnitude not yet *produced* in the laboratory might cause some metals to become super-conductive at room temperature. Super-conductivity, the complete absence of electrical resistance, has numerous potential scientific applications, but can now be obtained only at the extremely low temperatures close to absolute zero.

Pressures are measured in kilobars—one kilobar=1000 Kg/cm². Even the best modern presses are limited to sustained pressures of about 500 kilobars.

(c) *Seeing the Unseeable with Ultrasonic Sound:*

While playing, an 11-year-old Washington boy hammered on a rifle cartridge. It exploded, driving a six-millimetre brass silver

deep into his left eye. Had the fragment been steel or iron, surgeons could have removed it routinely with an electro-magnet. But exploring randomly with surgical instruments, for the non-magnetic fragment would almost surely have destroyed the eye, X-rays were also ruled out because of their error range of upto four millimeters.

Instead, surgeons introduced a new instrument—a pair of forceps, smaller and finer than any dentists drill, between which protruded a tip thinner than a newly sharpened pencil lead. From it emanated a beam of sound too high-pitched for human hearing. The instrument 'listened' as echoes of these inaudible sound waves bounced off the inner eye. These echoes produced a silhouette-like picture on an oscilloscope, like a 25-centimetre television screen. Guided by this picture Dr. Bronson pushed the in-

strument into jelly-like inner eye, closed the miniscule forceps and, within seconds, retrieved the brass silver.

Ultrasound is created by 'transducers' that convert electricity into mechanical vibrations. These are exactly like sound waves except their frequency is beyond human perception which is limited to sound of from 20 to 20,000 vibrations a second. Experimental transducers recently developed in the U.S. generate upto 9,000 million vibrations a second. Very high-powered ultrasound can drill holes into glass without physical contact; shatter rock layers to release concealed oil; join previously unjoinable materials, such as aluminium to glass, or aluminium to stainless steel; and clean delicate lenses and hypodermic needles by shaking off dirt, oil and other particles with the silent vibrations.

"MATHEMATICS CAN ENTERTAIN"

ANSWERS

- (1) The weight will also move upwards along with the monkey.
- (2) Door "Number-plates".
- (3) 13 persons. (1703 has only two factors: 13×131).
- (4) He divides the coins into three groups of three, three and two. He puts three coins on each side of the balance. If they balance, he can easily find the heavier from the other two in one weighing. If they do not balance, he puts two of the heavier three on the balance, one on each side. If they balance the third one is the heavier. If they do not, he will come to know the heavier one.
- (5) Rs. 12.50 P.
- (6) Half a dozen dozen balls at a dozen rupees a half dozen.
- (7) A is the son of Mr. and Mrs. X. Mrs. X takes a divorce and marries Mr. Y.

C is the daughter of Mrs. X and Mr. Y. Mr. Y takes a divorce and marries Mrs. Z. B is the son of Mr. Y and Mrs. Z.

- (8) He numbers the bags as 1, 2, 3...15. He takes out one coin from bag No. 1, two coins from bag No. 2, three coins from bag No. 3... and 15 coins from bag No. 15. He makes separate piles of these coins i.e. 15 piles of one, two, three...and fifteen coins each. He then puts these piles on the machine platform. He puts the 10 P. coin in the machine and gets the weight-card. The card will show the weight in lbs. and oz. If the card shows 1 oz., the counterfeit coins are in bag No. 1. If card shows 2, 3 or 4 oz., the counterfeit coins bag is 2nd, 3rd or 4th respectively; and so on.

Harcharan Singh S. E. Mech

THE LAMP THAT BURNS FOR EVER

Collected by: G. D. PAI

B.E. (Mech.)

The lamp that burns for ever. Well; may be not quite for ever, but for twenty years at least. And that is also without electricity, without batteries, without oil, without outside power of any kind, without heat or smell either. But surely it is not going to be Alladin's magic lamp.

Like so many other modern wonders, these lamps owe their existence to atomic science. They are glass bulbs filled with tritium, a radioactive form of the hydrogen gas (H_2). The bulbs are coated internally with a phosphor—the material used for making the glowing screen of a television tube.

One feature of all radioactive materials and isotopes is that their atoms are not stable like those of normal substances. In tritium, electrons—the minute, practically weightless particles whose movement we know as an electric current, are constantly being thrown off. These are the "moving parts" of the everlasting lamps, known as 'beta particles'. To understand the lamp's operation, we need only think of a television receiver. Inside the cathode ray tube electrons are set free from a heated wire. These are focussed into a highspeed beam which strikes the phosphoroacted screen of the tube to produce a tiny, but brilliant spot of light. By sweeping this beam over the whole face of the tube while varying its intensity, the television picture is produced.

The new lamp is not so very different from a television tube, except that the electrons are produced by atomic power from the very heart of the gas. Since there are no focussing arrangements, these electrons spread out to strike all over the inside of the bulb

at once, causing entire surface to glow brilliantly. Naturally the light is not so bright as that of a powerful electric bulb, but some of these lights can be seen at night over a distance of several hundred yards. And even fifty lamps, which are not grossly expensive to buy and glow for twenty years without attention, must cost very much less over that period than a single low power electric light which needs frequent replacement.

The one possible drawback—danger from radioactivity, does not exist. Tritium has a small atom which can give off practically none of the heavy alpha particles which in high concentration can be dangerous. Even the gas itself is no more lethal than a luminous wrist watch. And in the lamps, beta particles move so slowly that they cannot penetrate the glass. So we risk neither radiation sickness nor contamination.

Thanks to colour television research many new phosphors have been developed recently. This means that the new lamp can be produced in any hue of the rainbow. But the brightest light is given by green or yellow phosphors. For decorative purposes it would be possible to use several phosphors to give either a clear-cut design or an abstract blending of multicoloured light.

The shapes in which 20 year lamps can be made are limited only by what can be done with glass. If a fair amount of light is needed they can be in straight or curved cylinders upto about 2 ft. long by 2" in diameter. Other standard patterns are globe or a flat disc upto a few inches across. For precise work needle sized permanently glowing rods can be produced.

These lamps are not intended to provide a dazzling light, but rather for low-level illumination purposes. For instance it is possible to mount flat discs under a translucent telephone dial so that the instrument can be used without fumbling even in pitch darkness. A compass light which can never go out under any weather conditions will be a boon to mariners all over the world. Of course, they are ideal for glowing signs and emergency lighting. They could have their effect in the field of advertising too. Instead of a plain wooden hoarding carrying a poster which must be expensively floodlit before it can be seen at night, the lamps could be used to produce two or three dimensional dis-

plays which might rank as works of art in their own right.

But possibly their greatest use will be on the roads. Traffic control boards and signposts are often very difficult to see at night and the cost of effectively lighting every one would be very high. Now we can have signs which provide their own lights could be used to show the edges and centre of a road under any weather conditions. The menace of an unlit parked vehicle on a dark road could be banished, because suitably coloured lamps could provide front and rear warning lights that would never fail.

Bibliography:

Sunday Standard.

WILL YOU BELIEVE IT ?

(a) The Atomic Sleuth

A technique called neutron activation analysis promises to provide police with a powerful new weapon in crime detection. One example:—a cotton wool swab can be rubbed over a suspect's hand, irradiated with neutrons in a nuclear reactor and its gamma rays studied to determine whether the man has fired a gun. (Infinitesimal traces of gun powder components left on the hand by explosion gases show up unmistakably under neutron analysis).

The sensitivity of the technique extends to one thousand millionth of a gramme. It is a marvel at detecting the presence of poison, easily spotting a thimbleful (cap protecting end of finger in sewing) dissolved in ten railway water tankers. It can handle specimens far smaller than those needed for con-

ventional chemical analysis, a fragment of fluff, a strand of hair; a fleck of point will suffice.

(b) Germ Power

What seems an ideal source of electric power for houses, electric cars, silent submarines, is now coming out of laboratories. It is a battery that uses bacteria or enzymes to decompose material and release electricity. The same process goes on all the time in a septic tank. The material can be sawdust, corncobs, sewage, sea water; almost anything containing decaying matter will do. The U.S. Navy already has such a battery, which produces sufficient power for radio beacons and signal lights in buoys.

Gianani U.D.
(B.E. Mechanical)

EXAMINATION RESULTS

Contributed by : P Subramanian, B. E. (Mech.)

ONE of the chief hindrances to true education in India is the exaggerated emphasis put on University examination results. It amounts almost to a sort of *idolatry*, for it tends to expel the true divinity, Education, from its temple, in order to set up that trumpery, pinchbeck idol, Results, in its place.

What is the root of this false *idolatry*? It may be traced to three causes. The first is the Public's utilitarian valuation of University degrees and diplomas. The average Indian father sends his son to college, not so much to gain knowledge and culture, as to get degree, because a degree is supposed to be the 'opensesame' to government service, or at any rate to a respectable, lucrative job. Like a cautious business man, he seeks for the best investment of his hard earned savings, and so looks round for the college that secures the highest percentage of passes—the best 'results'.

In the second place comes communal rivalry. Many colleges are private denominational institutions, and the community to which a college belongs takes a communal pride in it. It is uplifted when its college gets good results and is depressed, ashamed and even angry, when its results are bad.

Thirdly, the local press takes the matter up and publishes and analyses the University results, pointing out that college A

stands top while college Z is at the bottom of the list. All this further impresses the public with the false idea that only test of educational efficiency is examination percentages.

This public opinion, made up of the opinions of the average parents, communal jealousies and press propaganda, presses upon the managing bodies of the colleges. If the results of a college are bad, the college committee warns the principal and staff that, if there is no improvement, they may be fined or even dismissed. The professors soon learn that their bread and butter depends on 'results'. They have no time for education; for 'education' does not pay. So they descend to every trick and device known to the crammer to get the students through; and resort to the detention system to weed out weak candidates. Finally, the pressure descends upon the heads of the wretched students. They, driven by their teachers and by their average parents at home, become equally feverish to pass. They cram up bazaar cram-books, hunt for examination 'tips' and load their memories with anything that may be of use in the examination.

What is the result? Instead of 'education' we get a vast system of cramming which is the very anti-thesis of true mental training and development. This is what the setting up or bowing down to a false idol ends in the negation of true education.

COLLEGE FOOTBALL TEAM



Standing:—Sri A. L. Shinde, Sri S. M. Rapawate, Sri S. Subramanyam, Sri Dalal, Sri Shenoy, Sri K. H. Mehta, Sri Hegde, Sri Mahajan
Sitting:—Sri A. R. Kumta, Sri K. K. Katkar, Prof. S. S. Dighe, Sri J. G. Bodhe (Chief Guest), Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar, Sri V. Ramaswamy, Sri A. P. Karle

COLLEGE INDOOR GAMES TEAM



Standing:—Sri V. S. Hattangady, Sri Cherian, Sri Y. Pandya, Sri Date, Sri Laxman
Sitting:—Sri Karve, Sri P. M. Kotecha, Prin. R. H. Chokhavatia, Prof. S. S. Dighe, Prof. A. G. Mhaskar, Sri N. N. Pandhi, Sri Doshi

COLLEGE ATHLETICS GROUP



Standing:—Sri A. R. Kumta, Sri V. S. Hattangady, Sri A. D. Naikwadi, Sri V. Ramaswamy, Sri Mahajan.

Sitting:—Sri R. S. Mandrekar, Sri S. K. Patel, Prof. S. S. Dighe, Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar, Sri A. L. Shinde, Sri N. M. Nakwha.

COLLEGE CRICKET TEAM



Standing:—Sri Devalkar, Sri Dalal, Sri Desai, Sri Shah; Sri S. B. Mahadevia, Sri V. D. Baindoor, Sri G. V. Mishra, Sri C. M. Banan, Sri R. M. Assar.

Sitting:—Sri A. P. Pradhan, Sri R. S. Mandrekar, Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar.

VERTICAL CURVES

By V. S. CHANDRASEKHAR

THE change of gradient cannot be avoided in the profile of a highway or rail road. The two gradients may meet either in a summit or valley. The vehicles cannot negotiate this abrupt change in the grade at the summit or valley. A vertical curve has, therefore, to be introduced to bring about a gradual change from one gradient to the other. The vertical curves should also satisfy the requirements of minimum sight distance and prevent the skidding effect due to centrifugal force at the centre of the curve where the radius is minimum.

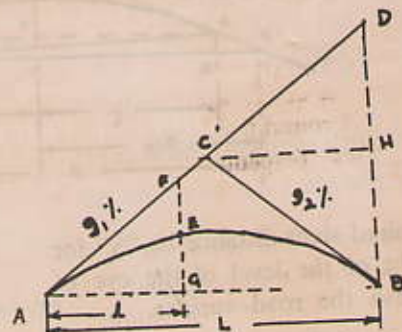
The vertical curves may be circular or parabolic in shape. The parabolic curves are popularly set because the properties of the

parabola render the calculations simpler and setting out the curve easier.

I. Elements of Vertical Curve: (Parabolic Curve).

AC and BC are two gradients $g_1\%$ and $g_2\%$ respectively. The up grade is considered as positive and the down grade as negative.

AEB is the vertical curve, connecting the two grades AC and BC. These two grades remain tangential to the curve at A and B. The Summit Point is "C" where two grades meet. Extend the gradient AC to D and draw DB perpendicular to the line CH, drawn horizontal at C.



From Fig ; $DB = DH + HB$
 $DH = \frac{g_1}{100} \times CH$

$$HB = \frac{g_2}{100} \times CH$$

$$\therefore DB = CH \left\{ \frac{g_1 + g_2}{100} \right\}$$

In small curves $CH = \frac{L}{2}$ where L is the horizontal length between A and B.

$$\therefore DB = \frac{L}{2} \frac{(g_1 + g_2)}{100}$$

Since the curve is parabolic ; $\frac{EF}{BD} = \frac{l^2}{L^2}$

$$\therefore EF = \frac{l^2}{L^2} BD = \frac{l^2}{L^2} \times \frac{L}{2} \frac{(g_1 + g_2)}{100}$$

$$EF = \frac{l^2}{2L} \cdot \frac{(g_1 + g_2)}{100}$$

But $EG = FG - EF$

$$= \frac{l \times g_1}{100} - \frac{l^2}{2L} \frac{(g_1 + g_2)}{100}$$

$$= l \left\{ \frac{g_1}{100} - \frac{l}{2L} \frac{(g_1 + g_2)}{100} \right\}$$

Let EG be y and $\frac{l}{L}$ be x

$$\text{Then } y = l \left\{ \frac{g_1}{100} - \frac{x}{2} \frac{(g_1 + g_2)}{100} \right\} \dots 1$$

From the equation 1 the offset at any point may be calculated. The reduced levels of the points on the curve can be found by

adding the offset to the R.L. of A. The data for setting the curve may be tabulated as follows.

R. L. of A,	Dist 'l' from A, $x = \frac{l}{L}$	$\frac{x}{2}(g_1 - g_2)$	$g_1 - \frac{x}{2}(g_1 - g_2)$	$y = \text{col. 5} \times \frac{l}{100}$	R.L. of Points Col. 1 + col. 6	Remarks
1	2	3	4	5	6	7
						8

II. (a) The sight distance is greater than length of curves:—

The design of vertical curves at ridges depends on the sight distance to be provided and also upon the safe minimum radius of the curve. The sight distance is dependent on the radius of the curve, the speed of the

vehicle and the height of the eye of the driver from the ground. The sight distance may be (a) more than the length of the curve (b) equal to the length of the curve and (c) less than the length of the curve.

II. a) The sight distance is greater than the length of the curve:—

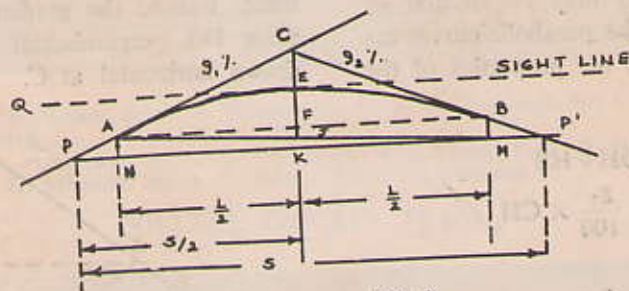


FIG. 2

Let the required sight distance be "S" for "Y" the height of the level of the eye of the driver above the road surface.

The line CEFJK bisects the angle ACB and can be considered as $\perp$ to the line PP' without much appreciable error in case of small curves. The QQ' is the sight line $EK = y = \text{ht. of the level of the eye of the driver above the road surface.}$

EJ = Offset at J taken from the horizontal line AJ.

$$\therefore EJ = \frac{l}{100} \left\{ g_1 - \frac{x}{2} (g_1 + g_2) \right\}$$

$$= \frac{L}{2 \times 100} \left\{ g_1 - \frac{L}{2 \times 2L} (g_1 + g_2) \right\}$$

$$\therefore \text{Since } l = \frac{L}{2} = AJ$$

$$EJ = \frac{L}{2 \times 100} \left\{ g_1 - \frac{1}{2} (g_1 + g_2) \right\}$$

$$FJ = \frac{1}{2} BM$$

$$\text{But } BM = \frac{L}{100} \left\{ g_1 - \frac{1}{2} (g_1 + g_2) \right\} \text{ from eqn-1}$$

$$\text{Since } l = L \text{ and } x = \frac{l}{L} = 1$$

$$\therefore FJ = \frac{L}{2 \times 100} \left\{ g_1 - \frac{1}{2} (g_1 + g_2) \right\}$$

$$EF = EJ - FJ$$

$$= \frac{L}{2 \times 100} \left\{ g_1 - \frac{1}{2} (g_1 + g_2) \right\}$$

$$= \frac{L}{2 \times 100} \left\{ g_1 - \frac{1}{2} (g_1 + g_2) \right\}$$

L of A. The
may be tabulated

Remarks
8

the eye of the
sight distance
length of the
of the curve
the curve.
greater than

$$EF = \frac{L}{2 \times 100} \left\{ \frac{(g_1 - g_2)}{4} \right\}$$

$$= \frac{L}{8} \cdot \frac{(g_1 + g_2)}{100}$$

But $Y = EF + FK$

$$\text{Now } FK = \frac{AN + BM}{2}$$

$$\text{Where } AN = \frac{g_1}{100} \times \left[(S/2 - L/2) \right] \text{ and}$$

$$BM = \frac{g_2}{100} \times \left[(S/2 - L/2) \right]$$

$$\therefore FK = \frac{(S-L)}{4} \left\{ \frac{(g_1 + g_2)}{100} \right\}$$

But $Y = EF + FK$

$$= \frac{L}{8} \left\{ \frac{(g_1 + g_2)}{100} \right\} + \frac{S-L}{4} \left\{ \frac{g_1 + g_2}{100} \right\}$$

$$= \frac{(g_1 + g_2)}{100} \left\{ \frac{L}{8} + \frac{S-L}{4} \right\}$$



FIG. 3

In Figure 3 ; $EF = EK - FK$

EK = Offset at the centre

$$= \frac{l}{100} \left\{ g_1 - \frac{x}{2} (g_1 + g_2) \right\}$$

$$EK = \frac{L}{2 \times 100} \left\{ g_1 - \frac{L}{2 \times 2L} (g_1 + g_2) \right\}$$

$$Y = \frac{(g_1 + g_2)}{4 \times 100} \left\{ S - \frac{L}{2} \right\}$$

$$\left(\frac{g_1 + g_2}{4 \times 100} \right) \frac{L}{2} = \frac{S (g_1 + g_2)}{4 \times 100} - Y$$

$$\frac{L}{2} = S - \frac{Y \times 4 \times 100}{(g_1 + g_2)}$$

$$L = 2S - \frac{8 \cdot Y \times 100}{(g_1 + g_2)} \dots\dots 2$$

II (b) When Sight distance is equal to the length of vertical curve :-

In equation 2 substitute $S = L$

$$L = 2L - \frac{8 \cdot Y \times 100}{(g_1 + g_2)}$$

$$L = \frac{8Y \times 100}{(g_1 + g_2)} \dots\dots\dots 3$$

II (c) When the sight distance is less than the length of the vertical curve :

$Q Q^1$ is the sight line PP^1 = sight distance = S

$EF = Y = h_0$ of the driver's eye above the road surface.

AM = horizontal length "L" of the curve

$$EK = \frac{L}{2 \times 100} \left\{ g_1 - \frac{1}{4} (g_1 + g_2) \right\}$$

$$FK = \frac{PR + P_1 R_1}{2}$$

$$PR = \text{Offset at R} = \frac{l}{100} \left\{ g_1 - \frac{x}{2} (g_1 + g_2) \right\}$$

LOCATION OF DANGEROUS CIRCLES

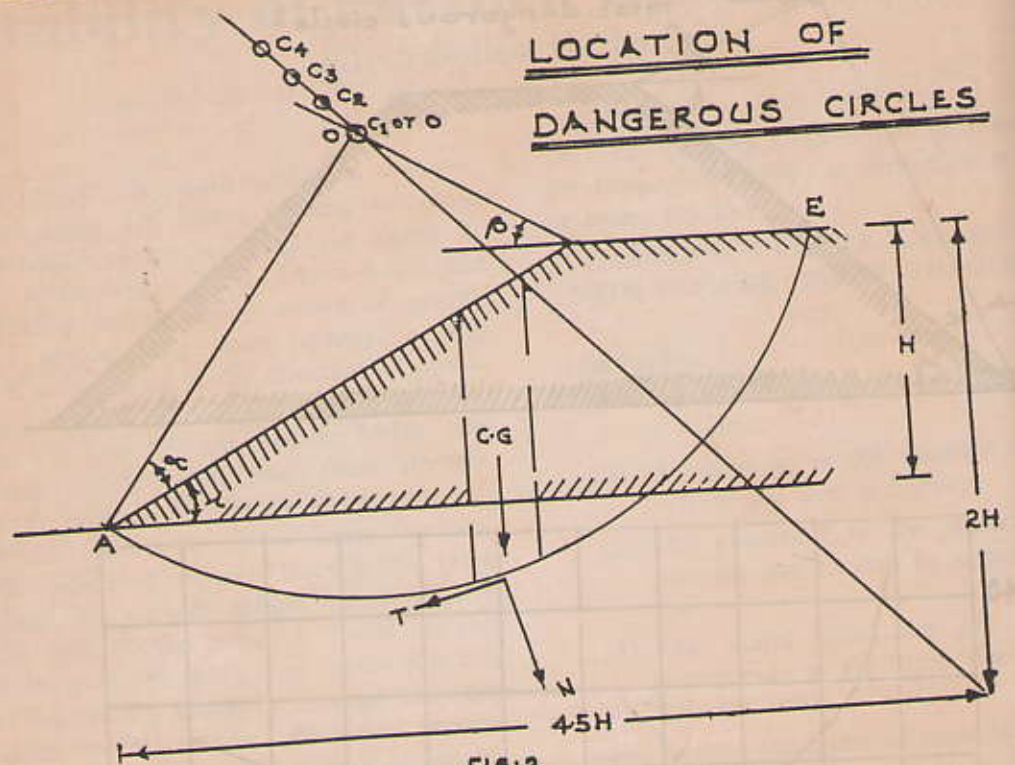


FIG:2

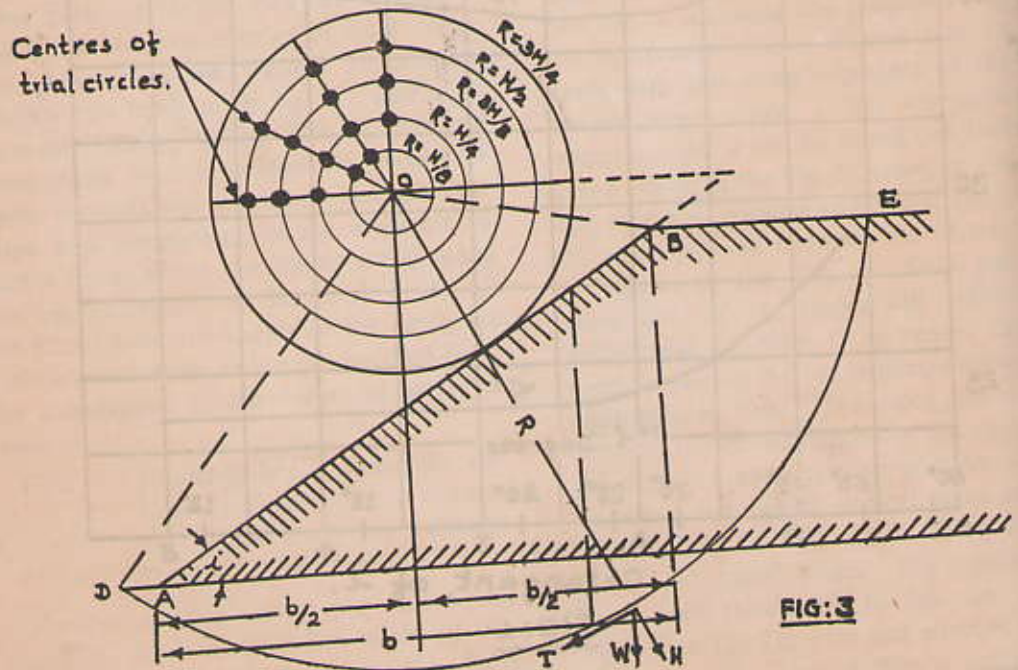
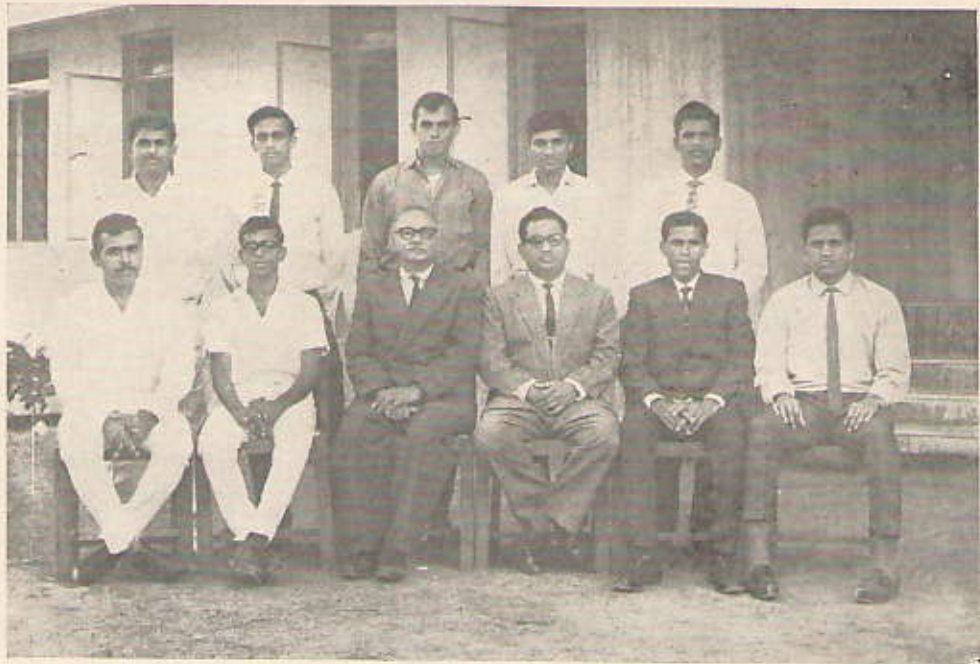


FIG:3

COLLEGE KHO-KHO TEAM



Standing:—Sri R. S. Mandrekar, Sri M. N. Nakwha, Sri Chittal, Sri Maheshwari, Sri S. K. Patel
Sitting:—Sri. G. P. Mishra, Sri A. R. Kumta, Prin. R. H. Chokhavatia, Prof. A. G. Mhaskar,
Sri A. L. Shinde, Sri A. D. Naikwadi

CULTURAL AFFAIRS COMMITTEE



Standing:—Sri S. L. Mody, Sri S. M. Ingle
Sitting:—Sri K. K. Katkar, Prof. S. S. Dighe, Sri J. G. Bodhe (Chief Guest), Prin. R. H. Chokhavatia, Sri R. P. Gadkari

COLLEGE BADMINTON TEAM



Standing:—Sri M. P. Wagh, Sri A. G. Heroor, Sri Laxman
Sitting:—Sri K. K. Katkar, Prof. S. S. Dighe, Sri J. G. Bodhe (Chief Guest), Prin. R. H. Chokhavatia, Pro. A. G. Mhaskar.

COLLEGE KABADI TEAM



Standing:—Sri M. N. Nakwha, Sri R. S. Mandrekar, Sri G. P. Mishra, Sri Maheswari, Sri S. K. Patel.
Sitting:—Sri A. L. Shinde, Sri V. S. Hattangady, Prin. R. H. Chokhavatia, Prof A. G. Mhaskar, Sri A. R. Kumta, Sri A. D. Naikwadi.



Prin. R.



Maheswari,

Prof A. G.

and a vertical line proportional to the total effective weight of the slice is drawn from its c.g. At the circumference this weight is resolved into its normal and tangential—components. This process is repeated for each of the vertical slice.

The next step is to add up all the tangential forces or T forces for the slices (with proper sign). Also add up all the normal forces.

ΣT = force tending to produce movement along the circumference (shear).

The force tending to prevent movement is $N \tan \phi + LC$

This is the total shear strength of the material along the circumference AE.

N = sum of the normal forces for all the slices.

ϕ = Angle of internal friction of the material as determined by tests.

L = Length of the arc AE intersecting the embankment.

C = Unit Cohesion.

$$\text{The factor of Safety} = \frac{N \tan \phi + LC}{\Sigma T}$$

The same process is repeated for number of circles. For the centre of additional trial circles through the toe of slope, proceed as follows:—

For getting centres of other circles a point $4.5 H$ (where H is the height of embankment), drawn horizontally from the toe of the slope towards the bank side and $2H$ below the top of the bank is joined with c_1 and prolonged. The circles with centres along this line give the most dangerous circle passing through the toe. The process is continued until the circle is found which gives the lowest factor of safety. For the given conditions this last circle is the most dangerous which gives the lowest factor of safety. But when the foundation of the dam has the same or lesser shear strength than the dam itself, it is still possible that there is another circle which does not pass through the toe of the slope and which is still more

dangerous. In the next paragraph this case is discussed.

DANGEROUS CIRCLE ANALYSIS WITH FAILURE PLANE BELOW TOE

Theoretically if the materials of the dam and foundation are entirely homogeneous, any practicable earth dam slope may have its most dangerous failure plane below the toe of the slope. Fellenius found that the angle intersected at O in (Fig. 3) for this case is about $133\frac{1}{2}^\circ$. To find the most dangerous circle below the toe, it is suggested that the process be as follows:—

If the slope of the face of the dam is as shown in (fig. 3), erect a vertical at the midpoint of the slope. On this vertical line, will lie the centre O of the first trial dangerous circle. In locating the trial circle use on angle of $133\frac{1}{2}^\circ$ between the two radii at which the circle intersects the surface of the embankment and foundation. After the first trial dangerous circle has been drawn, the method of analysis is the same as that described in the previous article. After the first dangerous circle has been analysed the other trial circles can be obtained as follows:—

Draw concentric circles of radii $H/8$, $H/4$, $3H/8$ and $H/2$ etc. as shown in the Fig. 3 where H is the height of dam. If radial lines are drawn at angles of 30, 60, 90, 120 degrees etc. the centres of intersection of these lines with the circles will give the centres for different trial circles. Additional such centres for the trial dangerous circle are spotted and the resulting circles analyzed. Finally after a number of circles have been analyzed the computed factors of safety of the various circles are tabulated and compared. The circle showing the lowest factor of safety will be the most dangerous circle.

The failure circle passing through the body of the dam is not very common since the material in the body of the dam is tested and the best quality material possessing enough shear strength is selected.

RADIO DETECTION AND RANGING

Contributed by: ANANDAN VIJAYAKUMAR

RADAR is abbreviation of "Radio Detection And Ranging". It is an electronic device, the transmitter of which projects energy in the form of high power, ultra-high frequency pulses. The targets such as a high flying plane, a mountain or a remote ship reflect some of the incident energy which is reflected towards the transmitter. The time delay caused between releasing of high energy pulse and reception of echo pulse is a measure of distance between transmitter and object. This distance can be accurately computed since the details of the transmitted pulse are known. Angular orientations of the target can be readily obtained by employing the directional antennas. Antenna in simple words means an aerial. This is in general the functional principle of Radar system. The technical details of Radar system requires higher theoretical knowledge regarding high frequency oscillators, receivers, pulse-techniques and servomechanism.

Radar has its applications both in navigational and military fields. It is used to see through mist and fog and to point long range guns to the targets. The so-called ICBMs. (Inter Continental Ballistic Missiles) are nothing but radar-aided shells of destruction. Radar is used in air crafts for instrument landing or landing in poor visibility.

The simplified block diagram of the radar circuit is given in figure 1.

The radar system is basically divided into two systems. (1) The transmitting system. (2) The receiving system. The transmitting system consists of a Radio-frequency oscillator controlled by a pulser so as to generate high power, high-frequency pulses.

Antenna is an important part of transmitting system. It is highly directional and arrangements are provided to change the direction of projection of pulses as desired. The same antenna can be used for transmitting and receiving pulses by connecting it alternately to receiver or transmitter by a fast acting electronic switch known as DUPLEXER.

The receiver is nothing, but an high-frequency Radio receiver having the lowest noise factor and high sensitivity. The receiver video output is usually displayed on the screen of a cathode ray indicator in such a fashion as to show the difference between transmitted and echoed pulses. This is obtained by synchronising a sweep voltage cathode Ray tube with the transmitted pulse.

As we are students of engineering we will take a peep at the mathematical considerations.

The Power in the direction of the beam is given by the expression GP where G = Power gain of antenna relative to isotropic radiator and P = transmitted peak power. Considering the isotropic radiator in space, the power per unit area at the target is given by the expression $PG/4\pi d^2$ where d = distance of target from the transmitter. This energy when strikes the target get scattered and some of the energy is reflected back. The target can be described in terms of an equivalent cross sectional area S such that the total power contained in a section of the incident wave front having area S were radiated by an isotropic radiator located at the target. So the strength of the reflected wave reaching the receiving antenna would be same as the actual echo produced by the target.

Echo power per unit area

$$\text{at the receiver} = \text{PGS} / (4\pi d^2)^2$$

The power delivered to

$$\text{receiving antenna} = \text{PGS} / [4\pi d^2]^2 A_o \times S$$

where A_o = capture area of receiving antenna.

The capture area and

$$\text{gain of antenna } G_A = \frac{4\pi A}{\lambda^2} = \frac{4\pi K A_o}{\lambda^2}$$

where $K = \frac{A}{A_o}$ and λ = wave length.

When same antenna is used for transmission and reception, $G = G_A$

Power Received = P_r

$$= \frac{\text{PG}^2 \lambda^2 S}{(4\pi)^3 d^4} = \frac{P^2 S K^2 A_o^2}{4\pi \lambda^2 d^4}$$

The minimum power that could be detected and received by antenna also limits the maximum range.

Thus Maximum range $d =$

$$\frac{\text{PG}^2 \lambda^2 S}{(4\pi)^3 P_{r.\min}} = \frac{P K^2 A_o^2 S}{4\pi^2 P_{r.\min}} \dots \dots \dots (1)$$

From equation (1) it is clear that received energy is inversely proportional to d . In order to increase the range of radar the size of antenna is to be increased so that transmitted beam concentrates to a thin beam.

A short pulse is necessary for detecting targets at close range. The quantity S is characteristic of the target, rather than a factor in radar design. The following numerical data gives an approximate physical nature of the problem.

P-250000 watts; G-20000; S-15 sq. Meters; P (r)-10 watts; λ =12 cm. Long range radars usually operate in S and L band. The chart given below is useful in Radar design.

Band	Frequency Range KMc	Wave length in cm.
P	0. 2—0.39	133—77
L	0.39—1.55	77—19
S	0.55—5. 2	19— 5.8

The usual frequencies are 500-10000 Megacycles per second.

The transmitting system employs oscillators upto 600 Mc/s and for higher frequencies Klystron and Magnetron are employed.

The Modulator: This generates pulses of appropriate wavelength for application between the anode and cathode of power tube transmitter. A 1 Mw radar at 50% efficiency will require a modulator capable of giving 200 Kw peak to the power tubes. The modulator circuit is given in figure 2.

Antenna: It is important to design antenna with proper care so as to yield best results. The type of antenna employed in a particular radar system depends on the frequency used and application involved. Low-frequency ground radars are used by air researchers, for tracking balloons carrying recording instruments. Mattress type antenna with reflectors, is used for the purpose. Ultra high frequency parabolic reflectors are universally employed for any sort of work. The reflectors in this case are shaped as rotational paraboloid, or cylindrical paraboloids. The shape of reflectors affect the pattern of the target on the C.R. screen.

The directional gain of radar antenna depends upon the physical size of antenna measured in wave length. It is important to see that the directive patterns of antenna is free from minor stray lobes of significant amplitude, especially in the horizontal plane. Otherwise radar will detect, odd fictitious objects leading to utter pandemonium, for the operator.

Antenna-scanning is effected by actually moving it in one or more planes at a slow speed. The rotation can be effected in vertical or horizontal plane or simultaneously in both the planes, depending upon the type of sweep required in the application. The long-range gun-aiming radars employ spiral scanning. The radars at air port employ rota-

tional scanning. The locus of the tip of the antenna is illustrated in figure 5.

Complex arrangements are involved in both vertical and horizontal feed of the antenna and it is essential that the separation between adjacent sweep of beam should not exceed half the width of the beam. Otherwise some directions in space will not be ranged. By visualising physically perhaps we could understand better. But resorting to lobe-switching, great degree of accuracy can be attained in finding the angular direction of the target.

Yet another important element in a radar system is the duplexor. This brings in operational economy. This furnishes the advantage of employing a single antenna to be used for transmitting as well as for reception. Duplexor, fundamentally reduces to fast acting radiofrequency switch commercially known as TR-ATR which gets power from transmitted pulses. The function of duplexor is to shield the delicate radar receiver from the damaging effects of the transmitting system.

Radar receiver: Functionally it is an ultra high frequency or microwave superheterodyne receiver with intermediate frequency and video band width sufficiently adequate to reproduce the radar pulse. The intermediate frequency employed is 30 and 60 megacycles as against a 445 Kc/s in the domestic radio receiver sets. The noise figure should be minimised to increase the sensitivity so as to detect the weakest signal. The L. bandwidth gives lowest noise figure when employing a grounded grid triode radio frequency. Automatic frequency controls are used. In microwave receiver the intermediate frequency is a very small percentage of transmitted frequency and hence in order that the difference should lie within the pass band of the intermediate frequency amplifier an automatic frequency control circuit is employed as in figure 3.

Indicator Screens of Radar: Screens show the position of targets in a visual pattern. The output of the receiver is fed to a special type cathode ray tube which gives the visual representations of the nature of the target. The electron beam traces patterns on the coated screen. The presentations are either deflection-modulated or intensity-modulated, depending upon whether target is characterised by deflection of the amplitude or the intensity of shades on the screen.

Deflection Modulation. This is a common form of deflection of the type A. The horizontal deflection is obtained on the screen, with a linearised saw tooth wave synchronized with transmitted pulse and vertical deflection is obtained by receiver output. D.C. restoration is employed in the receiver so that deflection is unidirectional from base upwards. This is illustrated in fig. 4.

Intensity Modulation: In this case, the saw tooth wave deflects the electron beam radially from centre to periphery, synchronised with the transmitted pulse so that distance from the centre is proportional to the range. The angular sweep of the saw tooth wave corresponds to angular sweep of antenna. Signals from receiver output are applied to the control electrode of cathode ray tube after D.C. restoration. The bias on the control is driven slightly greater than cut off. The significant amplitude gives a bright spot and spot is characterised by the polar coordinates of the target. The radial magnetic deflection system is synchronised with antenna sweep.

Automatic Tracking: When antenna is arranged to track a singular object, we call it automatic tracking. In practice this is attained by employing conical sweep of antenna. Both range and elevation are obtained.

Moving target indicator: The permanent echoes stage a problem, in locating moving

Screens
a visual pat-
ter is fed to
which gives
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sweep of an-
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cathode ray
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the permanent
moving

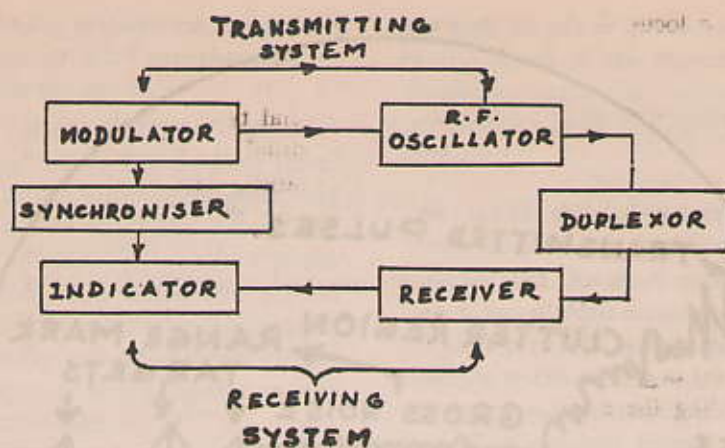


FIG. 1

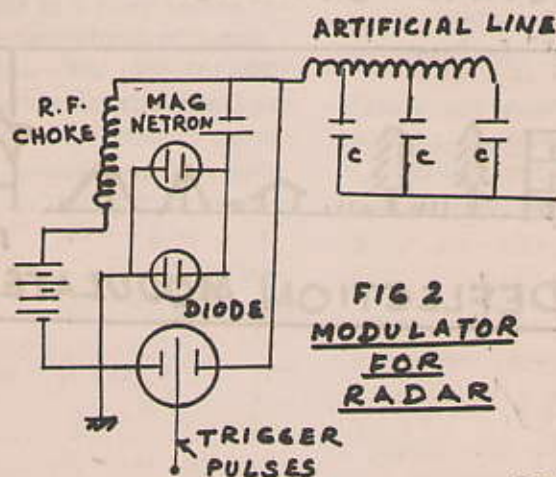


**FIG 2
MODULATOR
FOR
RADAR**

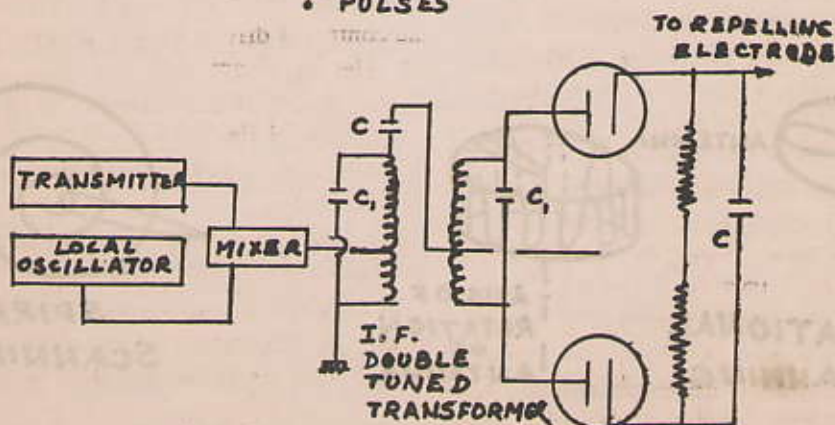


**FIG.3
CIRCUIT FOR AUTOMATIC FREQUENCY CONTROL**

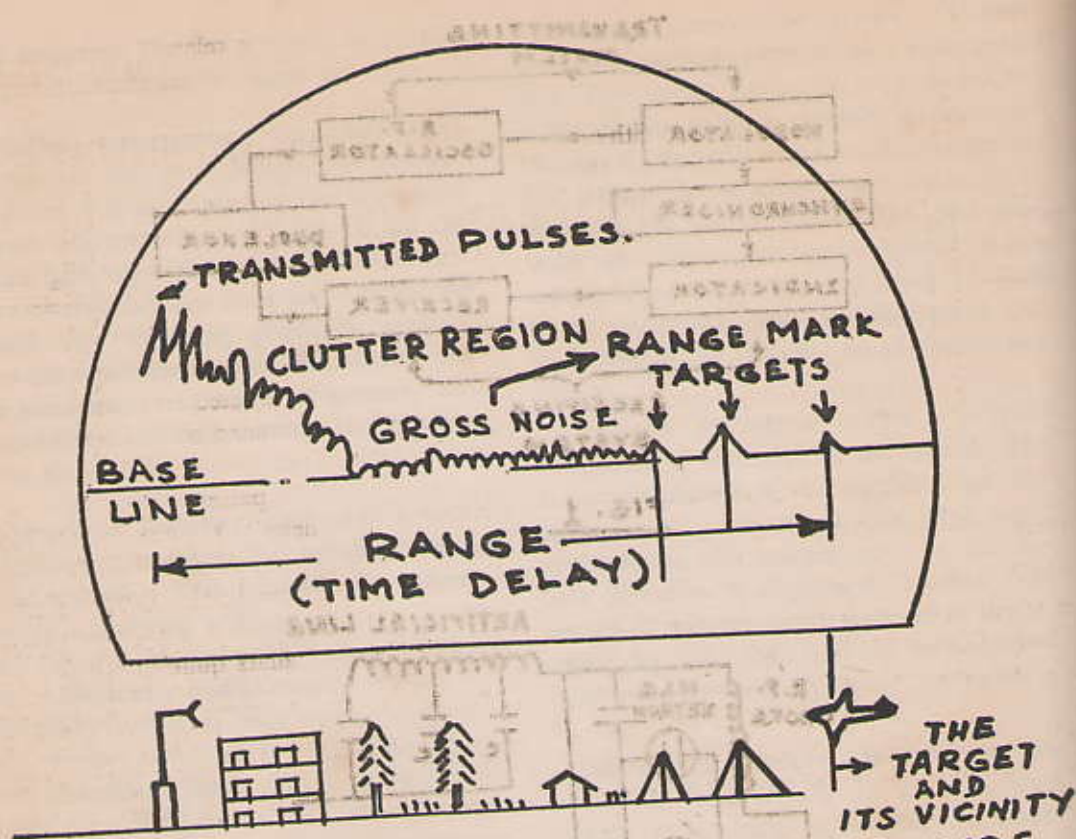


FIG. 4 DEFLECTION MODULATED TYPE



FIG. 5. SCANNING.

target. The moving object has range and bearing such that its echo superimposes on ground-clutter on the screen.

The "Doppler's effect" associated with moving target comes handy for tracking them. For the fixed target, the transmitted and echoed pulses are in the same phase. But for the moving targets, there exists a phase difference between transmitted and echoed pulses. This provides means for distinguishing between moving and fixed target on the screen. The frequency change in this case is given by the expression—

$$\Delta f = \frac{1}{2\pi} \frac{\Delta d}{\Delta t} = \frac{2v_r}{\lambda}$$

where V_r radial velocity of target.

MTI (Moving target indicator) system is resorted, to eliminate the permanent echoes. It uses Doppler's effect. The phase of the echo signal existing in the intermediate frequency amplifier system of a standard radar receiver is compared in a phase detector with the phase of a reference oscillator so opera-

ted that its phase is related in definite way to the phase of the transmitted pulse. The permanent echoes are suppressed, since the permanent echoes will not cause any phase difference.

Radar is still on the research tables of States and Russia and is becoming more sophisticated. As more and more devices to fool a radar have come up it is imperative to develop radars against such elements. For example a dummy ejected from the bomber, with its well-streamlined body gives the illusion of an outsized bomber to the operator and so the bomber passes almost unnoticed right above the head of the operating tower! Yet another device which is the so called antiradar smoke recently developed in States, absorbs the radar pulses and thus renders the conventional radars quite obsolete.

More and more complex radar systems are being developed by advanced countries. It is perhaps quite true that "No one can go to sleep in this scientific era".

ઓફિસના ક્લાર્કનું જીવન-કવન

બેરાજવાલા અશોક કે. એસ. ઈ. (ઈલેક્ટ્રીકલ)

ઈશ્વરના 'દુઃખબોન્ડ'ના 'ફો' માં પ્રથમ ઈનામ મેળવનાર માનવી તે હું જ—ઓફિસનો ક્લાર્ક... બ્રહ્માને પોતાની શક્તિનું પરિણામ દાખવવા રક્મડું ઘડવાનું મન થયું અને ઘડાયો. ઓફિસનો ક્લાર્ક! અહર્નિશ હું વેદનાની વેણ વડે સૂરીલું કહો કે ગમગીન કહો—સંગીત છેડું છું—જે કોઈ જ સાંભળતું નથી—અને કદાચ એટલે જ હું મારી પાસે આવતી ફરિયાદો સાંભળતો નથી!

સામાન્ય ક્લાર્ક એવા મારો જન્મ પણ તદ્દન સામાન્ય સંજોગોમાં થયો હતો. કેટલા વર્ષો પૂર્વે થયો એ યાદ હોત તો તો આજે હું ક્લાર્ક જ શા માટે થયો હોત? હા, શૈશવનાં મારા સંબંધો આજે પણ જુદા જુદા ક્ષેત્રમાં એ જ રીતે હયાતી ધરાવે છે, બાળપણમાં ભણતર મને—ભૂલ્યો, ભણતરને મારી સાથે બારમો ચંદ્રમા હતો; આજે એ ભણતરના સ્વામી ગણાતા ઉપરી સાથે મારે બારમો છે, વિદ્યાર્થી તરીકે શાળામાં છેલ્લી પાટલી જ બેસવું પડતું અને આજે પણ ઓફિસના છેવાડે ભાંગલી તૂટલી ખુરશી પર સત્તા ભોગવું છું! ત્યારે ભણતર અને શિક્ષણપદ્ધતિ અંગે મારો ઉગ્ર વિરોધ હતો અને આજે ઓફિસના ચપાસાશીથી માંડીને બધાને જ મારા વિષે ઉગ્ર વિરોધ છે, 'ઢ' વિદ્યાર્થી તરીકે એ વખતે પરીક્ષામાં પસાર થવા મેલી રીતો અજમાવવી, પડતી તો આજે ઓફિસમાં સ્થાયી રહેવા ચોપડાઓમાં પેલી રીતો અજમાવવી પડે છે. આ બધું જોતાં કહી શકાય કે મારું બાળપણ મારા ભાવિ જીવનનું 'ગ્રાન્ડ રીહર્સલ' જ હતું કેવળ પાત્રો અને ક્ષેત્રો જ જુદાં હતાં.

આમ ને આમ હું એક દિવસ વિદ્યાપીઠનો કળામાં સ્નાતક બની બેઠો. (કઈ 'કળા' એ પૂછ્યો જ નહિ!) પણ જ્યારે જાણ્યું કે છાપખાનામાંના છાપાની જેમ બહાર પડતા આ સ્નાતકોની કિંમત તો તેમણે એકાદ વર્ષમાં ખરીદેલી પુસ્તકોની કિંમત જેટલી પણ નથી ત્યારે મારી આશાઓ પંગુ બની ગઈ—પેલી પાકિસ્તાની 'પેટન ટેન્કો' ની જેમ જ, સારી નોકરી દ્વારા જીવનનું નવું દ્વાર ખોલવાના સેવેલ સ્વપ્નો એ તો સરી જવું જ પસંદ કર્યું. મત મેળવવા નીકળેલ નેતાની પ્રેરણામૂર્તિ નજર સમક્ષ રાખી હું નોકરી માટે ઠેર ઠેર ભટક્યો અને આખરે નોકરી પણ મળી! હા, કદાચ ત્યારે આવેલ આનંદના ઊભરામાં જ મારા જીવનની મીઠાશ વહી ગઈ હશે—તે સદાકાળ માટેના ઊકાળાને છોડીને! આશાને હિંમતે ચડેલું મારું ઘેલું મન ત્યારે ક્યાં સમજતું હતું કે એ નોકરી તો જીવનના ચુંટણીનંગમાં ડીપોઝીટ ન ગુમાવાય એટલા મત મેળવ્યા જેવી—માત્ર ક્લાર્કની નોકરી હતી!

અને હું ક્લાર્ક કહેવાયો ... લખું છું એટલી સરળતાથી જ કહેવાયો હોઈશ એમ રખે માનતા. એ માટે તો મારે અતિકઠિન એવી દીક્ષા લેવી પડી. ક્લાર્ક બનનાર દરેકને માટે એ ફરજિયાત જ છે. વળી આ દીક્ષાના સિદ્ધાંતો કોઈ Cease-fire Agreement ની શરતો નથી કે ફાવે તેમ ભંગ કરી શકાય. 'ક્લાર્ક' નામના દરેક પ્રાણીને અસ્તિત્વ ટકાવી રાખવા આ ઉચ્ચ સિદ્ધાંતોનું અક્ષરચા પાલન કરવું પડે છે. જાણવા આનુર છો ત્યારે તો મારે મારા 'ક્લાર્ક' વડવાઓના વર્ષોના સંશોધનના ફજ-સ્વરૂપ એ સિદ્ધાંતો તમને કહી જ દેવા પડશે.



Sri D. K. Chawla
First Class Honours
in B.E. (Mech.)
[now our Staff Member]

**KULAPATI'S
GOLD MEDAL
WINNERS
-1965-66**



Miss M. B. Gandhi
(First Class in F.E.)



Sri Rajan Gadkari
Winner of Elocution Competition



Sri K. K. Katkar
Gen. Secretary



Sri Pravin Popat
Joint Secretary



2nd Lt. M. H. Kalra



Sr. U/o. G. V. Mishra

(૧) પરમપ્રાપ્તિ માટે ઓફિસના સમયના મોટા ભાગમાં આ ફાની દુનિયાથી મનને દૂર લઈ જઈ ધ્યાન-મગ્ન બની જવું — એટલે કે... ઊંઘવું...

(૨) નાનામાં નાની વસ્તુ ઉપર વધુમાં વધુ વિચારનાર જ કંઈક નવું શોધી અમર બની જાય છે માટે મારે નાનામાં નાના કામમાં વધારેમાં વધારે સમય પસાર કરવો.....

(૩) સહનશીલતાને શીખરે પહોંચીને જ ઈશુ ને મહાવીર જેવાઓ ભગવાન બની શક્યા; માટે મારે અત્યંત સહનશીલ બની ઉપરી અમલદાર અને બીજાઓની રોકટોક ધોળીને પી જવી..... વગેરે... વગેરે.....

શરૂઆતમાં ઓફિસમાં મારું માન અને મોભો જળવાતાં, કારણ કે હું ‘સર્વગુણસંપન્ન’ ક્લાર્ક નહોતો બન્યો. ધીમે ધીમે મારામાં દીક્ષાના સિદ્ધાંતોની દટતા વધતી ગઈ તે સાથે જ મારા માટેનાં લોકોનો આદર ઘટતો ગયો — છે ને વ્યસ્ત પ્રમાણ! હવે તો એવો રીકો થઈ ગયો છું કે દિવસમાં નહિ - નહિ તો પાંચ - છ વાર કોઈ ન ધમકાવે તો ખાવાનું પચતું નથી. જેમ બરફ શીતળતા છેડવા કરતાં પાણી બની જવું પસંદ કરે છે તેમ હું સિદ્ધાંતભંગ કરતાં નોકરી છેડવી પસંદ કરું છું — માટે જ તો ઓફિસો બદલવાનો વિક્રમ ધરાવું છું ને!

વિદ્યાર્થી અવસ્થામાં કમનસીબે મારા હસ્તાક્ષર સારા હતા. એથી જ મને ક્લાર્ક બનતાં ખૂબ જ મુશ્કેલી પડી. તમને ખબર ન હોય તો કહી દઉં, ખરાબ અક્ષર એ માત્ર ડોક્ટરોનો જ ઈજારો નથી — અમ ક્લાર્ક બંધુઓનો ઉત્તમોત્તમ ગુણ છે! સાંભળ્યું છે કે ઉચ્ચ ધાર્મિક ગ્રંથોના હરેક શબ્દ સાથે અનેક અર્થ સંકળાયેલા હોય છે. એવા જ કોઈ ધર્મોપદેશકની અદાથી હું મારા લખાણના અનેક અર્થ કરી, થયેલી ભૂલનો ભોગ બનતાં ઘણી વખત છટકી જાઉં છું — કેવળ ખરાબ હસ્તાક્ષરને આધારે જ.

છતાંય એમ નહિ માની લેતા કે હું બિલકુલ કામ જ કરતો નથી. બંધ પડેલ ઘડિયાળ પણ દિવસમાં બે વખત તો સાચો સમય બતાવે જ છે તેમ હું પણ ક્વચિત્ કામ તો કરું જ છું. દરરોજ સમય કરતાં મોડો છતાં બીજાઓથી એટલે કે ઉપરીથી વહેલો ઓફિસે પહોંચી જાઉં છું. આવતાવિંત કામ શરૂ કરું તો તો મારા

નામને બટ્ટો જ લાગે ને? આમ તેમ આંટા મારવામાં જ ખાસો દોઢેક કલાક જતો રહે છે. પછી તો આગલા દિવસે કરેલ કાર્યને ફરીથી જોઈ જવાના ને બીજાએ કરેલ કાર્યની ઝાંખી કરવાના માનસિક શ્રમથી જ મને તો ભૂખ લાગી જાય છે. સરકાર અનાજ પર ‘કન્ટ્રોલ’ મૂકે તેથી ભૂખ પર થોડો ‘કન્ટ્રોલ’ આવી જાય છે! પાંચવર્ષીય યોજનાના લક્ષ્યાંકો જેવા મીઠા ભોજનની રાહ જોતો બેસું છું... અને ત્યાં તો... એ જીનની માફક ધસમસતો ડબાવાળો ‘Expired date’ ની દવા જેવા ખાણ સાથે હાજર થાય છે. પેલું ૩૦૩ ની ડમ્મી રાયફલ જેવું બેરું પણ શું કરે? ટૂંકા પગાર અને રેશનીંગના અનાજમાંથી સુમધુર ખાણ તે ક્યાંથી સંભવે?

ખાધા પછી સદાકાળ વફાદાર એવી એક માત્ર બહેનપણી — ઊંઘને શી રીતે વિસરાય! સવારના તો વહેલો ઊઠું છું — ઊઠવું પડે છે — કારણ કે મોંઘેરા મહેમાન જેવો સુધરાઈનો નળ, રાજદ્વારી પુરુષોની જેમ થોડા સમયની જ મુલાકાત આપે છે. તેથી જ મારે દીક્ષાના સિદ્ધાંતને અનુસરી, ઊંઘનું ખાતું સરભર કરવા ઓફિસમાં ઊંઘવું પડે છે.

ઊંઘમાં હું સ્વપ્નો પલ્લ સેવું છું. ના, ઉજળવળ ભાવિના રમ્ય સ્વપ્નોમાં રાચી તેને સાકાર કરવાનો હક્ક મને ક્યાંથી જ હોય? હું કોઈ પ્રધાન કે પ્રધાનનો સ્વજન પણ નથી કે મારું ભાવિ ભવ્ય હોય! સાચું કહું, મારું સુંદર સ્વપ્ન કેવું હોય છે? “હું ગાડીના ત્રીજા વર્ગમાં મુસાફરી કરી રહ્યો છું. ગાડીમાં માણસો ઊભરાઈ રહ્યા છે — વાંદાની સ્મશાનયાત્રામાં કીડીઓ ઊભરાય એમ જ. હરકોઈને શ્વાસ લેવા પણ વલખાં મારવાં પડે છે. પેલો સામ્યવાદી પંખો બધાને હવાની સરખે ભાગે વહેંચણી કરવાનો પાંગળો પ્રયાસ કરી રહ્યો છે. અને હું.... હું કોઈ પૂર્વભવના પુણ્યપ્રતાપે સીટ પર બેસી, ઘડીભર આ બધું નીહાળી, ઝાકાં ખાવામાં જ ગોરવ અનુભવું છું.” તમે કદાચ નહિ સમજી શકો કે ઊંઘમાં સ્વપ્ન અને સ્વપ્નમાં પણ ઊંઘ જ — ફક્ત ઊંઘ. હા, એ ક્લાર્ક જેવા કેટલાક કમભાગી પ્રાણીઓને અપાયેલી ઈશ્વરી બક્ષીસ છે. તેમણે આ સંસારના દુઃખ ન સહેવાતાં માત્ર આંખો જ મીંચવાની હોય છે — કારણ ઈશ્વર અને આ દુનિયાના માનવી એ પ્રાણીનાં સુખ કે સગવડ માટે પોતાની આંખો સદા મીંચીલી જ

રાખે છે, બાકી તો મને દર્દીવાંજી સ્વપ્નો ઘેરી વળે છે — તીર્થધામમાંના બાવાઓની જેમ. “ચીથરેલાલ કપડાવાળાં મારાં ભૂલકાઓની તસ્વીર હું બંધ આંખે જોઉં છું. તેમના ભણતરનું માંડ માંડ પૂરું કરતો હું તેમના રમતગમતના સાંધનો તો ઠીક-પૂરું ખાવાનું પણ આપી શકતો નથી. મારી ગરીબાઈ કે મારું દુઃખ દૂર કરવાની મારામાં કોઈ તાકાત નથી — કારણ હું એક ‘ઓફિસનો ક્લાર્ક’ છું. જવા દો એ વાત, દુઃખની કથની કોઈને ગમતી નથી ને વળી આજે સાચો સુખી પણ કોણ છે!

આમ ને આમ ચાં પીવાનો સમય થઈ જાય છે. પેલો ચાવાળો મારી તબીયતનું કેટલું ધ્યાન રાખે છે! એક કપ ચાના પૈસા લઈ, ખાસો અડધો કપ જ ચા આપે છે! એ ચાની વરાળ સાથે હંથા વરાળને ઊડાવી મૂકવા પ્રયત્ન કરતો હું કાર્યમાં રત હોવાનો ઊંઘ ચાલુ રાખું છું.

તમને થશે કે મારા જેવા અરિસકને વળી મિત્રો હશે કે નહિ? કદાચ વધારે પડતા સહૃદયી એવા એ છે — મારી ખુરશીમાંના માંકડ ઉપરી આંટો મારે એ પહેલાં એ મને સ્વપ્નોની દુનિયામાંથી જગાડે છે. એ ઉપકાર બદલ હું તેમને મારું બોહી આપું છું. કદાચ એટલે જ ઘરાકોને ધક્કા ખવડાવી, તેમનું બોહી પી, એ ખોટ પૂરી કરું છું. વધુ ખુશ થાઉં તો મારા એ મિત્રોને કપડામાં છૂપાવી ઘરે પણ લઈ જાઉં છું. મારી આ કૃતજ્ઞતા અને દર્દીવી એવી મારી દુનિયા જ્યાં પછી તેઓ સદા મારી પર રહેમ નજર રાખે છે — ભલે માનવીઓ ન રાખી શકતા હોય!

ઉપરી આવે છે, કરડી નજરે જોઈ, મને કોઈ ભૂલ માટે ધમકાવી ચાલ્યો જાય છે.... ટાયપીસ્ટ તરફ વર્ષોના મંથન પછીય મને એ સત્ય સમજતું નથી કે મારી પાસે લશ્કરનો કમાન્ડર બની આવતો ઉપરી પેલી બેડી ટાયપીસ્ટ પાસે કેટલો નમ્ર અને પ્રેમદિલ બની જાય છે! કદાચ ક્લાર્કને ઘણી વખતે બ્રહ્માના હાથમાં સોટી હશે ને બેડી ટાયપીસ્ટ વખતે પીંછી!

‘મહાદેવની ચોલ પોકિયો જાણે અને ઉપરીની ચોલ ક્લાર્ક જાણે’ એ ન્યાયે ઉપરીને ફેડનાર મારી પાસે નહોવા મૂલ્યે ચાવીનું કામ કરાવી જાય છે. એમને

માટે હું ખૂબ જ કાર્યસાધક બની રહું છું. છતાં જેમ ‘કચેરીમાંથી કાજુનો નથી હિસાબ કોરીનો’ તેમ ‘ઓફિસમાંથી ક્લાર્કનો નથી હિસાબ કોરીનો’ જેવી જ મારી પરિસ્થિતિ છે, પાર્કિન્સનના નિયમ મુજબ: “The time taken to finish an office matter is directly proportional to the No. of clerks working in the office.” આ સત્ય અમારા જીવનમાં કેટલે અંશે ખરું છે એ તો તમે સૌ જાણતા જ હશો. જે કહો તે, હું તો જેવો છું તેવો જ રહેવા માંગું છું.

વળી મારા બધા ઉપરી કાંઈ એટલા નિષ્કુર પણ નથી હોતા. કોઈક વખતે તેમનું પથ્થર દિલ મીણનું બની જાય છે. ધબકતું એ મીણનું હૃદય સાચી સ્થિતિના ખ્યાલની ઉષ્માએ પીગળી જાય છે. ત્યારે તેઓ મને પ્રેમપૂર્વક સમજાવે પણ છે. કોઈએ ગાયું છે:

‘દર્દીના દર્દની પીડા તો વિધિનેય દીસે છે ખરી, તો પછી દર્દ કાં દે છે ને ઔષધ કાં પછી?’ નાજુક પળોમાં હું મનમાં ગાઈ લઉં છું:

‘ક્લાર્કના હાર્ટની પીડા તો; ઉપરીનેય દીસે છે ખરી, તો પછી ઠપકો કાં દે છે; ને દિવાસો કાં પછી?’

બસ આમ ને આમ મારા કામના ક્લાર્ક પૂરા થઈ જાય છે. શરીરમાં અત્યંત થાક અને હાથમાં નકામા કાગળોની ભેગ સાથે, હું ધીમે પગલે અંજવાના જળ જેવી પગાર-વધારા અને ભોનસની આશામાં, મ્યુનિ-સિપાલિટી રચિત ડુંગરો અને ખીણો ઓળંગી સ્ટેશને પહોંચું છું. પૂર ઝડપે જતી ગાડીમાં બેસી જાણે જીવનની ઝડપ સાથે હરિફાઈમાં ઊતરું છું. મારું સ્ટેશન આવે છે. બીજા અનેકોની સાથે હું પણ ગાડીમાંથી નીચે ઊતરું છું — ધકેલાઈ જાઉં છું — ટયુબમાંથી પેસ્ટ ધકેલાય તેમ જ. મારા જીવનના પ્રતિબિંબ જેવી અંધારી રાતે ઘરે પહોંચું છું. મોડા પહોંચવામાં એક ફાયદો પણ છે: સ્વપ્નોની દુનિયામાં ખાવાયેલા મારા બાળકો મારી પાસે એક પણ વધારાની માગણી નથી મૂકી શકતા!

આ છે મારું જીવન-કવન કે વન! કાળના ચક્કરમાં ફસાયેલા મારે આમ કયાં સુધી રહેવું પડશે એ જાણવા તો ઈશ્વરી ઓફિસનો ક્લાર્ક તો કોણ જાણે કેટલાય ધક્કા ખવડાવશે!



ચાલો, કાંઈક લખીએ....

શિવકુમાર કે. જોષી બી. ઈ. (સિવિલ)

ચાલો, કાંઈક લખીએ. ના, પહેલાં તો કોઈકનું વાંચીએ. વાંચીને પછી લખીએ. ત્યારે કંઈ એમ ને એમ—હાસતો, વળી, થોડું જ લખાય છે! કોઈનું વાંચીએ, તો વળી થોડા વિચારો મળે, થોડા આપણા ઉમેરીએ. એ વિચારોથી પણ સારા વિચારોમાં, એ જ વસ્તુનું, આપણે નિરૂપણ કરી શકીએ છીએ એ બતાવી આપવામાં તો ખરી કુશળતા છે. બાકી, મૌલિક કૃતિ? છટ, એ તો માત્ર બહાશ જ! ‘હું કરું, હું કરું; એ જ અજ્ઞાનતા શકતો ભાર જેમ શ્વાન તાણે’; એવું જ આ. ભઈ, આપણે તો માનીએ છીએ કે વાંચો ને વિચારો વિચારોને (બની શકે તો) હજી સુધારો, અને પછી લખો (માત્ર શબ્દો જ તમારા ‘ફોર્મ’ ભલે એ જ રહ્યું.)

હાં, તો લખશું, શું,? લ્યો, આ વળી, ઘરણ ટાણે સાપ કાઢ્યો. ‘એમાં ને વળી શું વિચારવું ‘તું, હે’, લખી નાખવાનું કંઈક વાર્તા જેવું; મહાનિબંધ કે મહાકાવ્ય જેવું; કે પછી નાટક, ચેટક કે તમારા જેવું, હા, પણ બધાને ‘ઇન્ટરેસ્ટ’ પડે તેવું; હો! ‘કાંકે કંઈ મેટર’ પણ લાગવી જોઈએ, નહીંતર થઈ રહી તમારી કિમત!

તો એમ કરીએ, આ વાચરો વાચો છે ને, — આજ-કાલ આપણા જવાનોની શૌર્યગાથાઓની કથાઓ રચવાનો, તો આપણે પણ એવું કંઈક જોડી કાઢ્યું એટલે પત્યું! પણ જવાન કરતાં કોઈ પાયલટની વાર્તામાં સારી રોનક અને ચમક લાવી શકાય. હા, તો પહેલા દૃશ્યમાં, આપણા હીરો (નામ રાખીએ, ફ્લાઈંગ ઓફીસર દત્ત) તેમની પ્રિયતમા સાથે પોતાના શયનગૃહમાં આનંદ-પ્રમોદમાં મથગુલ હોય અને ભાવિનાં સોનેરી સોણલાંમાં ખાવાયેલાં હોય એવું બતાવવાનું, બીજા દૃશ્યમાં ફરજ પર હાજર થવાનો હુકમ મળતાં ફ્લાઈંગ ઓફીસર દત્ત અને તેની પત્નીનો કરુણ વિયોગ; અને પછી અંતિમ

દૃશ્ય લગાઈનું! લગાઈમાં ‘હીરો’ અજબ કૌશલ્ય દાખવે અને પાંચ પેટન ટેન્ક અને બે સેબર જેટ વિમાનો (હજી ઓછાં લાગે છે? કંઈ વાંધો નહીં આપણે પણ પાકિસ્તાનથી કાચા નથી, પાંચ નહીં તો પરચીસ ટેન્ક અને બે નહીં તો બાર સેબર જેટનો) ખુરદો બોલાવી દુશ્મની વિમાન વિરોધી તોપના ભોગ બની માભોમને ખાતર શહીદ બને છે એવું બતાવવાનું એટલે વાર્તા તૈયાર પછી ભારત સરકાર એ વીરને પરમચક્ર એનાયત કરે છે એવું બતાવવામાંય કંઈ ખોટું નથી પાકિસ્તાને પણ તેમની સબમરીન ‘ગાઝી’ ના કમાન્ડરને, ‘ભારતની ફ્રીગેટ ડુબાડવા માટે’ ક્યાં નથી નવાજ્યા? તો આપણી સરકાર કેમ મી. દત્તને ન નવાજે! અને ક્યાં આપણી સરકારને સાથે જ સુવર્ણચંદ્રક આપવો પડવાનો છે. પછી તો મીસીસ દત્તને મળેલો એ મુન્યોત્તર સુવર્ણચંદ્રક, તેઓ ‘ગોલ્ડ બોન્ડ’ માં જ જમા કરાવે ને! એટલે વળી લોકોમાં દેશ માટે ફના થવાની જગૃતિ આવશે. આવી વીરગાથાને ભારત સરકારે સત્ય ઘટના તરીકે પ્રસિદ્ધ કરાવી દેવી જોઈએ. જેથી લોકોમાં દેશદાઝની નદીઓ વહેશે. (અમે એ વાર્તા માટે રોયલ્ટી નહીં માંગીએ, ગભરાશો નહીં!)

પણ, લગાઈ ઉપરથી તો વળી, અંધારપટ દર-મ્યાન મુંબઈએ જે નવી રોશની જોઈ તેનું વર્ણન કરવાનું મન થઈ જાય છે. આહ! કેટલો સુંદર લાગતો! તો એ મરીનડ્રાઈવનો સમુદ્રકંઠો! એ રૂપેરી ચાંદની! કોણ જાણે ફરી ક્યારે જોવા મળશે? લ્યો, આ મરીનડ્રાઈવ અને ‘બ્લેક આઉટ ઈન બોમ્બે’ ઉપરથી વળી અમને કંઈક બીજું જ સૂઝે છે.

એમ કહીએ તો? — ‘આઉટ, ઈન બ્લેક બોમ્બે’, ઉપર એક સુંદર જસૂસ કથા લખી શકાય! નામ પણ જરા નવું લાગે અને સાથે ‘મોડર્ન’ પણ ખરું સ્તો! હાં, તો આઉટ એટલે બહાર-ઘરની બહાર. ક્યારે? અરે,

રાત્રે જ હોય ને! જસૂસ કથાનો પ્લોટ તો રાતના ‘સીન’ માં જ શોભે ને! એટલે નામ રાખવું — ‘આઉટ, ઈન બ્લેક બોમ્બે’. બોમ્બે જ્યારે બ્લેક હોય ત્યારે બ્લેક બોમ્બે! કાળી, બિહામણી, અપાઠી અંધારી રાત; ને ઝરમર ઝરમર મેહૂલો વરસતો હોય — એવી શરૂઆત ત્યારે, મરીનડ્રાઈવ પરનાં કોઈ ‘કુંજ વિલાસમાં’ થેઠ કુંજવિલાસીનું ખૂન થાય... અને પછી તો ભાઈ, એમાં જનું વિચારવાનું હોય! ‘શોરલોક હોમ્સ’ કે ‘જેમ્સ બોન્ડ’ ની સુધરેલી આવૃત્તિ (પુનરાવૃત્તિ ન કહેવાય, હોં)! આ આપણા હિન્દી ‘બોન્ડ’ ને એ ખૂન કેસ સોંપાય અને સ્ત્રીદાક્ષણ્યમાં પ્રવીણ એવા આ ‘બોન્ડ’ સીગરેટનાં ધૂમ્રવતુળા અને રમણીઓની રેશમી અલ-કાઓમાં અટવાયેલા હોવા છતાં અંતે તો ડાકુઓનો સામનો કરીને ખૂનીને શોધી આપે. તે વચમાં જોઈએ તેટલા રોમાન્સ, શૃંગાર, ભય, રહસ્ય કે હાસ્યનાં રસ વહેવડાવી દેવાનાં આપણા રસ માત્ર અનુસરણ — અનુકરણ નહીં જ તો!

આવું તો ઘણાં લખી આપે! પણ અમારે ઘાવું છે મહાન વિવેચક એટલે કંઈક પોલીટિક્સ કે ઇકોનોમીક્સનું ભરડવું પડે ને! આ જુઓ ને! થોડા સમય પહેલાં જ પેલા ‘ઈન્ટરનેશનલ મોનીટરી ફંડ’ અને વિશ્વ બેન્કના પ્રતિનિધિઓ ભારતની મુલાકાતે આવ્યા હતા ને? તમે શું ધારો છો? શું સલાહ આપી હશે તેમણે — આપણા પ્લાનિંગ કમીશનને? અમે પણ, એમ કંઈ બોલ્યા નથી! આ લ્યો; ભારતમાં મોંઘવારી વધશે. અન્ન પરિસ્થિતિ વણસી જશે. બેકારી રાત્રે ન વધે તેટલી દિવસે, ને દિવસે ન વધે તેટલી રાત્રે વધશે. ભારતને લોનો ભરવા માટે (અને એ નહીં તો કમસે કમ વ્યાજ ભરવા નવી લોનો લેવી પડશે. તેથી કર બોજી વધશે. શેરબજારો સૂકાઈ જશે, વાયદા બજાર મંદ પડશે અને સટ્ટા બજાર ભાંગી પડશે. હા! એક બજારનું જોર વધશે. તેને કહે છે કાળા બજાર! (સારું છે કે શાસ્ત્રીજીએ વહેલી ચૂંટણી થવાની શક્યતા નકારી દીધી હતી; નહીં તો પ્રધાન થવાની ‘ટિકીટ’ નાં પણ ‘કાળા બજાર’ કદાચ જોવા મળત!) આવું તો લખ્યું ખૂટે એમ નથી.

પણ, આવું તો બધું ચવાયેલા ચણા જેવું લાગે છે નહીં? એમાં ઇન્ટરેસ્ટ જેવું ક્યાં છે? ભઈ, આજે તો બધાને તમારો જ જોઈએ છે — જરા ચસકાદાર,

રસદાર! અને સાચું જ છે તો! તમારાને તે વળીતેડું શાનું! એટલે અમને વળી એમ થાય છે કે લખવું તો આ પોલીટિક્સ પર જ, એટલે કે પ્રધાનજીના તમા-શાઓ જ! આમેય જુઓ ને આ પંજાબી ફેરો પછી તો બિહારી બીજુ પટ્ટનાયક અને એવા કંઈકના ભાંડ ફૂટી ગયા છે. કો’કના આપણે ‘ફોડી નાખવાના’. કોઈના પેટનું પાણી હલે એમ નથી સમજ્યા ને! ‘તું બકતા હય, હમ સુનતે હૈ’, એવું. કોઈને પડી નથી. ‘બ્લીટ્ઝ’ ની જેમ બદનક્ષીનો કેસ થાય તો ગભરાશો નહીં દંડ ભરતાં પહેલાં તમારા લખાણથી થયેલી કમાણી અનેકગણી હશે. અને આપણે તો પ્રખ્યાત જ થવું છે, પછી શું ચિંતા? એમ તો હજી ચટકાદાર વિષય છે હોં! પેલા પ્રોફ્યુમો કીલર પ્રકરણની જેમ કોઈક પ્રધાનજીને “Prostitution & Politics” ના મથાળા નીચે ચમકાવી દેવાય. પછી જોઈ લ્યો મજા! દરોડો જ પડે, નકલો માટે! ભવિષ્યની ચિંતા કરવી જ નહી, કારણ કે આપણે તો પ્રખ્યાત જ થવું છે ને! પછી ભલે ઘોડે ચઢી કે ગધેડે બેસી, કે પછી પ્રમુખ જહોનસનની જેમ કંઈ ન મળ્યું તો કરાંચીના બશીરમીયાંની ઊંટ સવારી કરીને પણ પ્રખ્યાત તો થવું જ! ધનભાગ બીચારા બશીર-મીયાંના કે જે વ્હાઈટ હાઉસમાં જવાનું શાસ્ત્રીજીને મળેલું આમંત્રણ પાછું ખેંચી લેવાયું હતું ત્યાં ખુદ પ્રમુખ જહોનસને જ એ મીયાંજીને આવવા સ્વમુખે આમંત્રણ આપ્યું હતું. એટલે આપણે કોઈ ‘ઊંટસવારી’ નહીં તો ‘પેટન ટેન્ક પર સવારી’; પર કોઈ મહાનિબંધ લખી દિલ્હીના રાજભવનમાં જવાનું આમંત્રણ તો મેળવી જ શકશું એવું અમે ધારીએ છીએ.

આ તમે દિલ્હીની વાત યાદ કરી ને, તો અમને વળી નવું જ સૂઝે છે! કેમ કંટાળી ગયા? ના, આ જરા નવું છે! વાત એમ છે ને કે આ રાષ્ટ્રીય મુશાયરો દર વર્ષે દિલ્હીમાં ભરાય છે ને? તે અમને ય થાય છે કે અમે પણ કવિતા લઈને દિલ્હી પહોંચી જઈએ; રાષ્ટ્રીય! કવિ! આહ! કેવું સરસ! તો આ વાર્તા કે નિબંધ લખવા કરતાં કોઈક કાવ્યની પંક્તિઓ ઘડી કાઢી હોય તો! અને હા, અમે માત્ર દેશ-દાઝ અને શૌર્યગાથાઓ પર જ કાવ્ય રચીશું, એટલે રાષ્ટ્રીય કવિઓની પંક્તિમાં તો આમ જ પટ્ટી વગાડતામાં જ આવી જશું. પણ ના, અમે કવિતાઓ તો નહીં જ લખીએ. આજે જરા જમાનો

બદલાયો છે ને! કવિતા? છી. એ તો જૂનવાણી. હવે તો શાયરીઓનો-ઉર્દૂ શાયરીનો અને ગઝલોનો જમાનો છે, એટલે અમેય રાષ્ટ્રીય શાયર થવા શાયરીઓ જ રચીએ તો કેવું? હમણાં તો યુદ્ધ (યુદ્ધવિરામ) નો સમય છે; વીરસથી અમે શાયરી ઓને છલકાવી દેશું સાથે સાથે સામાજિક વિષયોની પણ છણાવટ કરીશું. ક્યાં આપણી એ સમૃદ્ધ પ્રાચીન ભારતીય સંસ્કૃતિ—શિસ્ત, લજ્જા અને ચારિત્ર્યના પ્રતિક સમી; અને ક્યાં આજનું ભારત—અશિષ્ટ અને ઉચ્છૃંખલ પાશ્ચાત્ય સંસ્કૃતિથી રંગાયેલું—અમે એને ઉન્નત કરશું—અમારી શાયરીઓ રચી. નફાખોરી અને કાળાંબજાર જેવાં દૂપણાને દૂર કરવા પ્રયત્ન કરીશું; શેઅર રચી. દાણચોરી અને રાષ્ટ્ર વિરોધી પ્રવૃત્તિઓ દૂર કરવા કમ્મર કસીશું; ગઝલો રચી.

પણ, પણ. શું, પણ? આ સાંભળ્યું નહીં? રેડિયો પર શું આવે છે? “કવિરાજ અબ કવિતા કે મત કાન મરેડો; કુછ ધંધેકી ભી બાત કરો.....”

હા! ભલા, વાત તો સાચી! માળું હાળું, આ

કવિતાનું પૂંછડું ભારી! અમે તો ભાઈ, કંટાળી ગયા! કેમ? તે શું, આ જોતા નથી, ‘શું લખવું ને શું ન લખવું’ એ જ સમજતું નથી. માળું, ભેનું જ ગેપ થઈ જાય છે. વાર્તા લખું, નિબંધ લખું, કવિતા લખું કે શાયરી જોડું? શું કરું?

હેં! હેં!! હા, હા; એમ જ કરીએ! ચાલો ભાઈ, આપણે પણ લકી નંબરની જેમ બધા વિષયોની ચિઠ્ઠી બનાવીને જે નીકળે તે વિષય પર મહા નિબંધ કે કોઈ અમર કાવ્ય લખીશું. એક સમારંભ રચીશું કોઈ પ્રધાનજીને હાથે ચિઠ્ઠી ખેંચાવશું. સરસ. સરસ. એમ જ....

છડ કાંઈ જ નથી લખવું. કેમ? પણ ઓચિતું શું થઈ ગયું? અરે! ભાઈ, તે જોતા નથી, આ ભવાડા જોઈને કોઈ કહેશે, જોયા ના હોય મોટા લખવાવાળા તે! હટ, લખી લખીને આવું જ લખ્યું ને?

હો, ત્યારે અમેય ક્યાં તમને બળજબરી કરી’તી હેં? ત્યારે, વાંચ્યું જ શા માટે? અમે ત્યારે, બીનું શું કહીએ—હટ, વાંચી વાંચીને ય આવું જ વાંચ્યું??



આશ નિરાશ

ખભે ભેરવી, દરદની એક પોટલી
આસની એક લાકડી હાથે ધરી
મા-બાપ કરા વૃથાની છાયા મહોંથી
બહાર આવી—જિંદગીની વાટ પર
ધીરજની દિવાી પર—વાટને સંકોરીને
મુસાફરી મેં આદરી.

ધુમ તડકો, ઊડતી રેતી
ઊની ઊની લુઓ વાતી
મિતિ જ સામે મોટ માંડી
ધ્યેય ભણી આજે બહું
જિંદગીની રાહ કાપું
કાપીને આગળ ધપું.



મધુસુદન ઝવેરી

દિવસને પછી રાત આવે
રાતને વળી દિવસ આવે
સમયનું એમ ચક્ર ચાલે.

ત્યાં દીકરી તારી સુંવાળી ઝુંપડી
જિંદગીના મારગને એક હરીયાળી સાંપડી
આશરો વળી દીધો તેં બોલાવીને
પોટલીનું ઓશીકું ને ઓટલીની ગાદલી
વિસામો લેતો હું પડ્યો, બાજુએ મેલી લાકડી

મોજરાની મહેક આખી રાત ભર આવી રહી’તી
રાત આખી કલ્પનાની ફલજડી ઊડતી હતી
આકાશ મેં જોયા કરી મેં રાત આખી
ચંદ્રકિરણમાં ય નહાતી

એક અટૂલી ધોળી ધોળી વાદળી
નવજાત વાછરડી ને પેકે દોડતી 'તી
હિલ્લોળતી-હિલોળતી
પવનના હિચકારે એ ઝુલતી 'તી.

રાત આખી સપનાની મહેફીલ ખરી જામી હતી
સપના માંહે આવી તું,
ને પ્યારની તેં છેડી સરગમ
એ સરગમ પર સરી ગયો
જગત સહુ વિસરી ગયો
પ્રેમનો હું પંથી વ્યાકુલ-ભાવનાકુલ
સરગમ સુરો પર સરી ગયો
ને થઈ ગયો એમાંજ મથગુલ.

પણ, પણ.....
પ્રેમ તો સર ના થયો-હું ગમ લઈ પાછો ફર્યો
વહાણે ઉઠી આકાશમાં મેં જોયું તો
ક્યાં ગઈ એ વાદળી?
ક્યાં ગયો એ ચંદ્ર?
મારી ક્યાં ગઈ એ લાકડી?

જિંદગીના દાવ પહેલો આજ હું હારી ગયો
એક મુસાફરને-મોલાવીને-લલચાવીને
મારી તેં જે એક દોકર
એજ દોકરથી ઉડ્યો
ને મંઝીલ ઉપર જઈ પડ્યો.

આજ મંઝીલ પદે, પરંતુ તું નથી
તું નથી-ને જીવનને કંઈ ગતિ નથી
જીવનમાં પ્રગતિ નથી
જે જીવનમાં જે પ્રેમ ના હો
એ જીવનને વ્યર્થ જાણો
વ્યર્થ એવા આ જીવનમાં
અર્થને પણ અર્થ શેનો?

જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી



પ્રેમને હોય છે લગની
બુદ્ધિ કદી હોતી નથી.
લગની વિના આ વિશ્વમાં
સિદ્ધિ કદી હોતી નથી.

ચકલીઓ ચણી જાય ખેતર
પછી પસ્તાયે શું વળે
પસ્તાવો કદી ના થાય નુજને
માટેજ તો એ કારણે
ચકલીઓને ચણતી અટકાવી દીધી.

સમયને મેં રોકી રાખ્યો
ઘટનાઓને રોકી રાખી
વીતી ગયેલો સમય નથી
કે તું બોલાવ ને હું
તોય પાછો આવ્યું ના.
તું જ મારી પ્રેરણા
ને તું જ મારી વેદના
તું જ મારું દર્દ છે
એ દર્દની છે તું દવા.

ઈશ્વર પાસે એક જીવન
માંડ માંડ હું માંગી લાવ્યો
એ જીવન પણ આદર્શ ના જીવ્યો
તો શું હું ખાક જીવ્યો.

દીપ્તિ માટે જે ઝગે કદી એ રવિ ના
કીર્તિ માટે જે લખે કદી એ કવિ ના
હેવાનો ખરિયો કરી-લોહીની શાહી કરી
જે પ્રીતિ માટે આ લખી છે આજ કવિતા.

શબ્દોનું આડંબર ધારી
આ કવિતાને અંતર ના દે
એમાં મુજ સમ એક કવિનું
સ્પષ્ટિત અંતર ના દે.

જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી
જિંદગીની મુશ્કેલી

સૌથીધર્મગમનને અપ્રતિમ આવકાર આપવાને ધરણીએ
અનેરો સાજ સજ્યો હતો. હરિયાળા ખેતરમાંના
પીળાથ પડતા ચણાનાં ડુંડાઓ પૂર્વ તરફ મસ્તક ઝુકાવી
રવિ નમસ્કાર કરી રહ્યાં હતાં. દૂર દૂર ઊભેલા નાના
નાના ટેકરાઓ કાળા-ભૂરા રંગમાંથી ભૂખરામાં પરિ-
વર્તિત થઈ રહ્યા હતા. ગામમાંથી ધીરે ધીરે ઊંચે ચડતો
ધૂમાડો સ્થગિત વાયુને લઈને સ્તંભશો બની ગગનને
ચૂમતો હતો. પૃથ્વીના યૌવને આજ માઝા મૂકી હતો
અને એ યૌવનના મહાન શૃંગાર રૂપ પેલા મોતી સા

“કર્તા નહિ કર્મ

ઓસબિન્દુઓ હરિયાળીમાં મલપતું ગૌર હાસ્ય વેરી રહ્યાં
હતાં-સૃષ્ટિના સૌન્દર્યને બહેકાવી રહ્યાં હતાં.

એજ સમયે અદેખાઈની આગમાં જવતું-વાંઝીયું
શું-વાયુ મંડળ એ સૌન્દર્યના નિર્મળ વારિને ડહોળાવતું
ધસી આવ્યું. રમણે ચડેલી પૃથ્વીદેવીના સૌન્દર્યને ઉજ-
વાવતાં વિખરાવતાં એ અભિમાનયુક્ત ગર્જના વડેવાતા-
પરણ કંકશ-કડવું બનાવવા લાગ્યું. એમાંય પેલી હીર-
કણિકાઓની (ઝાકળ બિન્દુઓની) માળા જોઈ દ્રૌપદું
ઝેર તેના અંગે અંગમાં વ્યાપી ગયું.

શૂ...ઉ...ઉ...ઉડ...ઉડ...સુસુ...ઊઊઊડ! ની ચીસોમાં
કંઈક ઘોઘારા સા સ્વરે એણે પડકાર ફેંક્યો: “રે
અલ્પ જીવડા! આ ક્ષણિક સૌન્દર્યનું આટલું ગુમાન?
પણ યાદ રાખ-દરેક વસ્તુ નાશવંત છે. તેમાંયે ગુમાન
અને તુજ થુદ્ર દેહ? ઘડી અધઘડીમાં તારું ચિન્હ પણ
આ પટમાં નહીં જડે. તારો આનંદ-આવેગ યાંભાવી
જરા ઈશ્વરને સ્મરી લે.”

ખડ! ખડ! ખડ!! ના હાસ્યધ્વનિથી સૃષ્ટિ ગાજી
ઊઠી. નિજ કાયાથીય વધારે કુમાશવાળા સ્વરોમાં
ઓસબિન્દુએ જવાબ વાળ્યો: “મિત્ર! હું જરૂર નાશ-
વંત છું, પરંતુ મુજ કાર્યો નહીં. મારા ઉર-અમીને સિંચી
મેં જ આ ફૂસલ (ચણાનો પાક જે મુખ્યત્વે ઝાકળ પરજ
આધારિત છે) ઉત્પન્ન કરી છે, તે હજારો માણસોની

જીવનાધાર બનશે. કદાચિત તું એ પાક પણ ધરાશય કર
દઈશ, પરંતુ એ પાકનાં કેટલાંક અમૃતબીજો આ પંખી-
ઓએ ક્યારનાં એ પોતાના ઉદરમાં છૂપાવીને મારો ઉપ-
કાર જગતની દશે દિશાઓમાં પોતાનાં હૃદયમંત્ર સ્વરોમાં
ફેલાવી દીધો છે. શું માફ આ ઋણ આ પૃથ્વીવાસીઓ
અને ભોળા નિર્દોષ પંખીઓ ભૂલી જશે? નહીં-કદાપી
નહીં. એ કાર્ય તુજ મર્યાદાની બહારનું છે, એ કરવાને
સર્વ પાર્થિવ શક્તિઓ અશક્તિમાન છે અને તેથી જ
હું મહાન છું. આ મહાનતા પર મુસ્તાક બની હું હસું
તો તેમાં ખોટું પણ શું છે? યાદ રાખ-કર્તા નહિ તેના
કર્મો (સારાં) અમર છે અને એ કર્મો કર્તાને અમર
બનાવે છે. દુષ્કર્મો પર જગતનો ખોફ કે દયા બે જ

અમર છે”

વર્ષા શકે છે જે સ્થુળ અને ક્ષણિક છે. આમ મારો ભોય
છે છતાં હું અક્ષય છું, ક્ષણિક છતાં ચિરંજીવ છું, નાશ-
વંત છતાં અવિનાશી છું; અલ્પ જીવિત છતાં અમર છું.”

આ શબ્દોસહુ સૃષ્ટિએ અલૌકિક નૃત્ય કર્યું; માનો
કે સૃષ્ટિના આણુઓએ જીવનના એ મહાન તાત્પર્યને
વધાવી લીધું. ચણાના ડુંડવાના ઝોકાએ અને ઓસ-
બિન્દુઓથી ભીની થયેલી માટીની સુવાસે ઓસબિન્દુએ
જય ઘોષ કર્યો. શૂ...ઉ...ઉડ! ના આનંદાદો અને કિકિ-
યારી પાડતો વાયુમંડળ નાસી ગયો. દૂર દૂર દેવાલયના
ઘંટે પોતાના સંગીતમય સ્વરમાં મૃદુલ ઓસબિન્દુને
વિજય ઘોષિત કર્યો ને વાયુમંડળને હાર સંભાષિત કરી
એજ પળે સૂર્ય પોતાના કિરણસરોને અણખાવી
જગતનાં દરેક આણુમાં, દશે ય દિશાઓમાં એ મહાન
સંદેશો પહોંચાડ્યો:

કર્તા નહીં કર્મ અમર છે. અમર કર્મ કર્તાને અમરતા
અર્પે છે.

● રમેશ શિયાલ



કોલેજના મેજીનીનમાં એકાદ વાર્તા આપવા નક્કી કર્યું. પરંતુ કેવી વાર્તા લખું? પ્રેમકહાની લખું સાહસકથા લખું, રહસ્યકથા લખું કે પછી પંચતંત્ર જેવી ઉપદેશાત્મક વાર્તા લખું; તત્ત્વજ્ઞાન પર લખું કે માનસશાસ્ત્ર પર લખું; આસ્તિક મનુષ્ય પર લખું કે નાસ્તિક; સમાજ સુધારણા પર લખું કે સમાજનાં દૂષણો પર લખું; નારીની પ્રગતિ પર લખું કે અધોગતિ અને બેવફાઈ પર લખું; સમજાતું નથી જ્ઞાના પર લખું.

ચાલો પ્રેમકથા જ લખું. આ ઉમરે પ્રેમકથા સારી લખાશે. વિચારોમાં વાસ્તવિકતા રહેશે. શશીકાંત અને મિનાક્ષી ઘણાં વર્ષોથી એકબીજાને ઓળખતાં હતાં, ઓળખાણમાંથી પ્રેમ થયો અને માતાપિતાની ઈચ્છા વિરુદ્ધ પરણી ગયા અને ખાધું-પીધું અને રાજ... નહીં મઝા કરી. નહીં પણ આવી વાર્તામાં શું મઝા આવે. અચાનક પ્રેમ થવો જોઈએ. એક દિવસ શશીકાંત-મિનાક્ષીની સહેલી સુશિલાને જુએ છે બસ એના દીવમાં એ વસી જાય છે. એ મિનાક્ષીને કહે છે એના એ પ્રેમની વાત. મિનાક્ષી પ્રથમ તો શશીકાંતને ચીડવે છે પરંતુ પછી પૂછે છે: “આમ એકદમ થઈ ગયું? દિવસ એકદમ છટકી ગયું?” શશીકાંત કહે છે;

મહોબતમાં કદી દિવની જીગરની વાત પૂછે માં, કમળમાં કેમ બીડાયો ભ્રમરની વાત પૂછે માં; મને પાગલ કરી દેતી નજરની વાત પૂછે માં; ઈશ્વારમાં જ લૂંટાતા જીગરની વાત પૂછે માં,

મિનાક્ષી કહે છે: “નિષ્ફળ જશે તો?” શશીકાંત કહે છે:

વસંતની મઝા માણી છે જીવનમાં નિરંતર મે કદી જોઈ નથી એ પાનખરની વાત પૂછે માં.

ઘોડા દિવસ પછી ઓળખાણ થાય છે અને વસંત એના પૂરબહારમાં ખીલે છે. શશીકાંત અને સુશિલા એક-

બીજાને ચાહે છે અને પરણી પણ જાય છે. નહીં પણ આમાં વાર્તાની મઝા નથી. પ્રેમમાં વિયોગની જરૂર છે. માટે આમ લખું; શશીકાંત અને સુશિલાના પ્રેમના પ્રવાહમાં એક અવરોધ આવે છે. સુશિલા એકાદ વર્ષ માટે શશીકાંતથી દૂર જાય છે. શશીકાંત વિયોગમાં ગમગીન રહે છે.

પ્રિયા વિણ જીવતર સૂનું; ગમે ન રાજ્ય આ ભૂનું
હૃદયમાં દર્દ દુઃખ દૂનું; નૂતન લાગે ન સહુ જૂનું.

પરંતુ એક વર્ષ પછી પાછા મળે છે અને લગન થાય છે. ના પણ આમ પણ કથા બરાબર નથી. પ્રેમમાં સફળતા જ મળે છે એવું નથી. નિષ્ફળતા જ ઘણાંને તો જોવા મળે છે. હા તો આમ લખું. શશીકાંત સુશિલાને પ્રથમ જુએ છે અને એનાં વિચારોમાં રાત-દિવસ પસાર કરે છે. ભણવામાં હવે એનું મન લાગતું નથી. ખાતા-પીતાંબિકતાં-બેસતાં એના જ વિચાર. પર્યટનમાં, પિક્ચરમાં, ફરવામાં એને સુશિલાની ખોટ સદા રહે છે. પહેલાં તો એ મિનાક્ષીથી બધું છુપાવે છે પરંતુ આખરે એ એને કહે છે. ના ના, આખરે એ એના બીજા ખાસ દોસ્ત નરેન્દ્રને કહે છે. નરેન્દ્ર એને સુશિલાને ભૂલી જવા કહે છે કારણ કે એ કદાચ ના જ પાડશે એમ એને લાગે છે. એ શશીકાંતને કોઈ બીજા છોકરીના વિચાર કરવા કહે છે પરંતુ સુશિલા તો નહીં જ મળે એમ કહે છે. શશીકાંત વિચારે છે સફળતા મેળવવી હોય તો એક જ વસ્તુને વળગી રહેવું જોઈએ. વેડફાતી વફાદારીમાં સફળતા નથી. આખરે એક દિવસ એ સુશિલાને પૂછી જ નાખે છે. નરેન્દ્રના ધારવા પ્રમાણે સુશિલા એનો ઈન્કાર કરે છે. શશીકાંત અત્યંત નિરાશ થાય છે. પરંતુ પછી શું? શું કામ ના પાડી હશે! મારામાં શી ખામી છે; એવા વિચારમાં શશીકાંત પાગલ જેવો થઈ જાય છે કે પછી એ આપઘાત કરે છે? કે પછી એ જિંદગીભર કુંવારો રહેવાનો નિશ્ચય કરે છે! શું શશીકાંતને કોઈબીજાના પ્રેમમાં પાડી પરણાવી દેવો. વાર્તા અટકી પડી. અંત શું આપવો સમજાતું

૨૬ ઈ. (મિક.)

નહીં પણ
ની જરૂર છે.
પ્રેમના પ્રવા-
વર્ષ માટે
ગમગીન

આ ભૂનું
જૂનું.

અને લગ્ન
પ્રેમમાં
ધણીને તો
સુશિલાને
સત-દિવસ
જનું નથી.

પર્યટનમાં,
રહે છે.

આખરે
ખાસ

મૂલી જવા
એને લાગે

કરવા
કહે છે.

હોય તો
વફા-

સુશિલાને
એનો

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એવાનો

પાડી
મજનું

N.C.C. GROUP

